CBSE

Class X

Chapter-wise Previous Years'

Questions

SCIENCE

MATHEMATICS

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Note: After attempting the questions, a student must refer to the stepwise solutions available on our website **www.aakash.ac.in** and compare his/her solutions with the solutions given on our website. To get the text solution, students are required to **sign in** their account with their login credentials.

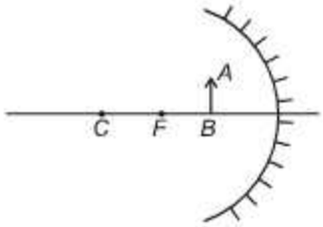
CHAPTER-WISE PREVIOUS YEARS' QUESTIONS

SCIENCE

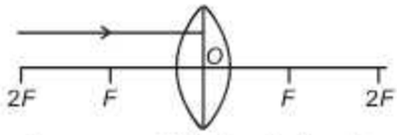
PHYSICS

1 : Light : Reflection and Refraction

1. Draw the following diagram in your answer-book and show the formation of image of the object, *AB* with the help of suitable rays. **[2008] ...[1M]**



2. Draw the given diagram in your answer book and complete it for the path of ray of light beyond the lens. **[2009] ...[1M]**

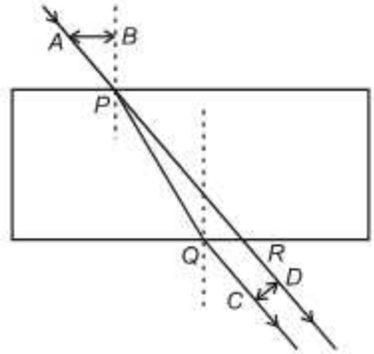


3. Why does a ray of light bend when it travels from one medium into another? **[2009] ...[1M]**

4. Explain why a ray of light passing through the centre of curvature of a concave mirror gets reflected along the same path. **[2010] ...[1M]**

5. What is the nature of the image formed by a concave mirror if the magnification produced by the mirror is +3? **[2010] ...[1M]**

6. For a ray of light passing through a glass slab, the lateral displacement was correctly measured as : **[2011] ...[1M]**



(a) *AB*

(b) *PQ*

(c) *CD*

(d) *PR*

7. To find the focal length of a concave mirror, Sita should choose which one of the following?

[2011] ...[1M]

(a) A mirror holder and screen holder

(b) A screen holder and a scale

(c) A mirror holder, a screen holder and a scale

(d) A screen, a mirror, holders for them and a scale

8. By using a convex lens, a student obtained a sharp image of his classroom window grill on a screen. In which direction should he move the lens to focus a distant tree instead of the grill?

[2011, 2016, 2017] ...[1M]

(a) Towards the screen

(b) Away from the screen

(c) Very far away from the screen

(d) Behind the screen

9. To determine the focal length of a convex lens by obtaining a sharp image of a distant object, the following steps were suggested which are not in proper sequence. **[2011, 2012] ...[1M]**

I. Hold the lens between the object and the screen.

II. Adjust the position of the lens to form a sharp image.

III. Select a suitable distant object.

IV. Measure the distance between the lens and the screen.

The correct sequence of steps to determine the focal length of the lens is

(a) III, I, II, IV

(b) III, I, IV, II

(c) III, IV, II, I

(d) I, II, III, IV

10. While tracing the path of a ray of light passing through a rectangular glass slab a student tabulated his observations as given below:

Sr. No.	$\angle i$	$\angle r$	$\angle e$
I	60°	40°	61°
II	50°	36°	51°
III	40°	28°	39°
IV	30°	20°	31°

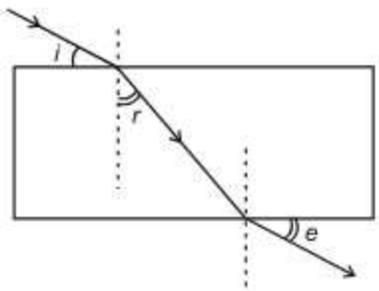
The **correct** observation is **[2012, 2013] ...[1M]**

(a) I (b) II

(c) III (d) IV

11. A student traces the path of a ray of white light through a rectangular glass slab and marks the angles of incidence ($\angle i$), refraction ($\angle r$) and emergence ($\angle e$) as shown.

[2012, 2014] ...[1M]



Which angle or angles have not been marked correctly?

(a) $\angle i$ only

(b) $\angle i$ and $\angle r$

(c) $\angle r$ and $\angle e$

(d) $\angle i$ and $\angle e$

12. A student obtained a sharp image of the grills of a window on a screen using a concave mirror. His teacher remarked that for getting better results a well lit distant object (preferably the Sun) should be focused on the screen. What should be done for this purpose?

[2012, 2013] ...[1M]

(a) Move the screen and the mirror towards the object

(b) Move the screen and the mirror away from the object

(c) Move the screen slightly away from the mirror

(d) Move the mirror slightly towards the screen

13. To determine focal length of a concave mirror a student obtains the image of a well lit distant object on a screen. To determine the focal length of the given concave mirror he needs to measure the distance between the

[2012]...[1M]

(a) Cannot be determined

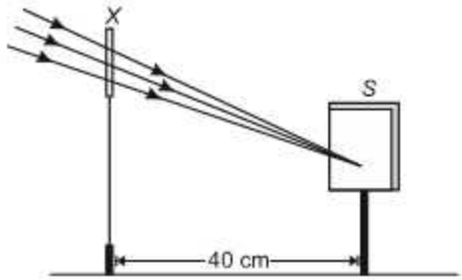
(b) Screen and the object

(c) Mirror and the object

(d) Mirror and the screen

14. A student focussed the image of a distant object using a device 'X' on a white screen 'S' as shown in the figure. If the distance of the screen from the device is 40 cm, select the correct statement about the device.

[2013, 2014, 2015, 2017] ...[1M]



(a) The device X is a convex lens of focal length 20 cm

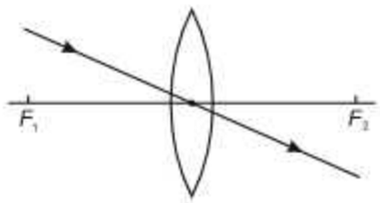
(b) The device X is a concave mirror of focal length 40 cm

(c) The device X is a convex mirror of radius of curvature 40 cm

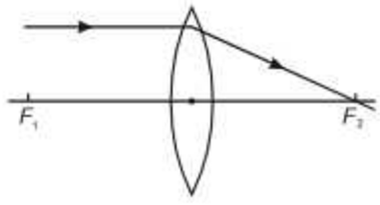
(d) The device X is a convex lens of focal length 40 cm.

15. Study the following ray diagrams : **[2013] ...[1M]**

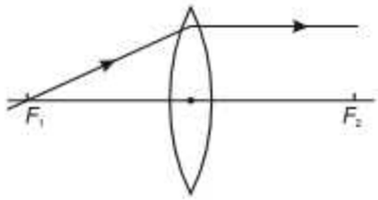
I.



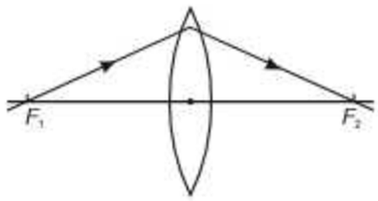
II.



III.



IV.



The diagrams showing the correct path of the ray after passing through the lens are :

(a) II and III only

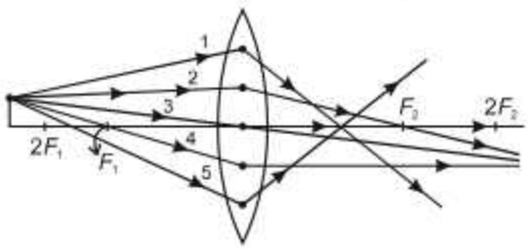
(b) I and II only

(c) I, II and III

(d) I, II and IV

16. Out of the five incident rays shown in the figure find the three rays which are obeying the laws of refraction and may be used for locating the position of the image formed by a convex lens:

[2013, 2014] ...[1M]



(a) 1, 2 and 3

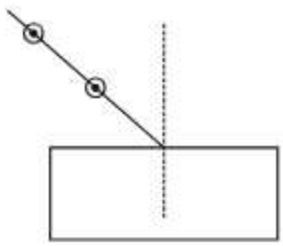
(b) 2, 3 and 4

(c) 3, 4 and 5

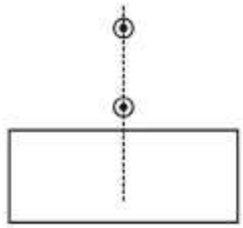
(d) 1, 2 and 4

17. Select from the following the best set-up for tracing the path of a ray of light through a rectangular glass slab: **[2013] ...[1M]**

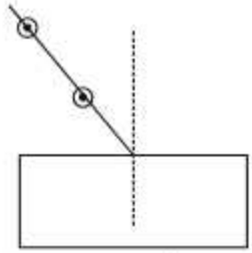
I.



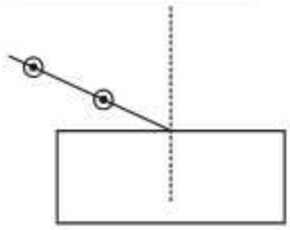
II.



III.



IV.



(a) I (b) II

(c) III (d) IV

18. In an experiment to trace the path of a ray of light through a glass prism for different values of angle of incidence a student would find that the emergent ray : **[2013] ...[1M]**

(a) Is parallel to the incident ray

(b) Perpendicular to the incident ray

(c) Is parallel to the refracted ray

(d) Bends at an angle to the direction of the incident ray

19. A student has obtained an image of a well-illuminated distant object on a screen to determine the focal length, F_1 of the given spherical mirror. The teacher then gave him another mirror of focal length, F_2 and asked him to obtain a focussed image of the same object on the same screen. The student found that in order to focus the same object using the second mirror, he has to move the mirror away from the screen. From this observation, it may be concluded that both the spherical mirrors given to the student were (select the correct option)

[2014] ...[1M]

(a) Concave and $F_1 < F_2$

(b) Concave and $F_1 > F_2$

(c) Convex and $F_1 < F_2$

(d) Convex and $F_1 > F_2$

20. A student is using a convex lens of focal length 10 cm to study the image formation by a convex lens for the various positions of the object. In one of his observations, he may observe that when the object is placed at a distance of 20 cm from the lens, its image is formed at (select the correct option) **[2014] ...[1M]**

(a) 20 cm on the other side of the lens and is of the same size, real and erect.

(b) 40 cm on the other side of the lens and is magnified, real and inverted.

(c) 20 cm on the other side of the lens and is of the same size, real and inverted.

(d) 20 cm on the other side of the lens and is of the same size, virtual and erect.

21. Draw a ray diagram to show the path of the reflected ray corresponding to an incident ray of light parallel to the principal axis of a convex mirror and show the angle of incidence and angle of reflection on it. **[2015] ...[1M]**

22. A student traces the path of a ray of light through a rectangular glass slab for the different values of angle of incidence. He observes all possible precautions at each step of the experiment. At the end of the experiment, on analyzing the measurements, which of the following conclusions is he likely to draw? **[2015] ...[1M]**

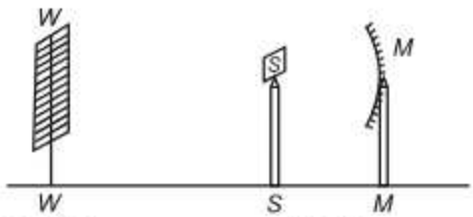
(a) $\angle i = \angle e < \angle r$

(b) $\angle i - \angle e < \angle r$

(c) $\angle i > \angle e > \angle r$

(d) $\angle i = \angle e > \angle r$

23. A student obtains a sharp image of the distant window (W) of the school laboratory on the screen (S) using the given concave mirror (M) to determine its focal length. Which of the following distances should he measure to get the focal length of the mirror? **[2015] ...[1M]**



(a) MW (b) MS

(c) SW (d) $MW - MS$

24. A 4 cm tall object is placed on the principal axis of a convex lens. The distance of the object from the optical centre of the lens is 12 cm and its sharp image is formed at a distance of 24 cm from it on a screen on the other side of the lens. If the object is now moved a little away from the lens, in which way (towards the lens or away from the lens) will he have to move the screen to get a sharp image of the object on it again?

How will the magnification of the image be affected? **[2015] ...[1M]**

25. To determine the approximate value of the focal length of a given concave mirror, you focus the image of a distant object formed by the mirror on a screen. The image obtained on the screen, as compared to the object is always. **[2016] ...[1M]**

(a) Laterally inverted and diminished

(b) Inverted and diminished

(c) Erect and diminished

(d) Erect and highly diminished

26. In your laboratory you trace the path of light rays through a glass slab for different values of angle of incidence ($\angle i$) and in each case measure the values of the corresponding angle of refraction ($\angle r$) and angle of emergence ($\angle e$). On the basis of your observations your correct conclusion is **[2016] ...[1M]**

(a) $\angle i$ is more than $\angle r$, but nearly equal to $\angle e$

(b) $\angle i$ is less than $\angle r$, but nearly equal to $\angle e$

(c) $\angle i$ is more than $\angle e$, but nearly equal to $\angle r$

(d) $\angle i$ is less than $\angle e$, but nearly equal to $\angle r$

27. An object is placed at a distance of 15 cm from a concave lens of focal length 30 cm. List four characteristic (nature, position, etc.) of the image formed by the lens. **[2017] ...[1M]**

28. The laws of reflection hold true for : **[2020] ...[1M]**

(a) Plane mirrors only

(b) Concave mirrors only

(c) Convex mirrors only

(d) All reflecting surfaces

29. When an object is kept within the focus of a concave mirror, an enlarged image is formed behind the mirror. This image is **[2020] ...[1M]**

(a) Real (b) Inverted

(c) Virtual and inverted (d) Virtual and erect

30. In which of the following is a concave mirror used? **[2021] ...[1M]**

(a) A solar cooker

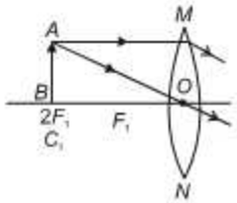
(b) A rear view mirror in vehicles

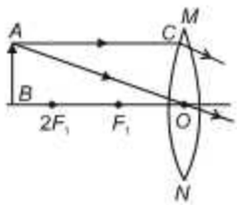
(c) A safety mirror in shopping malls

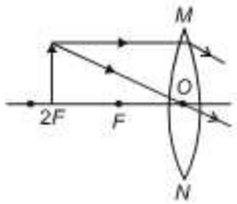
(d) In viewing full size image of distant tall buildings

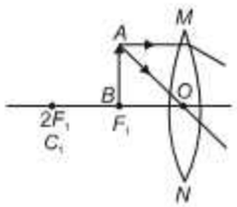
31. A student wants to obtain magnified image of an object *AB* as on a screen. Which one of the following arrangements shows the correct position of *AB* for him/her to be successful?

[2021] ...[1M]

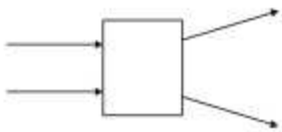
(a) 

(b) 

(c) 

(d) 

32. The following diagram shows the use of an optical device to perform an experiment of light. As per the arrangement shown, the optical device is likely to be a **[2021] ...[1M]**



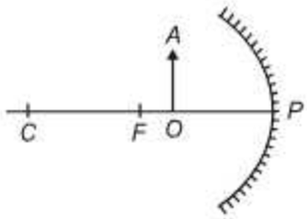
(a) Concave mirror (b) Concave lens

(c) Convex mirror (d) Convex lens

33. A ray of light starting from air passes through medium *A* of refractive index 1.50, enters medium *B* of refractive index 1.33 and finally enters medium *C* of refractive index 2.42. If this ray emerges out in air from *C*, then for which of the following pairs of media the bending of light is least? **[2021] ...[1M]**

(a) air-*A* (b) *A*-*B*

(c) *B*-*C* (d) *C*-air

34. 

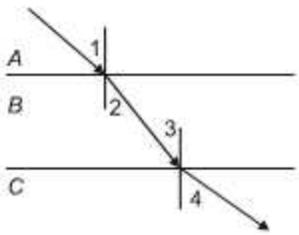
For the diagram shown, according to the new Cartesian sign convention the magnification of the image formed will have the following specifications: **[2021] ...[1M]**

(a) Sign - Positive, Value - Less than 1

(b) Sign - Positive, Value - More than 1

(c) Sign - Negative, Value - Less than 1

(d) Sign - Negative, Value - More than 1

35. 

A ray of light is incident as shown. If *A*, *B* and *C* are three different transparent media, then which among the following options is true for the given diagram? **[2021] ...[1M]**

(a) $\angle 1 > \angle 4$

(b) $\angle 1 < \angle 2$

(c) $\angle 3 = \angle 2$

(d) $\angle 3 > \angle 4$

36. If a lens can converge the sun rays at a point 20 cm away from its optical centre, the power of this lens is **[2021] ...[1M]**

(a) +2 D

(b) –2 D

(c) +5 D

(d) –5 D

37. The radius of curvature of a converging mirror is 30 cm. At what distance from the mirror should an object be placed so as to obtain a virtual image? **[2021] ...[1M]**

(a) Infinity

(b) 30 cm

(c) Between 15 cm and 30 cm

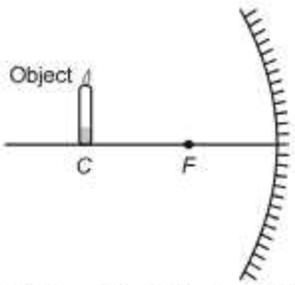
(d) Between 0 cm and 15 cm

38. A converging lens forms a three times magnified image of an object, which can be taken on a screen. If the focal length of the lens is 30 cm, then the distance of the object from the lens is **[2021] ...[1M]**

(a) –55 cm (b) –50 cm

(c) –45 cm (d) –40 cm

39.



Which of the following statements is **not** true in reference to the diagram shown above? **[2021] ...[1M]**

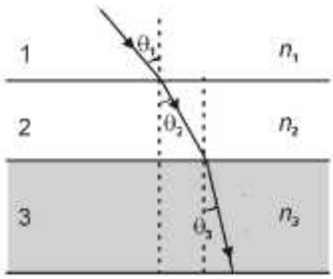
(a) Image formed is real

(b) Image formed is enlarged

(c) Image is formed at a distance equal to double the focal length

(d) Image formed is inverted

40.



In the diagram shown above n_1, n_2 and n_3 are refractive indices of the media 1, 2 and 3 respectively. Which one of the following is true in this case? **[2021] ...[1M]**

(a) $n_1 = n_2$ (b) $n_1 > n_2$

(c) $n_2 > n_3$ (d) $n_3 > n_1$

41. The refractive index of medium *A* is 1.5 and that of medium *B* is 1.33. If the speed of light in air is 3×10^8 m/s, what is the speed of light in medium *A* and *B* respectively? **[2021] ...[1M]**

(a) 2×10^8 m/s and 1.33×10^8 m/s

(b) 1.33×10^8 m/s and 2×10^8 m/s

(c) 2.25×10^8 m/s and 2×10^8 m/s

(d) 2×10^8 m/s and 2.25×10^8 m/s

42. An object of height 4 cm is kept at a distance of 30 cm from the pole of a diverging mirror. If the focal length of the mirror is 10 cm, the height of the image formed is **[2021] ...[1M]**

(a) +3.0 cm (b) +2.5 cm

(c) +1.0 cm (d) +0.75 cm

Case Study Based Questions (Q.43 to Q.46) :

A compound microscope is an instrument which consists of two lenses L_1 and L_2. The lens L_1 called objective, forms a real, inverted and magnified image of the given object. This serves as the object for the second lens L_2; the eye piece. The eye piece functions like a simple microscope or magnifier. It produces the final image, which is inverted with respect to the original object, enlarged and virtual.

43. What types of lenses must be L_1 and L_2? **[2021] ...[1M]**

(a) Both concave

(b) Both convex

(c) L_1 - concave and L_2 - convex

(d) L_1 - convex and L_2 - concave

44. What is the value and sign of magnification (according to the new Cartesian sign convention) of the image formed by L_1? **[2021] ...[1M]**

(a) Value = Less than 1 and Sign = Positive

(b) Value = More than 1 and Sign = Positive

(c) Value = Less than 1 and Sign = Negative

(d) Value = More than 1 and Sign = Negative

45. What is the value and sign of (according to new Cartesian sign convention) magnification of the image formed by L_2? **[2021] ...[1M]**

(a) Value = Less than 1 and Sign = Positive

(b) Value = More than 1 and Sign = Positive

(c) Value = Less than 1 and Sign = Negative

(d) Value = More than 1 and Sign = Negative

46. If power of the eyepiece (L_2) is 5 diopters and it forms an image at a distance of 80 cm from its optical centre, at what distance should the object be? **[2021] ...[1M]**

(a) 12 cm (b) 16 cm

(c) 18 cm (d) 20 cm

47. Draw ray diagrams to represent the nature, position and relative size of the image formed by a convex lens for the object placed :

(a) at $2F_1$.

(b) Between F_1 and the optical centre O of lens.

[2008] ...[2M]

48. What is the minimum number of rays required for locating the image formed by a concave mirror for an object? Draw a ray diagram to show the formation of a virtual image by a concave mirror. **[2009] ...[2M]**

49. State any four characteristics of the image of the objects formed by a plane mirror. **[2011] ...[2M]**

50. List four properties of the image formed by a concave mirror when an object is placed between the focus and pole of the mirror.

[2012] ...[2M]

51. "A concave mirror of focal length 15 cm can form a magnified, erect as well as inverted image of an object placed in front of it." Justify this statement stating the position of the object with respect to the pole of the mirror in both the cases for obtaining the images. **[2014] ...[2M]**

52. An object of height 2.5 cm is placed at a distance of 15 cm from the optical centre 'O' of a convex lens of focal length 10 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical 'O', principal focus F and height of the image on the diagram.

[2016, 2018] ...[2M]

53. The refractive indices of glass and water with respect to air are $\frac{3}{2}$ and $\frac{4}{3}$ respectively. If speed of light in glass 2×10^8 m/s, find the speed of light in water. **[2016] ...[2M]**

54. If the image formed by a spherical mirror for all positions of the object placed in front of it is always erect and diminished, what type of mirror is it? Draw a labelled ray diagram to support your answer. **[2018] ...[2M]**

55. List four precautions which a student should observe while determining the focal length of a given convex lens by obtaining image of a distant object on a screen. **[2019] ...[2M]**

56. At what distance should an object be placed from a convex lens of focal length 18 cm to obtain an image at 24 cm from it on the other side. What will be magnifications produced in this case? **[2010] ...[3M]**

57. An object is placed between infinity and the pole of a convex mirror. Draw a ray diagram and also state the position, the relative size and the nature of the image formed. **[2011] ...[3M]**

58. What is the principle of reversibility of light? Show that the incident ray of light is parallel to the emergent ray of light when light falls obliquely on a side of a rectangular glass slab. **[2011, 2013] ...[3M]**

59. State the type of mirror preferred as **[2012, 2013] ...[3M]**

(i) Rear view mirrors in vehicles

(ii) Shaving mirrors.

Justify your answer giving two reasons in each case.

60. The image of a candle flame placed at a distance of 36 cm from a spherical lens is formed on a screen placed at a distance of 72 cm from the lens. Identify the type of lens and calculate its focal length. If the height of the flame is 2.5 cm, find the height of the image. **[2012] ...[3M]**

61. A student wants to project the image of a candle flame on a screen 90 cm in front of a mirror by keeping the flame at a distance of 15 cm from its pole. **[2014] ...[3M]**

(a) Suggest the type of mirror he should use

(b) Determine the linear magnification in this case

(c) Find the distance between the object and its image

(d) Draw ray diagram to show the image formation in this case

62. Draw a ray diagram to show the path of the refracted ray in each of the following cases :

A ray of light incident on a concave lens is **[2014] ...[3M]**

(i) Passing through its optical centre.

(ii) Parallel to its principal axis.

(iii) Directed towards its principal focus.

63. An object of height 5 cm is placed perpendicular to the principal axis of a concave lens of focal length 10 cm. If the distance of the object from the optical centre of the lens is 20 cm, determine the position, nature and size of the image formed using the lens formula.

[2015] ...[3M]

64. The image formed by a spherical mirror is real, inverted and is of magnification –2. If the image is at a distance of 30 cm from the mirror, where is the object placed? Find the focal length of the mirror. List two characteristics of the image formed if the object is moved 10 cm towards the mirror. **[2016] ...[3M]**

65. "A lens can form a magnified erect image as well as magnified inverted image of an object placed in front of it". State the nature of this lens and draw ray diagrams to justify the above statement. Mark the positions of *O*, *F* and *2F* in the diagram.

[2017] ...[3M]

66. State the laws of refraction of light. Explain the term 'absolute refractive of a medium' and write an expression to relate it with the speed of light in vacuum. **[2018] ...[3M]**

67. (A) Define the following terms in the context of a diverging mirror : **[2023] ...[3M]**

(i) Principal focus

(ii) Focal length

Draw a labelled ray diagram to illustrate your answer.

OR

(B) An object of height 10 cm is placed 25 cm away from the optical centre of a converging lens of focal length 15 cm. Calculate the image-distance and height of the image formed.

68. The power of a lens is +4 D. Find the focal length of this lens. An object is placed at a distance of 50 cm from the optical centre of this lens. State the nature and magnification of the image formed by the lens and also draw a ray diagram to justify your answer. **[2023] ...[3M]**

69. The ability of a medium to refract light is expressed in terms of its optical density. Optical density has a definite connotation. It is not the same as mass density. On comparing two media, the one with the large refractive index is optically denser medium than the other. The other medium with a lower refractive index is optically rarer. Also the speed of light through a given medium is inversely proportional to its optical density. **[2023] ...[4M]**

(i) Determine the speed of light in diamond if the refractive index of diamond with respect to vacuum is 2.42. Speed of light in vacuum is 3×10^8 m/s.

(ii) Refractive indices of glass, water and carbon disulphide are 1.5, 1.33 and 1.62 respectively. If a ray of light is incident in these media at the same angle (say θ), then write the increasing order of the angle of refraction in these media.

(iii) (A) The speed of light in glass is 2×10^8 m/s and in water is 2.25×10^8 m/s.

(a) Which one of the two is optically denser and why?

(b) A ray of light is incident normally at the water-glass interface when it enters a thick glass container filled with water. What will happen to the path of the ray after entering the glass? Give reason.

OR

(iii) (B) The absolute refractive indices of water and glass are 4/3 and 3/2 respectively. If the speed of light in glass is 2×10^8 m/s, find the speed of light in (i) vacuum and (ii) water.

70. (a) Draw a ray diagram to show the formation of image of an object placed between infinity and the optical centre of a concave lens.

(b) A concave lens of focal length 15 cm forms an image 10 cm from the lens. Calculate

(i) The distance of the object from the lens.

(ii) The magnification for the image formed.

(iii) The nature of the image formed.

[2011] ...[5M]

71. List the sign conventions for reflection of light by spherical mirrors. Draw a diagram and apply these conventions in the determination of focal length of a spherical mirror which forms a three times magnified real image of an object placed 16 cm in front of it.

[2012] ...[5M]

72. (a) Explain the following terms related to spherical lenses : **[2014] ...[5M]**

(i) Optical centre

(ii) Centres of curvature

(iii) Principal axis

(iv) Aperture

(v) Principal focus

(vi) Focal length

(b) A converging lens has focal length of 12 cm. Calculate at what distance the object should be placed from the lens so that it forms an image at 48 cm on the other side of the lens?

73. What is meant by power of a lens? Define its SI unit. You have two lenses *A* and *B* of focal lengths +10 cm and –10 cm, respectively. State the nature and power of each lens. Which of the two lenses will form a virtual and magnified image of an object placed 8 cm from the lens? Draw a ray diagram to justify your answer.

[2015, 2018] ...[5M]

74. One half of a convex lens of focal length 10 cm is covered with a black paper. Can such a lens produce an image of a complete object placed at a distance of 30 cm from the lens? Draw a ray diagram to justify your answer. A 4 cm tall object is placed perpendicular to its principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 15 cm. Find the nature, position and the size of the image. **[2015] ...[5M]**

75. It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm.

(i) What should be the range of distance of an object placed in front of the mirror?

(ii) Will the image be smaller or larger than the object? Draw ray diagram to show the formation of image in this case.

(iii) Where will the image of this object be, if it is placed 24 cm in front of the mirror? Draw ray diagram for this situation also justify your answer.

Show the positions of pole, principal focus and the centre of curvature in the above ray diagrams.

[2016] ...[5M]

76. (a) Define focal length of a divergent lens.

(b) A divergent lens of focal length 30 cm forms the image of an object of size 6 cm on the same side as the object at a distance of 15 cm from its optical center. Use lens formula to determine the distance of the object from the lens and the size of the image formed.

(c) Draw a ray diagram to show the formation of image in the above situation. **[2016] ...[5M]**

77. Analyse the following observation table showing variation of image distance (v) with object distance (u) in case of convex lens and answer the questions that follow without doing any calculations:

Sr. No.	Object Distance u (cm)	Image Distance v (cm)
1	–100	+25
2	–60	+30
3	–40	+40
4	–30	+60
5	–25	+100
6	–15	+120

(a) What is the focal length of the convex lens? Give reason to justify your answer.

(b) Write the serial number of the observation which is not correct. On what basis have you arrived at this conclusion?

(c) Select an appropriate scale and draw a ray diagram for the observation at S. No. 2. Also find the approximate value of magnification.

[2017] ...[5M]

78. (a) If the image formed by a mirror for all position of the object placed in front of it is always diminished, erect and virtual. State the type of the mirror and also draw a ray diagram to justify your answer. Write one use of such mirrors are put to and why.

(b) Define the radius of curvature of spherical mirrors. Find the nature and focal length of a spherical mirror whose radius of curvature is +24 cm. **[2017] ...[5M]**

79. An object is placed at a distance of 60 cm from a concave lens of focal length 30 cm.

[2019] ...[5M]

(a) Use lens formula to find the distance of the image from the lens.

(b) List four characteristics of the image (nature, position, size, erect/inverted) formed by the lens in this case.

(c) Draw ray diagram to justify your answer of part (b).

80. Draw a ray diagram in each of the following cases to show the formation of image, when the object is placed: **[2020] ...[5M]**

(i) Between optical centre and principal focus of a convex lens.

(ii) Anywhere in front of a concave lens.

(iii) At $2F$ of a convex lens.

State the signs and values of magnifications in the above mentioned cases (i) and (ii).

81. An object 4.0 cm in size, is placed 25.0 cm in front of a concave mirror of focal length 15.0 cm.

(i) At what distance from the mirror should a screen be placed in order to obtain a sharp image?

(ii) Find the size of the image.

(iii) Draw a ray diagram to show the formation of image in this case. **[2020] ...[5M]**

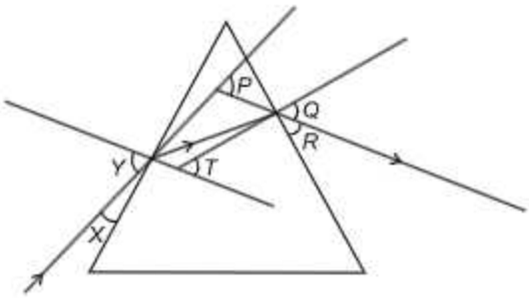
2 : Human Eye and Colourful World

1. Why does sky look blue on a clear day?

[2009] ...[1M]

2. In the following diagram, the path of a ray of light passing through a glass prism is shown:

[2014] ...[1M]



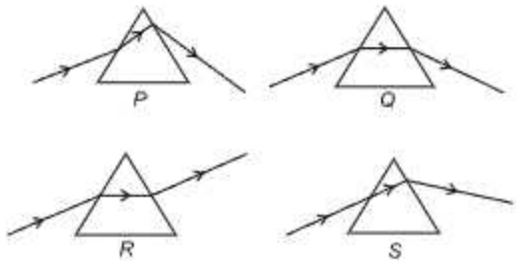
In this diagram the angle of incidence, the angle of emergence and the angle of deviation respectively are (select the correct option) :

(a) X, R and T (b) Y, Q and T

(c) X, Q and P (d) Y, Q and P

3. Study the following diagrams in which the path of a ray of light passing through a glass prism as traced by four students P, Q, R and S is shown:

[2014] ...[1M]

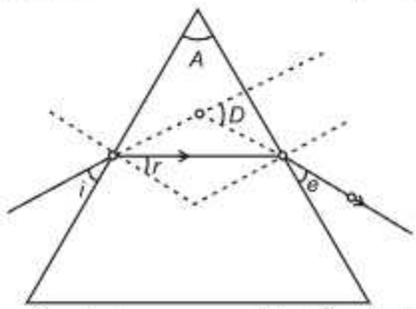


The student who has traced the path correctly is

(a) P (b) Q

(c) R (d) S

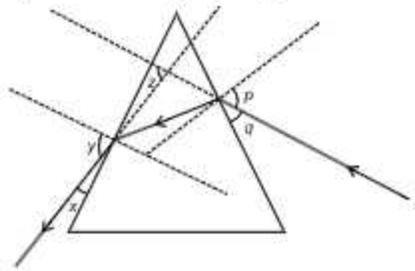
4. In the following ray diagram the correctly marked angles are: **[2016] ...[1M]**



(a) $\angle i$ and $\angle e$ (b) $\angle A$ and $\angle D$

(c) $\angle i$, $\angle e$ and $\angle D$ (d) $\angle r$, $\angle A$ and $\angle D$

5. Study the following ray diagram:



In this diagram, the angle of incidence, the angle of emergence and the angle of deviation respectively have been represented by

[2017] ...[1M]

(a) y, p, z (b) x, q, z

(c) p, y, z (d) p, z, y

6. A student very cautiously traces the path of a ray through a glass slab for different values of the angle of incidence ($\angle i$). He then measures the corresponding values of the angle of refraction ($\angle r$) and the angle of emergence ($\angle e$) for every value of the angle of incidence. On analysing these measurement of angles, his conclusion would be. **[2017] ...[1M]**

(a) $\angle i > \angle r > \angle e$ (b) $\angle i = \angle e > \angle r$

(c) $\angle i < \angle r < \angle e$ (d) $\angle i = \angle e < \angle r$

7. Which of the following statements is not true for scattering of light? **[2021] ...[1M]**

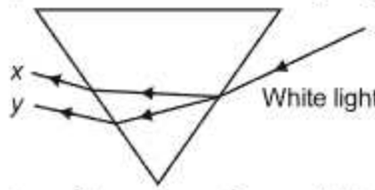
(a) Colour of the scattered light depends on the size of particles of the atmosphere

(b) Red light is least scattered in the atmosphere.

