30/04/2024

Phase-I
CODE-B

Aakash
Medical | IIT-JEE | Foundations

***Corporate Office*: Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456**

FINAL TEST SERIES for NEET-2024

MM : 720 **Test-12** **Time : 3 Hrs. 20 Mins.**

Mock Test for NEET (Complete Syllabus of class XI & XII)

Instructions :

(i) There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15.

(ii) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from the total score. Unanswered / unattempted questions will be given no marks.

(iii) Use blue/black ballpoint pen only to darken the appropriate circle.

(iv) Mark should be dark and completely fill the circle.

(v) Dark only one circle for each entry.

(vi) Dark the circle in the space provided only.

(vii) Rough work must not be done on the Answer sheet and do not use white-fluid or any other rubbing material on the Answer sheet.

PHYSICS

Choose the correct answer :

SECTION-A

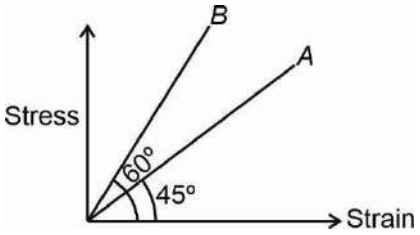
1. A particle of mass 1 kg is executing SHM according to the equation $y = 4\sin(4t + \pi/3)$, having time period T. If y is measured in cm, then kinetic energy of the particle at $t = T/4$, will be
   (1) 9.6 mJ (2) 0.48 mJ
   (3) 1.92 mJ (4) 0.96 mJ

2. An organ pipe 'X' open at one end vibrating in its fundamental mode, is in resonance with another organ pipe 'Y' open at both ends also vibrating in its fundamental mode. These pipes have lengths l_1 and l_2 respectively, then $\frac{l_1}{l_2}$ will be
   (1) $\frac{1}{4}$ (2) $\frac{3}{8}$
   (3) $\frac{1}{2}$ (4) $\frac{3}{4}$

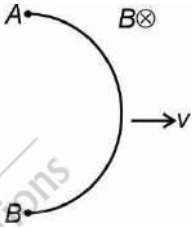
3. Three waves of equal frequency having amplitudes 12, 4 and 8 unit, meet at a point with successive phase difference of $\frac{\pi}{2}$. Amplitude of resulting wave will be
   (1) 24 unit (2) $12\sqrt{2}$ unit
   (3) $4\sqrt{2}$ unit (4) 20 unit

4. A block of mass 'm' is projected horizontally on a rough horizontal surface having coefficient of kinetic friction as 'μ'. If it stops after moving through a distance d then its initial linear momentum was
   (1) $m\mu gd$ (2) $m\sqrt{\mu gd}$
   (3) $2m\mu gd$ (4) $m\sqrt{2\mu gd}$

5. For measuring current across a circuit having a cell of emf 10 V and internal resistance 2 Ω connected in series with a resistance 8 Ω, an ammeter of resistance 10 Ω is used. The reading of ammeter is
   (1) 1 A (2) 0.5 A
   (3) 2 A (4) 2.5 A
6. Consider the displacement equation of a travelling wave $y = A\sin(\omega t - kx)$ where y, A and x are in 'm' and t is in 's'. The unit of $\frac{Ak}{\omega}$ is
   (1) (second)$^{-1}$
   (2) Metre per second
   (3) Metre squared per second
   (4) Second
7. A rail-road cart is moving at speed 10 m/s along horizontal. A ball is projected at speed 20 m/s making an angle 37° with horizontal. Horizontal distance travelled by ball after attaining the same horizontal level is
   (1) 62.4 m (2) 24 m
   (3) 48.4 m (4) 5.2 m
8. According to Newton's third law of motion, the action and reaction forces
   (1) Must act on the same body
   (2) Must act on the different bodies
   (3) Must be unequal in magnitude
   (4) Must be equal in magnitude and act in the same direction
9. The stress versus strain graph for wires of two materials A and B are shown in figure. The ratio of their young's modulus $\frac{Y_A}{Y_B}$ is