(c) Scattering of light takes place as various colours of white light travel with different speed in air.

(d) The fine particles in the atmospheric air scatter the blue light more strongly than red. So the scattered blue light enters our eyes.

8. In the diagram given below, *x* and *y* are the end colours of the spectrum of white light. The colour of '*y*' represents the **[2021] ...[1M]**



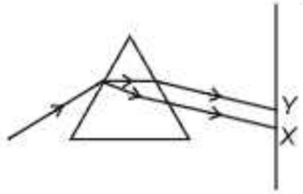
(a) Colour of sky as seen from earth during the day

(b) Colour of the sky as seen from the moon

(c) Colour used to paint the danger signals

(d) Colour of sun at the time of noon

9. In the figure given below a narrow beam of white light is shown to pass through a triangular glass prism. After passing through the prism it produces a spectrum *XY* on a screen. **[2010] ...[2M]**



(a) State the colour seen at *X* and *Y*.

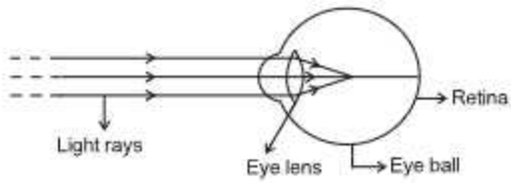
(b) Why do different colours of white light bend through different angles with respect to the incident beam of light?

10. Draw a diagram to show dispersion of white light by a glass prism. What is the cause of this dispersion? **[2011] ...[2M]**

11. When we place a glass prism in the path of a narrow beam of white light, a spectrum is obtained. What happens when a second identical prism is placed in an inverted position with respect to the first prism? Draw a labelled ray diagram to illustrate it. **[2012] ...[2M]**

12. Define the term power of accommodation. Write the modification in the curvature of the eye lens which enables us to see the nearby objects clearly. **[2019] ...[2M]**

13. (A) Observe the following diagram and answer the questions following it : **[2023] ...[2M]**



(i) Identify the defect of vision shown.

(ii) List its two causes.

(iii) Name the type of lens used for the correction of this defect.

OR

(B) The colour of clear sky from the earth appears blue but from the space it appears black. Why?

14. What is hypermetropia? State the two causes of hypermetropia. With the help of ray diagrams, show :

(i) The eye-defect hypermetropia

(ii) Correction of hypermetropia by using a lens

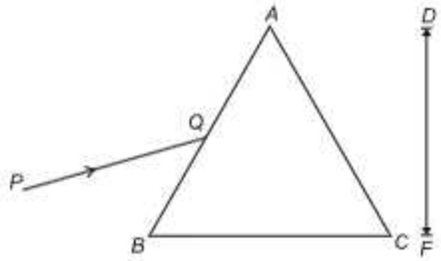
[2009] ...[3M]

15. At what distance should an object be placed from a convex lens of focal length 18 cm to obtain an image at 24 cm from it on the other side. What will be magnification produced in this case? **[2010] ...[3M]**

16. (a) What is meant by the power of accommodation of an eye?

(b) A person with a myopic eye cannot see objects beyond 1.2 m directly. What should be the type of the corrective lens used? What would be its power? **[2011] ...[3M]**

17. A narrow beam *PQ* of white light is passing through a glass prism *ABC* as shown in the diagram. **[2014] ...[3M]**



Trace it on your answer sheet and show the path of the emergent beam as observed on the screen *DE*.

(i) Write the name and cause of the phenomenon observed.

(ii) Where else in nature is this phenomenon observed?

(iii) Based on this observation, state the conclusion which can be drawn about the constituents of white light.

18. Write the importance of ciliary muscles in the human eye. Name the defect of vision that arises due to gradual weakening of the ciliary muscles. What types of lenses are required by the person suffering from this defect to see the objects clearly?

Akshay, sitting in the last row in his class, could not see clearly the words written on the blackboard. When the teacher noticed it, he announced if any student sitting in the front row could volunteer to exchange his seat with Akshay. Salman immediately agreed to exchange his seat with Akshay. He could now see the words written on the blackboard clearly. The teacher thought it fit to send the message to Akshay's parents advising them to get his eyesight checked. In the context of the above event, answer the following questions:

(a) Which defect of vision is Akshay suffering from? Which type of lens is used to correct this defect?

(b) State the values displayed by the teacher and Salman.

(c) In your opinion, in what way can Akshay express his gratitude towards the teacher and Salman? **[2015] ...[3M]**

19. Describe an activity to show that colours of white light splitted by a glass prism can be recombined to get white light by another identical glass prism. Also draw ray diagram to show the recombination of the spectrum of white light. **[2016] ...[3M]**

20. What is "dispersion of white light"? Draw a labelled diagram to illustrate the recombination of the spectrum of white light. Why it is essential that the two prisms used for the purpose should be identical and placed in an inverted position with respect to each other? **[2017] ...[3M]**

21. Trace the sequence of events which occur when a bright light is focussed on your eyes. **[2019] ...[3M]**

22. What is a rainbow? Draw a labelled diagram to show the formation of a rainbow. **[2019] ...[3M]**

23. Why is Tyndall effect shown by colloidal particles? State four instances of observing the Tyndall effect. **[2020]...[3M]**

24. Differentiate between a glass slab and a glass prism. What happens when a narrow beam of (i) a monochromatic light, and (ii) white light passes through (a) glass slab and (b) glass prism? **[2020]...[3M]**

25. (a) Give reasons for the following :

(i) Colour of the clear sky is blue.

(ii) We cannot see an object clearly if it is placed very close to the eyes.

(b) What is Presbyopia? Write two causes of this defect. **[2008] ...[4M]**

26. (a) What is meant by dispersion of white light? Describe the formation of rainbow in the sky with the help of a diagram.

(b) What is hypermetropia? Draw ray diagrams to show the image formation of an object by :

(i) Hypermetropic eye

(ii) Correction made with a suitable lens for hypermetropic eye. **[2008] ...[5M]**

27. (a) A student suffering from myopia is not able to see distinctly the object placed beyond 5 m. List two possible reasons due to which this defect of vision may have arisen. With the help of ray diagrams explain

(i) Why the student is unable to see distinctly the objects placed beyond 5 m from his eyes.

(ii) The type of the corrective lens used to restore proper vision and how this defect is corrected by the use of this lens.

(b) If in this case, the numerical value of the focal length of the corrective lens is 5 m. Find the power of the lens as per the new Cartesian sign convention. **[2017] ...[5M]**

28. A student is unable to see clearly the words written on the blackboard placed at a distance of approximately 3 m from him. Name the defect of vision of the boy is suffering from. State the possible causes of this defect and explain the method of correcting it. **[2018] ...[3M]**

29. Write the function of each of the following parts of human eye:

(i) Cornea (ii) Iris

(iii) Crystalline lens (iv) Ciliary muscles

[2018] ...[2M]

3 : Electricity

1. Out of 60 W and 40 W lamps, which one has a higher electrical resistance when in use?

[2008] ...[1M]

2. What is the function of a galvanometer in a circuit? **[2019] ...[1M]**

3. At the time of short circuit, the electric current in the circuit : **[2020] ...[1M]**

(a) vary continuously

(b) does not change

(c) reduces substantially

(d) increases heavily

4. Two bulbs of 100 W and 40 W are connected in series. The current through the 100 W bulb is 1 A. The current through the 40 W bulb will be:

[2020] ...[1M]

(a) 0.4 A (b) 0.6 A

(c) 0.8 A (d) 1 A

5. Two LED bulbs of 12 W and 6 W are connected in series. If the current through 12 W bulb is 0.06 A the current through 6 W bulb will be :

[2023] ...[1M]

(a) 0.04 A (b) 0.06 A

(c) 0.08 A (d) 0.12 A

6. The resistance of a resistor is reduced to half of its initial value. If other parameters of the electrical circuit remain unaltered, the amount of heat produced in the resistor will become:

[2023] ...[1M]

(a) Four times (b) Two times

(c) Half (d) One fourth

7. Why are the coils of electric toasters made of an alloy rather than a pure metal?

[2008] ...[2M]

8. A piece of wire of resistance 20 Ω is drawn out so that its length is increased to twice its original length. Calculate the resistance of the wire in the new situation.

[2009] ...[2M]

9. The values of current (I) flowing through a given resistor of resistance (R), for the corresponding values of potential difference (V) across the resistor are as given below :

V(volts)	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0
I (amperes)	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0

Plot a graph between current (I) and potential difference (V) and determine the resistance (R) of the resistor. **[2018] ...[2M]**

10. While studying the dependence of potential difference (V) across a resistor on the current (I) passing through it, in order to determine the resistance of the resistor, a student took 5 readings for different values of current and plotted a graph between V and I. He got a straight line graph passing through the origin. What does the straight line signify? Write the method of determining resistance of the resistor using this graph. **[2019] ...[2M]**

11. What would you suggest to a student if while performing an experiment he finds that the pointer/ needle of the ammeter and voltmeter do not coincide with the zero marks on the scales when circuit is open? No extra ammeter/ voltmeter is available in the laboratory.

[2019] ...[2M]

12. Two lamps, one rated 60 W at 220 V and the other 40 W at 220 V, are connected in parallel to the electric supply at 220 V. **[2008] ...[3M]**

(a) Draw a circuit diagram to show the connections

(b) Calculate the current drawn from the electric supply.

(c) Calculate the total energy consumed by the two lamps together when they operate for one hour.

13. Two resistor, with resistances 5 Ω and 10 Ω respectively are to be connected to a battery of emf 6 V so as to obtain:

(a) How will you connect the resistances in each case?

(i) Minimum current flowing

(ii) Maximum current flowing

(b) Calculate the strength of the total current in the circuit in the two cases. **[2009] ...[3M]**

14. (a) Write Joule's law of heating.
(b) Two lamps, one rated 100 W ; 220 V, and the other 60 W; 220 V, are connected in parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is 220 V. **[2018] ...[3M]**

15. (a) List the factors on which the resistance of a conductor in the shape of a wire depends.
(b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.
(c) Why are alloys commonly used in electrical heating devices? Give reason. **[2018]...[3M]**

16. Show how would you join three resistors, each of resistance 9 Ω so that the equivalent resistance of the combination is **[2018]...[3M]**
(i) 13 Ω (ii) 6 Ω

17. (a) State the relation correlating the electric current flowing in a conductor and the voltage applied across it. Also draw a graph to show this relationship.
(b) Find the resistance of a conductor if the electric current flowing through it is 0.35 A when the potential difference across it is 1.4 V. **[2020] ...[3M]**

18. (a) Write the mathematical expression for Joule's law of heating.
(b) Compute the heat generated while transferring 96000 coulomb of charge in two hours through a potential difference of 40 V. **[2020] ...[3M]**

19. (a) State Ohm's Law. Represent it mathematically.
(b) Define 1 ohm.
(c) What is the resistance of a conductor through which a current of 0.5 A flows when a potential difference of 2 V is applied across its ends? **[2022] ...[3M]**

20. (a) List the factors on which the resistance of a uniform cylindrical conductor of a given material depends.
(b) The resistance of a wire of 0.01 cm radius is 10 Ω. If the resistivity of the wire is 50×10^{-8} Ω m, find the length of this wire. **[2022] ...[3M]**

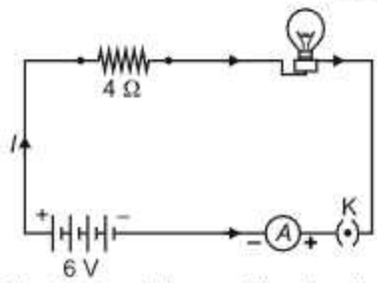
21. (a) What is the meaning of electric power of an electrical device? Write its SI unit.
(b) An electric kettle of 2 kW is used for 2h. Calculate the energy consumed in
(i) kilowatt hour, and
(ii) joules. **[2022] ...[3M]**

22. Derive the expression for the heat produced due to a current '*I*' flowing for a time interval '*t*' through a resistor '*R*' having a potential difference '*V*' across it ends. With which name is the relation known? How much heat will an instrument of 12 W produce in one minute if it is connected to a battery of 12 V? **[2010]...[5M]**

23. Explain with the help of a labelled circuit diagram how you will find the resistance of a combination of three resistor, of resistance R_1, R_2 and R_3 joined in parallel. Also mention how you will connect the ammeter and the voltmeter in the circuit when measuring the current in the circuit and the potential difference across one of the three resistors of the combination. **[2010] ...[5M]**

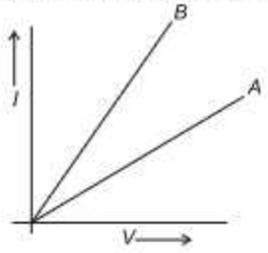
24. (a) With the help of a suitable circuit diagram prove that the reciprocal of the equivalent resistance of a group of resistances joined in parallel is equal to the sum of the reciprocals of the individual resistances.
(b) In an electric circuit two resistors of 12 Ω each are joined in parallel to a 6 V battery. Find the current drawn from the battery. **[2019] ...[5M]**

25. An electric lamp of resistance 20 Ω and a conductor of resistance 4 Ω are connected to a 6 V battery as shown in the circuit. Calculate : **[2019] ...[5M]**



(a) The total resistance of the circuit,
(b) The current through the circuit,
(c) The potential difference across the
(i) electric lamp and
(ii) conductor, and
(d) Power of the lamp.

26. (i) How is electric current related to the potential difference across the terminals of a conductor?
Draw a labelled circuit diagram to verify this relationship.
(ii) Why should an ammeter have low resistance?
(iii) Two *V-I* graphs *A* and *B* for series and parallel combinations of two resistors are as shown. Giving reason state which graph shows
(a) Series,
(b) Parallel combination of the resistors.

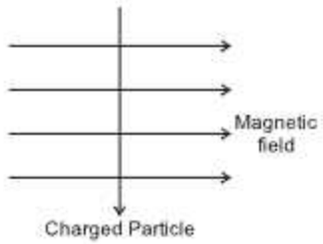


[2023] ...[5M]

4 : Magnetic Effects of Electric Current

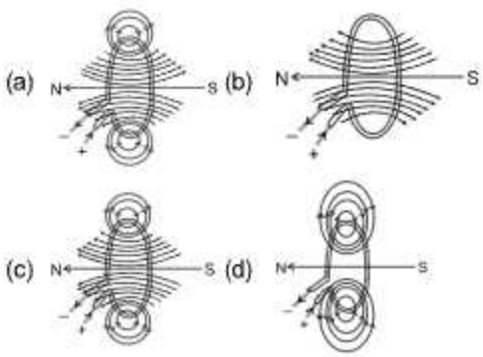
1. Why is a series arrangement not used for connecting domestic electrical appliances in a circuit? **[2008] ...[1M]**

2. A charged particle enters at right angles into a uniform magnetic field is shown. What should be the nature of charge on the particle if it begins to move in a direction pointing vertically out of the page due to its interaction with the magnetic field? **[2010] ...[1M]**

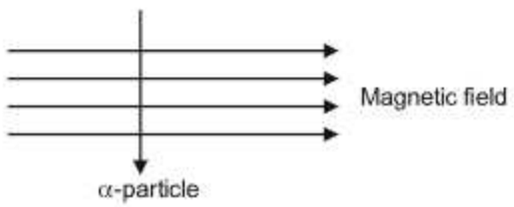


3. What is the function of a galvanometer in a circuit? **[2019] ...[1M]**

4. The correct pattern of magnetic field lines of the field produced by a current carrying circular loop is: **[2023] ...[1M]**



5. An alpha particle enters a uniform magnetic field as shown. The direction of force experienced by the alpha particle is: **[2023] ...[1M]**



(a) Towards right

(b) Towards left

(c) Into the page

(d) Out of the page

6. **A :** A current carrying straight conductor experiences a force when placed perpendicular to the direction of magnetic field. **[2023] ...[1M]**

R : The net charge on a current carrying conductor is always zero.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A)

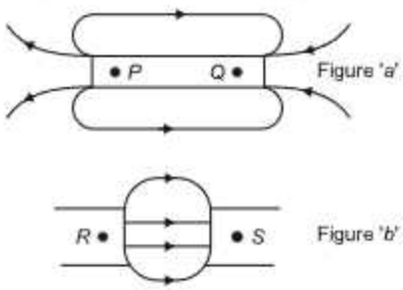
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(c) (A) is true but (R) is false

(d) (A) is false but (R) is true

7. What is meant by the term, 'magnetic field'? Why does a compass needle show deflection when brought near a bar magnet? **[2008] ...[2M]**

8. (a) Name the poles *P*, *Q*, *R* and *S* of the magnets in the following figures 'a' and 'b':



(b) State the inference drawn about the direction of the magnetic field lines on the basis of these diagrams. **[2022] ...[2M]**

OR

When is the force experienced by a current - carrying straight conductor placed in a uniform magnetic field **[2022] ...[2M]**

(i) Maximum ;

(ii) Minimum ?

9. (a) Distinguish between the terms 'overloading' and 'short-circuiting' as used in domestic circuits.

(b) Why are the coils of electric toasters made of any alloy rather than a pure metal?

[2008] ...[3M]

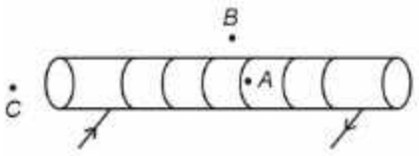
10. (A) (i) Why is an alternating current (A.C.) considered to be advantageous over direct current (D.C.) for the long distance transmission of electric power?

(ii) How is the type of current used in household supply different from the one given by a battery of dry cells?

(iii) How does an electric fuse prevent the electric circuit and the appliances from a possible damage due to short circuiting or overloading. **[2023] ...[3M]**

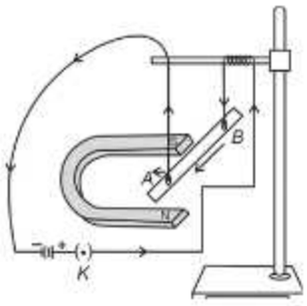
OR

(B) For the current carrying solenoid as shown, draw magnetic field lines and give reason to explain that out of the three points *A*, *B* and *C*, at which point the field strength is maximum and at which point it is minimum?



11. ***Case Study Based Questions :***

A student was asked to perform an experiment to study the force on a current carrying conductor in a magnetic field. He took a small aluminium rod *AB*, a strong horse shoe magnet, some connecting wires, a battery and a switch and connected them as shown. He observed that on passing current, the rod gets displaced. On reversing the direction of current, the direction of displacement also gets reversed. On the basis of your understanding of this phenomenon, answer the following questions: **[2022] ...[4M]**



(a) Why does the rod get displaced on passing current through it?

(b) State the rule that determines the direction of the force on the conductor *AB*.

(c) (i) If the U shaped magnet is held vertically and the aluminium rod is suspended horizontally with its end *B* towards due north, then on passing current through the rod from *B* to *A* as shown, in which direction will the rod be displaced?

(ii) Name any two devices that use current carrying conductors and magnetic field.

OR

Draw the pattern of magnetic field lines produced around a current carrying straight conductor held vertically on a horizontal cardboard. Indicate the direction of the field lines as well as the direction of current flowing through the conductor.

12. (a) What is a magnetic field? How can the direction of magnetic field lines at a place be determined?

(b) State the rule for the direction of the magnetic field produced around a current carrying conductor. Draw sketch of the pattern of field lines due to a current flowing through a straight conductor. **[2009] ...[5M]**

13. (a) What is a solenoid? Draw a sketch of the pattern of field lines of the magnetic field through and around a current carrying solenoid.

(b) Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right hand rule to find out the direction of the magnetic field inside and outside the loop. **[2009, 2010] ...[5M]**

14. State Fleming's left hand rule. **[2018] ...[1M]**

15. What is a solenoid? Draw the pattern of magnetic field lines of **[2019] ...[5M]**

(i) A current carrying solenoid and

(ii) A bar magnet.

List two distinguishing features between the two fields.

16. (a) What is an electromagnet? List any two uses.

(b) Draw a labelled diagram to show how an electromagnet is made.

(c) State the purpose of soft iron core used in making an electromagnet.

(d) List two ways of increasing the strength of an electromagnet if the material of the electromagnet is fixed. **[2020] ...[5M]**

CHEMISTRY

1 : Chemical Reactions and Equations

1. Balance the following chemical equation:

   $Fe(s) + H_2O(g) \longrightarrow Fe_3O_4(s) + H_2(g)$

   [2008]...[1M]

2. Why is respiration considered an exothermic process? **[2008]...[1M]**

3. Balance the following chemical equation:

   $Pb(NO_3)_2(s) \xrightarrow{heat} PbO(s) + NO_2(g) + O_2(g)$

   [2009]...[1M]

4. Name a reducing agent that may be used to obtain manganese from manganese dioxide.

   [2009]...[1M]

5. What change in the colour of iron nails and copper sulphate solution you observe after keeping the iron nails dipped in copper sulphate solution for about 30 minutes? **[2010]...[1M]**

6. In a double displacement reaction such as the reaction between sodium sulphate solution and barium chloride solution :

   (A) exchange of atoms takes place

   (B) exchange of ions takes place

   (C) a precipitate is produced

   (D) an insoluble salt is produced

   The correct option is : **[2020]...[1M]**

   (a) (B) and (D) (b) (A) and (C)

   (c) Only (B) (d) (B), (C) and (D)

7. A student took sodium sulphate solution in a test tube and added barium chloride solution to it. He observed that an insoluble substance has formed. The colour and molecular formula of the insoluble substance is **[2021]...[1M]**

   (a) Grey, Ba_2SO_4 (b) Yellow, $Ba(SO_4)_2$

   (c) White, $BaSO_4$ (d) Pink, $BaSO_4$

8. Sodium reacts with water to form sodium hydroxide and hydrogen gas. The balanced equation which represents the above reaction is **[2021]...[1M]**

   (a) $Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + 2H_2(g)$

   (b) $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$

   (c) $2Na(s) + 2H_2O(l) \rightarrow NaOH(aq) + 2H_2(g)$

   (d) $2Na(s) + H_2O(l) \rightarrow 2NaOH(aq) + 2H_2(g)$

9. $C_6H_{12}O_6(aq) + 6O_2(aq) \rightarrow 6CO_2(aq) + 6H_2O(l)$

   The above reaction is a/an **[2021]...[1M]**

   (a) displacement reaction

   (b) endothermic reaction

   (c) exothermic reaction

   (d) neutralisation reaction

10. Which of the following statements about the reaction given below are correct?

    $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

    (i) HCl is oxidized to Cl_2

    (ii) MnO_2 is reduced to $MnCl_2$

    (iii) $MnCl_2$ acts as an oxidizing agent

    (iv) HCl acts as an oxidizing agent

    [2021]...[1M]

    (a) (ii), (iii) and (iv) (b) (i), (ii) and (iii)

    (c) (i) and (ii) only (d) (iii) and (iv) only

11. It is important to balance the chemical equations to satisfy the law of conservation of mass. Which of the following statements of the law is incorrect?

    [2021]...[1M]

    (a) The total mass of the elements present in the reactants is equal to the total mass of the elements presents in the products.

    (b) The number of atoms of each element remains the same, before and after a chemical reaction.

    (c) The chemical composition of the reactants is the same before and after the reaction.

    (d) Mass can neither be created nor can it be destroyed in a chemical reaction.

12. Which one of the following reactions is categorised as thermal decomposition reaction?

    [2021]...[1M]

    (a) $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$

    (b) $2AgBr(s) \rightarrow 2Ag(s) + Br_2(g)$

    (c) $2AgCl(s) \rightarrow 2Ag(s) + Cl_2(g)$

    (d) $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

13. **Assertion (A) :** Burning of natural gas is an endothermic process.

Reason (R) : Methane gas combines with oxygen to produce carbon dioxide and water.

[2021]...[1M]

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true, but (R) is false.

(d) (A) is false, but (R) is true.

14. When aqueous solutions of potassium iodide and lead nitrate are mixed, an insoluble substance separates out. The chemical equation for the reaction involved is **[2023]...[1M]**

(a) $KI + PbNO_3 \rightarrow PbI + KNO_3$

(b) $2KI + Pb(NO_3)_2 \rightarrow PbI_2 + 2KNO_3$

(c) $KI + Pb(NO_3)_2 \rightarrow PbI + KNO_3$

(d) $KI + PbNO_3 \rightarrow PbI_2 + KNO_3$

15. A metal ribbon 'X' burns in oxygen with a dazzling white flame forming a white ash 'Y'. The correct description of X, Y and the type of reaction is **[2023]...[1M]**

(a) X = Ca; Y = CaO; Type of reaction = Decomposition

(b) X = Mg; Y = MgO; Type of reaction = Combination

(c) X = Al; Y = Al_2O_3; Type of reaction = Thermal decomposition

(d) X = Zn; Y = ZnO; Type of reaction = Endothermic

16. **A** : Reaction of Quicklime with water is an exothermic reaction. **[2023]...[1M]**

R : Quicklime reacts vigorously with water releasing a large amount of heat.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A)

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(c) (A) is true but (R) is false

(d) (A) is false but (R) is true

17. Give an example of a decomposition reaction. Describe an activity to illustrate such a reaction by heating. **[2008]...[2M]**

18. (i) What is the colour of ferrous sulphate crystals? How does this colour change after heating?

(ii) Name the products formed on strongly heating ferrous sulphate crystals. What type of chemical reaction occurs in this change?

[2009]...[2M]

19. What happen when an aqueous solution of sodium sulphate reacts with an aqueous solution of barium chloride? State the physical conditions of reactants in which the reaction between them will not take place. Write the balanced chemical equation for the reaction and name the type of reaction. **[2010]...[2M]**

20. No chemical reaction takes place when granules of a solid, A, are mixed with the powder of another solid, B. However, when the mixture is heated, a reaction takes place between its components. One of the products, C, is a metal and settles down in the molten state while the other product, D floats over it. It was observed that the reaction is highly exothermic.

(i) Based on the given information make an assumption about A and B and write a chemical equation for the chemical reaction indicating the conditions of reaction, physical state of reactants and products and thermal status of reaction.

(ii) Mention any two types of reaction under which above chemical reaction can be classified. **[2010]...[3M]**

21. Decomposition reactions require energy either in the form of heat or light or electricity for breaking down the reactants. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity.

[2018]...[3M]

22. 2 g of silver chloride is taken in a china dish and the china dish is placed in sunlight for sometime. What will be your observation in this case? Write the chemical reaction involved in the form of a balanced chemical equation. Identify the type of chemical reaction. **[2019]...[3M]**

23. Identify the type of reactions taking place in each of the following cases and write the balanced chemical equation for the reactions.

(i) Zinc reacts with silver nitrate to produce zinc nitrate and silver.

(ii) Potassium iodide reacts with lead nitrate to produce potassium nitrate and lead iodide.

[2019]...[3M]

24. (i) While electrolysing water before passing the current some drops of an acid are added. Why? Name the gases liberated at cathode and anode. Write the relationship between the volume of gas collected at anode and the volume of gas collected at cathode.

(ii) What is observed when silver chloride is exposed to sunlight? Give the type of reaction involved. **[2023]...[3M]**

2 : Acids, Bases and Salts

1. How does the flow of acid rain water into a river make the survival of aquatic life in the river difficult? **[2008] ...[1M]**

2. Fresh milk has a pH of 6. When it changes into curd (yogurt), will its pH value increase or decrease? Why? **[2009] ...[1M]**

3. Which of the following observations is true about dilute solution of acetic acid? **[2012] ...[1M]**

(a) It smells like vinegar and turns red litmus blue

(b) It smells like onion and turns blue litmus blue

(c) It smells like orange and turns red litmus blue

(d) It smells like vinegar and turns blue litmus red

4. A student adds 4 ml of acetic to a test tube containing 4 ml of distilled water. He then shakes the test tube and leaves it to settle. After about 10 minutes he observes: **[2012] ...[1M]**

(a) A layer of water over the layer of acetic acid

(b) A layer of acetic acid over the layer of water

(c) A precipitate settling at the bottom of the test tube

(d) A clear colourless solution

5. A student prepared 20% sodium hydroxide solution in a beaker containing water. The observations noted by him are given below. **[2013] ...[1M]**

(I) Sodium hydroxide is in the form of pellets.

(II) It dissolves in water readily.

(III) The beaker appears cold when touched from outside.

(IV) Red litmus paper turns blue when dipped into the solution.

The correct observations are:

(a) (I), (II), and (III) (b) (II), (III) and (IV)

(c) (III), (IV) and (I) (d) (I), (II) and (IV)

6. In an experiment to study the properties of acetic acid, a student takes about 2 ml of acetic acid in a dry test tube. He adds about 2 ml of water to it and shakes the test tube well. He is likely to observe that: **[2013] ...[1M]**

(a) The acetic acid dissolves readily in water.

(b) The solution becomes light orange.

(c) Water floats over the surface of acetic acid.

(d) Acetic acid floats over the surface of water.

7. The chemical formula for plaster of Paris is : **[2020] ...[1M]**

(a) $CaSO_4 \cdot 2H_2O$ (b) $CaSO_4 \cdot H_2O$

(c) $CaSO_4 \cdot \frac{1}{2}H_2O$ (d) $2CaSO_4 \cdot H_2O$

8. Baking soda is a mixture of : **[2020] ...[1M]**

(a) Sodium carbonate and acetic acid

(b) Sodium carbonate and tartaric acid

(c) Sodium hydrogen carbonate and tartaric acid

(d) Sodium hydrogen carbonate and acetic acid

9. Which of the following oxide(s) is/are soluble in water to form alkalies? **[2021] ...[1M]**

(i) Na_2O

(ii) SO_2

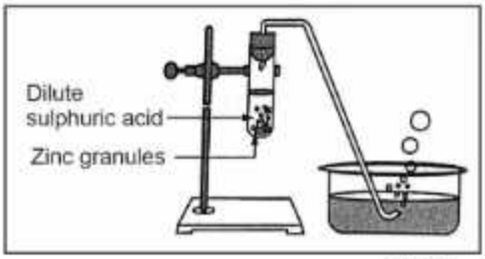
(iii) K_2O

(iv) NO_2

(a) (i) and (iii) (b) (i) only

(c) (ii) and (iv) (d) (iii) only

10. Study the diagram given below and identify the gas formed in the reaction.



[2021] ...[1M]

(a) Carbon di-oxide which extinguishes the burning candle
(b) Oxygen due to which the candle burns more brightly
(c) Sulphur dioxide which produces a suffocating smell
(d) Hydrogen which while burning produces a popping sound

11. Which of the options in the given table are correct?

Option	Natural Source	Acid Present
(i)	Orange	Oxalic acid
(ii)	Sour milk	Lactic acid
(iii)	Ant sting	Methanoic acid
(iv)	Tamarind	Acetic acid

[2021] ...[1M]

(a) (i) and (ii) (b) (i) and (iv)
(c) (ii) and (iii) (d) (iii) and (iv)

12. Select from the following statement which is true for bases. **[2021] ...[1M]**

(a) Bases are bitter and turn blue litmus red.
(b) Bases have a pH less than 7.
(c) Bases are sour and change red litmus to blue.
(d) Bases turn pink when a drop of phenolphthalein is added to them.

13. Study the following table and choose the correct option :

	Salt	Parent Acid	Parent Base	Nature of Salt
(a)	Sodium Chloride	HCl	NaOH	Basic
(b)	Sodium Carbonate	H_2CO_3	NaOH	Neutral
(c)	Sodium Sulphate	H_2SO_4	NaOH	Acidic
(d)	Sodium Acetate	CH_3COOH	NaOH	Basic

[2021] ...[1M]

14. Consider the pH value of the following acidic samples :

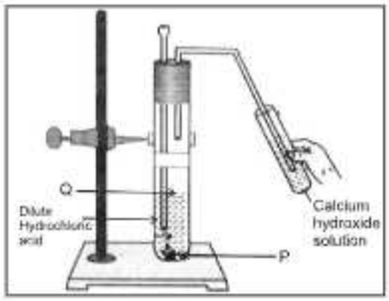
S.No.	Sample	pH value
1.	Lemon juice	2.2
2.	Gastric juice	1.2
3.	Vinegar	3.76
4.	Dil. Acetic acid	3.0

The decreasing order of their H^+ ion concentration is

[2021] ...[1M]

(a) 3 > 4 > 1 > 2 (b) 2 > 1 > 3 > 4
(c) 2 > 1 > 4 > 3 (d) 3 > 4 > 2 > 1

15. Study the experimental set up shown in given figure and choose the correct option from the following :



[2021] ...[1M]

	P	Q	Change observed in calcium hydroxide solution
(a)	K_2CO_3	Cl_2 gas	No change
(b)	$KHCO_3$	CO_2 gas	No change
(c)	$KHCO_3$	H_2 gas	Turns milky
(d)	K_2CO_3	CO_2 gas	Turns milky

16. Which of the following salts do not have the water of crystallisation? **[2021] ...[1M]**

(i) Beaching Powder
(ii) Plaster of Paris
(iii) Washing soda
(iv) Baking soda

(a) (ii) and (iv) (b) (i) and (iii)
(c) (ii) and (iii) (d) (i) and (iv)

17. **Assertion (A) :** Sodium hydrogen carbonate is used as an ingredient in antacids.

Reason (R) : $NaHCO_3$ is a mild non-corrosive basic salt. **[2021] ...[1M]**

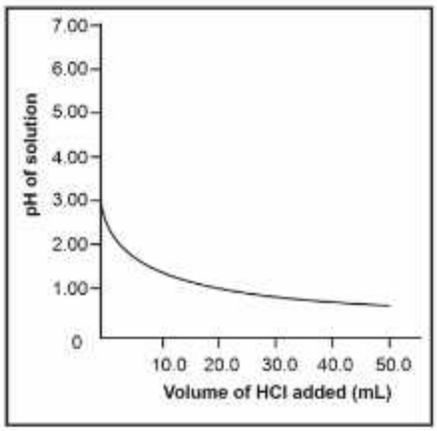
(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(c) (A) is true, but (R) is false

(d) (A) is false, but (R) is true

18. 50.0 mL of tap water was taken in a beaker. Hydrochloric acid was added drop by drop to water. The temperature and pH of the solution was noted. The following graph was obtained. Choose the correct statements related to this activity.



(i) The process of dissolving an acid in water is highly endothermic.

(ii) The pH of the solution increases rapidly on addition of acid.

(iii) The pH of the solution decreases rapidly on addition of acid.

(iv) The pH of tap water was around 7.0.

[2021] ...[1M]

(a) (i) and (ii) (b) (i) and (iii)

(c) (iii) and (iv) (d) (ii) and (iv)

19. When Sodium bicarbonate reacts with dilute hydrochloric acid, the gas evolved is **[2023] ...[1M]**

(a) Hydrogen; it gives pop sound with burning match stick.

(b) Hydrogen; it turns lime water milky.

(c) Carbon dioxide; it turns lime water milky.

(d) Carbon dioxide; it blows off a burning match stick with a pop sound.

20. Acid present in tomato is : **[2023] ...[1M]**

(a) Methanoic acid (b) Acetic acid

(c) Lactic acid (d) Oxalic acid

21. Sodium hydroxide is termed an alkali while Ferric hydroxide is not because : **[2023] ...[1M]**

(a) Sodium hydroxide is a strong base, while Ferric hydroxide is a weak base.

(b) Sodium hydroxide is a base which is soluble in water while Ferric hydroxide is also a base but it is not soluble in water.

(c) Sodium hydroxide is a strong base while Ferric hydroxide is a strong acid.

(d) Sodium hydroxide and Ferric hydroxide both are strong base but the solubility of Sodium hydroxide in water is comparatively higher than that of Ferric hydroxide.

22. The name of the salt used to remove permanent hardness of water is : **[2023] ...[1M]**

(a) Sodium hydrogen carbonate ($NaHCO_3$)

(b) Sodium chloride (NaCl)

(c) Sodium carbonate decahydrate ($Na_2CO_3 \times 10H_2O$)

(d) Calcium sulphate hemihydrate

$$(CaSO_4 \cdot \frac{1}{2}H_2O)$$

23. Write the chemical formula for washing soda. How may it be obtained from baking soda? Name an industrial use of washing soda other than washing clothes. **[2008] ...[2M]**

24. A compound which is prepared from gypsum has the property of hardening when mixed with a proper quantity of water. Identify the compound. Write the chemical equation for its preparation. For what purpose is it used in hospitals? **[2009] ...[2M]**

25. Blue litmus solution is added to two test tubes A and B containing dilute HCl and NaOH solution respectively. In which test tube a colour change will be observed? State the colour change and give its reason. **[2019] ...[2M]**

26. What is observed when 2 mL of dilute hydrochloric acid is added to 1 g of sodium carbonate taken in a clean and dry test tube? Write chemical equation for the reaction involved. **[2019] ...[2M]**

27. (A) A student took a small amount of copper oxide in a conical flask and added dilute hydrochloric acid to it with constant stirring. He observed a change in colour of the solution. **[2023] ...[2M]**

(i) Write the name of the compound formed and its colour.

(ii) Write a balanced chemical equation for the reaction involved.

OR

(B) The industrial process used for the manufacture of caustic soda involves electrolysis of an aqueous solution of compound 'X'. In this process, two gases 'Y' and 'Z' are liberated. 'Y' is liberated at cathode and 'Z', which is liberated at anode, on treatment with dry slaked lime forms a compound 'B'. Name X, Y, Z and B.

28. 2 mL of sodium hydroxide solution is added to a few pieces of granulated zinc metal taken in a test tube. When the contents are warmed, a gas evolves which is bubbled through a soap solution before testing. Write the equation of the chemical reaction involved and the test to detect the gas. Name the gas which will be evolved when the same metal reacts with dilute solution of a strong acid. **[2018] ...[3M]**

29. The pH of a salt used to make tasty and crispy pakoras is 14. Identify the salt and write a chemical equation for its formation. List its two uses. **[2018] ...[3M]**

30. Identify the acid and the base from which sodium chloride is obtained. Which type of salt is it? When is it called rock salt? How is rock salt formed? **[2019] ...[3M]**

31. List the important products of the Chlor-alkali process. Write one important use of each. **[2020] ...[3M]**

32. How is washing soda prepared from sodium carbonate? Give its chemical equation. State the type of this salt. Name the type of hardness of water which can be removed by it. **[2020] ...[3M]**

33. (i) Suggest a safe procedure of diluting a strong concentrated acid.

(ii) Name the salt formed when sulphuric acid is added to sodium hydroxide and write its pH.

(iii) Dry HCl gas does not change the colour of dry blue litmus paper. Why? **[2023] ...[3M]**

3 : Metals and Non-metals

1. A clean aluminium foil was placed in an aqueous solution of zinc sulphate. When the aluminium foil was taken out of the zinc sulphate solution after 15 minutes, its surface was found to be coated with a silvery grey deposit. From the above observation it can be concluded that: **[2011] ...[1M]**

(a) Aluminium is more reactive than zinc

(b) Zinc is more reactive than aluminium

(c) Zinc and aluminium both are equally reactive

(d) Zinc and aluminium both are non-reactive

2. Iron nails were dipped in an aqueous solution of copper sulphate. After about 30 minutes, it was observed that the colour of the solution changed from **[2011] ...[1M]**

(a) Colorless to light green

(b) Blue to light green

(c) Blue to colourless

(d) Green to blue

3. The colours of aqueous solutions of $CuSO_4$ and $FeSO_4$ as observed in the laboratory are : **[2012] ...[1M]**

(a) Pale green and light blue respectively

(b) Light blue and dark green respectively

(c) Dark blue and dark green respectively

(d) Dark blue and pale green respectively

4. A student prepared an aqueous solution of $CuSO_4$ in beaker X and an aqueous solution of $FeSO_4$ in beaker Y. He then dropped some iron pieces in beaker X and some zinc pieces in beaker Y. After about 10 hours, he observed that the solution in X and Y respectively appears: **[2012] ...[1M]**

(a) Blue and green

(b) Colourless and pale green

(c) Colourless and light blue

(d) Greenish and colourless

5. The compound obtained on reaction of iron with steam is/are : **[2020] ...[1M]**

(a) Fe_2O_3 (b) Fe_3O_4

(c) FeO (d) Fe_2O_3 and Fe_3O_4

6. An element 'X' reacts with O_2 to give a compound with a high melting point. This compound is also soluble in water. The element 'X' is likely to be :

[2020] ...[1M]

(a) Iron (b) Calcium

(c) Carbon (d) Silicon

7. Which one of the following structures correctly depicts the compound $CaCl_2$? **[2021] ...[1M]**

(a) $Ca^{2+}\left[:\ddot{Cl}:\right]^{2-}$

(b) $\left[:Ca:\right]^{2+}\left[:\ddot{Cl}:\right]_2$

(c) $Ca^{2+}\left[:\ddot{Cl}:\right]_2$

(d) $\left[:Ca:\right]^{+}\left[:\ddot{Cl}:\right]^{-}_2$

8. The pair(s) which will show displacement reaction is/are

(i) NaCl solution and copper metal

(ii) $AgNO_3$ solution and copper metal

(iii) $Al_2(SO_4)_3$ solution and magnesium metal

(iv) $ZnSO_4$ solution and iron metal

[2021] ...[1M]

(a) (ii) only

(b) (ii) and (iii)

(c) (iii) and (iv)

(d) (i) and (ii)

Case Study Based Questions (Q.9 to Q.12) :

A student, took four metals P, Q, R and S and carried out different experiments to study the properties of metals. Some of the observations were:

- All metals could not be cut with knife except metal R.
- Metal P combined with oxygen to form an oxide M_2O_3 which reacted with both acids and bases.
- Reaction with water.

P - Did not react either with cold or hot water but reacted with steam

Q - Reacted with hot water and the metal started floating

R - Reacted violently with cold water.

S - Did not react with water at all

Based on the above observations answer the following questions:

9. Out of the given metals, the one which needs to be stored using kerosene is **[2021] ...[1M]**

(a) P (b) R

(c) S (d) Q

10. Out of the given metals, the metal Q is

[2021] ...[1M]

(a) Iron (b) Zinc

(c) Potassium (d) Magnesium

11. Metal which forms amphoteric oxides is

[2021] ...[1M]

(a) P (b) Q

(c) R (d) S

12. The increasing order of the reactivity of the four metals is: **[2021] ...[1M]**

(a) P < Q < R < S

(b) S < R < Q < P

(c) S < P < Q < R

(d) P < R < Q < S

13. (a) What are amphoteric oxides? Choose the amphoteric oxides from amongst the following oxides :

Na_2O, ZnO, Al_2O_3, CO_2, H_2O

(b) Why is it that non-metals do not displace hydrogen from dilute acids? **[2008] ...[3M]**

14. What is meant by 'rusting'? With labelled diagrams, describe an activity to find out the conditions under which iron rusts? **[2009] ...[3M]**

15. Write the electronic configuration of two elements X and Y whose atomic numbers are 20 and 17 respectively. Write the molecular formula of the compound formed when element X reacts with element Y. Draw electron-dot structure of the product and also state the nature of the bond formed between both the elements.

[2017] ...[3M]

16. What is 'rusting'? Describe with a labelled diagram an activity to investigate the conditions under which iron rusts.

[2020] ...[3M]

17. The melting points and boiling points of some ionic compounds are given below:

Compound	Melting Point (K)	Boiling Point (K)
NaCl	1074	1686
LiCl	887	1600
$CaCl_2$	1045	1900
CaO	2850	3120
$MgCl_2$	981	1685

These compounds are termed ionic because they are formed by the transfer of electrons from a metal to a non-metal. The electron transfer in such compounds is controlled by the electronic configuration of the elements involved. Every element tends to attain a completely filled valence shell of its nearest noble gas or a stable octet. **[2023]**

(i) Show the electron transfer in the formation of magnesium chloride. **[1]**

(ii) List two properties of ionic compounds other than their high melting and boiling points. **[1]**

(iii) (A) While forming an ionic compound say sodium chloride how does sodium atom attain its stable configuration? **[2]**

OR

(iii) (B) **Give reason :** **[2]**

(a) Why do ionic compounds in the solid state not conduct electricity?

(b) What happens at the cathode when electricity is passed through an aqueous solution of sodium chloride?

18. Write the name and symbols of two most reactive metals belonging to group-I of the periodic table. Explain by drawing electronic structure how either one of the two metals reacts with a halogen. With which name is the bond formed between these elements known and what is the class of the compound so formed known? State any four physical properties of such compounds.

[2010] ...[5M]

19. What is meant by refining of metals? Name the most widely used method of refining impure metals produced by various reduction processes. Describe with the help of a labelled diagram how this method may be used for refining of copper.

[2010] ...[5M]

20. (i) Write the steps involved in the extraction of pure metals in the middle of the activity series from their carbonate ores.

(ii) How is copper extracted from its sulphide ore? Explain the various steps supported by chemical equations. Draw labelled diagram for the electrolytic refining of copper.

[2018] ...[5M]

21. (i) List in tabular form three chemical properties on the basis of which we can differentiate between a metal and a non-metal.

(ii) Give reasons for the following :

(a) Most metals conduct electricity well.

(b) The reaction of iron (III) oxide [Fe_2O_3] with heated aluminium is used to join cracked machine parts. **[2019] ...[5M]**

22. (a) What is thermit process? Where is this process used? Write balanced chemical equation for the reaction involved.

(b) Where does the metal aluminium, used in the process, occurs in the reactivity series of metals?

(c) Name the substances that are getting oxidised and reduced in the process.

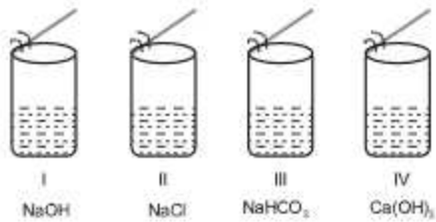
[2020] ...[5M]

4 : Carbon and its Compounds

1. State two characteristic features of carbon which when put together give rise to large number of carbon compounds. **[2010] ...[1M]**

2. Draw the structure of Butanone molecule, $CH_3COC_2H_5$ **[2011] ...[1M]**

3. A student added acetic acid to test tubes I, II, III and IV containing the labelled substances and then brought a burning splinter near the mouth of each test tube.



The splinter would be extinguished when brought near the mouth of test tube. **[2011] ...[1M]**

(a) I (b) II

(c) III (d) IV

4. Acetic acid reacts with solid sodium hydrogen carbonate, **[2011] ...[1M]**

(a) Slowly forming no gas

(b) Vigorously with effervescence

(c) Slowly without effervescence

(d) Vigorously without gas formation

5. Vapours of acetic acid smell: **[2011] ...[1M]**

(a) Pungent like vinegar

(b) Sweet like rose

(c) Suffocating like sulphur dioxide

(d) Odorless like water

6. A student takes Na_2CO_3 powder in a test tube and pours some drops of acetic acid in it.

He observes: **[2012] ...[1M]**

(a) No reaction in the test tube

(b) Colourless gas with pungent smell

(c) Bubbles of a colourless and odourless gas

(d) White fumes with smell of vinegar

7. Hard water required for an experiment is not available in a school laboratory. However, following salts are available in the laboratory. Select the salts which may be dissolved in water to make it hard for the experiment.

1. Calcium Sulphate
2. Sodium Sulphate
3. Calcium Chloride
4. Potassium Sulphate
5. Sodium Hydrogen Carbonate
6. Magnesium Chloride **[2013] ...[1M]**

(a) 1, 2 and 4 (b) 1, 3 and 6

(c) 3, 5 and 6 (d) 2, 4 and 5

8. A student takes 2 ml acetic acid in a dry test tube and adds a pinch of sodium hydrogen carbonate to it. He makes the following observations:

(I) A colourless and odourless gas evolves with a brisk effervescence.

(II) The gas turns lime water milky when passed through it.

(III) The gas burns with an explosion when a burning splinter is brought near it.

(IV) The gas extinguishes the burning splinter which is brought near it.

The correct observations are : **[2013] ...[1M]**

(a) (I), (II) and (III) (b) (II), (III) and (IV)

(c) (III), (IV) and (I) (d) (IV), (I) and (II)

9. In an experiment to study the properties of ethanoic acid, a student takes about 3 mL of ethanoic acid in a dry test tube. He adds an equal amount of distilled water to it and shakes the test tube well. After some time he is likely to observe that **[2014] ...[1M]**

(a) A colloid is formed in the test tube

(b) The ethanoic acid dissolves readily in water

(c) The solution becomes light orange

(d) Water floats over the surface of ethanoic acid

10. We need 20% aqueous solution of sodium hydroxide for the study of saponification reaction. When we open the lid of the bottle containing solid sodium hydroxide we observe it in which form?

[2014] ...[1M]

(a) Colourless transparent beads

(b) Small white beads

(c) White pellets/flakes

(d) Fine white powder

11. While studying saponification reaction, a student measures the temperature of the reaction mixture and also finds its nature using blue/red litmus paper. On the basis of his observations the correct conclusion would be

[2014] ...[1M]

(a) The reaction is exothermic and the reaction mixture is acidic

(b) The reaction is endothermic and the reaction mixture is acidic

(c) The reaction is endothermic and the reaction mixture is basic

(d) The reaction is exothermic and the reaction mixture is basic

12. In a locality, hard water, required for an experiment, is not available. However, the following salts are available in the school laboratory :

1. Sodium sulphate
2. Calcium sulphate
3. Magnesium chloride
4. Sodium chloride
5. Calcium chloride
6. Potassium sulphate

Which of the above salts may be dissolved in water to obtain hard water for the experiment?

[2014] ...[1M]

(a) 2, 3 and 5 (b) 1, 2 and 5

(c) 1, 2, 4 and 6 (d) 3 and 5 only

13. Write the number of covalent bonds in the molecule of butane, C_4H_{10}.

[2015] ...[1M]

14. While preparing soap a small quantity of common salt is generally added to the reaction mixture of vegetable oil and sodium hydroxide. Which one of the following may be the purpose of adding common salt? **[2015] ...[1M]**

(a) To reduce the basic nature of the soap

(b) To make the soap neutral

(c) To enhance the cleansing power of the soap

(d) To favour the precipitation of the soap

15. A student takes about 4 ml of distilled water in four test tubes marked P, Q, R and S. He then dissolves in each test tube an equal amount of one salt in one test tube, namely sodium sulphate in P, potassium sulphate in Q, calcium sulphate in R and magnesium sulphate in S. After that he adds an equal amount of soap solution in each test tube. On shaking each of these test tubes well, he observes a good amount of lather (foam) in the test tube marked.

[2015] ...[1M]

(a) P and Q

(b) Q and R

(c) P, Q and S

(d) P, R and S

16. When you add sodium hydrogen carbonate to acetic acid in a test tube, a gas liberates immediately with brisk effervescence. Name this gas. Describe the method of testing this gas.

[2015] ...[1M]

17. Write the name and structure of an aldehyde with four carbon atoms in its molecule.

[2016] ...[1M]

18. Write the molecular formula of the 2nd and 3rd member of the homologous series where the first member is ethyne. **[2017] ...[1M]**

19. A student requires hard water for an experiment in his laboratory which is not available in the neighbouring area. In the laboratory there are some salts, which when dissolved in distilled water can convert it into hard water. Select from the following groups of salts, a group, each salt of which when dissolved in distilled water will make it hard. **[2017] ...[1M]**

    (a) Sodium chloride, Potassium chloride

    (b) Sodium sulphate, Potassium sulphate

    (c) Sodium sulphate, Calcium sulphate

    (d) Calcium sulphate, Calcium chloride

20. Name the functional group present in propanone. **[2020] ...[1M]**

21. **Assertion (A) :** In a homologous series of alcohols, the formula for the second member is C_2H_5OH and the third member is C_3H_7OH.

    Reason (R) : The difference between the molecular masses of the two consecutive members of a homologous series is 144.

    [2020] ...[1M]

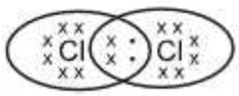
    (a) Both A and R are true and R is the correct explanation of the Assertion.

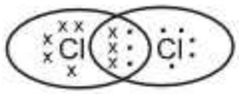
    (b) Both A and R are true but R is not the correct explanation of the Assertion.

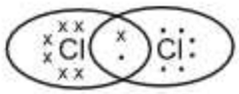
    (c) A is true but R is false.

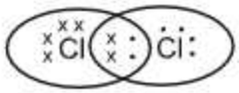
    (d) A is false but R is true.

22. The electron dot structure of chlorine molecule is: **[2023] ...[1M]**

    (a) 

    (b) 

    (c) 

    (d) 

23. Write the name and general formula of a chain of hydrocarbons in which an addition reaction with hydrogen is possible. State the essential condition for an addition reaction. Stating this condition, write a chemical equation giving the name of the reactant and the product of the reaction. **[2015] ...[2M]**

24. A student adds a spoon full of powdered sodium hydrogen carbonate to a flask containing ethanoic acid. List two main observations, he must note in his note book, about the reaction that takes place. Also write chemical equation for the reaction. **[2016] ...[2M]**

25. Mention the essential material (chemicals) to prepare soap in the laboratory. Describe in brief the test of determining the nature (acidic/ alkaline) of the reaction mixture of saponification reaction. **[2017] ...[2M]**

26. A compound 'X' on heating with excess conc. sulphuric acid at 443 K gives an unsaturated compound 'Y'. 'X' also reacts with sodium metal to evolve a colourless gas 'Z'. Identify 'X', 'Y' and 'Z'. Write the equation of the chemical reaction of formation of 'Y' and also write the role of sulphuric acid in the reaction.

    [2018] ...[2M]

27. In three test tubes A, B and C, three different liquids namely, distilled water, underground water and distilled water in which a pinch of calcium sulphate is dissolved, respectively are taken. Equal amount of soap solution is added to each test tube and the contents are shaken. In which test tube will the length of the foam (lather) be longest? Justify your answer.

    [2019] ...[2M]

28. "Carbon prefers to share its valence electrons with other atoms of carbon or with atoms of other elements rather than gaining or losing the valence electrons in order to attain noble gas configuration." Give reasons to justify this statement. **[2022] ...[2M]**

29. The atomic number of an element 'X' is 11.

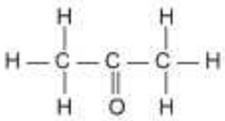
(i) Write the electronic configurations of X and find its valency.

(ii) Write the formula and nature of its oxide.

[2022] ...[2M]

30. (i) Why are covalent compounds generally poor conductors of electricity?

(ii) Name the following compound:



(iii) Name the gas evolved when ethanoic acid is added to sodium carbonate. How would you prove the presence of this gas?

[2008] ...[3M]

31. Give reasons for the following observations :

(i) The element carbon forms a very large number of compounds.

(ii) Air holes of a gas burner have to be adjusted when the heated vessels get blackened by the flame.

(iii) Use of synthetic detergents causes pollution of water. **[2009] ...[3M]**

32. Name the functional group of organic compounds that can be hydrogenated. With the help of suitable example, explain the process of hydrogenation mentioning the conditions of the reaction any one change in physical property with the formation of the product. Name any one natural source of organic compounds that are hydrogenated. **[2010] ...[3M]**

33. Write chemical equations to show what happens when:

(i) Ethanol is heated with concentrated sulphuric acid at 443 K.

(ii) Ethanol reacts with ethanoic acid in the presence of an acid acting as a catalyst.

(iii) An ester reacts with a base **[2011] ...[3M]**

34. Complete the following equations:

(i) $CH_4 + O_2 \longrightarrow$

(ii) $C_2H_5OH \xrightarrow{\text{Hot conc. } H_2SO_4}$

(iii) $CH_3COOH + NaOH \longrightarrow$ **[2012] ...[3M]**

35. Name the oxidising agent used for the conversion of ethanol to ethanoic acid. Distinguish between ethanol and ethanoic acid on the basis of

(i) Litmus test

(ii) Reaction with sodium carbonate

[2013] ...[3M]

36. (i) Differentiate between alkanes and alkenes. Name and draw the structure of one member of each.

(ii) Alkanes generally burn with clean flame. Why? **[2013] ...[3M]**

37. A carboxylic acid (molecular formula $C_2H_4O_2$) reacts with an alcohol in the presence of an acid catalyst to form a compound 'X'. The alcohol on oxidation with alkaline $KMnO_4$ followed by acidification gives the same carboxylic acid $C_2H_4O_2$.

Write the name and structure of

(i) carboxylic acid,

(ii) alcohol and

(iii) the compound 'X'. **[2014] ...[3M]**

38. Define the term 'structural' isomerism'. Explain why propane cannot exhibit this property. Draw the structures of possible isomers of butane, C_4H_{10} **[2014] ...[3M]**

39. List two tests for experimentally distinguishing between an alcohol and a carboxylic acid and describe how these tests are performed.

[2015] ...[3M]

40. Write three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate. Write balanced chemical equation in each case. Write the name of the reactants and the products other than ethanoic acid and sodium ethanoate in each case.

[2016] ...[3M]

41. Distinguish between esterification and saponification reactions with the help of the chemical equations for each. State one use of each (i) Esters, and (ii) Saponification process.

[2017] ...[3M]

42. Write the structural formula of ethanol. What happens when it is heated with excess of conc. H_2SO_4 at 443 K? Write the chemical equation for the reaction stating the role of conc. H_2SO_4 in this reaction. **[2017] ...[3M]**

43. (i) Why are most carbon compounds poor conductors of electricity?

(ii) Write the name and structure of a saturated compound in which the carbon atoms are arranged in a ring. Give the number of single bonds present in this compound.

[2018] ...[3M]

44. 3 mL of ethanol is taken in a test tube and warmed gently in a water bath. A 5% solution of alkaline potassium permanganate is added first drop by drop to this solution, then in excess.

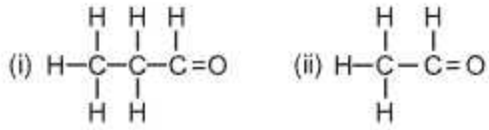
(i) How is 5% solution of $KMnO_4$ prepared?

(ii) State the role of alkaline potassium permanganate in this reaction. What happens on adding it in excess?

(iii) Write chemical equation of this reaction.

[2020] ...[3M]

45. Consider the following organic compounds:



(a) Name the functional group present in these compounds.

(b) Write the general formula for the compounds of this functional group.

(c) State the relationship between these compounds and draw the structure of any other compound having similar functional group. **[2022] ...[3M]**

46. (a) Draw the electron dot structure for ethyne.

(b) List two differences between the properties exhibited by covalent compounds and ionic compounds.

[2022] ...[1+2=3M]

47. (i) State two properties of carbon which lead to a very large number of carbon compounds.

(ii) Why does micelle formation take place when soap is added to water? Why are micelles not formed when soap is added to ethanol?

[2011] ...[5M]

48. Explain isomerism. State any four characteristics of isomers. Draw the structures of possible isomers of butane, C_4H_{10}. **[2011] ...[5M]**

49. List in tabular form three physical and two chemical properties on the basis of which ethanol and ethanoic acid can be differentiated.

[2012] ...[5M]

50. (i) Define the term 'isomers'

(ii) Draw two possible isomers of the compound with molecular formula C_3H_6O and write their names.

(iii) Give the electron dot structures of the above two compounds **[2013] ...[5M]**

51. Both soap and detergent are some type of salts. What is the difference between them? Describe in brief the cleansing action of soap. Why do soaps not form lather in hard water? List two problems that arise due to the use of detergents instead of soaps. **[2015] ...[5M]**

52. A carbon compound 'P' on heating with excess conc. H_2SO_4 forms another carbon compound 'Q' which on addition of hydrogen in the presence of nickel catalyst forms a saturated carbon compound 'R'. One molecule of 'R' on combustion forms two molecules of carbon dioxide and three molecules of water. Identify P, Q and R and write chemical equations for the reactions involved.

[2016] ...[5M]

53. Why certain compounds are called hydrocarbons? Write the general formula for homologous series of alkanes, alkenes and alkynes and also draw the structure of the first member of each series. Write the name of the reaction that converts alkenes into alkanes and also write a chemical equation to show the necessary conditions for the reaction to occur.

[2017] ...[5M]

54. Write the chemical formula and name of the compound which is the active ingredient of all alcoholic drinks. List its two uses. Write chemical equation and name of the product formed when this compound reacts with

    (i) Sodium metal

    (ii) Hot concentrated sulphuric acid

[2019] ...[5M]

55. What is methane? Draw its electron dot structure. Name the type of bonds formed in this compound.

    Why are such compounds :

    (i) Poor conductors of electricity? and

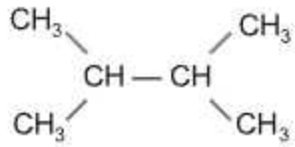
    (ii) Have low melting and boiling points? What happens when this compound burns in oxygen? **[2019] ...[5M]**

56. (A) (i) Draw the structure of the following compounds : **[2023] ...[5M]**

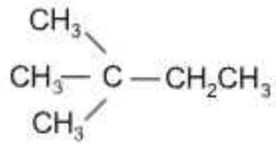
    (a) Butanoic acid

    (b) Chloropentane

    (ii) How are structure (i) and structure (ii) given below related to one another? Give reason to justify your answer.



Structure (i)



Structure (ii)

Draw one more possible structure for above case.

(iii) Differentiate between saturated and unsaturated carbon compounds on the basis of their general formula.

OR

(B) (i) What happens when a small piece of sodium is dropped in ethanol? Write the equation for this reaction.

(ii) Why is glacial acetic acid called so?

(iii) What happens when ethanol is heated at 443 K in the presence of conc. H_2SO_4? Write the role of conc. H_2SO_4 in this case.

(iv) Write an equation showing saponification.

BIOLOGY

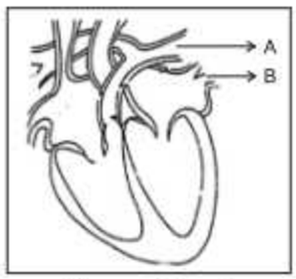
1 : Life Processes

1. How do autotrophs obtain CO_2 and N_2 to make their food? **[2008] ...[1M]**

2. What will happen to a plant if its xylem is removed? **[2009] ...[1M]**

3. Name the green dot like structures in some cells observed by a student when a leaf peel was viewed under a microscope. What is this green colour due to? **[2010] ...[1M]**

4. Consider the following statements in connection with the functions of the blood vessels marked A and B in the diagram of a human heart as shown.



(i) Blood vessel A - It carries carbon dioxide rich blood to the lungs.

(ii) Blood vessel B - It carries oxygen rich blood from the lungs.

(iii) Blood vessel B - Left atrium relaxes as it receives blood from this blood vessel.

(iv) Blood vessel A - Right atrium has thick muscular wall as it has to pump blood to this blood vessel.

The correct statements are **[2021]...[1M]**

(a) (i) and (ii) only (b) (ii) and (iii) only

(c) (ii), (iii) and (iv) (d) (i), (ii) and (iii)

5. In living organisms during respiration which of the following products are not formed if oxygen is not available? **[2021]...[1M]**

(a) Carbon dioxide + Water

(b) Carbon dioxide + Alcohol

(c) Lactic acid + Alcohol

(d) Carbon dioxide + Lactic Acid

6. The correct statements with reference to single celled organisms are

(i) Complex substances are not broken down into simpler substances.

(ii) Simple diffusion is sufficient to meet the requirement of exchange of gases.

(iii) Specialised tissues perform different functions in the organism.

(iv) Entire surface of the organism is in contact with the environment for taking in food.

[2021]...[1M]

(a) (i) and (iii) (b) (ii) and (iii)

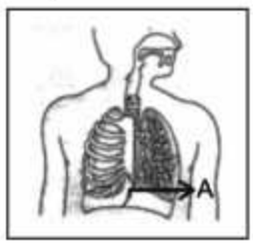
(c) (ii) and (iv) (d) (i) and (iv)

7. Which one among the following is not removed as a waste product from the body of a plant? **[2021]...[1M]**

(a) Resins and Gums (b) Urea

(c) Dry Leaves (d) Excess Water

8. Which of the following statements are correct in reference to the role of A (shown in the given diagram) during a breathing cycle in human beings?



(i) It helps to decrease the residual volume of air in lungs.

(ii) It flattens as we inhale.

(iii) It gets raised as we inhale.

(iv) It helps the chest cavity to become larger.

[2021]...[1M]

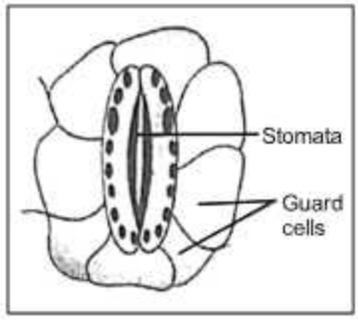
(a) (ii) and (iv)

(b) (iii) and (iv)

(c) (i) and (ii)

(d) (i), (ii) and (iv)

9. Which one of the following conditions is true for the state of stomata of a green leaf shown in the given diagram? **[2021]...[1M]**



(a) Large amount of water flows into the guard cells.

(b) Gaseous exchange is occurring in large amount.

(c) Large amount of water flows out from the guard cells.

(d) Large amount of sugar collects in the guard cells.

10. **Assertion (A) :** Nitrogen is an essential element for plant growth and is taken up by plants in the form of inorganic nitrates or nitrites.

Reason (R) : The soil is the nearest and richest source of raw materials like Nitrogen, Phosphorus and other minerals for the plants. **[2021]...[1M]**

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true, but (R) is false.

(d) (A) is false, but (R) is true.

11. **Assertion (A) :** Hydrochloric acid helps in the digestion of food in the stomach.

Reason (R) : Hydrochloric acid creates an acidic medium to activate protein digesting enzymes.

[2021]...[1M]

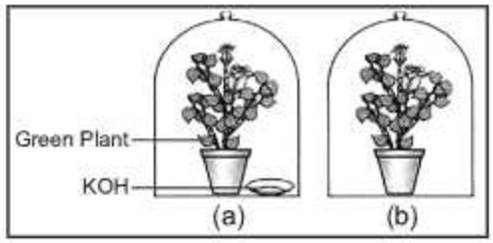
(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true, but (R) is false.

(d) (A) is false, but (R) is true.

12. A student was asked to write a stepwise procedure to demonstrate that carbon dioxide is necessary for photosynthesis. He wrote the following steps. The wrongly worded step is



[2021]...[1M]

(a) Both potted plants are kept in dark room for at least three days.

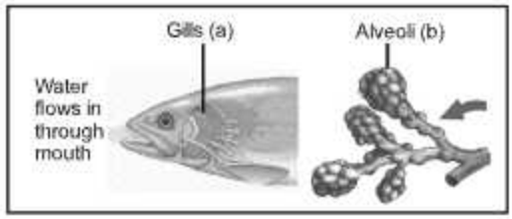
(b) Bottom of the bell jars is sealed to make them air tight.