   (1) 3 : 1 (2) 1 : $\sqrt{3}$
   (3) 1 : 3 (4) $\sqrt{3}$: 1
10. A container contains 100 g ice at –10°C kept in a laboratory having ambient temperature of 40°C. After some time half of the ice is found to melt, the temperature of water so formed is
   (1) Less than 0°C (2) 0ºC
   (3) More than 0ºC (4) 40ºC
11. A convex mirror forms an image of the sun at a distance of 10 cm from it, then
   (1) The radius of curvature of the mirror is 20 cm
   (2) The radius of curvature of the mirror is 10 cm
   (3) The radius of curvature of the mirror is 5 cm
   (4) The radius of curvature of the mirror is 40 cm
12. A thin wire AB of length l is bent into a semicircle. It is then moved with speed v as shown in a uniform transverse magnetic field. The potential difference across its two ends is

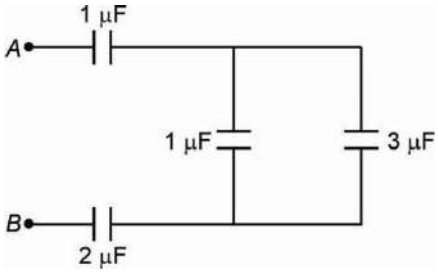


   (1) Blv (2) $\frac{2Blv}{\pi}$
   (3) $\frac{Blv}{\pi}$ (4) $2Blv$
13. An ideal transformer has a 300 turns in primary coil while it has 60 turns in secondary coil. If output power is 300 kW and input voltage is 10^4 V then output current is
   (1) 30 A (2) 300 A
   (3) 1500 A (4) 150 A
14. Two point charges +3 C and +6 C repel each other with a force of 18 N. If –4 C is given to both the charges separately, the new force will be
   (1) 2 N, repulsive (2) 2 N, attractive
   (3) 6 N, repulsive (4) 6 N, attractive

Space for Rough Work

15. A uniform electric field $\vec{E} = \left(2\hat{i} + 3\hat{j} - 4\hat{k}\right)$ N/C exists in a region. The magnitude of electric flux (in SI units) passing through a square of side 2 cm lying in $x - y$ plane is
(1) 4×10^{-4} (2) 32×10^{-4}
(3) 16×10^{-4} (4) Zero

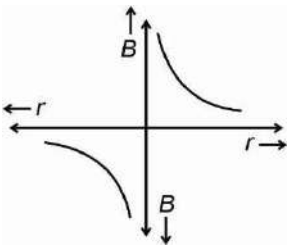
16. The effective capacitance of the network between points *A* and *B* is

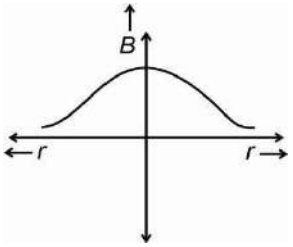


(1) $\frac{7}{4}$ μF (2) 7 μF
(3) $\frac{4}{7}$ μF (4) $\frac{4}{9}$ μF

17. Light of wavelength 3100 Å is incident on a photosensitive metal surface having work function 6 eV. The maximum kinetic energy of ejected photoelectrons will be
(1) 2 eV
(2) 4 eV
(3) 6 eV
(4) Zero

18. Variation of magnetic field (*B*) with distance from the centre of ring (*r*) along its axis is best represented by

(1)


(2)


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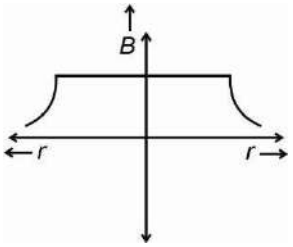
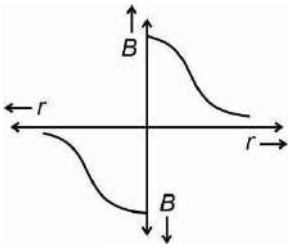


(4)


19. On the basis of Bohr's atomic model the speed of electron in 3rd orbit of hydrogen atom is
(1) Three times of speed in first orbit
(2) Nine times of speed in first orbit
(3) One third of speed in first orbit
(4) Equal to the speed in first orbit

20. **Assertion (A):** In YDSE, if wavelength of light used is increased then angular width of fringes remains unchanged while linear width of fringes increases.
Reason (R): Linear fringe width is proportional to wavelength and while angular fringe width is independent of wavelength.
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