(c) Both potted plants are kept in sunlight after the starch test.

(d) A leaf from both the plants is taken to test the presence of starch.

13. Respiratory structures of two different animals-a fish and a human being are as shown.

Observe (a) and (b) and select one characteristics that holds true for both of them.



[2021]...[1M]

(a) Both are placed internally in the body of animal.

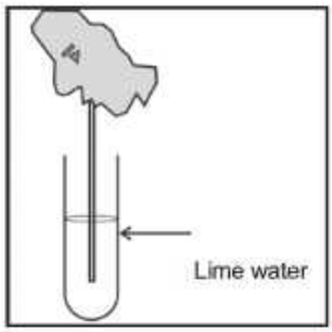
(b) Both have thin and moist surface for gaseous exchange.

(c) Both are poorly supplied with blood vessels to conserve energy

(d) In both the blood returns to the heart after being oxygenated.

14. Observe the diagram of an activity given below. What does it help to conclude, when the person exhales into the test-tube?

[2021]...[1M]



(a) Percentage of carbon dioxide is more in inhaled air.

(b) Fermentation occurs in the presence of oxygen.

(c) Percentage of carbon dioxide is more in the exhaled air.

(d) Fermentation occurs in the presence of carbon dioxide.

15. The length of small intestine in a deer is more as compared to the length of small intestine of a tiger. The reason for this is **[2021]...[1M]**

(a) Mode of intake of food.

(b) Type of food consumed.

(c) Presence or absence of villi in intestines.

(d) Presence or absence of digestive enzymes.

16. Identify the two components of Phloem tissue that help in transportation of food in plants.

[2021]...[1M]

(a) Phloem parenchyma & sieve tubes

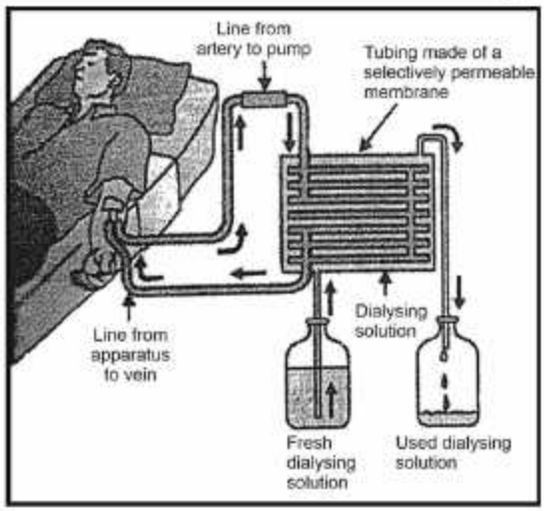
(b) Sieve tubes & companion cells

(c) Phloem parenchyma & companion cells

(d) Phloem fibres and sieve tubes

Case Study Based Questions (Q.17 to Q.20) :

The figure shown below represents a common type of dialysis called as Haemodialysis. It removes waste products from the blood such as excess salts and urea which are insufficiently removed by the kidney in patients with kidney failure. During the procedure, the patient's blood is cleaned by filtration through a series of semi-permeable membranes before being returned to the blood of the patient. On the basis of this, answer the following questions:



17. The haemodialyzer has semi-permeable lining of tubes which help **[2021]...[1M]**

(a) To maintain osmotic pressure of blood

(b) To filter nitrogenous wastes from the dialyzing solution

(c) In passing the waste products in the dialyzing solution

(d) To pump purified blood back into the body of the patient

18. Which one of the following is not a function of Artificial Kidney? **[2021]...[1M]**

(a) To remove nitrogenous wastes from the blood.

(b) To remove excess fluids from the blood.

(c) To reabsorb essential nutrients from the blood.

(d) To filter and purify the blood.

19. The 'used dialysing' solution is rich in:

[2021]...[1M]

(a) Urea and excess salts

(b) Blood cells

(c) Lymph

(d) Proteins

20. Which part of the nephron in human kidney, serves the function of reabsorption of certain substances? **[2021]...[1M]**

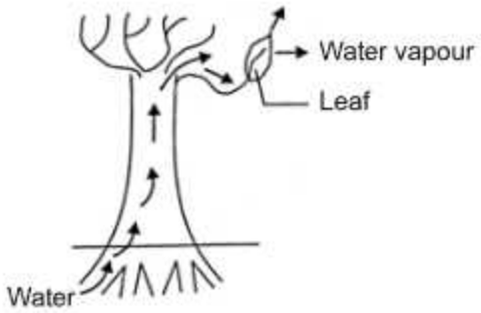
(a) Glomerulus

(b) Bowman's capsule

(c) Tubules

(d) Collecting duct

21. Observe the following diagram and identify the process and its significance from the following options: **[2023]...[1M]**



(a) Evaporation : maintains water contents in leaf cells.

(b) Transpiration : creates a suction force which pulls water inside the plant.

(c) Excretion : helps in excreting out waste water from the plant.

(d) Translocation : helps in transporting materials from one cell to another.

22. Opening and closing of stomata is due to : **[2023]...[1M]**

(a) High pressure of gases inside the cells.

(b) Movement of water in and out of the guard cells.

(c) Stimulus of light in the guard cells.

(d) Diffusion of CO_2 in and out of the guard cells.

23. **A :** The inner walls of the small intestine have finger like projections called villi which are rich in blood. **[2023]...[1M]**

R : These villi have a large surface area to help the small intestine in completing the digestion of food.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A)

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(c) (A) is true but (R) is false

(d) (A) is false but (R) is true

24. Write one function each of the following components of the transport system in human beings: **[2008] ...[2M]**

(a) Blood vessels (b) Blood platelets

(c) Lymph (d) Heart

25. Write two different ways in which glucose is oxidized to provide energy in human body. Write the products formed in each case. **[2019]...[2M]**

26. In the experimental set up to show that "CO_2 is given out during respiration", name the substance taken in the small test tube kept in the conical flask. State its function and the consequence of its use. **[2019] ...[2M]**

27. Write one specific function each of the following organs in relation with excretion in human beings: **[2023]...[2M]**

(i) Renal Artery

(ii) Urethra

(iii) Glomerulus

(iv) Tubular part of nephron

28. Two green plants are kept separately in oxygen free containers, one in the dark and other in sunlight. It was observed that plant kept in dark could not survive longer. Give reason for this observation. **[2023]...[2M]**

29. How are oxygen and carbon dioxide transported in human beings? How are lungs designed to maximize the area for exchange of gases? **[2008] ...[3M]**

30. Write three types of blood vessels. Give one important feature of each. **[2019] ...[3M]**

31. (A) (i) How does *Paramecium* obtain its food?

(ii) List the role of each of the following in our digestive system:

(a) Hydrochloric acid

(b) Trypsin

(c) Muscular walls of stomach

(d) Salivary amylase **[2023]...[3M]**

OR

(B) (i) What is double circulation?

(ii) Why is the separation of the right side and the left side of the heart useful? How does it help birds and mammals?

32. (a) Draw a diagram of human alimentary canal and label on it :

Oesophagus, Gall bladder, Liver and Pancreas

(b) Explain the statement, 'Bile does not contain any enzyme but it is essential for digestion'. **[2009] ...[5M]**

33. (a) Draw a diagram of excretory system in human beings and label on it:
Aorta, vena cava, urinary bladder, urethra
(b) List two vital functions of the kidney.
[2009] ...[5M]

34. Explain the process of digestion of food in mouth, stomach and small intestine in human body. **[2010] ...[5M]**

35. (a) List the three events that occur during the process of photosynthesis. Explain the role of stomata in this process.
(b) Describe an experiment to show that "sunlight is essential for photosynthesis."
[2010] ...[5M]

36. (a) Mention any two components of blood.
(b) Trace the movement of oxygenated blood in the body.
(c) Write the function of valves present in between atria and ventricles.
(d) Write one structural difference between the composition of artery and veins.
[2018]...[5M]

37. (a) Define excretion.
(b) Name the basic filtration unit present in the kidney.
(c) Draw excretory system in human beings and label the following organs of excretory system which perform following functions:
(i) Form urine
(ii) Is a long tube which collects urine from kidney
(iii) Store urine until it is passed out.
[2018] ...[5M]

38. (a) Why is there a difference in the rate of breathing between aquatic organisms and terrestrial organisms? Explain.
(b) Draw a diagram of human respiratory system and label – pharynx, trachea, lungs, diaphragm and alveolar sac on it.
[2020]...[5M]

OR

(a) Name the organs that form the excretory system in human beings.
(b) Describe in brief how urine is produced in human body. **[2020]...[5M]**

2 : Control and Coordination

1. Name two tissues that provide control and coordination in multicellular animals. **[2009]...[1M]**

2. How is the spinal cord protected in the human body? **[2010] ...[1M]**

3. In plants the role of cytokinin is : **[2023] ...[1M]**
(a) Promote cell division
(b) Wilting of leaves
(c) Promote the opening of stomatal pore
(d) Help in the growth of stem

4. What are 'nastic' and 'curvature' movements? Give one example of each. **[2009] ...[2M]**

5. What are hormones? Name the hormone secreted by thyroid gland and state its function.
[2010] ...[2M]

6. (a) Name one gustatory receptor and one olfactory receptor present in human beings.
(b) Write a and b in the given flow chart of neuron through which information travels as an electrical impulse.

Dendrite → a → b → End point of Neuron

[2018] ...[2M]

7. (A) Name the part of brain which is responsible for the following actions: **[2023] ...[2M]**
(i) Maintaining posture and balance
(ii) Beating of heart
(iii) Thinking
(iv) Blood pressure

OR

(B) Where are auxins synthesized in a plant ? Which organ of the plant shows:
(i) Positive phototropism
(ii) Negative geotropism
(iii) Positive hydrotropism

8. Name the hormones secreted by the following endocrine glands and specify one function of each:
(a) Thyroid
(b) Pituitary
(c) Pancreas **[2018] ...[3M]**

9. What are plant hormones? Name the plant hormones responsible for the following.
   (i) Growth of stem
   (ii) Promotion of cell division
   (iii) Inhibition of growth
   (iv) Elongation of cells **[2019] ...[3M]**

10. A squirrel is in a scary situation. Its body has to prepare for either fighting or running away. State the immediate changes that take place in its body so that the squirrel is able to either fight or run. **[2020] ...[3M]**

OR

Why is chemical communication better than electrical impulses as a means of communication between cells in a multi-cellular organism? **[2020] ...[3M]**

11. (a) Draw the structure of a neuron and label the following on it :
   Nucleus, Dendrite, Cell body and Axon
   (b) Name the part of neuron:
   (i) Where information is acquired.
   (ii) Through which information travels as an electrical impulse. **[2008] ...[5M]**

12. (a) What is
   (i) Phototropism and
   (ii) Geotropism?
   With labelled diagrams describe an activity to show that light and gravity change the direction that plant parts grow in.
   (b) Mention the role of each of the following plant hormones:
   (i) Auxin
   (ii) Abscisic acid **[2008] ...[5M]**

3 : How do Organisms Reproduce?

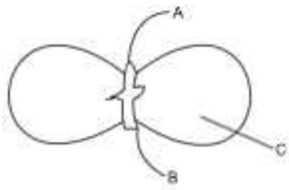
1. What is the effect of DNA copying which is not perfectly accurate on the reproduction process? **[2008] ...[1M]**

2. After observing the prepared slides of binary fission in *Amoeba* and budding in yeast, the following observations were reported :
   (A) Single cells of *Amoeba* and Yeast were undergoing binary fission and budding respectively.
   (B) Cytokinesis was observed in the Yeast cell.
   (C) Elongated nucleus was dividing to form two daughter nuclei in *Amoeba*.
   (D) A chain of buds were observed due to reproduction in *Amoeba*.
   The correct observation(s) is/are: **[2012] ...[1M]**
   (a) (D), (A) and (C)
   (b) (C) and (D)
   (c) (B) only
   (d) (A) and (C)

3. A student after observing a slide showing different stages of binary fission in *Amoeba* draws the following diagrams. However these diagrams are not in proper sequence.

The correct sequence is: **[2011, 2013] ...[1M]**
(a) I, V, IV, III, II (b) I, V, III, IV, II
(c) I, III, IV, V, II (d) None of these

4. In the figure, the parts marked A, B and C are sequentially **[2013, 2014] ...[1M]**



(a) Plumule, Cotyledon and Radicle
(b) Radicle, Cotyledon and Plumule
(c) Radicle, Plumule and Cotyledon
(d) Plumule, Radicle and Cotyledon

5. Select the correct statements for the process of budding in yeast:

I. A bud arises from a particular region on a parent body.

II. A parent cell divides into two daughter cells; here the parental identity is lost.

III. Before detaching from the parent body a bud may form another bud.

IV. A bud when detached from the parent body grows into a new individual. **[2013] ...[1M]**

(a) II, III and IV

(b) I, II and III

(c) III, IV and I

(d) None of the above

OR

When you study a slide showing different stages of budding in yeast, you observe the following stages:

I. The bud may get separated from the parent body and develop into a new individual.

II. The body of the bud develops and gives rise to another baby bud.

III. A bud comes out in any direction from the body of the parent cell.

IV. Thus they may form a colony.

The proper sequence of the above stages is **[2014] ...[1M]**

(a) II, I, III, IV

(b) II, III, I, IV

(c) III, II, I, IV

(d) III, I, II, IV

6. Name two simple organisms having the ability of regeneration. **[2015] ...[1M]**

7. Students were asked to observe the permanent slides showing different stages of budding in yeast under high power of a microscope. **[2015] ...[1M]**

(a) Which adjustment screw (coarse/fine) were you asked to move to focus the slides?

(b) Draw three diagrams in correct sequence showing budding in yeast.

8. A student was asked to observe and identify the various parts of an embryo of a red kidney bean seed. He identified the parts and listed them as under :

I. Tegmen

II. Testa

III. Cotyledon

IV. Radicle

V. Plumule

The correctly identified parts among these are : **[2015] ...[1M]**

(a) I, II and III

(b) II, III and IV

(c) III, IV and V

(d) I, III, IV and V

9. List two functions of ovary of human female reproductive system. **[2016] ...[1M]**

10. A student while observing an embryo of a pea seed in the laboratory listed various parts of the embryo as given below:

Testa, Tegmen, Radicle, Plumule, Micropyle, Cotyledon.

On examining the list the teacher remarked that only three parts are correct.

Select three correct parts from the above list: **[2016] ...[1M]**

(a) Testa, Radicle, Cotyledon

(b) Tegmen, Radicle, Micropyle

(c) Cotyledon, Plumule, Testa

(d) Radicle, Cotyledon, Plumule

11. **Answer question numbers (a) to (d) on the basis of your understanding of the following paragraphs and the related studied concepts.**

The growing size of the human population is a cause of concern for all people. The rate of birth and death in a given population will determine its size. Reproduction is the process by which organisms increase their population. The process of sexual maturation for reproduction is gradual and takes place while general body growth is still going on. Some degree of sexual maturation does not necessarily mean that the mind or body is ready for sexual acts or for having and

bringing up children. Various contraceptive devices are being used by human beings to control the size of population.

(a) List two common signs of sexual maturation in boys and girls. **[2020] ...[1M]**

(b) What is the result of reckless female foeticide? **[2020] ...[1M]**

(c) Which contraceptive method changes the hormonal balance of the body? **[2020] ...[1M]**

(d) Write two factors that determine the size of a population. **[2020] ...[1M]**

12. The number of chromosomes in parents and offsprings of a particular species undergoing sexual reproduction remain constant due to: **[2023] ...[1M]**

(a) doubling of chromosomes after zygote formation

(b) halving of chromosomes after zygote formation

(c) doubling of chromosomes before gamete formation

(d) halving of chromosomes at the time of gamete formation

13. With the help of diagrams show the different stages of binary fission in *Amoeba*. **[2010, 2017, 2018] ...[2M]**

14. List any four reasons for vegetative propagation being practised in the growth of some type of plants. **[2011] ...[2M]**

15. State the role of

i. Seminal vesicle

ii. Prostate gland in the human body. **[2011] ...[2M]**

16. Define the term puberty. List two changes observed in girls at the time of puberty. **[2012] ...[2M]**

17. What is meant by asexual reproduction? List any two of its different forms. **[2012] ...[2M]**

18. A student is observing a permanent slide showing sequentially the different stages of asexual reproduction taking place in yeast. Name this process and draw diagrams, of what he observes, in a proper sequence. **[2012, 2016] ...[2M]**

19. Mention two functions of the human testis. **[2013] ...[2M]**

20. Draw labelled diagrams to illustrate budding in *Hydra*. **[2014] ...[2M]**

OR

Draw a labelled diagram in proper sequence to show budding in *Hydra*. **[2019] ...[2M]**

21. Give reasons:

(i) Placenta is extremely essential for foetal development.

(ii) Uterine lining becomes thick and spongy after fertilisation. **[2022] ...[2M]**

22. (a) Name the reproductive and non-reproductive parts of bread mould (Rhizopus).

(b) List any two advantages of vegetative propagation. **[2022] ...[2M]**

23. Name the reproductive parts of an angiosperm. Where are these parts located? Explain the structure of its male reproductive part. **[2022] ...[2M]**

OR

What is puberty? Mention any two changes that are common to both boys and girls in early teenage years.

24. (a) Explain the terms :

(i) Implantation

(ii) Placenta

(b) What is the average duration of human pregnancy? **[2009] ...[3M]**

25. Write the full form of DNA. Name the part of the cell where it is located. Explain its role in the process of reproduction of the cell. **[2010]...[3M]**

26. What does HIV stand for? Is AIDS an infectious disease? List any four modes of spreading AIDS. **[2011] ...[3M]**

27. Explain the meaning of sexually transmitted diseases (STD's). Give two examples of STD's each, caused due to

i. bacterial infection

ii. viral infection.

State in brief how the spread of such diseases may be prevented. **[2008, 2012, 2013] ...[3M]**

28. (a) Explain the process of regeneration in *Planaria*.

(b) How is regeneration different from reproduction? **[2013] ...[3M]**

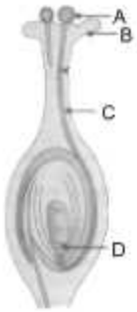
29. Write one difference between asexual and sexual mode of reproduction. Which species is likely to have better chances of survival - the one reproducing asexually or the one reproducing sexually? Justify your answer. **[2014] ...[3M]**

30. What is the effect of DNA copying, which is not perfectly accurate, on the reproduction process? How does the amount of DNA remain constant though each new generation is a combination of DNA copies of two individuals?

[2014, 2018] ...[3M]

31. List any four methods of contraception used by humans. State in brief two advantages of adopting such preventive methods. **[2015]...[3M]**

32. (a) List two reasons for the appearance of variations among the progeny formed by sexual reproduction.

(b) 

(i) Name the part marked 'A' in the diagram.

(ii) How does 'A' reaches part 'B'?

(iii) State the importance of the part 'C'

(iv) What happens to the part marked 'D' after fertilization is over? **[2016] ...[3M]**

33. Define reproduction. How does it help in providing stability to the population of species?

[2016] ...[3M]

34. Explain the term "Regeneration" as used in relation to reproduction of organisms. Describe briefly how regeneration is carried out in multicellular organisms like *Hydra*.

[2016]...[3M]

35. List the two types of reproduction. Which one of the two is responsible for bringing in more variations in its progeny and how?

[2017]...[3M]

36. List three techniques that have been developed to prevent pregnancy. Which one of these techniques is not meant for males? How does the use of these techniques have a direct impact on the health and prosperity of a family?

[2017] ...[3M]

37. What is vegetative propagation? State two advantages and two disadvantages of this method. **[2017] ...[3M]**

38. (a) List in tabular form two differences between binary fission and multiple fission.

(b) What happens when a mature *Spirogyra* filament attains considerable length?

[2020]...[3M]

39. With the help of suitable diagrams, explain the various steps of budding in *Hydra*.

OR

What is binary fission in organisms? With the help of suitable diagrams, describe the mode of reproduction in *Amoeba*. **[2011] ...[5M]**

40. Define the terms pollination and fertilisation. Draw a diagram of a pistil showing pollen tube growth into the ovule and label the following: pollen grain, male gamete, female gamete and ovary.

OR

Describe in brief the role of :

(i) Testis, (ii) Seminal vesicle, (iii) Vas deferens,

(iv) Ureter, (v) Prostate gland in human male reproductive system. **[2012] ...[5M]**

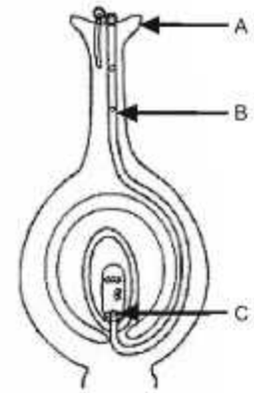
41. (a) Write the function of placenta in females.

(b) List four ways of preventing pregnancy. State two advantages of using such preventive methods. **[2013] ...[5M]**

42. (a) Identify A, B and C in the given diagram and write their functions.

(b) Mention the role of gamete and zygote in sexually reproducing organisms.

[2013, 2015] ...[5M]



43. (a) Draw a sectional view of human female reproductive system and label the part where

(i) eggs develop.

(ii) fertilisation takes place.

(iii) fertilised egg gets implanted.

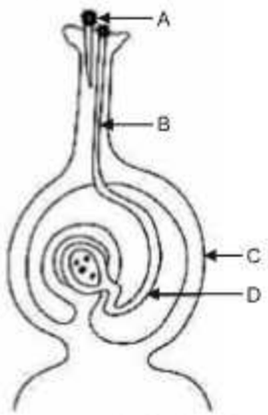
(b) Describe, in brief, the changes the uterus undergoes

(i) to receive the zygote.

(ii) if zygote is not formed.

[2014] ...[5M]

44. (a) Name the parts labelled as A, B, C and D in the diagram given below:



(b) What is pollination? State its significance.

(c) How does fertilisation occur in flowers? Name the parts of the flower that develop into (i) seed, and (ii) fruit after fertilisation.

[2014] ...[5M]

45. (a) Name the human male reproductive organ that produces sperm and also secretes a hormone. Write the functions of the secreted hormone.

(b) Name the parts of the human female reproductive system where

(i) Fertilizations takes place

(ii) Implantation of the fertilized egg occurs. Explain how the embryo gets nourishment inside the mother's body.

[2015] ...[5M]

46. What is placenta? Describe its structure. State its functions in case of a pregnant human female. **[2016] ...[5M]**

47. (a) Write the functions of each of the following parts in a human female reproductive system:

(i) Ovary

(ii) Uterus

(iii) Fallopian tube

(b) Write the structure and functions of placenta in a human female.

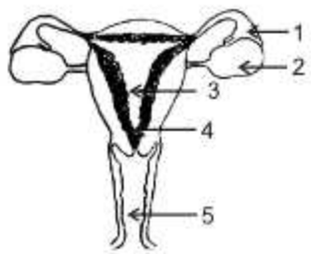
[2017, 2018] ...[5M]

48. Define pollination. Explain the different types of pollination. List two agents of pollination? How does suitable pollination lead to fertilization?

[2019] ...[5M]

OR

(a) Identify the given diagram. Name the parts 1 to 5.



(b) What is contraception? List three advantages of adopting contraceptive measures.

[2019] ...[5M]

49. (i) Name and explain the two modes of asexual reproduction observed in hydra.

(ii) What is vegetative propagation? List two advantages of using this technique.

[2023] ...[5M]

4 : Heredity and Evolution

1. Why is variation important for a species?
[2017] ...[1M]

2. A cross between pea plant with white flowers (vv) and pea plant with violet flowers (VV) resulted in F_2 progeny in which ratio of violet (VV) and white (vv) flowers will be : **[2023] ...[1M]**
(a) 1 : 1 (b) 2 : 1
(c) 3 : 1 (d) 1 : 3

3. **A** : In humans, if gene (B) is responsible for black eyes and gene (b) is responsible for brown eyes, then the colour of eyes of the progeny having gene combination Bb, bb or BB will be black only.
R : The black colour of the eyes is a dominant trait. **[2023] ...[1M]**
(a) Both (A) and (R) are true and (R) is the correct explanation of (A)
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(c) (A) is true but (R) is false
(d) (A) is false but (R) is true

4. Give one example each of characters that are inherited and the ones that are acquired in humans. Mention the difference between the inherited and the acquired characters.
[2010] ...[2M]

5. A Mendelian experiment consisted of breeding pea plants bearing violet flowers with pea plants bearing white flowers. What will be the result in F_1 progeny? **[2018] ...[2M]**

6. Describe any three ways in which individuals with a particular trait may increase in population.
[2011] ...[3M]

7. A blue colour flower plant denoted by BB is crossbred with a white colour flower plant denoted by bb. **[2012]...[3M]**
(a) State the colour of flower you expect in their F_1 generation plants.
(b) What must be the percentage of white flower plants in F_2 generation if flowers of F_1 plants are self-pollinated?
(c) State the expected ratio of the genotypes BB and Bb in the F_2 progeny.

8. "A trait may be inherited, but may not be expressed." Justify this statement with the help of a suitable example. **[2014] ...[3M]**

9. What are chromosomes? Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained.
[2015] ...[3M]

10. How do Mendel's experiment show that traits are inherited independently? **[2016] ...[3M]**

11. How did Mendel's explain that it is possible that a trait is inherited but not expressed in an organism? **[2017] ...[3M]**

12. Name the plant Mendel used for his experiment. What type of progeny was obtained by Mendel in F_1 and F_2 generations when he crossed the tall and short plants? Write the ratio he obtained in F_2 generation plants. **[2019] ...[3M]**

13. List two differences between acquired traits and inherited traits by giving an example of each.
[2019] ...[3M]

14. (a) Name the two types of gametes produced by men.
(b) Does a male child inherit X chromosome from his father? Justify.
(c) How many types of gametes are produced by a human female? **[2022] ...[3M]**

15. ***Case Study Based Questions :***
Mendel blended his knowledge of Science and mathematics to keep the count of the individuals exhibiting a particular trait in each generation. He observed a number of contrasting visible characters controlled in pea plants in a field. He conducted many experiments to arrive at the laws of inheritance. **[2022] ...[4M]**
(a) What do the F_1 progeny of tall plants with round seeds and short plants with wrinkled seeds look like?
(b) Name the recessive traits in above case.
(c) Mention the type of the new combinations of plants obtained in F_2 progeny along with their ratio, if F_1 progeny was allowed to self pollinate.

OR

If 1600 plants were obtained in F_2 progeny, write the number of plants having traits:

(i) Tall with round seeds

(ii) Short with wrinkled seeds

Write the conclusion of the above experiment.

16. The most obvious outcome of the reproductive process is the generation of individuals of similar design, but in sexual reproduction they may not be exactly alike. The resemblances as well as differences are marked. The rules of heredity determine the process by which traits and characteristics are reliably inherited. Many experiments have been done to study the rules of inheritance. **[2022]**

(i) Why an offspring of human being is not a true copy of his parents in sexual reproduction? **[1]**

(ii) While performing experiments on inheritance in plants, what is the difference between F_1 and F_2 generation? **[1]**

(iii) (A) Why do we say that variations are useful for the survival of a species over time? **[2]**

OR

(B) Study Mendel's cross between two plants with a pair of contrasting characters. **[2]**

RRYY × rryy

Round Yellow Wrinkled Green

He observed 4 types of combinations in F_2 generation. Which of these were new combinations? Why do new features which are not present in the parents, appear in F_2 generation?

17. 'The sex of a newborn child is a matter of chance and none of the parents may be considered responsible for it.' Justify this statement with the help of flow chart showing determination of sex of a newborn. **[2012]...[5M]**

18. How do Mendel's experiments show that the

(a) Traits may be dominant or recessive

(b) Traits are inherited independently **[2015] ...[5M]**

19. With the help of one example for each, distinguish between the acquired traits and the inherited traits. Why are the traits/experiences acquired during the entire lifetime of an individual not inherited in the next generation? Explain the reason of this fact with an example. **[2017] ...[5M]**

20. (a) What is genetics?

(b) What are genes? Where are the genes located?

(c) State and define three factors responsible for the rise of a new species. **[2020]...[5M]**

5 : Our Environment

1. How is the increasing demand for energy adversely affecting our environment? **[2010] ...[1M]**

2. Select two non-biodegradable substances from the following waste generated in a kitchen: Spoilt food, paper bags, milk bags, vegetable peels, tin cans, used tea leaves solution **[2012] ...[1M]**

3. Mention one negative effect of our affluent life style on the environment. **[2013, 2014] ...[1M]**

4. In a food chain of frog, grass, insect and snake, assign trophic level to frog. **[2016] ...[1M]**

5. In the following food chain, 20,000 J of energy was available to the plants. How much energy would be available to man in this chain?

Plants → Sheep → Man **[2017] ...[1M]**

6. **Answer question numbers (i) to (iv) on the basis of your understanding of the following paragraphs and the related studied concepts.**

Human body is made up of five important components, of which water is the main component. Food as well as potable water are essential for every human being. The food is

obtained from plants through agriculture. Pesticides are being used extensively for a high yield in the fields. These pesticides are absorbed by the plants from the soil along with water and minerals and from the water bodies these pesticides are taken up by the aquatic animals and plants. As these chemicals are not biodegradable, they get accumulated progressively at each trophic level. The maximum concentration of these chemicals gets accumulated in our bodies and greatly affects the health of our mind and body.

(i) Why is the maximum concentration of pesticides found in human beings? **[2020] ...[1M]**

(ii) Give one method which could be applied to reduce our intake of pesticides through food to some extent. **[2020] ...[1M]**

(iii) Various steps in a food chain represent: **[2020] ...[1M]**

(a) Food web (b) Trophic level

(c) Ecosystem (d) Biomagnification

(iv) With regard to various food chain operating in an ecosystem, man is a: **[2020] ...[1M]**

(a) Consumer

(b) Producer

(c) Producer and consumer

(d) Producer and decomposer

7. In an ecosystem, 10% of energy available for transfer from one trophic level to the next is in the form of : **[2020] ...[1M]**

(a) heat energy (b) chemical energy

(c) mechanical energy (d) light energy

8. Soil fertility is determined by its ability to : **[2020]...[1M]**

(a) Decay organic matter

(b) Hold organic matter

(c) Hold water

(d) Support life

9. "Burning fossil fuels is a cause of global warming." Justify this statement. **[2012] ...[2M]**

10. We often observe domestic waste decomposing in the bylanes of residential colonies. Suggest ways to make people realise that the improper disposal of waste is harmful to the environment. **[2013] ...[2M]**

11. State with reason any two possible consequences of elimination of decomposers from the Earth. **[2014] ...[2M]**

12. You being an environmentalist are interested in contributing towards the conservation of natural resources. List four activities that you can do on your own. **[2017] ...[2M]**

13. In the following food chain, only 2 J of energy was available to the peacocks. How much energy would have been present in Grass? Justify your answer. **[2022] ...[2M]**

GRASS → GRASS HOPPER → FROG → SNAKE → PEACOCK

OR

(a) What is meant by garbage? List two classes into which garbage is classified.

(b) What do we actually mean when we say that the "enzymes are specific in their action"? **[2022] ...[2M]**

14. Use of several pesticides which results in excessive accumulation of pesticides in rivers or ponds, is a matter of deep concern. Justify this statement. **[2023] ...[2M]**

15. How is ozone formed in the upper atmosphere? Why is damage to ozone layer a cause of concern to us? What causes this damage? **[2008] ...[3M]**

16. (a) What is an ecosystem? List its two main components.

(b) We do not clean ponds or lakes, but an aquarium needs to be cleaned regularly. Explain. **[2009, 2013] ...[3M]**

17. Explain the phenomenon of "biological magnification." How does it affect organisms belonging to different trophic levels particularly the tertiary consumers? **[2010] ...[3M]**

18. "Energy flow in a food chain is unidirectional". Justify this statement. Explain how the pesticides enter a food chain and subsequently get into our body. **[2014] ...[3M]**

19. Differentiate between biodegradable and non-biodegradable substances with the help of one example each. List two changes in habit that people must adopt to dispose non-biodegradable waste, for saving the environment. **[2015] ...[3M]**

20. The activities of man had adverse effects on all forms of living organisms in the biosphere. Unlimited exploration of nature by man disturbed the delicate ecological balance between the living and nonliving components of the biosphere. The unfavorable conditions created by man himself threatened the survival not only of himself but also of the entire living organisms on the mother earth. One of your classmates is an active member of 'Eco club' of your school which is creating environmental awareness amongst the school students, spreading the same in the society and also working hard for preventing environmental degradation of the surroundings.
    (a) Why is it necessary to conserve our environment?
    (b) State the importance of green and blue dust-bins in the safe disposal of the household waste.
    (c) List two values exhibited by your classmate who is an active member of Eco-club of your school. **[2016] ...[3M]**
21. Students in a school listened to the news read in the morning assembly that the mountain of garbage in Delhi suddenly exploded and various vehicles got buried under it. Several people were also injured and there was traffic jam all ground. In the brain storming session the teacher also discussed this issue and asked the students to find out a solution to the problem of garbage. Finally they arrived at two main points - one is self management of the garbage we produce and the second is to generate least garbage at individual level.
    (a) Suggest two measures to manage the garbage we produce.
    (b) As an individual, what can we do to generate the least garbage? Give two points.
    (c) List two values the teacher instilled in his students in this episode. **[2018] ...[3M]**
22. How can we help in reducing the problem of waste disposal? Suggest any three methods.

    OR

    Define an ecosystem. Draw a block diagram to show the flow of energy in an ecosystem. **[2017, 2019] ...[3M]**
23. (a) We do not clean ponds or lakes, but an aquarium needs to be cleaned regularly. Why?
    (b) Why is ozone layer getting depleted at the higher levels of the atmosphere? Mention one harmful effect caused by its depletion. **[2022] ...[3M]**
24. Write one difference between biodegradable and non-biodegradable wastes. List two impacts of each type of the accumulated waste on environment if not disposed off properly. **[2023] ...[3M]**

6 : Sustainable Management of Natural Resources

1. What are the advantages of water stored in the ground? **[2012] ...[2M]**
2. Every one of us can do something to reduce our consumption of various natural resources. List four such activities based on the 3-R approach. **[2013] ...[2M]**
3. Why is sustainable management of natural resources necessary? Out of the two - reuse and recycle - which, in your opinion, is better to practice? Give reason. **[2015] ...[2M]**
4. What is meant by bio-diversity? List two advantages of conserving forests and wildlife. **[2015] ...[2M]**
5. List four stakeholders which may be helpful in the conservation of forests. **[2016] ...[2M]**
6. You being an environmentalist are interested in contributing towards the conservation of natural resources. List four activities that you can do on your own. **[2017] ...[2M]**
7. Why are coal and petroleum categorized as natural resources? Give a reason as to why they should be used judiciously. **[2017] ...[2M]**
8. (a) Water is an elixir of life, a very important natural resource. Your science teacher wants you to prepare a plan for a formative assessment activity, "How to save water, the vital natural resource". Write any two ways that you will suggest to bring awareness in your neighbourhood, on how to 'save water'.
    (b) Name and explain any one way by which the underground water table does not go down further. **[2017] ...[3M]**
9. What is a dam? Why do we seek to build large dams? While building large dams, which three main problems should particularly be addressed to maintain peace among local people? Mention them. **[2018] ...[3M]**
10. What is water harvesting? List two main advantages associated with water harvesting at the community level. Write two causes for the failure of sustained availability of groundwater. **[2019] ...[3M]**

❑ ❑ ❑

CHAPTER-WISE PREVIOUS YEARS' QUESTIONS

MATHEMATICS

MATHEMATICS

1 : Real Numbers

1. HCF of 144 and 198 is **[2020] ...[1M]**

   (a) 9 (b) 18

   (c) 6 (d) 12

2. 225 can be expressed as **[2020] ...[1M]**

   (a) 5×3^2 (b) $5^2 \times 3$

   (c) $5^2 \times 3^2$ (d) $5^3 \times 3$

3. The total number of factors of a prime number is **[2020] ...[1M]**

   (a) 1 (b) 0

   (c) 2 (d) 3

4. The HCF and the LCM of 12, 21, 15 respectively are **[2020] ...[1M]**

   (a) 3, 140 (b) 12, 420

   (c) 3, 420 (d) 420, 3

5. HCF of 92 and 152 is **[2021] ...[1M]**

   (a) 4 (b) 19

   (c) 23 (d) 57

6. HCF of two consecutive even numbers is **[2021] ...[1M]**

   (a) 0 (b) 1

   (c) 2 (d) 4

7. The (HCF × LCM) for the numbers 50 and 20 is **[2021] ...[1M]**

   (a) 1000 (b) 50

   (c) 100 (d) 500

8. For which natural number n, 6^n ends with digit zero? **[2021] ...[1M]**

   (a) 6 (b) 5

   (c) 0 (d) None

9. The exponent of 5 in the prime factorisation of 3750 is **[2021] ...[1M]**

   (a) 3

   (b) 4

   (c) 5

   (d) 6

10. What is the greatest possible speed at which a girl can walk 95 m and 171 m in an exact number of minutes? **[2021] ...[1M]**

    (a) 17 m/min (b) 19 m/min

    (c) 23 m/min (d) 13 m/min

11. Three alarm clocks ring their alarms at regular intervals of 20 min, 25 min and 30 min respectively. If they first beep together at 12 noon, at what time will they beep again for the first time? **[2021] ...[1M]**

    (a) 4 : 00 pm (b) 4 : 30 pm

    (c) 5 : 00 pm (d) 5 : 30 pm

12. The greatest number which when divides 1251, 9377 and 15628 leaves remainder 1, 2, and 3 respectively is **[2021] ...[1M]**

    (a) 575 (b) 450

    (c) 750 (d) 625

13. If a and b are two coprime numbers, then a^3 and b^3 are **[2021] ...[1M]**

    (a) Coprime (b) Not coprime

    (c) Even (d) Odd

14. If n is a natural number, then $2(5^n + 6^n)$ always ends with **[2021] ...[1M]**

    (a) 1 (b) 4

    (c) 3 (d) 2

15. The LCM of two numbers is 2400. Which of the following CANNOT be their HCF? **[2021] ...[1M]**

    (a) 300 (b) 400

    (c) 500 (d) 600

16. (HCF × LCM) for the numbers 30 and 70 is **[2023] ...[1M]**

    (a) 2100

    (b) 21

    (c) 210

    (d) 70

17. The number $(5-3\sqrt{5}+\sqrt{5})$ is **[2023] ...[1M]**

(a) an integer

(b) a rational number

(c) an irrational number

(d) a whole number

18. The ratio of HCF to LCM of the least composite number and the least prime number is **[2023] ...[1M]**

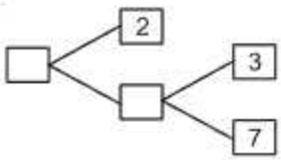
(a) 1 : 2

(b) 2 : 1

(c) 1 : 1

(d) 1 : 3

19. Complete the missing entries in the following factor tree: **[2008] ...[1M]**



20. Find the (HCF × LCM) for the numbers 100 and 190. **[2009] ...[1M]**

21. What is the HCF of smallest prime number and the smallest composite number? **[2018] ...[1M]**

22. Given that $\sqrt{2}$ is irrational, prove that $(5+3\sqrt{2})$ is an irrational number. **[2018] ...[2M]**

23. Two numbers are in the ratio 2 : 3 and their LCM is 180. What is the HCF of these numbers? **[2023] ...[2M]**

24. Prove that $3+\sqrt{2}$ is an irrational number. **[2009] ...[3M]**

25. Prove that $2-3\sqrt{5}$ is an irrational number. **[2010] ...[3M]**

26. Find HCF and LCM of 404 and 96 and verify that HCF × LCM = Product of the two given numbers. **[2018] ...[3M]**

27. Prove that $\sqrt{2}$ is an irrational number. **[2019] ...[3M]**

28. Given that $\sqrt{3}$ is an irrational number, show that $(5+2\sqrt{3})$ is an irrational number. **[2020] ...[3M]**

OR

An army contingent of 612 members is to march behind an army band of 48 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns in which they can march? **[2020] ...[3M]**

29. Prove that $\sqrt{3}$ is an irrational number. **[2023] ...[3M]**

30. Khushi wants to organize her birthday party. Being health conscious, she decided to serve only fruits in her birthday party. She bought 36 apples and 60 bananas and decided to distribute fruits equally among all.

Based on the above information, answer the following questions :

(i) How many guests Khushi can invite at the most? **[2023] ...[1M]**

(ii) How many apples and bananas will each guest get? **[2023] ...[1M]**

(iii) (A) If Khushi decides to add 42 mangoes, how many guests Khushi can invite at the most? **[2023] ...[2M]**

OR

(B) If the cost of 1 dozen of bananas is ₹60, the cost of 1 apple is ₹15 and cost of 1 mango is ₹20, find the total amount spent on 60 bananas, 36 apples and 42 mangoes. **[2023] ...[2M]**

2 : Polynomials

1. If $(x + a)$ is a factor of $2x^2 + 2ax + 5x + 10$, find a. **[2008] ...[1M]**

2. If 1 is a zero of the polynomial $p(x) = ax^2 - 3(a - 1)x - 1$, then find the value of a. **[2009]...[1M]**

3. If α, β are the zeroes of a polynomial, such that $\alpha + \beta = 6$ and $\alpha\beta = 4$, then write the polynomial. **[2010] ...[1M]**

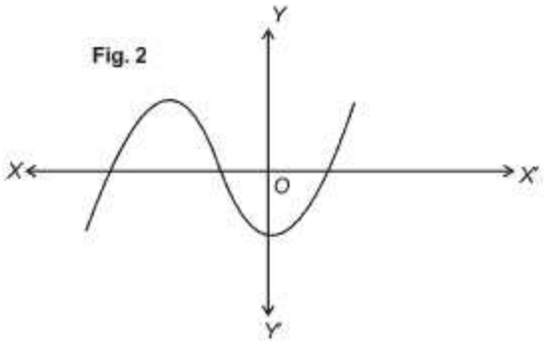
4. If one zero of a quadratic polynomial $(kx^2 + 3x + k)$ is 2, then the value of k is **[2020] ...[1M]**

   (a) $\frac{5}{6}$ (b) $-\frac{5}{6}$

   (c) $\frac{6}{5}$ (d) $-\frac{6}{5}$

5. The graph of a polynomial is shown in Fig. 2, then the number of its zeroes is **[2020] ...[1M]**

   Fig. 2



   (a) 3 (b) 1

   (c) 2 (d) 4

6. If one of the zeroes of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is **[2020] ...[1M]**

   (a) 10 (b) –10

   (c) –7 (d) –2

7. The quadratic polynomial, the sum of whose zeroes is –5 and their product is 6, is **[2020] ...[1M]**

   (a) $x^2 + 5x + 6$

   (b) $x^2 - 5x + 6$

   (c) $x^2 - 5x - 6$

   (d) $-x^2 + 5x + 6$

8. A quadratic polynomial having sum and product of its zeroes as 5 and 0 respectively, is **[2021] ...[1M]**

   (a) $x^2 + 5x$ (b) $2x(x - 5)$

   (c) $5x^2 - 1$ (d) $x^2 - 5x + 5$

9. Zeroes of a quadratic polynomial $x^2 - 5x + 6$ are **[2021] ...[1M]**

   (a) –5, 1 (b) 5, 1

   (c) 2, 3 (d) –2, –3

10. The zeroes of quadratic polynomial $x^2 + 99x + 127$ are **[2021] ...[1M]**

    (a) Both negative

    (b) Both positive

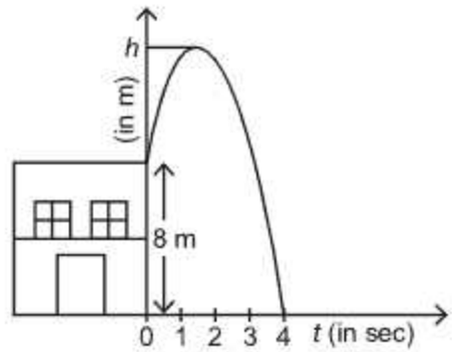
    (c) One positive and one negative

    (d) Reciprocal of each other

Case Study Based Questions (Q.11 to Q.15) : Sukriti throws a ball upwards, from a rooftop which is 8 m high from ground level. The ball reaches to some maximum height and then returns and hit the ground.

If height of the ball at time t(in sec) is represented by h(m), then equation of its path is given as $h = -t^2 + 2t + 8$

Based on above information, answer the following:



11. The maximum height achieved by ball is **[2021] ...[1M]**

    (a) 7 m (b) 8 m

    (c) 9 m (d) 10 m

12. The polynomial represented by above graph is **[2021] ...[1M]**

    (a) Linear polynomial

    (b) Quadratic polynomial

    (c) Constant polynomial

    (d) Cubic polynomial

13. Time taken by ball to reach maximum height is **[2021] ...[1M]**

(a) 2 sec. (b) 4 sec.

(c) 1 sec. (d) 2 min.

14. Number of zeroes of the polynomial whose graph is given, is **[2021] ...[1M]**

(a) 1 (b) 2

(c) 0 (d) 3

15. Zeroes of the polynomial are **[2021] ...[1M]**

(a) 4 (b) –2, 4

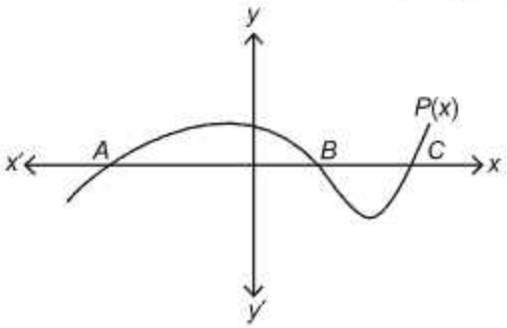
(c) 2, 4 (d) 0, 4

16. The graph of a polynomial $P(x)$ cuts the x-axis at 3 points and touches it at 2 other points. The number of zeroes of $P(x)$ is **[2021] ...[1M]**

(a) 1 (b) 2

(c) 3 (d) 5

17. In figure, the graph of a polynomial $P(x)$ is shown. The number of zeroes of $P(x)$ is **[2021] ...[1M]**



(a) 1 (b) 2

(c) 3 (d) 4

18. A quadratic polynomial, the product and sum of whose zeroes are 5 and 8 respectively is **[2021] ...[1M]**

(a) $k[x^2 - 8x + 5]$ (b) $k[x^2 + 8x + 5]$

(c) $k[x^2 - 5x + 8]$ (d) $k[x^2 + 5x + 8]$

19. If $x - 1$ is a factor of the polynomial $p(x) = x^3 + ax^2 + 2b$ and $a + b = 4$, then **[2021] ...[1M]**

(a) $a = 5, b = -1$

(b) $a = 9, b = -5$

(c) $a = 7, b = -3$

(d) $a = 3, b = 1$

20. If α, β are the zeroes of the quadratic polynomial $p(x) = x^2 - (k + 6)x + 2(2k - 1)$, then the value of k, if $\alpha + \beta = \frac{1}{2}\alpha\beta$, is **[2021] ...[1M]**

(a) –7 (b) 7

(c) –3 (d) 3

21. If $p(x) = x^2 + 5x + 6$, then $p(-2)$ is **[2023] ...[1M]**

(a) 20 (b) 0

(c) –8 (d) 8

22. A quadratic polynomial whose sum and product of zeroes are 2 and –1 respectively is **[2023] ...[1M]**

(a) $x^2 + 2x + 1$ (b) $x^2 - 2x - 1$

(c) $x^2 + 2x - 1$ (d) $x^2 - 2x + 1$

23. If α, β are zeroes of the polynomial $x^2 - 1$, then the value of $(\alpha + \beta)$ is **[2023] ...[1M]**

(a) 2 (b) 1

(c) –1 (d) 0

24. If α, β are the zeroes of the polynomial $p(x) = 4x^2 - 3x - 7$, then $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$ is equal to: **[2023] ...[1M]**

(a) $\frac{7}{3}$ (b) $\frac{-7}{3}$

(c) $\frac{3}{7}$ (d) $\frac{-3}{7}$

25. If one zero of the polynomial $p(x) = 6x^2 + 37x - (k - 2)$ is reciprocal of the other, then find the value of k. **[2023] ...[2M]**

26. Find the value of k such that the polynomial $x^2 - (k + 6)x + 2(2k - 1)$ has sum of its zeros equal to half of their product. **[2019] ...[3M]**

27. If α and β are the zeroes of the polynomial $f(x) = x^2 - 4x - 5$, then find the value of $\alpha^2 + \beta^2$. **[2020] ...[3M]**

28. Find a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $f(x) = ax^2 + bx + c$, $a \neq 0$, $c \neq 0$. **[2020] ...[3M]**

29. If α, β are zeroes of the quadratic polynomial $x^2 - 5x + 6$, form another quadratic polynomial whose zeroes are $\frac{1}{\alpha}, \frac{1}{\beta}$. **[2023] ...[3M]**

3 : Pair of Linear Equations in Two Variables

1. Find the number of solutions of the following pair of linear equations :

   $x + 2y - 8 = 0$

   $2x + 4y = 16$ **[2009] ...[1M]**

2. If the equations $kx - 2y = 3$ and $3x + y = 5$ represent two intersecting lines at unique point, then the value of k is _____.

   [2020] ...[1M]

3. The value of k for which the system of equations $x + y - 4 = 0$ and $2x + ky = 3$, has no solution, is **[2020] ...[1M]**

   (a) –2 (b) $\neq 2$

   (c) 3 (d) 2

4. The value of k, for which the pair of linear equations $x + y - 4 = 0$, $2x + ky - 3 = 0$ have no solution, is **[2021] ...[1M]**

   (a) 0 (b) 2

   (c) 6 (d) 8

5. Perimeter of a rectangle whose length (l) is 4 cm more than twice its breadth (b) is 14 cm.

   The pair of linear equations representing the above information is **[2021] ...[1M]**

   (a) $\begin{matrix} l + 4 = 2b \\ 2(l + b) = 14 \end{matrix}$ (b) $\begin{matrix} l - b = 4 \\ 2(l + b) = 14 \end{matrix}$

   (c) $\begin{matrix} l = 2b + 4 \\ l + b = 14 \end{matrix}$ (d) $\begin{matrix} l = 2b + 4 \\ 2(l + b) = 14 \end{matrix}$

6. The solution of the pair of linear equations $x = -5$ and $y = 6$ is **[2021] ...[1M]**

   (a) (–5, 6) (b) (–5, 0)

   (c) (0, 6) (d) (0, 0)

7. The value of k for which the pair of linear equations $3x + 5y = 8$ and $kx + 15y = 24$ has infinitely many solutions, is **[2021] ...[1M]**

   (a) 3 (b) 9

   (c) 5 (d) 15

8. The values of x and y satisfying the two equations $32x + 33y = 34$, $33x + 32y = 31$ respectively are : **[2021] ...[1M]**

   (a) –1, 2 (b) –1, 4

   (c) 1, –2 (d) –1, –4

9. Two lines are given to be parallel. The equation of one of the lines is $3x - 2y = 5$. The equation of the second line can be **[2021] ...[1M]**

   (a) $9x + 8y = 7$ (b) $-12x - 8y = 7$

   (c) $-12x + 8y = 7$ (d) $12x + 8y = 7$

Case Study Based Questions (Q.10 to Q.14) : A book store shopkeeper gives books on rent for reading. He has variety of books in his store related to fiction, stories and quizzes etc. He takes a fixed charge for the first two days and an additional charge for subsequent day. Amruta paid ₹22 for a book and kept for 6 days; while Radhika paid ₹16 for keeping the book for 4 days.

Assume that the fixed charge be ₹x and additional charge (per day) be ₹y.

Based on the above information, answer any **four** of the following questions.

10. The situation of amount paid by Radhika, is algebraically represented by **[2021] ...[1M]**

    (a) $x - 4y = 16$ (b) $x + 4y = 16$

    (c) $x - 2y = 16$ (d) $x + 2y = 16$

11. The situation of amount paid by Amruta, is algebraically represented by **[2021] ...[1M]**

    (a) $x - 2y = 11$ (b) $x - 2y = 22$

    (c) $x + 4y = 22$ (d) $x - 4y = 11$

12. What are the fixed charges for a book?

    [2021] ...[1M]

    (a) ₹ 9

    (b) ₹10

    (c) ₹13

    (d) ₹15

13. What are the additional charges for each subsequent day for a book? **[2021] ...[1M]**

(a) ₹ 6 (b) ₹ 5

(c) ₹ 4 (d) ₹ 3

14. What is the total amount paid by both, if both of them have kept the book for 2 more days?

[2021] ...[1M]

(a) ₹ 35 (b) ₹ 52

(c) ₹ 50 (d) ₹ 58

15. If the pair of linear equations $x - y = 1$, $x + ky = 5$ has a unique solution $x = 2$, $y = 1$, then the value of k is **[2023] ...[1M]**

(a) –2 (b) –3

(c) 3 (d) 4

16. The pair of linear equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ has **[2023] ...[1M]**

(a) A unique solution

(b) Exactly two solutions

(c) Infinitely many solutions

(d) No solution

17. The pair of linear equations $2x = 5y + 6$ and $15y = 6x - 18$ represents two lines which are

[2023] ...[1M]

(a) Intersecting

(b) Parallel

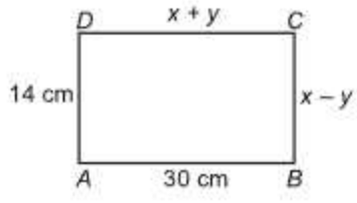
(c) Coincident

(d) Either intersecting or parallel

18. Find the value of k for which the following pair of linear equations have infinitely many solutions $2x + 3y = 7$; $(k - 1)x + (k + 2)y = 3k$.

[2010] ...[2M]

19. In figure, $ABCD$ is a rectangle. Find the values of x and y. **[2018] ...[2M]**



20. Find c if the system of equations $cx + 3y + (3 - c) = 0$; $12x + cy - c = 0$ has infinitely many solutions? **[2019] ...[2M]**

21. Represent the following pair of equations graphically and write the coordinate of points where the lines intersect y-axis.

$x + 3y = 6$

$2x - 3y = 12$ **[2008] ...[3M]**

22. Solve for x and y

$$\frac{ax}{b} - \frac{by}{a} = a + b$$

$ax - by = 2ab$ **[2009] ...[3M]**

23. The sum of numerator and denominator of a fraction is 3 less than twice the denominator. If each of the numerator and denominator is decreased by 1, the fraction becomes $\frac{1}{2}$. Find the fraction. **[2010] ...[3M]**

24. Solve the following pair of equations $\frac{4}{x} + 3y = 8, \frac{6}{x} - 4y = -5$. **[2010] ...[3M]**

25. A father's age is three times the sum of the ages of his two children. After 5 years his age will be two times the sum of their ages. Find the present age of the father. **[2019] ...[3M]**

26. A fraction becomes $\frac{1}{3}$ when 2 is subtracted from the numerator and it becomes $\frac{1}{2}$ when 1 is subtracted from the denominator. Find the fraction. **[2019] ...[3M]**

27. Solve graphically : $2x + 3y = 2$, $x - 2y = 8$

[2020] ...[3M]

28. Determine graphically the coordinates of the vertices of a triangle, the equations of whose sides are given by $2y - x = 8$, $5y - x = 14$ and $y - 2x = 1$. **[2020] ...[3M]**

29. (A) If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1. It becomes $\frac{1}{2}$ if we only add 1 to the denominator. What is the fraction?

[2023] ...[3M]

OR

(B) For which value of 'k' will the following pair of linear equations have no solution?

[2023] ...[3M]

$3x + y = 1$

$(2k - 1)x + (k - 1)y = 2k + 1$

30. Two schools '*P*' and '*Q*' decided to award prizes to their students for two games of Hockey ₹*x* per student and Cricket ₹*y* per student. School '*P*' decided to award a total of ₹9,500 for the two games to 5 and 4 students respectively; while school '*Q*' decided to award ₹7,370 for the two games to 4 and 3 students respectively.

Based on the above information, answer the following questions:

(i) Represent the following information algebraically (in terms of *x* and *y*).

[2023] ...[1M]

(ii) (A) What is the prize amount for hockey?

[2023] ...[2M]

OR

(B) Prize amount on which game is more and by how much? **[2023] ...[2M]**

(iii) What will be the total prize amount if there are 2 students each from two games?

[2023] ...[1M]

31. A peacock is sitting on the top of a pillar, which is 9 m high. From a point 27 in away from the bottom of the pillar, a snake is coming to its hole at the base of the pillar. Seeing the snake the peacock pounces on it. If their speeds are equal, at what distance from the hole is the snake caught ? **[2008] ...[6M]**

4 : Quadratic Equations

1. The root of the equation $x^2 - 3x - m(m + 3) = 0$, where m is a constant, are **[2011] ...[1M]**

   (a) $m, m + 3$ (b) $-m, m + 3$

   (c) $m, -(m + 3)$ (d) $-m, -(m + 3)$

2. If 1 is a root of the equations $ay^2 + ay + 3 = 0$ and $y^2 + y + b = 0$, then ab equals **[2012]...[1M]**

   (a) 3 (b) $-\frac{7}{2}$

   (c) 6 (d) –3

3. A quadratic equation whose one root is 2 and the sum of whose roots is zero, is **[2023] ...[1M]**

   (a) $x^2 + 4 = 0$ (b) $x^2 - 2 = 0$

   (c) $4x^2 - 1 = 0$ (d) $x^2 - 4 = 0$

4. Which of the following is not a quadratic equation? **[2023] ...[1M]**

   (a) $2(x - 1)^2 = 4x^2 - 2x + 1$

   (b) $2x - x^2 = x^2 + 5$

   (c) $(\sqrt{2}x + \sqrt{3})^2 + x^2 = 3x^2 - 5x$

   (d) $(x^2 + 2x)^2 = x^4 + 3 + 4x^3$

5. The roots of the equation $x^2 + 3x - 10 = 0$ are **[2023] ...[1M]**

   (a) 2, –5 (b) –2, 5

   (c) 2, 5 (d) –2, –5

6. Show that $x = -3$ is a solution of $x^2 + 6x + 9 = 0$. **[2008] ...[1M]**

7. Find the discriminant of the quadratic equation $3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$. **[2009] ...[1M]**

8. If the quadratic equation $px^2 - 2\sqrt{5}px + 15 = 0$ has two equal roots, then find the value of p. **[2015] ...[1M]**

9. If $x = 3$ is one root of the quadratic equation $x^2 - 2kx - 6 = 0$, then find the value of k. **[2018] ...[1M]**

10. For what values of k, the roots of the equation $x^2 + 4x + k = 0$ are real? **[2019] ...[1M]**

11. Find the value of k for which the roots of the equation $3x^2 - 10x + k = 0$ are reciprocal of each other. **[2019] ...[1M]**

12. If quadratic equation $3x^2 - 4x + k = 0$ has equal roots, then the value of k is _____. **[2020] ...[1M]**

13. **Assertion (A):** If one root of the quadratic equation $4x^2 - 10x + (k - 4) = 0$ is reciprocal of the other, then value of k is 8.

Reason (R): Roots of the quadratic equation $x^2 - x + 1 = 0$ are real. **[2023] ...[1M]**

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

(c) Assertion (A) is true but Reason (R) is false

(d) Assertion (A) is false but Reason (R) is true

14. Find the value of m so that the quadratic equation $mx(x - 7) + 49 = 0$ has two equal roots. **[2011] ...[2M]**

15. Find the value(s) of k so that the quadratic equation $3x^2 - 2kx + 12 = 0$ has equal roots. **[2012] ...[2M]**

16. Solve the following quadratic equation for x: $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$. **[2013] ...[2M]**

17. Solve the quadratic equation $2x^2 + ax - a^2 = 0$ for x. **[2014] ...[2M]**

18. Solve the following quadratic equation for x:

$4x^2 + 4bx - (a^2 - b^2) = 0$ **[2015] ...[2M]**

19. If -5 is a root of the quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, find the value of k. **[2016] ...[2M]**

20. Find the value of p, for which one root of the quadratic equation $px^2 - 14x + 8 = 0$ is 6 times the other. **[2017] ...[2M]**

21. Find the nature of the roots of the quadratic equation : **[2022] ...[2M]**

$4x^2 - 5x - 1 = 0$

22. Solve the quadratic equation :

$x^2 + 2\sqrt{2}x - 6 = 0$ for x. **[2022] ...[2M]**

23. (A) Find the discriminant of the quadratic equation and hence find the nature of its roots. **[2023] ...[2M]**

OR

(B) Find the roots of the quadratic equation $x^2 - x - 2 = 0$ **[2023] ...[2M]**

24. (A) Find the sum and product of the roots of the quadratic equation $2x^2 - 9x + 4 = 0$. **[2023] ...[2M]**

OR

(B) Find the discriminant of the quadratic equation $4x^2 - 5 = 0$ and hence comment on the nature of roots of the equation. **[2023] ...[2M]**

25. The sum of two numbers is 8. Determine the numbers if the sum of their reciprocals is $\frac{8}{15}$. **[2009] ...[3M]**

26. Find the roots of the following quadratic equation : $x^2 - 3\sqrt{5}x + 10 = 0$. **[2011] ...[3M]**

27. Solve for x : $4x^2 - 4ax + (a^2 - b^2) = 0$. **[2012] ...[3M]**

28. Solve for x : $3x^2 - 2\sqrt{6}x + 2 = 0$. **[2012] ...[3M]**

29. For what value(s) of k, the roots of the quadratic equation $(k + 4)x^2 + (k + 1)x + 1 = 0$ are equal? **[2013] ...[3M]**

30. Solve of x :

$\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$ **[2015] ...[3M]**

31. If $ad \neq bc$, then prove that the equation $(a^2 + b^2)x^2 + 2(ac + bd)x + (c^2 + d^2) = 0$ has no real roots. **[2017] ...[3M]**

32. A plane left 30 minutes late than its scheduled time and in order to reach the destination 1500 km away in time, it had to increase its speed by 100 km/h from the usual speed. Find its usual speed. **[2018] ...[3M]**

33. In a flight of 600 km, an aircraft was slowed due to bad weather. Its average speed for the trip was reduced by 200 km/hr and time of flight increased by 30 minutes. Find the original duration of flight. **[2020] ...[3M]**

34. Find the value of 'p' for which the quadratic equation **[2023] ...[3M]**

$px(x - 2) + 6 = 0$ has two equal real roots.

35. Sum of the areas of two squares is 400 cm^2. If the difference of their perimeters is 16 cm, find the sides of the two squares. **[2013] ...[4M]**

36. The difference of two natural numbers is 5 and the difference of their reciprocals is $\frac{1}{10}$. Find the numbers. **[2014] ...[4M]**

37. Find the values of k for which the quadratic equation $(k + 4)x^2 + (k + 1)x + 1 = 0$ has equal roots. Also, find the roots. **[2014] ...[4M]**

38. The diagonal of a rectangular field is 16 metres more than the shorter side. If the longer side is 14 metres more than the shorter side, then find the lengths of the sides of the field.

[2015]...[4M]

39. A train travels at a certain average speed for a distance of 54 km and then travels a distance of 63 km at an average speed of 6 km/h more than the first speed. If it takes 3 hours to complete the total journey, what is its first speed?

[2015] ...[4M]

40. A motor-boat whose speed is 24 km/h in still water takes 1 hour more to go 32 km upstream than to return downstream to the same spot. Find the speed of the stream. **[2016] ...[4M]**

41. Two taps running together can fill a tank in $3\frac{1}{13}$ hours. If one tap takes 3 hours more than the other to fill the tank, then how much time will each tap take to fill the tank? **[2017] ...[4M]**

42. A motor-boat whose speed is 18 km/hr in still water take 1 hr more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream. **[2018] ...[4M]**

43. A train travels at a certain average speed for a distance of 63 km and then travels a distance of 72 km at an average speed of 6 km/hr more than its original speed. It takes 3 hours to complete total journey, what is the original average speed? **[2018] ...[4M]**

44. Two water taps together can fill a tank in $1\frac{7}{8}$ hours. The tap with longer diameter takes 2 hours less than the tap with smaller one to fill the tank separately. Find the time in which each tap can fill the tank separately. **[2019] ...[4M]**

45. A two digit number is such that the product of its digits is 14. If 45 is added to the number; the digits interchange their places. Find the number.

[2020] ...[4M]

46. The sum of the ages of a boy and his sister (in years) is 25 and product of their ages is 150. Find their present ages. **[2022] ...[4M]**

47. (a) A 2-digit number is such that the product of its digits is 24. If 18 is subtracted from the number, the digits interchange their places. Find the number. **[2022] ...[4M]**

OR

(b) The difference of the squares of two numbers is 180. The square of the smaller number is 8 times the greater number. Find the two numbers. **[2022] ...[4M]**

48. The difference of two numbers is 4. If the difference of their reciprocals is $\frac{4}{21}$, find the two numbers. **[2008] ...[6M]**

49. Solve the following equation for x:

$9x^2 - 9(a + b)x + (2a^2 + 5ab + 2b^2) = 0$

[2009] ...[6M]

50. If (-5) is a root of the quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, then find the values of p and k. **[2009] ...[6M]**

51. Three consecutive positive integers are such that the sum of the square of the first and the product of the other two is 46, find the integers.

[2010] ...[6M]

52. The difference of squares of two numbers is 88. If the larger number is 5 less than twice the smaller number, then find the two numbers.

[2010] ...[6M]

53. A train travels 180 km at a uniform speed. If the speed had been 9 km/hour more, it would have taken 1 hour less for the same journey. Find the speed of the train. **[2011] ...[6M]**

54. A shopkeeper buys books of the ₹80. If he had bought 4 more books for the same amount, each book would have cost ₹1 less. Find the number of books he bought. **[2012] ...[6M]**

55. The sum of two numbers is 9 and the sum of their reciprocals is $\frac{1}{2}$. Find the numbers.

[2012] ...[6M]

5 : Arithmetic Progressions

1. If the common difference of an AP is 3, then $a_{20} - a_{15}$ is **[2011] ...[1M]**

   (a) 5

   (b) 3

   (c) 15

   (d) 20

2. The sum of first 20 odd natural number is **[2012] ...[1M]**

   (a) 100

   (b) 210

   (c) 400

   (d) 420

3. The common difference of AP $\frac{1}{3q}, \frac{1-6q}{3q}, \frac{1-12q}{3q}, \ldots$ is **[2013] ...[1M]**

   (a) q

   (b) $-q$

   (c) -2

   (d) 2

4. The first three terms of an AP respectively are $3y - 1$, $3y + 5$ and $5y + 1$. The y equals **[2014] ...[1M]**

   (a) -3

   (b) 4

   (c) 5

   (d) 2

5. The value of x for which $2x$, $(x + 10)$ and $(3x + 2)$ are the three consecutive terms of an AP, is **[2020] ...[1M]**

   (a) 6

   (b) -6

   (c) 18

   (d) -18

6. The first term of an AP is p and the common difference is q, then its 10^{th} term is **[2020] ...[1M]**

   (a) $q + 9p$

   (b) $p - 9q$

   (c) $p + 9q$

   (d) $2p + 9q$

7. If $k + 2$, $4k - 6$ and $3k - 2$ are three consecutive terms of an A.P., then the value of k is **[2023] ...[1M]**

   (a) 3

   (b) -3

   (c) 4

   (d) -4

8. ***DIRECTION :*** *In the question, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option out of the following :*

   Assertion (A) : a, b, c are in A.P. if and only if $2b = a + c$.

   Reason (R) : The sum of first n odd natural numbers is n^2. **[2023] ...[1M]**

   (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

   (b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

   (c) Assertion (A) is true but Reason (R) is false

   (d) Assertion (A) is false but Reason (R) is true

9. The first term of an AP is p and its common difference is q. Find its 10^{th} term. **[2008] ...[1M]**

10. If $\frac{4}{5}$, a, 2 are three consecutive terms of an AP, then find the value of a. **[2009] ...[1M]**

11. If the sum of first p terms of an AP, is $ap^2 + bp$, find its common difference. **[2010] ...[1M]**

12. For what value of k will $k + 9$, $2k - 1$ and $2k + 7$ are the consecutive terms of an AP?

[2016] ...[1M]

13. What is the common difference of an AP in which $a_{21} - a_7 = 84$? **[2017] ...[1M]**

14. In an AP, if the common difference (d) = – 4, and the seventh term (a_7) is 4, then find the first term. **[2018] ...[1M]**

15. How many two digit numbers are divisible by 3? **[2019] ...[1M]**

16. The n^{th} term of an AP is $(7 - 4n)$, then what is its common difference? **[2020] ...[1M]**

17. Which term of the AP 3, 15, 27, 39, ... will be 120 more than its 21^{st} term? **[2009, 2019]...[2M]**

18. In an AP, the first term is 2, the last term is 29 and sum of the terms is 155. Find the common difference of the AP **[2010] ...[2M]**

19. Find how many two-digit numbers are divisible by 6. **[2011] ...[2M]**

20. Find the sum of all three digit natural numbers, which are multiples of 7. **[2012] ...[2M]**

21. The first and the last term of an AP are 5 and 45 respectively. If the sum of all its terms is 400, find its common difference. **[2014, 2017] ...[2M]**

22. In an AP, if $S_5 + S_7 = 167$ and $S_{10} = 235$, then find the AP, where S_n denotes the sum of its first n terms. **[2015] ...[2M]**

23. The 4^{th} term of an AP is zero. Prove that the 25^{th} term of the AP is three times its 11^{th} term.

[2016] ...[2M]

24. Which term of the progression 20, $19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, ...$ is the first negative term?

[2017] ...[2M]

25. Find the sum of first 8 multiples of 3. **[2018]...[2M]**

26. If S_n, the sum of first n terms of an AP is given by $S_n = 3n^2 - 4n$, find the n^{th} term.

[2019]...[2M]

27. Show that $(a - b)^2$, $(a^2 + b^2)$ and $(a + b)^2$ are in A.P. **[2020] ...[2M]**

28. (a) Which term of the A.P. 3, 8, 13, 18, ... is 78? **[2022] ...[2M]**

OR

(b) Find the common difference of an A.P. whose n^{th} term is given by

$a_n = 6n - 5$. **[2022] ...[2M]**

29. Find the sum of the first fifteen multiples of 8.

[2022] ...[2M]

30. (a) Which term of the A.P. $-\frac{11}{2}, -3, -\frac{1}{2}, ...$

is $\frac{49}{2}$? **[2022] ...[2M]**

OR

(b) Find a and b so that the numbers

a, 7, b, 23 are in A.P. **[2022] ...[2M]s**

31. Find the sum of first 20 terms of an A.P. whose n^{th} term is given as $a_n = 5 - 2n$. **[2022] ...[2M]**

32. For what value of n are the n^{th} terms of two AP's 63, 65, 67, ... and 3, 10, 17, ... equal?

[2008] ...[3M]

33. If m times the m^{th} term of an AP is equal to n times its n^{th} term, find the $(m + n)^{th}$ term of the AP. **[2008] ...[3M]**

34. In an AP, the first term is 8, n^{th} term is 33 and sum to first n terms is 123. Find n and d, the common difference. **[2008] ...[3M]**

35. The sum of first six terms of an arithmetic progression is 42. The ratio of its 10^{th} term to its 30^{th} term is 1 : 3. Calculate the first and the thirteenth term of the AP.? **[2009] ...[3M]**

36. In an AP, the sum of first ten terms is –150 and the sum of its next ten terms is –550. Find the AP **[2010] ...[3M]**

37. Find an AP whose fourth term is 9 and the sum of its sixth term and thirteenth term is 40.

[2011] ...[3M]

38. The 16^{th} term of an AP is 1 more than twice its 8^{th} term. If the 12^{th} term of the AP is 47, then find its n^{th} term. **[2012] ...[3M]**

39. The sum of first n terms of an AP is $3n^2 + 4n$. Find the 25th term of this AP. **[2013] ...[3M]**

40. If the seventh term of an AP is $\frac{1}{9}$ and its ninth term is $\frac{1}{7}$, find its 63rd term. **[2014] ...[3M]**

41. The 14th term of an AP is twice its 8th term. If its 6th term is –8, then find the sum of its first 20 terms. **[2015] ...[3M]**

42. If the ratio of the sum of first n terms of two AP's is $(7n + 1) : (4n + 27)$, find the ratio of their m^{th} terms. **[2016] ...[3M]**

43. (A) The sum of first 15 terms of an A.P. is 750 and its first term is 15. Find its 20th term. **[2023] ...[3M]**

OR

(B) Rohan repays his total loan of ₹ 1,18,000 by paying every month starting with the first instalment of ₹ 1,000. If he increases the instalment by ₹ 100 every month, what amount will be paid by him in the 30th instalment? What amount of loan has he paid after 30th instalment? **[2023] ...[3M]**

44. The first and the last terms of an A.P. are 8 and 350 respectively. If its common difference is 9, how many terms are there and what is their sum? **[2011] ...[4M]**

45. How many multiples of 4 lie between 10 and 250? Also find their sum. **[2011] ...[4M]**

46. Sum of the first 20 terms of an AP is –240 and its first term is 7. Find its 24th term. **[2012] ...[4M]**

47. Find the number of terms of the AP –12, –9, –6, ... 12. If 1 is added to each term of this AP, then find the sum of terms of the AP thus obtained. **[2013] ...[4M]**

48. In an AP of 50 terms, the sum of first 10 terms is 210 and the sum of its last 15 terms is 2565. Find the AP. **[2014] ...[4M]**

49. Find the 60th term of the AP 8, 10, 12 ....., if it has a total of 60 terms and hence find the sum of its last 10 terms. **[2015] ...[4M]**

50. The houses in a row numbered consecutively from 1 to 49. Show that there exists a value of X such that sum of numbers of houses preceding the house numbered X is equal to sum of the numbers of houses following X.

[2016] ...[4M]

51. The sum of four consecutive numbers in an AP is 32 and the ratio of the product of the first and the last term to the product of two middle terms is 7 : 15. Find the numbers. **[2018] ...[4M]**

52. If the sum of first four terms of an AP is 40 and that of first 14 terms is 280. Find the sum of its first n terms. **[2019] ...[4M]**

53. If 4 times the 4th term of an AP is equal to 18 times the 18th term, then find the 22nd term.

[2020] ...[4M]

OR

How many terms of the AP : 24, 21, 18, ... must be taken so that their sum is 78?

[2020] ...[4M]

54. The sum of four consecutive numbers in AP is 32 and the ratio of the product of the first and last terms to the product of two middle terms is 7 : 15. Find the numbers. **[2020] ...[4M]**

OR

Solve : $1 + 4 + 7 + 10 + \ldots + x = 287$

[2020] ...[4M]

55. (A) Find the sum of first 51 terms of an A.P. whose second and third terms are 14 and 18, respectively. **[2023] ...[5M]**

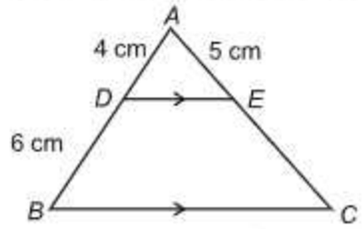
OR

(B) The first term of an A.P. is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.

[2023] ...[5M]

6 : Triangles

1. In ΔABC, $DE \parallel BC$, $AD = 4$ cm, $DB = 6$ cm and $AE = 5$ cm. The length of EC is **[2021] ...[1M]**



(a) 7 cm (b) 6.5 cm

(c) 7.5 cm (d) 8 cm

2. Which of the following is a correct statement? **[2021] ...[1M]**

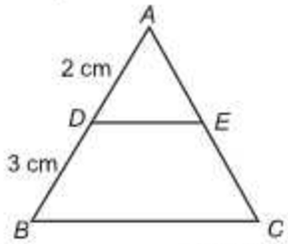
(a) Two congruent figures are always similar

(b) Two similar figures are always congruent

(c) All rectangles are similar

(d) The polygons having same number sides are similar

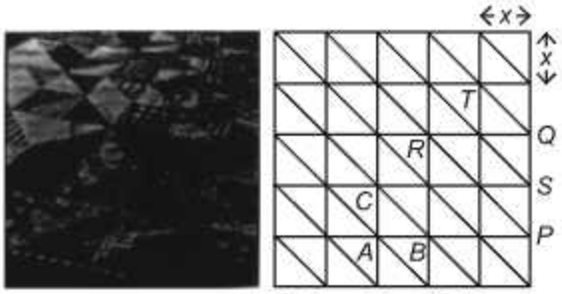
3. In ΔABC, $DE \parallel BC$, $AD = 2$ cm, $DB = 3$ cm, $DE : BC$ is equal to **[2021] ...[1M]**



(a) 2 : 3 (b) 2 : 5

(c) 1 : 2 (d) 3 : 5

Case Study Based Questions (Q.4 to Q.7) :



Diagrammatic View

Quilts are available in various colours and design. Geometric design includes shapes like squares, triangles, rectangles, hexagons, etc.

One such design is shown above. Two triangles are highlighted, ΔABC and ΔPQR.

Based on above information, answer the following questions:

4. Which of the following criteria is not suitable for ΔABC to be similar to ΔQRP? **[2021] ...[1M]**

(a) SAS

(b) AAA

(c) SSS

(d) RHS

5. If each square is of length x unit, then length BC is equal to **[2021] ...[1M]**

(a) $x\sqrt{2}$ unit

(b) $2x$ unit

(c) $2\sqrt{x}$ unit

(d) $x\sqrt{x}$ unit

6. Ratio $BC : PR$ is equal to **[2021] ...[1M]**

(a) 2 : 1

(b) 1 : 4

(c) 1 : 2

(d) 4 : 1

7. Which of the following is **not** true? **[2021] ...[1M]**

(a) $\Delta TQS \sim \Delta PQR$

(b) $\Delta CBA \sim \Delta STQ$

(c) $\Delta BAC \sim \Delta PQR$

(d) $\Delta PQR \sim \Delta ABC$

8. In ΔABC and ΔDEF, $\angle F = \angle C$, $\angle B = \angle E$ and $AB = \frac{1}{2}DE$. Then, the two triangles are **[2021] ...[1M]**

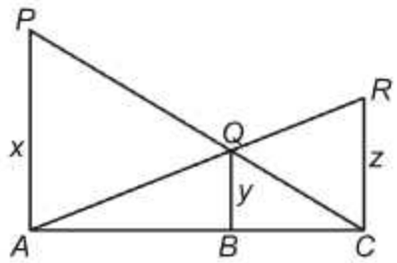
(a) Congruent, but not similar.

(b) Similar, but not congruent

(c) Neither congruent nor similar.

(d) Congruent as well as similar.

9. In fig., PA, QB and RC are each perpendicular to AC. If $x = 8$ cm and $z = 6$ cm, then y is equal to **[2021] ...[1M]**



(a) $\frac{56}{7}$ cm

(b) $\frac{7}{56}$ cm

(c) $\frac{25}{7}$ cm

(d) $\frac{24}{7}$ cm

10. In a ΔABC, $\angle A = x°$, $\angle B = (3x - 2)°$, $\angle C = y°$. Also $\angle C - \angle B = 9°$. The sum of the greatest and the smallest angles of this triangle is **[2021] ...[1M]**

(a) 107°

(b) 135°

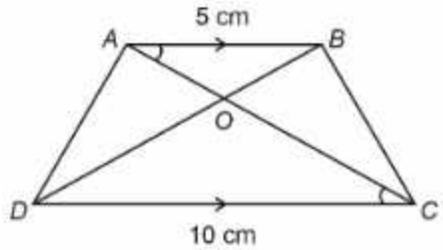
(c) 155°

(d) 145°

Case Study Based Questions (Q.11 to Q.14) :

A farmer has a field in the shape of trapezium, whose map with scale 1 cm = 20 m, is given below :

The field is divided into four parts by joining the opposite vertices.



Based on above information, answer the following:

11. The two triangular regions AOB and COD are **[2021] ...[1M]**

(a) Similar by AA criterion

(b) Similar by SAS criterion

(c) Similar by RHS criterion

(d) Not similar

12. If the ratio of the perimeter of ΔAOB to the perimeter of ΔCOD would have been 1 : 4, then **[2021] ...[1M]**

(a) $AB = 2CD$

(b) $AB = 4CD$

(c) $CD = 2AB$

(d) $CD = 4AB$

13. If in Δs AOD and BOC, $\frac{AO}{BC} = \frac{AD}{BO} = \frac{OD}{OC}$, then **[2021] ...[1M]**

(a) $\Delta AOD \sim \Delta BOC$

(b) $\Delta AOD \sim \Delta BCO$

(c) $\Delta ADO \sim \Delta BCO$

(d) $\Delta ODA \sim \Delta OBC$

14. If $\Delta ABC \sim \Delta DEF$ and $\angle A = 47°$, $\angle E = 83°$, then $\angle C$ is equal **[2023] ...[1M]**

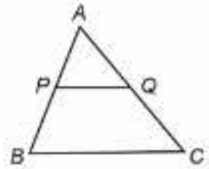
(a) 47°

(b) 50°

(c) 83°

(d) 130°

15. In ΔABC, $PQ \parallel BC$. If $PB = 6$ cm, $AP = 4$ cm, $AQ = 8$ cm, find the length of AC. **[2023] ...[1M]**

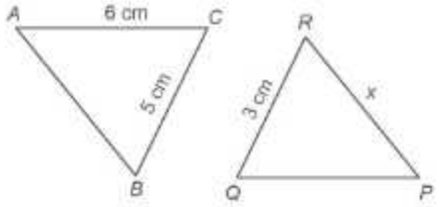


(a) 12 cm

(b) 20 cm

(c) 6 cm

(d) 14 cm

16. 

In the given figure, $\Delta ABC \sim \Delta QPR$. If $AC = 6$ cm, $BC = 5$ cm, $QR = 3$ cm and $PR = x$, then the value of x is **[2023] ...[1M]**

(a) 3.6 cm

(b) 2.5 cm

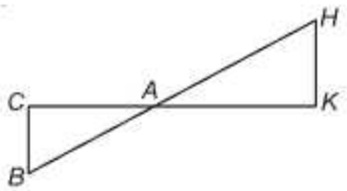
(c) 10 cm

(d) 3.2 cm

17. The lengths of the diagonals of a rhombus are 30 cm and 40 cm. Find the side of the rhombus. **[2008] ...[1M]**

18. In ΔLMN, $\angle L = 50°$ and $\angle N = 60°$. If $\Delta LMN \sim \Delta PQR$, then find $\angle Q$. **[2009] ...[1M]**

19. In below figure, ΔAHK is similar to ΔABC. If $AK = 10$ cm, $BC = 3.5$ cm and $HK = 7$ cm, find AC. **[2010] ...[1M]**



20. The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one side of the first triangle is 9 cm, then the corresponding side of second triangle is _____. **[2020] ...[1M]**

21. In Fig. 3, in ΔABC, $DE \parallel BC$ such that $AD = 2.4$ cm, $AB = 3.2$ cm and $AC = 8$ cm, then what is the length of AE? **[2020] ...[1M]**

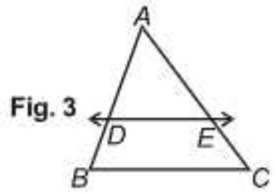


Fig. 3

22. E is a point on the side AD produced of parallelogram $ABCD$ and BE intersects CD at F. Show that $\Delta ABE \sim \Delta CFB$. **[2008] ...[2M]**

23. In Fig.2, $DE \parallel AC$ and $DC \parallel AP$. Prove that $\frac{BE}{EC} = \frac{BC}{CP}$ **[2020] ...[2M]**

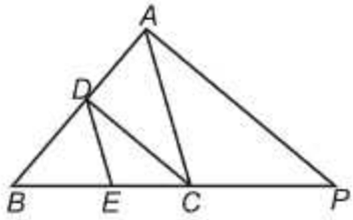
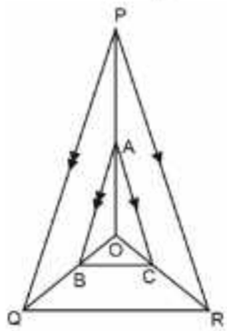
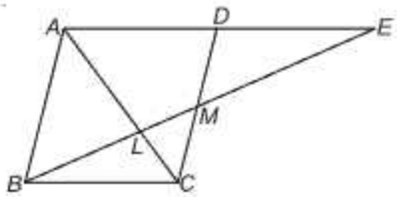


Fig. 2

24. In the adjoining figure, A, B and C are points on OP, OQ and OR respectively such that $AB \| PQ$ and $AC \| PR$. Show that $BC \| QR$. **[2023] ...[2M]**



25. In figure, M is mid-point of side CD of a parallelogram $ABCD$. The line BM is drawn intersecting AC at L and AD produced at E. Prove that $EL = 2BL$. **[2009] ...[3M]**



26. In Fig. 5, $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$, prove that BAC is an isosceles triangle. **[2020] ...[3M]**

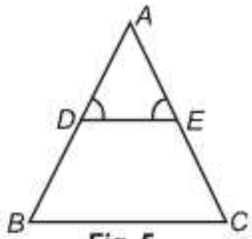


Fig. 5

27. In Fig. 6, *DEFG* is a squre in a triantgle *ABC* right angled at *A*.

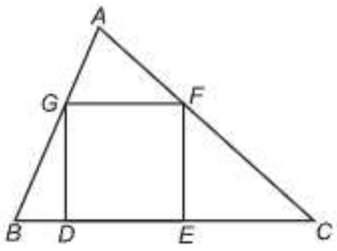


Fig. 6

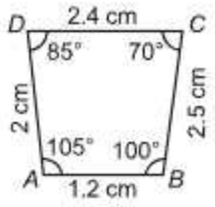
Prove that

$\Delta AGF \sim \Delta DBG$, (ii) $\Delta AGF \sim \Delta EFC$

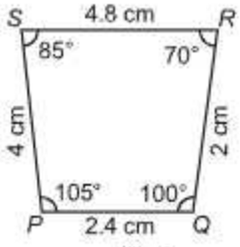
[2020] ...[4M]

28. Observe the figures given below carefully and answer the questions :

Figure A

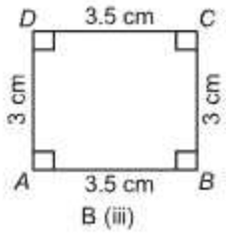


A (i)

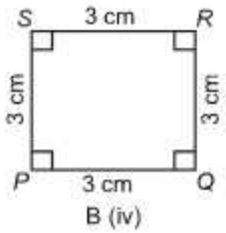


(ii) A

Figure B

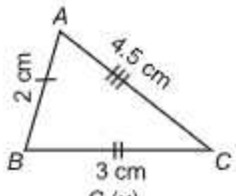


B (iii)

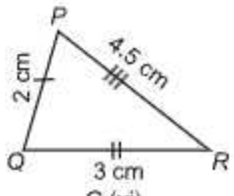


B (iv)

Figure C



C (v)



C (vi)

(i) Name the figure(s) wherein two figures are similar. **[2023] ...[1M]**

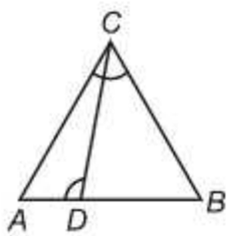
(ii) Name the figure(s) wherein the figures are congruent. **[2023] ...[1M]**

(iii) (A) Prove that congruent triangles are also similar but not the converse. **[2023] ...[2M]**

OR

(B) What more is least needed for two similar triangles to be congruent ? **[2M]**

29. (A) In the given figure, $\angle ADC = \angle BCA$; prove that $\Delta ACB \sim \Delta ADC$. Hence find *BD* if *AC* = 8 cm and *AD* = 3 cm. **[2023] ...[5M]**



OR

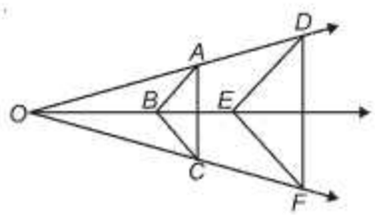
(B) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

[2023] ...[5M]

30. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.

Using the above, prove the following :

In figure, *AB* | | *DE* and *BC* | | *EF*. Prove that *AC* | | *DF*. **[2008] ...[6M]**



7 : Coordinate Geometry

1. If $P\left(\frac{a}{2}, 4\right)$ is the midpoint of the line-segment joining the points $A(-6, 5)$ and $B(-2, 3)$, then the value of a is **[2011] ...[1M]**

   (a) –8 (b) 3

   (c) –4 (d) 4

2. If A and B are the points (–6, 7) and (–1, –5) respectively, then the distance $2AB$ is equal to **[2011] ...[1M]**

   (a) 13 (b) 26

   (c) 169 (d) 238

3. The coordinates of the point P dividing the line segment joining the points $A(1, 3)$ and $B(4, 6)$ in the ratio 2 : 1 are **[2012] ...[1M]**

   (a) (2, 4) (b) (3, 5)

   (c) (4, 2) (d) (5, 3)

4. If the coordinates of the one end of a diameter of a circle are (2, 3) and the coordinates of its centre are (–2, 5), then the coordinates of the other end of the diameter are **[2012] ...[1M]**

   (a) (–6, 7) (b) (6, –7)

   (c) (6, 7) (d) (–6, –7)

5. Find the distance of a point $P(x, y)$ from the origin. **[2018] ...[1M]**

6. Find the coordinates of a point A, where AB is diameter of a circle whose centre is (2, –3) and B is the point (1, 4). **[2019] ...[1M]**

7. Distance of point $P(3, 4)$ from x-axis is **[2020] ...[1M]**

   (a) 3 units (b) 4 units

   (c) 5 units (d) 1 unit

8. If the distance between the points $A(4, p)$ and $B(1, 0)$ is 5 units, then the value(s) of p is (are) **[2020] ...[1M]**

   (a) 4 only (b) –4 only

   (c) ±4 (d) 0

9. If the point $C(k, 4)$ divides the line segment joining two points $A(2, 6)$ and $B(5, 1)$ in ratio 2 : 3, the value of k is _____. **[2020] ...[1M]**

10. The distance between the points $(a\cos\theta + b\sin\theta, 0)$ and $(0, a\sin\theta - b\cos\theta)$, is **[2020] ...[1M]**

    (a) $a^2 + b^2$ (b) $a^2 - b^2$

    (c) $\sqrt{a^2 + b^2}$ (d) $\sqrt{a^2 - b^2}$

11. If the point $P(k, 0)$ divides the line segment joining the points $A(2, -2)$ and $B(-7, 4)$ in the ratio 1 : 2, then the value of k is **[2020] ...[1M]**

    (a) 1 (b) 2

    (c) –2 (d) –1

12. A point $(x, 1)$ is equidistant from (0, 0) and (2, 0). The value of x is **[2021] ...[1M]**

    (a) 1 (b) 0

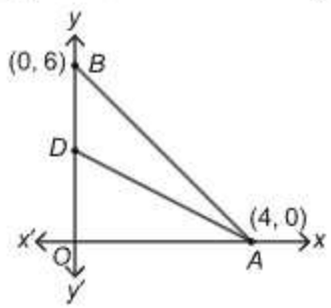
    (c) 2 (d) 1/2

13. The ratio in which the point (4, 0) divides the line segment joining the points (4, 6) and (4, –8) is **[2021] ...[1M]**

    (a) 1 : 2 (b) 3 : 4

    (c) 4 : 3 (d) 1 : 1

14. The vertices of a triangle OAB are $O(0, 0)$, $A(4, 0)$ and $B(0, 6)$. The median AD is drawn on OB. The length AD is **[2021] ...[1M]**



    (a) $\sqrt{52}$ units (b) 5 units

    (c) 25 units (d) 10 units

15. The origin divides the line segment AB joining the points $A(1, -3)$ and $B(-3, 9)$ in the ratio : **[2021] ...[1M]**

    (a) 3 : 1

    (b) 1 : 3

    (c) 2 : 3

    (d) 1 : 1

16. A circle of radius 3 units is centred at (0, 0). Which of the following points lie outside the circle? **[2021] ...[1M]**

(a) (–1, –1) (b) (0, 3)

(c) (1, 2) (d) (3, 1)

17. The mid-point of line segment joining the points (–3, 9) and (–6, –4) is **[2021] ...[1M]**

(a) $\left(\frac{-3}{2}, \frac{-13}{2}\right)$ (b) $\left(\frac{9}{2}, \frac{-5}{2}\right)$

(c) $\left(\frac{-9}{2}, \frac{5}{2}\right)$ (d) $\left(\frac{9}{2}, \frac{5}{2}\right)$

18. If $A\left(3, \sqrt{3}\right)$, $B(0, 0)$ and $C(3, k)$ are the three vertices of an equilateral triangle ABC, then the value of k is **[2021] ...[1M]**

(a) 2 (b) –3

(c) $-\sqrt{3}$ (d) $-\sqrt{2}$

19. Three vertices of a parallelogram $ABCD$ are $A(1, 4)$, $B(-2, 3)$ and $C(5, 8)$. The ordinate of the fourth vertex D is **[2021] ...[1M]**

(a) 8 (b) 9

(c) 7 (d) 6

20. Points $A(-1, y)$ and $B(5, 7)$ lie on a circle with centre $O(2, -3y)$. The values of y are **[2021] ...[1M]**

(a) 1, –7 (b) –1, 7

(c) 2, 7 (d) –2, –7

21. The ratio in which the line $3x + y - 9 = 0$ divides the line segment joining the points (1, 3) and (2, 7) is **[2021] ...[1M]**

(a) 3 : 2

(b) 2 : 3

(c) 3 : 4

(d) 4 : 3

22. If $A(4, -2)$, $B(7, -2)$ and $C(7, 9)$ are the vertices of a ΔABC, then ΔABC is **[2021] ...[1M]**

(a) Equilateral triangle

(b) Isosceles triangle

(c) Right angled triangle

(d) Isosceles right angled triangle

23. The line segment joining the points $P(-3, 2)$ and $Q(5, 7)$ is divided by the y-axis in the ratio **[2021] ...[1M]**

(a) 3 : 1 (b) 3 : 4

(c) 3 : 2 (d) 3 : 5

24. The distance of the point (–6, 8) from origin is **[2023] ...[1M]**

(a) 6 (b) –6

(c) 8 (d) 10

25. The distance of the point (–1, 7) from x-axis is **[2023] ...[1M]**

(a) –1 (b) 7

(c) 6 (d) $\sqrt{50}$

26. If $P(2, p)$ is the mid-point of the line segment joining the points $A(6, -5)$ and $B(-2, 11)$, find the value of p. **[2010] ...[1M]**

27. If $A(1, 2)$, $B(4, 3)$ and $C(6, 6)$ are the three vertices of a parallelogram $ABCD$, find the coordinates of the fourth vertex D. **[2010] ...[1M]**

28. If the points $A(4, 3)$ and $B(x, 5)$ are on the circle with the centre $O(2, 3)$, find the value of x. **[2009] ...[2M]**

29. Find the value of y for which the distance between the points $A(3, -1)$ and $B(11, y)$ is 10 units. **[2011] ...[2M]**

30. If a point $A(0, 2)$ is equidistant from the points $B(3, p)$ and $C(p, 5)$ then find the value of p. **[2012] ...[2M]**

31. The points $A(4, 7)$, $B(p, 3)$ and $C(7, 3)$ are the vertices of a right triangle, right-angled at B, find the values of p. **[2015] ...[2M]**

32. Prove that the points (3, 0), (6, 4) and (–1, 3) are the vertices of a right angled isosceles triangle. **[2016] ...[2M]**

33. A line intersects the y-axis and x-axis at the points P and Q respectively. If (2, –5) is the mid-point of PQ, then find the coordinates of P and Q. **[2017] ...[2M]**

34. If the distances of $P(x, y)$ from $A(5, 1)$ and $B(-1, 5)$ are equal, then prove that $3x = 2y$. **[2017] ...[2M]**

35. Find the ratio in which $P(4, m)$ divides the line segment joining the points $A(2, 3)$ and $B(6, -3)$. Hence find m. **[2018] ...[2M]**

36. Find the ratio in which the segment joining the points (1, –3) and (4, 5) is divided by x-axis? Also find the coordinates of this point on x-axis. **[2019] ...[2M]**

37. (A) Find the coordinates of the point which divides the join of $A(-1, 7)$ and $B(4, -3)$ in the ratio 2 : 3. **[2023] ...[2M]**

OR

(B) If the points $A(2, 3)$, $B(-5, 6)$, $C(6, 7)$ and $D(p, 4)$ are the vertices of a parallelogram $ABCD$, find the value of p. **[2023] ...[2M]**

38. If P divides the joining of $A(-2, -2)$ and $B(2, -4)$ such that $\frac{AP}{AB} = \frac{3}{7}$, find the coordinates of P. **[2008] ...[3M]**

39. The mid-points of the sides of a triangle are (3, 4), (4, 6) and (5, 7). Find the coordinates of the vertices of the triangle. **[2008] ...[3M]**

40. Find the ratio in which the point $(2, y)$ divides the line segment joining the points $A(-2, 2)$ and $B(3, 7)$. Also find the value of y. **[2009] ...[3M]**

41. Point P divides the line segment joining the points $A(2, 1)$ and $B(5, -8)$ such that $\frac{AP}{AB} = \frac{1}{3}$. If P lies on the line $2x - y + k = 0$, find the value of k. **[2010] ...[3M]**

42. A point P divides the line segment joining the points $A(3, -5)$ and $B(-4, 8)$ such that $\frac{AP}{PB} = \frac{K}{1}$. If P lies on the line $x + y = 0$, then find the value of K. **[2012] ...[3M]**

43. Find the ratio in which the y-axis divides the line segment joining the points (–4, –6) and (10, 12). Also, find the coordinates of the point of division. **[2013] ...[3M]**

44. Show that the points (–2, 3), (8, 3) and (6, 7) are the vertices of a right triangle. **[2013] ...[3M]**

45. If the point $A(0, 2)$ is equidistant from the points $B(3, p)$ and $C(p, 5)$, find p, also find the length of AB. **[2014] ...[3M]**

46. If the coordinates of points A and B are (–2, –2) and (2, –4) respectively, find the coordinates of P such that $AP = \frac{3}{7}AB$, where P lies on the line segment AB. **[2015] ...[3M]**

47. If the point $P(x, y)$ is equidistant from the points $A(a + b, b - a)$ and $B(a - b, a + b)$. Prove that $bx = ay$. **[2016] ...[3M]**

48. In what ratio does the point $\left(\frac{24}{11}, y\right)$ divide the line segment joining the points $P(2, -2)$ and $Q(3, 7)$? Also find the value of y. **[2017] ...[3M]**

49. Find the point on y-axis which is equidistant from the points (5, –2) and (–3, 2). **[2019]...[3M]**

50. **Read the following passage carefully and then answer the questions given at the end.**

To conduct Sports Day activities, in your rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AD, as shown in Fig. 5. Niharika runs $\frac{1}{4}$th the distance AD on the 2nd line and posts a green flag. Preet runs $\frac{1}{5}$th the distance AD on the eighth line and posts a red flag. **[2020] ...[3M]**

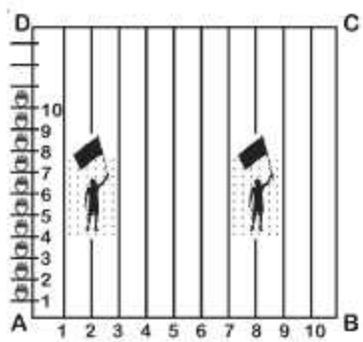


Fig. 5

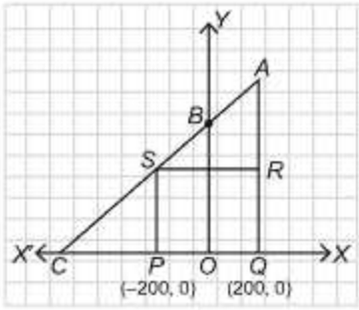
(i) What is the distance between the two flags?

(ii) If Rashmi has to post a blue flag exactly half way between the line segment joining the two flags, where should she post the blue flag?

51. If the point $C(-1, 2)$ divides internally the line segment joining $A(2, 5)$ and $B(x, y)$ in the ratio 3 : 4, find the coordinates of B. **[2020] ...[3M]**

52. Find the ratio in which the point $P(x, 2)$ divides the line segment joining the points $A(12, 5)$ and $B(4, -3)$. Also find the value of x. **[2014] ...[4M]**

53. Jagdish has a field which is in the shape of a right angled triangle *AQC*. He wants to leave a space in the form of a square *PQRS* inside the field for growing wheat and the remaining for growing vegetables (as shown in the figure). In the field, there is a pole marked as *O*.



Based on the above information, answer the following questions:

(i) Taking *O* as origin, coordinates of *P* are (–200, 0) and of *Q* are (200, 0). *PQRS* being a square, what are the coordinates of *R* and *S*? **[2023] ...[1M]**

(ii) (A) What is the area of square *PQRS*?

[2023] ...[2M]

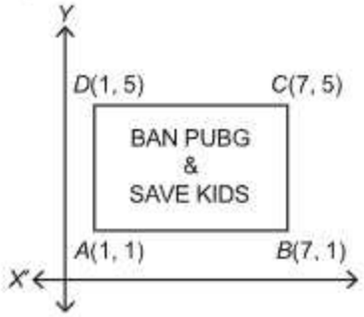
OR

(B) What is the length of diagonal *PR* in square *PQRS*? **[2023] ...[2M]**

(iii) If *S* divides *CA* in the ratio *K* : 1, what is the value of *K*, where point *A* is (200, 800)?

[2023] ...[1M]

54. Use of mobile screen for long hours makes your eye sight weak and give you headaches. Children who are addicted to play "PUBG" can get easily stressed out. To raise social awareness about ill effects of playing PUBG, a school decided to start 'BAN PUBG' campaign, in which students are asked to prepare campaign board in the shape of a rectangle. One such campaign board made by class X student of the school is shown in the figure.



Based on the above information, answer the following questions :

(i) Find the coordinates of the point of intersection of diagonals *AC* and *BD*.

[2023] ...[2M]

(ii) Find the length of the diagonal *AC*.

[2023] ...[1M]

(iii) (A) Find the area of the campaign Board *ABCD*. **[2023] ...[2M]**

OR

(B) Find the ratio of the length of side *AB* to the length of the diagonal *AC*.

[2023] ...[2M]

8 : Introduction to Trigonometry

1. The value of $(\tan^2 45° - \cos^2 60°)$ is

[2021] ...[1M]

(a) 1/2
(b) 1/4
(c) 3/2
(d) 3/4

2. Which of the following is not defined?

[2021] ...[1M]

(a) sec 0°
(b) cosec 90°
(c) tan 90°
(d) cot 90°

3. In a right-angled triangle *PQR*, $\angle Q = 90°$. If $\angle P = 45°$, then value of $\tan P - \cos^2 R$ is

[2021] ...[1M]

(a) 0 (b) 1
(c) 1/2 (d) 3/2

4. If $\tan\theta = \frac{2}{3}$, then the value of sec θ is

[2021] ...[1M]

(a) $\frac{\sqrt{13}}{3}$ (b) $\frac{\sqrt{5}}{3}$
(c) $\sqrt{\frac{13}{3}}$ (d) $\frac{3}{\sqrt{13}}$

5. If $\sin\theta - \cos\theta = 0$, then the value of θ is **[2021] ...[1M]**

(a) 30° (b) 45°

(c) 90° (d) 0°

6. $\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta}$ can be simplified to get **[2021] ...[1M]**

(a) $2\cos^2\theta$ (b) $\frac{1}{2}\sec^2\theta$

(c) $\frac{2}{\sin^2\theta}$ (d) $2\sec^2\theta$

7. $(1 + \tan^2 A)(1 + \sin A)(1 - \sin A)$ is equal to **[2021] ...[1M]**

(a) $\frac{\cos^2 A}{\sec^2 A}$ (b) 1

(c) 0 (d) 2

8. If $\cot\theta = \frac{1}{\sqrt{3}}$, the value of $\sec^2\theta + \text{cosec}^2\theta$ is **[2021] ...[1M]**

(a) 1 (b) $\frac{40}{9}$

(c) $\frac{38}{9}$ (d) $5\frac{1}{3}$

9. In ΔABC right angled at B, $\sin A = \frac{7}{25}$, then the value of cos$C$ is **[2021] ...[1M]**

(a) $\frac{7}{25}$ (b) $\frac{24}{25}$

(c) $\frac{7}{24}$ (d) $\frac{24}{7}$

10. Given that $\sec\theta = \sqrt{2}$, the value of $\frac{1+\tan\theta}{\sin\theta}$ is **[2021] ...[1M]**

(a) $2\sqrt{2}$ (b) $\sqrt{2}$

(c) $3\sqrt{2}$ (d) 2

11. If θ is an acute angle and $\tan\theta + \cot\theta = 2$, then the value of $\sin^3\theta + \cos^3\theta$ is **[2021] ...[1M]**

(a) 1 (b) $\frac{1}{2}$

(c) $\frac{\sqrt{2}}{2}$ (d) $\sqrt{2}$

12. If $a\cot\theta + b\,\text{cosec}\theta = p$ and $b\cot\theta + a\,\text{cosec}\theta = q$, then $p^2 - q^2 =$ **[2021] ...[1M]**

(a) $a^2 - b^2$ (b) $b^2 - a^2$

(c) $a^2 + b^2$ (d) $b - a$

13. If $\sec\theta + \tan\theta = p$, then $\tan\theta$ is **[2021] ...[1M]**

(a) $\frac{p^2+1}{2p}$ (b) $\frac{p^2-1}{2p}$

(c) $\frac{p^2-1}{p^2+1}$ (d) $\frac{p^2+1}{p^2-1}$

14. $\left(\frac{2}{3}\sin 0° - \frac{4}{5}\cos 0°\right)$ is equal to **[2023] ...[1M]**

(a) $\frac{2}{3}$ (b) $\frac{-4}{5}$

(c) 0 (d) $\frac{-2}{15}$

15. Which of the following is true for all values of $\theta (0° \le \theta \le 90°)$? **[2023] ...[1M]**

(a) $\cos^2\theta - \sin^2\theta = 1$

(b) $\text{cosec}^2\theta - \sec^2\theta = 1$

(c) $\sec^2\theta - \tan^2\theta = 1$

(d) $\cot^2\theta - \tan^2\theta = 1$

16. If $\tan A = \frac{5}{12}$, find the value of $(\sin A + \cos A)\sec A$. **[2008] ...[1M]**

17. If $\sec^2\theta(1 + \sin\theta)(1 - \sin\theta) = k$, then find the value of k. **[2009] ...[1M]**

18. If $3x = \text{cosec}\theta$ and $\frac{3}{x} = \cot\theta$, find the value of $3\left(x^2 - \frac{1}{x^2}\right)$. **[2010] ...[1M]**

19. If $\tan(A+B) = \sqrt{3}$ and $\tan(A-B) = \frac{1}{\sqrt{3}}$, $A > B$, then the value of A is _____. **[2020] ...[1M]**

20. If $5\tan\theta = 3$, then what is the value of $\left(\frac{5\sin\theta - 3\cos\theta}{4\sin\theta + 3\cos\theta}\right)$? **[2020] ...[1M]**

21. The value of $\left(\sin^2\theta + \frac{1}{1+\tan^2\theta}\right) =$ _____. **[2020] ...[1M]**

OR

The value of $(1 + \tan^2\theta)(1 - \sin\theta)(1 + \sin\theta) =$ _____. **[2020] ...[1M]**

22. In a ΔABC, right-angled at C, if $\tan A = \frac{1}{\sqrt{3}}$, find the value of $\sin A \cos B + \cos A \sin B$.

[2008] ...[2M]

23. If $\cot\theta = \frac{15}{8}$, then evaluate

$$\frac{(2+2\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2-2\cos\theta)}.$$

[2009] ...[2M]

24. Find the value of $\tan 60°$, geometrically.

[2009] ...[2M]

25. Find the value of $\text{cosec}\, 30°$ geometrically.

[2010] ...[2M]

26. Prove that $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$.

[2020] ...[2M]

OR

Prove that $\frac{\tan^2\theta}{1+\tan^2\theta} + \frac{\cot^2\theta}{1+\cot^2\theta} = 1$

[2020] ...[2M]

27. The rod AC of a TV disc antenna is fixed at right angles to the wall AB and a rod CD is supporting the disc as shown in Fig.4. If AC = 1.5 m long and CD = 3 m, find (i) $\tan\theta$ (ii) $\sec\theta$ + $\text{cosec}\theta$ **[2020] ...[2M]**

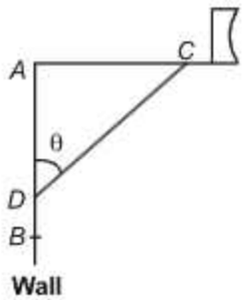


Fig.4

28. If $\sin\alpha = \frac{1}{2}$, then find the value of $(3\cos\alpha - 4\cos^3\beta)$. **[2023] ...[2M]**

29. (A) Evaluate :

$$\frac{5}{\cot^2 30°} + \frac{1}{\sin^2 60°} - \cot^2 45° + 2\sin^2 90°$$

[2023] ...[2M]

OR

(B) If θ is an acute angle and $\sin\theta = \cos\theta$, find the value of $\tan^2\theta + \cot^2 - 2$. **[2023] ...[2M]**

30. Prove that : $(1 + \cot A + \tan A)(\sin A - \cos A) = \sin A \tan A - \cot A \cos A$. **[2008] ...[3M]**

31. Prove the following :

$$(\text{cosec}\, A - \sin A)(\sec A - \cos A) = \frac{1}{\tan A + \cot A}.$$

[2010] ...[3M]

32. If $4\tan\theta = 3$, evaluate $\left(\frac{4\sin\theta - \cos\theta + 1}{4\sin\theta + \cos\theta - 1}\right)$

[2018] ...[3M]

33. Prove that : $(\sin\theta + \text{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$. **[2019] ...[3M]**

34. Prove that : $(1 + \cot A - \text{cosec}A)(1 + \tan A + \sec A) = 2$. **[2019] ...[3M]**

35. Prove that $(1 + \tan A - \sec A) \times (1 + \tan A + \sec A) = 2\tan A$ **[2020] ...[3M]**

OR

Prove that $\frac{\text{cosec}\,\theta}{\text{cosec}\,\theta - 1} + \frac{\text{cosec}\,\theta}{\text{cosec}\,\theta + 1} = 2\sec^2\theta$

[2020] ...[3M]

36. If $\sin\theta + \cos\theta = \sqrt{3}$, then prove that $\tan\theta + \cot\theta = 1$. **[2020] ...[3M]**

37. Prove that $\frac{1+\tan^2 A}{1+\cot^2 A} = \sec^2 A - 1$ **[2023] ...[3M]**

38. (A) Prove that $\frac{\sin A - 2\sin^3 A}{2\cos^3 A - \cos A} = \tan A$

[2023] ...[3M]

OR

(B) Prove that $\sec A\,(1 - \sin A)(\sec A + \tan A) = 1$

[2023] ...[3M]

39. Prove that $\frac{\sin A - 2\sin^3 A}{2\cos^3 A - \cos A} = \tan A$ **[2018] ...[4M]**

40. Prove that $\frac{\sin A - \cos A + 1}{\sin A + \cos A - 1} = \frac{1}{\sec A - \tan A}$

[2019] ...[4M]

9 : Some Applications of Trigonometry

1. A tower stands vertically on the ground. From a point on the ground which is 25 m away from the foot of the tower, the angle of elevation of the top of the tower is found to be 45°. Then the height (in meters) of the tower is **[2011] ...[1M]**

   (a) $25\sqrt{2}$ (b) $25\sqrt{3}$

   (c) 25 (d) 12.5

2. The length of shadow of a tower on the plane ground is $\sqrt{3}$ times the height of the tower. The angle of elevation of Sun is **[2012] ...[1M]**

   (a) 45° (b) 30°

   (c) 60° (d) 90°

3. The angle of depression of a car, standing on the ground, from the top of a 75 m high tower, is 30°. The distance of the car from the base of the tower (in metre) is **[2013] ...[1M]**

   (a) $25\sqrt{3}$ (b) $50\sqrt{3}$

   (c) $75\sqrt{3}$ (d) 150

4. A ladder makes an angle of 60° with the ground when placed against a wall. If the foot of the ladder is 2 m away from the wall, then the length (in meters) is **[2014] ...[1M]**

   (a) $\frac{4}{\sqrt{3}}$ (b) $4\sqrt{3}$

   (c) $2\sqrt{2}$ (d) 4

5. The angle of elevation of the top of a 15 m high tower at a point away from the base of the tower is: **[2023] ...[1M]**

   (a) 30° (b) 45°

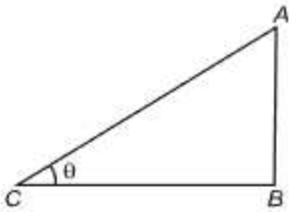
   (c) 60° (d) 90°

6. If a pole 6 m high casts a shadow $2\sqrt{3}$ m long on the ground, then sun's elevation is **[2023] ...[1M]**

   (a) 60° (b) 45°

   (c) 30° (d) 90°

7. In the following figure, a tower AB is 20 m high and BC, its shadow on the ground is $20\sqrt{3}$ m long. Find the Sun's altitude. **[2015] ...[1M]**



8. A ladder leaning against a wall makes an angle of 60° with the horizontal. If the foot of the ladder is 2.5 m away from the wall, find the length of the ladder. **[2016] ...[1M]**

9. If a tower 30 m high, casts a shadow $10\sqrt{3}$ m long on the ground, then what is the angle of elevation of the sun? **[2017] ...[1M]**

10. The ratio of the length of a vertical rod and the length of its shadow is $1:\sqrt{3}$. Find the angle of elevation of the sun at that moment. **[2020] ...[1M]**

11. From the top of a vertical tower, the angles of depression of two cars, in the same straight line with the base of the tower, at an instant are found to be 45° and 60°. If the cars are 100 m in apart and are on the same side of the tower, find the height of the tower. ($\sqrt{3}$ = 1.73) **[2011] ...[3M]**

12. A kite is flying at a height of 45 m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60°. Find the length of the string assuming that there is no slack in the string. **[2012] ...[3M]**

13. The horizontal distance between two poles is 15 m. The angle of depression of the top of first pole as seen from the top of second pole is 30°. If the height of the second pole is 24 m, find the height of the first pole. [Use $\sqrt{3}$ = 1.732] **[2013] ...[3M]**

14. Two ships are there in the sea on either side of a light house in such a way that the ships and the light house are in the same straight line. The angles of depression of two ships as observed from the top of the light house are 60° and 45°. If the height of the light house is 200 m, find the distance between the two ships.

$[\text{Use } \sqrt{3} = 1.73]$ **[2014] ...[3M]**

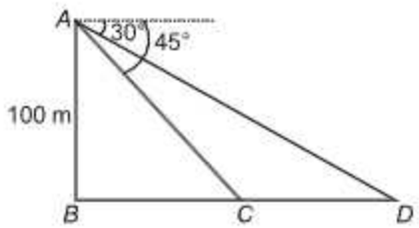
15. The angle of elevation of an aeroplane from point A on the ground is 60°. After flight of 15 seconds, the angle of elevation changes to 30°. If the aeroplane is flying at a constant height of $1500\sqrt{3}$ m, find the speed of the plane in km/hr. **[2015] ...[3M]**

16. A man standing on the deck of a ship, which is 10 m above water level, observes the angle of elevation of the top of a hill as 60° and the angle of depression of the base of the hill as 30°. Find the distance of the hill from the ship and the height of the hill. **[2016] ...[3M]**

17. On a straight line passing through the foot of a tower, two points *C* and *D* are at distances of 4 m and 16 m from the foot respectively. If the angles of elevation from *C* and *D* of the top of the tower are complementary, then find the height of the tower. **[2017] ...[3M]**

18. (a) As observed from the top of a light house 100 m above sea level, the angle of depression of a ship, sailing directly towards it, changes from 30° to 45°. Determine the distance travelled by the ship during this time. **[2022] ...[3M]**

$(\text{Use } \sqrt{3} = 1.73)$



OR

(b) At a point on level ground, the angle of elevation of a vertical tower is, found to be α such that $\tan\alpha = \frac{1}{3}$. After walking 100 m towards the tower, the angle of elevation β becomes such that $\tan\beta = \frac{3}{4}$. Find the height of the tower. **[2022] ...[3M]**

19. In Fig. 3, *AB* is tower of height 50 m. A man standing on its top, observes two cars on the opposite sides of the tower with angles of depression 30° and 45° respectively. Find the distance between the two cars. **[2022] ...[3M]**

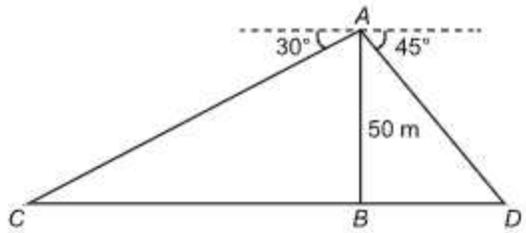


Fig. 3

20. Two poles of equal heights are standing opposite to each other on either side of the roads, which is 80 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles and the distances of the point from the poles. **[2013] ...[4M]**

21. The angles of elevation and depression of the top and the bottom of a tower from the top of a building, 60 m high, are 30° and 60° respectively. Find the difference between the heights of the building and the tower and the distance between them. **[2014] ...[4M]**

22. At a point *A*, 20 metres above the level of water in a lake, the angle of elevation of a cloud is 30°. The angle of depression of the reflection of the cloud in the lake, at *A* is 60°. Find the distance of the cloud from *A*. **[2015] ...[4M]**

23. The angle of elevation of the top Q of a vertical tower PQ from a point X on the ground is 60°. From a point Y, 40 m vertically above X, the angle of elevation of the top Q of tower is 45°. Find the height of the tower PQ and the distance PX. $(\text{Use } \sqrt{3} = 1.73)$ **[2016] ...[4M]**

24. An aeroplane is flying at a height of 300 m above the ground. Flying at this height, the angles of depression from the aeroplane of two points on both banks of a river in opposite directions are 45° and 30° respectively. Find the width of the river. $[\text{Use } \sqrt{3} = 1.732]$ **[2017] ...[4M]**

25. As observed from the top of a 100 m high light house from the sea-level, the angles of depression of two ships are 30° and 45°. If one ship is exactly being the other on the same side of the light house, find the distance between the two ships. $[\text{Use } \sqrt{3} = 1.732]$ **[2018] ...[4M]**

26. A man in a boat rowing away from a light house 100 m high takes 2 minutes to change the angle of elevation of the top of the light house from 60° to 30°. Find the speed of the boat in metres per minute. $[\text{Use } \sqrt{3} = 1.732]$ **[2019] ...[4M]**

27. The angle of elevation of the top of a building from the foot of a tower is 30°. The angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 60 m high, find the height of the building. **[2020] ...[4M]**

28. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag-staff of height 6 m. At a point on the plane, the angle of elevation of the bottom and top of the flag-staff are 30° and 45° respectively. Find the height of the tower. $(\text{Take } \sqrt{3} = 1.73)$ **[2020] ...[4M]**

29. ***Case Study Based Question :*** Qutub Minar, located in South Delhi, India, was built in the year 1193. It is 72 m high tower. Working on a school project, Charu and Daljeet visited the monument. They used trigonometry to find their distance from the tower. Observe the picture given below. Points C and D represent their positions on the ground in line with the base of tower, the angles of elevation of top of the tower (Point A) are 60° and 45° from points C and D respectively. **[2022]**

(i) Based on above information, draw a well-labelled diagram. **[1]**

(ii) Find the distances CD, BC and BD. (use $\sqrt{3} = 1.73$) **[3]**

30. **Case Study Based Question :**

Kite Festival

Kite festival is celebrated in many countries at different times of the year. In India, every year 14th January is celebrated as International Kite Day. On this day many people visit India and participate in the festival by flying various kinds of kites.

The picture given below, shows three kites flying together.

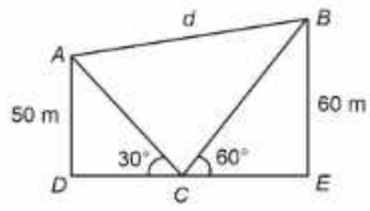


Fig. 5

In Fig. 5, the angles of elevation of two kites (Points A and B) from the hands of a man (Point C) are found to be 30° and 60° respectively. Taking AD = 50 m and BE = 60 m, find **[2022]**

(1) the lengths of strings used (take them straight) for kites A and B as shown in the figure. **[2]**

(2) the distance 'd' between these two kites **[2]**

31. (A) The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it was 60°. Find the height of the tower. **[2023] ...[5M]**

OR

(B) From the top of a 7 m high building the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower. **[2023] ...[5M]**

32. (A) A straight highway leads to the foot of a tower. A man standing on the top of the 75 m high tower observes two cars at angles of depression of 30° and 60°, which are approaching the foot of the tower. If one car is exactly behind the other on the same side of the tower, find the distance between the two cars. $\left(\text{use } \sqrt{3} = 1.73\right)$ **[2023] ...[5M]**

OR

(B) From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 30°. Determine the height of the tower. **[2023] ...[5M]**

33. The angle of elevation of an aeroplane from a point A on the ground is 60°. After a flight of 30 seconds, the angle of elevation changes to 30°. If the plane is flying at a constant height of $3600\sqrt{3}$ m, then find the speed (in km/hour) of the plane. **[2008] ...[6M]**

34. An aeroplane when flying at a height 3125 m from the ground passes vertically below another plane at that instant when the angles of elevation of the two planes from the same point on the ground are 30° and 60° respectively. Find the distance between the two planes at that instant. **[2009] ...[6M]**

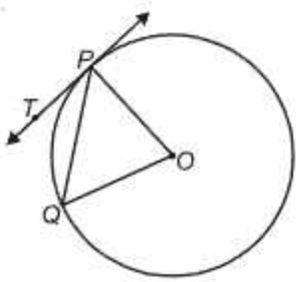
35. From the top of a 7 m high building, the angle of elevation of the top of a tower is 60° and the angle of depression of the foot of the tower is 45°. Find the height of the tower. **[2010] ...[6M]**

36. The angle of elevation of the top of a vertical tower from a point on the ground is 60°. From another point 10 m vertically above the first, its angle of elevation is 30°. Find the height of the tower. **[2011] ...[6M]**

37. The angle of elevation of the top of a hill from the foot of a tower is 60° and the angle of depression from the top of the tower to the foot of the hill is 30°. If the tower is 50 m high, find the height of the hill. **[2012] ...[6M]**

10 : Circles

1. If figure, O is the centre of a circle, PQ is a chord and PT is the tangent at P. If $\angle POQ = 70°$, then $\angle TPQ$ is equal to **[2011] ...[1M]**



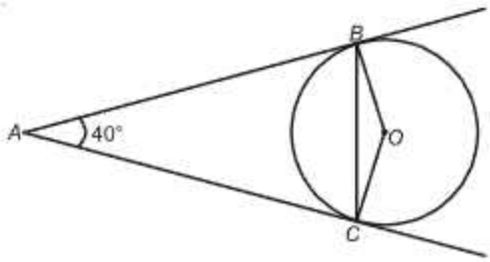
(a) 55°

(b) 70°

(c) 45°

(d) 35°

2. In figure, AB and AC are tangents to the circle with center O such that $\angle BAC = 40°$. Then $\angle BOC$ is equal to **[2011] ...[1M]**



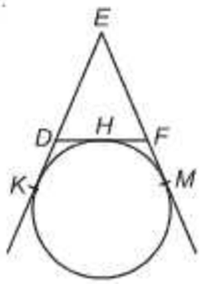
(a) 40°

(b) 50°

(c) 140°

(d) 160°

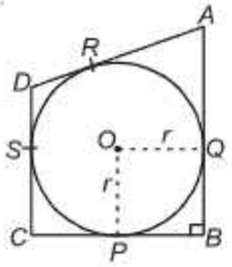
3. In figure, a circle touches the side DF of ΔEDF at H and touches ED and EF produced at K and M respectively. If $EK = 9$ cm, then the perimeter of ΔEDF (in cm) is **[2012] ...[1M]**



(a) 18 (b) 13.5

(c) 12 (d) 9

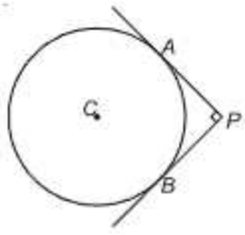
4. In below figure, a circle with centre O is inscribed in a quadrilateral $ABCD$ such that, it touches the sides BC, AB, AD and CD at point P, Q, R and S respectively. If $AB = 29$ cm, $AD = 23$ cm, $\angle B = 90°$ and $DS = 5$ cm, then the radius of the circle (in cm) is **[2013] ...[1M]**



(a) 11 (b) 18

(c) 6 (d) 15

5. In below figure, PA and PB are two tangents drawn from an external point P to a circle with centre C and radius 4 cm. If $PA \perp PB$, then the length of each tangent is **[2013] ...[1M]**



(a) 3 cm

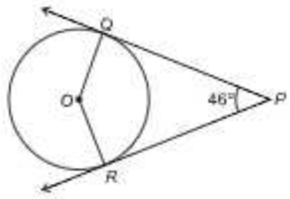
(b) 4 cm

(c) 5 cm

(d) 6 cm

6. In figure, PQ and PR two tangents to a circle with centre O. If $\angle QPR = 46°$, $\angle QOR$ equals:

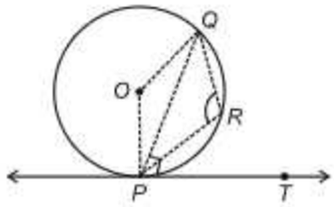
[2014] ...[1M]



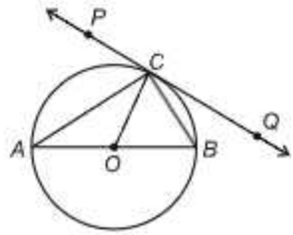
(a) 67° (b) 134°

(c) 44° (d) 46°

7. In the following figure, PQ is a chord of a circle with centre O and PT is a tangent. If $\angle QPT = 60°$, find $\angle PRQ$ **[2015] ...[1M]**



8. In the figure, PQ is a tangent at a point C to a circle with centre O. If AB is a diameter and $\angle CAB = 30°$, find $\angle PCA$. **[2016] ...[1M]**



9. If the angle between two tangents drawn from an external point P to a circle of radius a and centre of O, is 60°, then find the length of OP.

[2017] ...[1M]

10. In Fig. 1, on a circle of radius 7 cm, tangent PT is drawn from a point P such that $PT = 24$ cm. If O is the centre of the circle, then the length of PR is **[2020] ...[1M]**

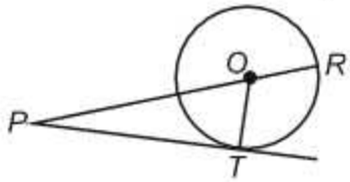


Fig. 1

(a) 30 cm (b) 28 cm

(c) 32 cm (d) 25 cm

11. How many tangents can be drawn to a circle from a point on it? **[2023] ...[1M]**

(a) One

(b) Two

(c) Infinite

(d) Zero

12. The length of the tangent from an external point A to a circle, of radius 3 cm, is 4 cm. The distance of A from the centre of the circle is:

[2023] ...[1M]

(a) 7 cm

(b) 5 cm

(c) $\sqrt{7}$ cm

(d) 25 cm

13. The length of tangent drawn to a circle of radius 9 cm from a point 41 cm from the centre is

[2023] ...[1M]

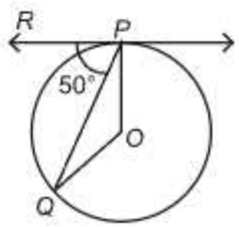
(a) 40 cm

(b) 9 cm

(c) 41 cm

(d) 50 cm

14. In the given figure, O is the centre of the circle and PQ is the chord. If the tangent PR at P makes an angle of 50° with PQ, then the measure of $\angle POQ$ is **[2023] ...[1M]**



(a) 50°

(b) 40°

(c) 100°

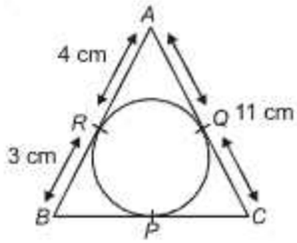
(d) 130°

15. **Assertion (A):** A tangent to a circle is perpendicular to the radius through the point of contact.

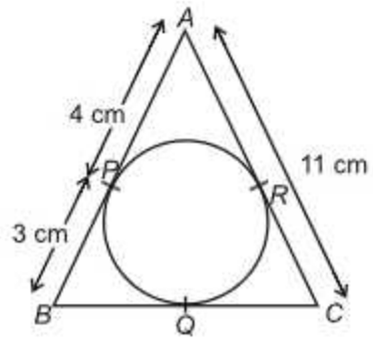
Reason (R): The lengths of tangents drawn from an external point to a circle are equal.

[2023] ...[1M]

16. In figure, ΔABC is circumscribing a circle. Find the length of BC. **[2009, 2012] ...[1M]**



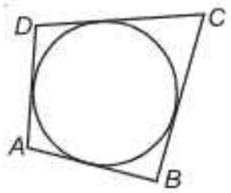
17. In Fig. 1, ΔABC is circumscribing a circle, the length of BC is _____ cm. **[2020] ...[1M]**



18. If all the sides of a parallelogram touch a circle, show that the parallelogram is a rhombus.

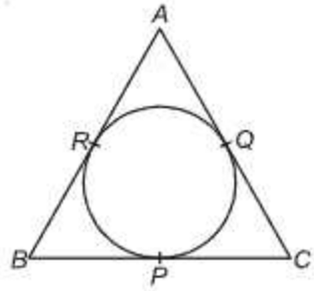
[2008, 2010, 2012] ...[3M], [2013, 2014] ...[2M]

19. In figure, a circle touches all the four sides of a quadrilateral $ABCD$ whose sides are AB = 6 cm, BC = 9 cm and CD = 8cm, find the length of side AD. **[2011] ...[2M]**



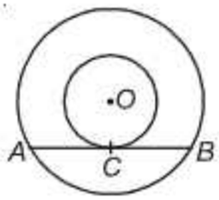
20. In figure, an isosceles triangle ABC, with $AB = AC$, circumscribes a circle. Prove that the point of contact P bisects the base BC.

[2012] ...[2M]

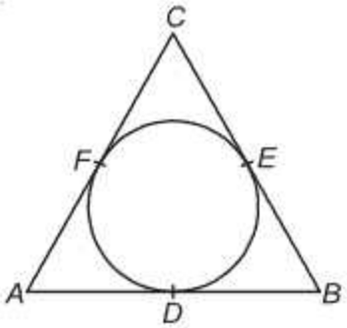


21. In figure, the chord AB of the larger of the two concentric circles, with centre O, touches the smaller circle at C. Prove that $AC = CB$.

[2012] ...[2M]



22. In below figure, a circle is inscribed in triangle ABC touches its sides AB, BC and AC at points D, E and F respectively. If $AB = 12$ cm, $BC = 8$ cm and $AC = 10$ cm, then find the length of AD, BE and CF. **[2013] ...[2M]**

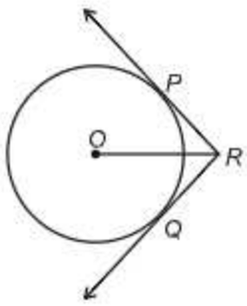


23. Prove that the line segment joining the point of contact of two parallel tangents of a circle passes through its centre. **[2014] ...[2M]**

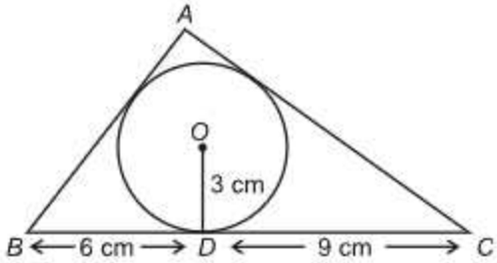
24. If from an external point P of a circle with centre O, two tangents PQ and PR are drawn such that $\angle QPR = 120°$, prove that $2PQ = PO$.

[2014] ...[2M]

25. In the following figure, two tangents RQ and RP are drawn from an external point R to the circle with centre O, if $\angle PRQ = 120°$, then prove that $OR = PR + RQ$. **[2015] ...[2M]**

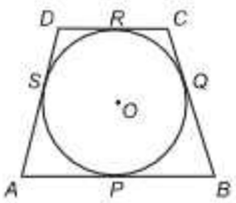


26. In figure, a ΔABC is drawn to circumscribe a circle of radius 3 cm, such that the segments BD and DC are respectively of lengths 6 cm and 9 cm. If the area of ΔABC is 54 cm^2, then find the lengths of sides AB and AC. **[2015] ...[2M]**

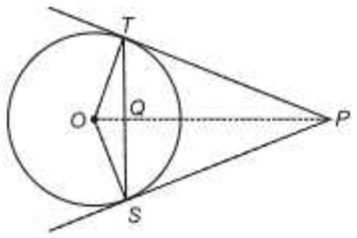


27. In figure, a quadrilateral $ABCD$ is drawn to circumscribe a circle, with centre O, in such a way that the sides AB, BC, CD and DA touch the circle at the points P, Q, R and S respectively. Prove that $AB + CD = BC + DA$.

[2012[4], 2016] ...[2M]



28. In figure, from an external point P, two tangents PT and PS are drawn to a circle with centre O and radius r. If $OP = 2r$, show that $\angle OTS = \angle OST = 30°$ **[2016] ...[2M]**



29. Prove that the tangents drawn at the end points of a chord of a circle make equal angles with the chord. **[2017] ...[2M]**

30. A circle touches all the four sides of a quadrilateral $ABCD$. Prove that $AB + CD = BC + DA$.

[2017] ...[2M]

31. In Fig. 4, a circle touches all the four sides of a quadrilateral *ABCD*. If *AB* = 6 cm, *BC* = 9 cm and *CD* = 8 cm, then find the length of *AD*.

[2020] ...[2M]

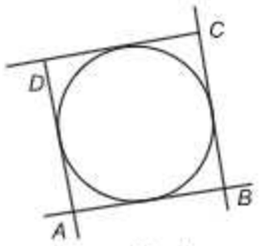


Fig. 4

32. In Fig.3, two tangents *TP* and *TQ* are drawn to a circle with centre *O* from an external point *T*. Prove that $\angle PTQ = 2\angle OPQ$. **[2020] ...[2M]**

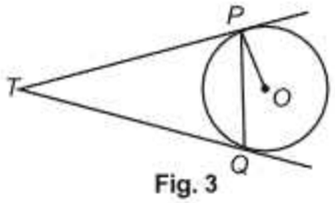


Fig. 3

33. (a) In Fig. 1, perimeter of ΔPQR is 20 cm. Find the length of tangent *PA*. **[2022] ...[2M]**

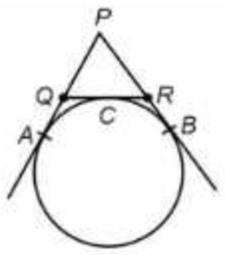


Fig. 1

OR

(b) In Fig. 2, *BC* is tangent to the circle at point *B* of circle centred at *O*. *BD* is a chord of the circle so that $\angle BAD = 55°$. Find $m\angle DBC$

[2022] ...[2M]

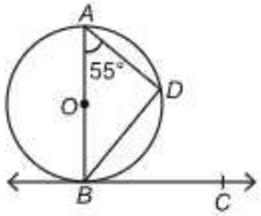


Fig. 2

34. In Fig. 2, *XAY* is a tangent to the circle centered at *O*. If $\angle ABO = 40°$, then find $m\angle BAY$ and $m\angle AOB$. **[2022] ...[2M]**

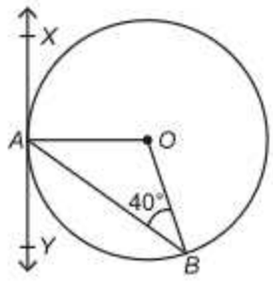
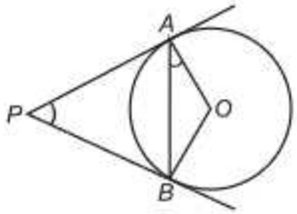
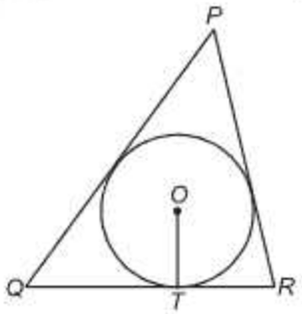


Fig. 2

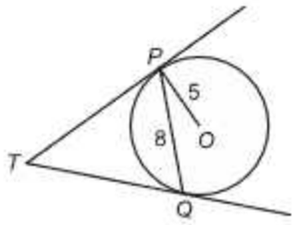
35. *PA* and *PB* are tangents drawn to the circle with centre O as shown in the figure. Prove that $\angle APB = 2\ \angle OAB$ **[2023] ...[2M]**



36. In given figure, a triangle *PQR* is drawn to circumscribe a circle of radius 6 cm such that the segments *QT* and *TR* into which *QR* is divided by the point of contact *T*, are of lengths 12 cm and 9 cm respectively. If the area of $\Delta PQR = 189\ cm^2$, then find the lengths of sides *PQ* and *PR*. **[2011] ...[3M]**



37. In Figure, *PQ* is a chord of length 8 cm of a circle of radius 5 cm and centre *O*. The tangents at *P* and *Q* intersect at point *T*. Find the length of *TP*. **[2019] ...[3M]**

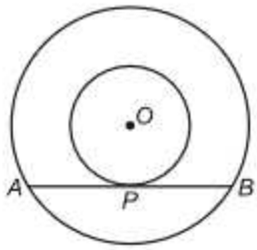


38. (A) Prove that the lengths of tangents drawn from an external point to a circle are equal.

[2023] ...[3M]

OR

(B) Two concentric circles with centre O are of radii 3 cm and 5 cm. Find the length of chord AB of the larger circle which touches the smaller circle at P. **[2023] ...[3M]**



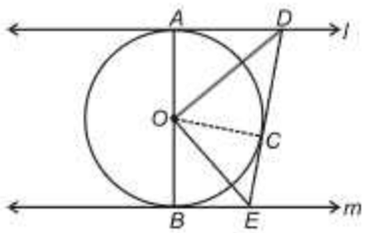
39. Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.

[2023] ...[3M]

40. Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre. **[2023] ...[3M]**

41. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact. **[2011, 2012, 2013] ...[4M]**

42. In figure, l and m are two parallel tangents to a circle with centre O, touching the circle at A and B respectively. Another tangent at C intersects the line l at D and m at E. Prove that $\angle DOE = 90°$ **[2013] ...[4M]**

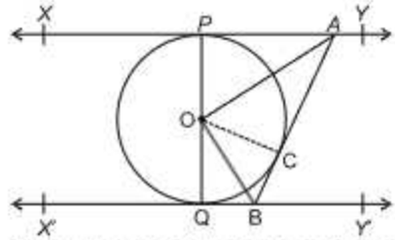


43. Prove that the length of the tangents drawn from an external point to a circle are equal.

[2014, 2015, 2016, 2017] ...[4M]

44. Prove that the tangent drawn at the midpoint of an arc of a circle is parallel to the chord joining the end points of the arc. **[2015] ...[4M]**

45. In the given figure, XY and $X'Y'$ are two parallel tangents to a circle with centre O and another tangent AB with point of contact C, is intersecting XY at A and $X'Y'$ at B. Prove that $\angle AOB = 90°$. **[2017] ...[4M]**



46. (a) Prove that a parallelogram circumscribing a circle is a rhombus. **[2022] ...[4M]**

OR

(b) Prove that the perpendicular at the point of contact to the tangent to a circle passes through the centre of the circle. **[2022] ...[4M]**

47. In Fig. 4, PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents at P and Q meet at a point T. Find the length of TP.

[2022] ...[4M]

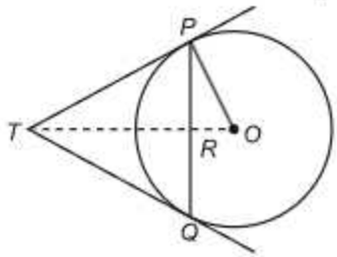
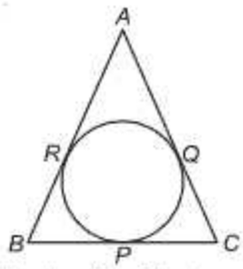


Fig. 4

48. Prove that the lengths of tangents drawn from an external point to a circle are equal.

Using the above, prove the following :

ABC is an isosceles triangle in which $AB = AC$, circumscribed about a circle, as shown in figure, Prove that the base is bisected by the point of contact. **[2008] ...[6M]**



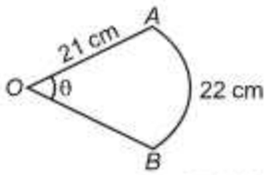
49. Prove that the lengths of the tangents drawn from an external point to a circle are equal.

Using the above theorem prove that:

If quadrilateral $ABCD$ is circumscribing a circle, then $AB + CD = AD + BC$. **[2009] ...[6M]**

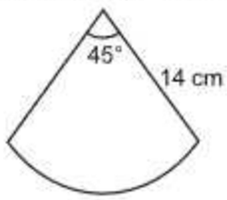
11 : Areas Related to Circles

1. A circular arc of length 22 cm subtends an angle θ at the centre of the circle of radius 21 cm. The value of θ is **[2021] ...[1M]**



(a) 90° (b) 50°
(c) 60° (d) 30°

2. The perimeter of the sector of a circle of radius 14 cm and central angle 45° is **[2021] ...[1M]**



(a) 11 cm (b) 22 cm
(c) 28 cm (d) 39 cm

3. The area of a quadrant of a circle where the circumference of circle is 176 m, is **[2021] ...[1M]**

(a) 2464 m^2 (b) 1232 m^2
(c) 616 m^2 (d) 308 m^2

4. The minute hand of a clock is 84 cm long. The distance covered by the tip of minute hand from 10 : 10 am to 10 : 25 am is **[2021] ...[1M]**

(a) 44 cm (b) 88 cm
(c) 132 cm (d) 176 cm

5. The length of the arc of a circle of radius 14 cm which subtends an angle of 60° at the centre of the circle is **[2023] ...[1M]**

(a) $\frac{44}{3}$cm

(b) $\frac{88}{3}$ cm

(c) $\frac{308}{3}$cm

(d) $\frac{616}{3}$ cm

6. If the radius of a semi-circular protractor is 7 cm, then its perimeter is **[2023] ...[1M]**

(a) 11 cm
(b) 14 cm
(c) 22 cm
(d) 36 cm

7. What is the area of a semi-circle of diameter 'd'? **[2023] ...[1M]**

(a) $\frac{1}{16}\pi d^2$

(b) $\frac{1}{4}\pi d^2$

(c) $\frac{1}{8}\pi d^2$

(d) $\frac{1}{2}\pi d^2$

8. A piece of wire 22 cm long is bent into the form of an arc of a circle subtending an angle of 60° at its centre. Find the radius of the circle.

$\left[\text{Use } \pi = \frac{22}{7}\right]$ **[2020] ...[2M]**

9. A chord of a circle of radius 14 cm subtends an angle of 120° at the centre. Find the area of the corresponding minor segment of the circle.

$\left[\text{Use } \pi = \frac{22}{7} \text{ and } \sqrt{3} = 1.73\right]$ **[2011] ...[3M]**

10. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find (i) the length of the arc (ii) area of the sector formed by the arc.

$\left(\text{Use } \pi = \frac{22}{7}\right)$ **[2013] ...[3M]**

11. Find the area of the minor segment of a circle of radius 14 cm, when its central angle is 60°. Also find the area of the corresponding major segment.

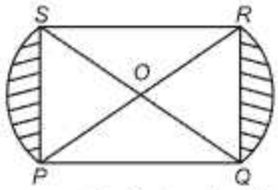
$\left[\text{Use } \pi = \frac{22}{7}\right]$ **[2015] ...[3M]**

12. Find the area of the sector of a circle of radius 7 cm and of central angle 90°. Also, find the area of corresponding major sector.

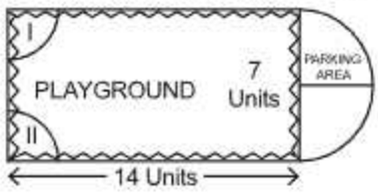
[2023] ...[3M]

13. In the following figure, *PQRS* is square lawn with side *PQ* = 42 metres. Two circular flower beds are there on the sides *PS* and *QR* with centre at *O*, the intersections of its diagonals. Find the total area of the two flower beds (shaded parts).

[2015] ...[4M]



14. Governing council of a local public development authority of Dehradun decided to build an adventurous playground on the top of a hill, which will have adequate space for parking.



After survey, it was decided to build rectangular playground, with a semi-circular area allotted for parking at one end of the playground. The length and breadth of the rectangular playground are 14 units and 7 units, respectively. There are two quadrants of radius 2 units on one side for special seats.

Based on the above information, answer the following questions:

(i) What is the total perimeter of the parking area? **[2023] ...[1M]**

(ii) (a) What is the total area of parking and the two quadrants? **[2023] ...[2M]**

OR

(b) What is the ratio of area of playground to the area of parking area?

[2023] ...[2M]

(iii) Find the cost of fencing the playground and parking area at the rate of ₹2 per unit.

[2023] ...[1M]

12 : Surface Areas and Volumes

1. The radius (in cm) of the largest right circular cone that can be cut out from a cube of edge 4.2 cm is **[2011] ...[1M]**

(a) 4.2

(b) 2.1

(c) 8.4

(d) 1.05

2. Two cubes each of volume 27 cm^3 are joined end to end to form a solid. Find the surface area of the resulting cuboid. **[2011] ...[2M]**

3. From a solid cylinder of height 7 cm and base diameter 12 cm, a conical cavity of same height and same base diameter is hollowed out. Find the total surface area of the remaining solid.

$\left[\text{Use } \pi = \frac{22}{7}\right]$ **[2012] ...[3M]**

4. A vessel is in the form of hemispherical bowl surmounted by a hollow cylinder of same diameter. The diameter of the hemispherical bowl is 14 cm and the total height of the vessel is 13 cm. Find the total surface area of the vessel.

$\left[\text{Use } \pi = \frac{22}{7}\right]$ **[2013] ...[3M]**

5. A wooden toy was made by scooping out a hemisphere of same radius from each end of a solid cylinder. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the volume of wood in the toy. $\left[\text{Use } \pi = \frac{22}{7}\right]$

[2013] ...[3M]

6. A farmer connects a pipe of internal diameter 20 cm from a canal into cylindrical tank which is 10 m in diameter and 2 m deep. If the water flows through the pipe at the rate of 4 km per hour, in how much time will the tank be filled completely? **[2014] ...[3M]**

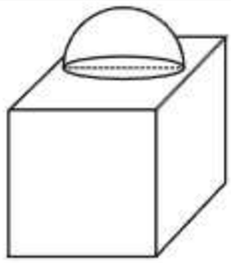
7. Due to sudden floods, some welfare associations jointly requested the government to get 100 tents fixed immediately and offered to contribute 50% of the cost. If the lower part of each tent is of the form of a cylinder of diameter 4.2 m and height 4 m with the conical upper part of same diameter but height 2.8 m, and the canvas to be used costs ₹ 100 per sq. m, find the amount, the association will have to pay. What values are shown by these association? $\left[\text{Use } \pi = \frac{22}{7}\right]$ **[2015] ...[3M]**

8. A cubical block of side 10 cm is surmounted by a hemisphere. What is the largest diameter that the hemisphere can have? Find the cost of painting the total surface area of the solid so formed, at the rate of ₹ 5 per sq. cm. [Use $\pi = 3.14$] **[2015] ...[3M]**

9. A sphere of diameter 12 cm, is dropped in a right circular cylindrical vessel, partly filled with water. If the sphere is completely submerged in water, the water level in the cylindrical vessel rises by $3\frac{5}{9}$ cm. Find the diameter of the cylindrical vessel. **[2016] ...[3M]**

10. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in figure. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm. Find the total surface area of the article. **[2018] ...[3M]**

11. Figure shows a decorative block which is made of two solids – a cube and a hemisphere. The base of the block is a cube with edge 5 cm and the hemisphere, fixed on the top, has a diameter of 4.2 cm. Find the total surface area of the block. $\left[\text{Take } \pi = \frac{22}{7}\right]$ **[2009] ...[4M]**



12. From a solid cylinder of height 2.8 cm and diameter 4.2 cm a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid. [Take π = 22/7] **[2014] ...[4M]**

13. Due to heavy floods in a state, thousands were rendered homeless. 50 schools collectively offered to the state government to provide place and the canvas for 1500 tents to be fixed by the governments and decided to share the whole expenditure equally. The lower part of each tent is cylindrical of base radius 2.8 cm and height 3.5 m, with conical upper part of same base radius but of height 2.1 m. If the canvas used to make the tents costs ₹ 120 per sq. m, find the amount shared by each school to set up the tents. What value is generated by the above problem? $\left(\text{Use } \pi = \frac{22}{7}\right)$ **[2016] ...[4M]**

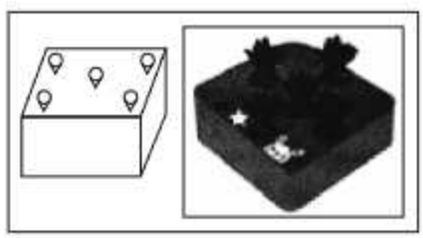
14. A solid is in the shape of a cone surmounted on a hemisphere. The radius of each of them being 3.5 cm and the total height of the solid is 9.5 cm. Find the volume of the solid. **[2020] ...[4M]**

15. **Case Study Based Question :**

A solid cuboidal toy is made of wood. It has five cone shaped cavities to hold toy carrots.

The dimensions of the toy are cuboid – 10 cm × 10 cm × 8 cm.

Each cone carved out – Radius = 2.1 cm and Height = 6 cm. **[2022] ...[4M]**



(i) Find the volume of wood carved out to make five conical cavities.

(ii) Find the volume of the wood in the final product.

16. ***Case Study Based Question :***

A 'circus' is a company of performers who put on shows of acrobats, clowns, etc. to entertain people started around 250 years back, in open fields, now generally performed in tents.

[2022] ...[4M]

On such 'Circus Tent' is shown below.

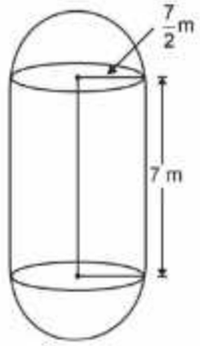
The tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of cylindrical part are 9 m and 30 m respectively and height of conical part is 8 m with same diameter as that of the cylindrical part, then find

(1) the area of the canvas used in making the tent; **[3]**

(2) the cost of the canvas bought for the tent at the rate ₹ 200 per sq. m, if 30 sq. m canvas was wasted during stitching. **[1]**

17. The boilers are used in thermal power plants to store water and then used to produce steam. One such boiler consists of a cylindrical part in middle and two hemispherical parts at its both ends. Length of the cylindrical part is 7 m and radius of cylindrical part is $\frac{7}{2}$m. Find the total surface area and the volume of the boiler. Also, find the ratio of the volume of cylindrical part to the volume of one hemispherical part.

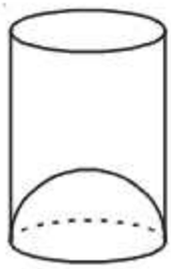
[2023] ...[5M]



18. From a solid cylinder of height 20 cm and diameter 12 cm, a conical cavity of height 8 cm and radius 6 cm is hallowed out. Find the total surface area of the remaining solid.

[2023] ...[5M]

19. A juice seller serves his customers using a glass as shown in figure. The inner diameter of the cylindrical glass is 5 cm, but the bottom of the glass has a hemispherical portion raised which reduces the capacity of the glass. If the height of the glass is 10 cm, find the apparent capacity of the glass and its actual capacity. (Use π = 3.14) **[2009] ...[6M]**



20. A cylindrical vessel with internal diameter 10 cm and height 10.5 cm is full of water. A solid cone of base diameter 7 cm and height 6 cm is completely immersed in water. Find the volume of

(i) Water displaced out of the cylindrical vessel.

(ii) Water left in the cylindrical vessel.

[2009] ...[6M]

21. A toy is in the form of a hemisphere surmounted by a right circular cone of the same base radius as that of the hemisphere. If the radius of base of the cone is 21 cm and its volume is $\frac{2}{3}$ of the volume of the hemisphere, calculate the height of the cone and the surface area of the toy.

[2010] ...[6M]

13 : Statistics

1. For the following distribution : **[2023] ...[1M]**

Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

The sum of lower limits of median class and modal class is

(a) 15

(b) 25

(c) 30

(d) 35

2. Find the class marks of classes 10 – 25 and 35 – 55. **[2008] ...[1M]**

3. Find the mean of the following distribution: **[2020] ...[2M]**

Classes	Frequency
3 – 5	5
5 – 7	10
7 – 9	10
9 – 11	7
11 – 13	8

OR

Find the mode of the following data : **[2020] ...[2M]**

Class :	Frequency :
0 – 20	6
20 – 40	8
40 – 60	10
60 – 80	12
80 – 100	6
100 – 120	5
120 – 140	3

4. Find the mode of the following frequency distribution: **[2022] ...[2M]**

Class :	Frequency :
20 – 30	25
30 – 40	30
40 – 50	45
50 – 60	42
60 – 70	35

5. If mode of the following frequency distribution is 55, then find the value of x. **[2022] ...[2M]**

Class :	Frequency :
0 – 15	10
15 – 30	7
30 – 45	x
45 – 60	15
60 – 75	10
75 – 90	12

6. The table below shown the salaries of 280 persons : **[2018] ...[3M]**

Salary (In thousand)	No. of Person
5 – 10	49
10 – 15	133
15 – 20	63
20 – 25	15
25 – 30	6
30 – 35	7
35 – 40	4
40 – 45	2
45 – 50	1

Calculate the median salary of the data.

7. Find the mode of the following frequency distribution. **[2019] ...[3M]**

Class	Frequency
0 - 10	8
10 - 20	10
20 - 30	10
30 - 40	16
40 - 50	12
50 - 60	6
60 - 70	7

8. Find the mean of the following frequency distribution : **[2022] ...[3M]**

Class :	Frequency :
10 – 15	4
15 – 20	10
20 – 25	5
25 – 30	6
30 – 35	5

9. The median of following frequency distribution is 25. Find the value of x. **[2022] ...[3M]**

Class :	Frequency :
0 – 10	6
10 – 20	9
20 – 30	10
30 – 40	8
40 – 50	x

10. (a) The mean of the following frequency distribution is 25. Find the value of f.

[2022] ...[3M]

Class	Frequency
0 – 10	5
10 – 20	18
20 – 30	15
30 – 40	f
40 – 50	6

OR

(b) Find the mean of the following data using assumed mean method : **[2022] ...[3M]**

Class	Frequency
0 – 5	8
5 – 10	7
10 – 15	10
15 – 20	13
20 – 25	12

11. Heights of 50 students of Class X of a school are recorded and following data is obtained :

[2022] ...[3M]

Height (in cm)	Number of students
130 – 135	4
135 – 140	11
140 – 145	12
145 – 150	7
150 – 155	10
155 – 160	6

Find the median height of the students.

12. The mean of the following distribution is 18. Find the frequency f of the class 19 – 21. **[2018]...[4M]**

Class	Frequency
11 – 13	3
13 – 15	6
15 – 17	9
17 – 19	13
19 – 21	f
21 – 23	5
23 – 25	4

13. The following distribution gives the daily income of 50 workers of a factory :

Daily income (In)	Number of workers
100 – 120	12
120 – 140	14
140 – 160	8
160 – 180	6
180 – 200	10

Convert the distribution above to a less than type cumulative frequency distribution and draw its ogive. **[2018] ...[4M]**

14. If the median of the following frequency distribution is 32.5. Find the values of f_1 and f_2.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Frequency	f_1	5	9	12	f_2	3	2	40

[2019] ...[4M]

15. Find the mean of the following data:

[2020] ...[4M]

Classes	Frequency
0 – 20	20
20 – 40	35
40 – 60	52
60 – 80	44
80 – 100	38
100 – 120	31

16. The following table gives production yield per hectare (in quintals) of wheat of 100 farms of a village :

Production yield / hect.	No. of farms
40 – 45	4
45 – 50	6
50 – 55	16
55 – 60	20
60 – 65	30
65 – 70	24

Change the distribution to 'a more than' type distribution and draw its ogive. **[2020] ...[4M]**

OR

The median of the following data is 525. Find the values of *x* and *y*, if total frequency is 100 :

[2020] ...[4M]

Class :	Frequency :
0 – 100	2
100 – 200	5
200 – 300	*x*
300 – 400	12
400 – 500	17
500 – 600	20
600 – 700	*y*
700 – 800	9
800 – 900	7
900 – 1000	4

17. The distribution below gives the weights of 30 students of a class. Find the median weight of the students : **[2023] ...[5M]**

Weight in kg	Number of Students
40-45	2
45-50	3
50-55	8
55-60	6
60-65	6
65-70	3
70-75	2

18. The monthly expenditure on milk in 200 families of a Housing Society is given below :

Monthly Expenditure (in ₹)	Number of families
1000 – 1500	24
1500 – 2000	40
2000 – 2500	33
2500 – 3000	x
3000 – 3500	30
3500 – 4000	22
4000 – 4500	16
4500 – 5000	7

Find the value of x and also, find the median and mean expenditure on milk. **[2023] ...[5M]**

19. Find mean, median and mode of the following data: **[2008] ...[6M]**

Classes	Frequency
0 – 20	6
20 – 40	8
40 – 60	10
60 – 80	12
80 – 100	6
100 – 120	5
120 – 140	3

20. Find the mean, mode and median of the following frequency distribution: **[2010] ...[6M]**

Class	Frequency
0 – 10	4
10 – 20	4
20 – 30	7
30 – 40	10
40 – 50	12
50 – 60	8
60 – 70	5

14 : Probability

1. A card is drawn from a well-shuffled deck of 52 playing cards. The probability that the card will not be an ace is **[2011] ...[1M]**

(a) $\frac{1}{13}$ (b) $\frac{1}{4}$

(c) $\frac{12}{13}$ (d) $\frac{3}{4}$

2. Two dice are thrown together. The probability of getting the same number on both dice is **[2012] ...[1M]**

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$

(c) $\frac{1}{6}$ (d) $\frac{1}{12}$

3. The probability of getting an even number, when a die is thrown once, is **[2013] ...[1M]**

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$

(c) $\frac{1}{6}$ (d) $\frac{5}{6}$

4. A box contains 90 discs, numbered from 1 to 90. If one disc is drawn at random from the box, the probability that it bears a prime-number less than 23, is **[2013] ...[1M]**

(a) $\frac{7}{90}$

(b) $\frac{10}{90}$

(c) $\frac{4}{45}$

(d) $\frac{9}{89}$

5. If two different dice are rolled together, the probability of getting an even number on both dice, is : **[2014] ...[1M]**

(a) $\frac{1}{36}$

(b) $\frac{1}{2}$

(c) $\frac{1}{6}$

(d) $\frac{1}{4}$

6. A number is selected at random from the numbers 1 to 30. The probability that it is a prime number. **[2014] ...[1M]**

(a) $\frac{2}{3}$ (b) $\frac{1}{6}$

(c) $\frac{1}{3}$ (d) $\frac{11}{30}$

7. The probability that a number selected at random from the numbers 1, 2, 3, ..., 15 is a multiple of 4 is **[2020] ...[1M]**

(a) $\frac{4}{15}$ (b) $\frac{2}{15}$

(c) $\frac{1}{15}$ (d) $\frac{1}{5}$

8. If a pair of dice is thrown once, then what is the probability of getting a sum of 8? **[2020] ...[1M]**

9. A letter of English alphabet is chosen at random. What is the probability that the chosen letter is a consonant. **[2020] ...[1M]**

10. A die is thrown once. What is the probability of getting a number less than 3? **[2020] ...[1M]**

OR

If the probability of winning a game is 0.07, what is the probability of losing it? **[2020] ...[1M]**

11. Two coins are tossed together. The probability of getting exactly one head is **[2021] ...[1M]**

(a) 1/4 (b) 1/2

(c) 3/4 (d) 1

12. If $P(E) = 0.65$, then the value of $P(\text{not } E)$ is **[2021] ...[1M]**

(a) 1.65 (b) 0.25

(c) 0.65 (d) 0.35

13. A bag contains 16 red balls 8 green balls and 6 blue balls. One ball is drawn at random. The probability that it is blue is **[2021] ...[1M]**

(a) $\frac{1}{6}$ (b) $\frac{1}{5}$

(c) $\frac{1}{30}$ (d) $\frac{5}{6}$

14. The probability of happening of an event is 0.02. The probability of not happening of the event is **[2021] ...[1M]**

(a) 0.02 (b) 0.80

(c) 0.98 (d) $\frac{49}{100}$

15. For an event E, $P(E)+P(\overline{E})=x$, then the value of x^3-3 is **[2021] ...[1M]**

(a) –2 (b) 2

(c) 1 (d) –1

16. The probability that the drawn card from a pack of 52 cards is neither an ace nor a spade is **[2021] ...[1M]**

(a) $\frac{9}{13}$ (b) $\frac{35}{52}$

(c) $\frac{10}{13}$ (d) $\frac{19}{26}$

17. Which of the following cannot be the probability of an event? **[2021] ...[1M]**

(a) 0.01 (b) 3%

(c) $\frac{16}{17}$ (d) $\frac{17}{16}$

18. A dice is rolled twice. The probability that 5 will not come up either time is **[2021] ...[1M]**

(a) $\frac{11}{36}$ (b) $\frac{1}{3}$

(c) $\frac{13}{36}$ (d) $\frac{25}{36}$

19. Let E be an event such that $P(\text{not } E) = \frac{1}{5}$, then $P(E)$ is equal to **[2023] ...[1M]**

(a) $\frac{1}{5}$

(b) $\frac{2}{5}$

(c) 0

(d) $\frac{4}{5}$

20. From a well-shuffled deck of 52 cards, a card is drawn at random. What is the probability of getting king of hearts? **[2023] ...[1M]**

(a) $\frac{1}{52}$ (b) $\frac{1}{26}$

(c) $\frac{1}{13}$ (d) $\frac{12}{13}$

21. A card is drawn at random from a well-shuffled pack of 52 cards. The probability that the card drawn is not an ace is **[2023] ...[1M]**

(a) $\frac{1}{13}$ (b) $\frac{9}{13}$

(c) $\frac{4}{13}$ (d) $\frac{12}{13}$

22. A bag contains 5 red balls and n green balls. If the probability of drawing a green ball is three times that of a red ball, then the value of n is **[2023] ...[1M]**

(a) 18 (b) 15

(c) 10 (d) 20

23. **Assertion (A) :** The probability that a leap year has 53 Sundays is $\frac{2}{7}$. **[2023] ...[1M]**

Reason (R) : The probability that a non-leap year has 53 Sundays is $\frac{5}{7}$.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

(c) Assertion (A) is true but Reason (R) is false

(d) Assertion (A) is false but Reason (R) is true

24. A die is thrown once. Find the probability of getting a number less than 3. **[2008] ...[1M]**

25. Two coins are tossed simultaneously. Find the probability of getting exactly one head. **[2009] ...[1M]**

26. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability of getting a red face card. **[2010] ...[1M]**

27. Two different dice are tossed together. Find the probability that the product of the two numbers on the top of the dice is 6. **[2015] ...[1M]**

28. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability of getting neither a red card nor a queen.

[2016] ...[1M]

29. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap?

[2017] ...[1M]

30. A ticket is drawn at random from a bag containing tickets numbered from 1 to 40. Find the probability that the selected ticket has a number which is a multiple of 5. **[2011] ...[2M]**

31. A number is selected at random from first 50 natural numbers. Find the probability that it is a multiple of 3 and 4. **[2012] ...[2M]**

32. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability that the drawn card is neither a king nor a queen.

[2013] ...[2M]

33. Rahim tosses two different coins simultaneously. Find the probability of getting at least one tail.

[2014] ...[2M]

34. Two different dice are tossed together. Find the probability.

(i) Of getting doublet

(ii) Of getting a sum 10, of the numbers on the two dice. **[2018] ...[2M]**

35. An integer is chosen at random between 1 and 100. Find the probability that it is

(i) Divisible by 8

(ii) Not divisible by 8 **[2018] ...[2M]**

36. A game consists of tossing a coin 3 times and noting the outcome each time. If getting the same result in all the tosses is a success, find the probability of losing the game. **[2019]...[2M]**

37. A die is thrown once. Find the probability of getting a number which (i) is a prime number (ii) lies between 2 and 6. **[2019] ...[2M]**

38. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball at random from the bag is three times that of a red ball, find the number of blue balls in the bag.

[2020] ...[2M]

39. Two different dice are thrown together, find the probability that the sum of the numbers appeared is less than 5. **[2020] ...[2M]**

OR

Find the probability that 5 Sundays occur in the month of November of a randomly selected year.

[2020] ...[2M]

40. If a number x is chosen at random from the numbers $-3, -2, -1, 0, 1, 2, 3$. What is probability that $x^2 \leq 4$? **[2020] ...[2M]**

41. If a fair coin is tossed twice, find the probability of getting 'atmost one head'. **[2023] ...[2M]**

42. Two dice are thrown simultaneously. What is the probability that

(i) 5 will not come up on either of them?

(ii) 5 will come up on at least one?

(iii) 5 will come up at both dice? **[2009] ...[3M]**

43. Cards bearing numbers 1, 3, 5, ..., 35 are kept in a bag. A card is drawn at random from the bag. Find the probability of getting a card bearing

(i) A prime number less than 15

(ii) A number divisible by 3 and 5. **[2010]...[3M]**

44. Two dice are rolled once. Find the probability of getting such numbers on the two dice, whose product is 12. **[2011] ...[3M]**

45. A box contains 80 discs which are numbered from 1 to 80. If one disc is drawn at random from the box, find the probability that it bears a perfect square number. **[2011] ...[3M]**

46. A card is drawn from a well shuffled deck of 52 cards. Find the probability of getting (i) a king of red colour (ii) a face card (iii) the queen of diamond. **[2012] ...[3M]**

47. The probability of selecting a red ball at random from a jar that contains only red, blue and orange balls is $\frac{1}{4}$. The probability of selecting a blue ball at random from the same jar is $\frac{1}{3}$. If the jar contains 10 orange balls, find the total number of balls in the jar. **[2015] ...[3M]**

48. A bag contains 15 white and some black balls. If the probability of drawing a black ball from the bag is thrice that of drawing a white ball, find the number of black balls in the bag. **[2017] ...[3M]**

49. A die is rolled once. Find the probability of getting: **[2023] ...[3M]**

    (i) An even prime number.

    (ii) A number greater than 4.

    (iii) An odd number.

50. A group consists of 12 persons, of which 3 are extremely patient, other 6 are extremely honest and rest are extremely kind. A person from the group is selected at random. Assuming that each person is equally likely to be selected, find the probability of selecting a person who is

    (i) Extremely patient

    (ii) Extremely kind or honest. Which of the above values you prefer more? **[2013]...[4M]**

51. A bag contains cards numbers from 1 to 49. A card is drawn from the bag at random, after mixing the cards thoroughly. Find the probability that the number on the drawn card is

    [2014] ...[4M]

    (i) An odd number

    (ii) A multiple of 5

    (iii) A perfect square

    (iv) An even prime number

52. A card is drawn at random from a well-shuffled deck of playing cards. Find the probability that the card drawn is **[2015] ...[4M]**

    (i) A card of spade or an ace.

    (ii) A black king.

    (iii) Neither a jack nor a king

    (iv) Either a king or a queen.

53. A number x is selected at random from the 1, 2, 3 and 4. Another number y is selected at random from the numbers 1, 4, 9 and 16. Find the probability the product of x and y is less than 16. **[2016] ...[4M]**

54. Two different dice are thrown together. Find the probability that the numbers obtained have

    [2017] ...[4M]

    (i) Even sum, and (ii) Even product

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