Space for Rough Work

21. Which of the following is/are true for electromagnetic waves?
(I) They transport energy.
(II) They are longitudinal in nature.
(III) They have momentum.
(1) I and III (2) III only
(3) I only (4) I, II and III

22. All components of the electromagnetic spectrum in vacuum have the same
(1) Energy (2) Speed
(3) Wavelength (4) Frequency

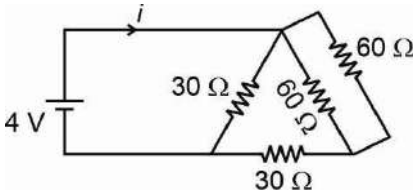
23. A disc of radius R and mass m rotates about a fixed axis passing through its centre and perpendicular to its plane with angular velocity ω. Its kinetic energy is
(1) $\frac{mR\omega^2}{2}$ (2) $\frac{mR^2\omega}{2}$
(3) $\frac{mR\omega^2}{4}$ (4) $\frac{mR^2\omega^2}{4}$

24. The centre of mass of a system of two particles divides the straight line joining between them
(1) In inverse ratio of square of masses of particles
(2) In direct ratio of square of masses of particles
(3) In inverse ratio of masses of particles
(4) In direct ratio of masses of particles

25. A body moves a distance of 5 m along a straight line under the action of a force of 10 N. If the work done is $25\sqrt{3}$ J, then the angle which the force makes with the direction of motion of the body is
(1) 37° (2) 30°
(3) 53° (4) 60°

26. The energy band gap is maximum in
(1) Metals (2) Alloys
(3) Insulators (4) Semiconductors

27. The current i in the circuit shown below is

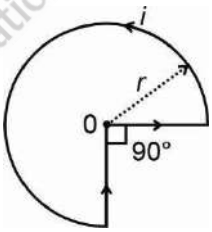


(1) 0.6 A (2) 0.5 A
(3) 0.4 A (4) 0.2 A

28. The specific heat at constant volume of a gas is $\frac{5R}{2}$, then the value of γ will be
(1) $\frac{5}{3}$ (2) $\frac{3}{2}$
(3) $\frac{7}{5}$ (4) $\frac{5}{2}$

29. Volume of 1 mole of an ideal gas at 27°C is doubled at constant pressure. The work done in this process is [Given R = 2 cal $mol^{-1}°c^{-1}$]
(1) 1200 cal (2) 300 cal
(3) 1900 cal (4) 600 cal

30. For the arrangement as shown in the figure, the magnetic induction at the centre (0) is



(1) $\frac{3}{4}\frac{\mu_0 i}{r}$ (2) $\frac{3}{8}\frac{\mu_0 i}{r}$
(3) $\frac{\mu_0 i}{8r}$ (4) $\frac{\mu_0 i}{8}(3+\pi)$

31. Relative permeability of iron is 5460, then its magnetic susceptibility will be
(1) $5460 \times 4\pi \times 10^{-7}$ (2) 5460×10^{-7}
(3) 5459 (4) 5461

Space for Rough Work

32. The angular momentum of electron in 4th Bohr's orbit is given by

(1) $\frac{h}{2\pi}$ (2) $\frac{2h}{\pi}$

(3) $\frac{4h}{\pi}$ (4) $\frac{h}{\pi}$

33. Consider the following two statements A and B, identify the correct answer.

A: Nuclear density is nearly same for all nuclei

B: Radius of nucleus R and its mass number A are related as $R^2 \propto A^{1/6}$

(1) Both A and B are true

(2) Both A and B are false

(3) A is true but B is false

(4) A is false but B is true

34. In a vernier calliper, one main scale division is 1 mm and 20 division of the vernier scale coincide with 18 division of the main scale. The least count of the calliper is

(1) 0.1 mm (2) 1 mm

(3) 0.01 mm (4) 0.2 mm

35. The capacitance of an isolated conducting sphere of radius R is proportional to

(1) R^{-1} (2) R

(3) R^{-2} (4) R^2

SECTION-B

36. The angular velocity of a rotating body is $\vec{\omega}$, velocity $(\vec{v})$ of a point on the body having position vector $\vec{r}$ is given by

(1) $\vec{v} = \vec{\omega} \times \vec{r}$ (2) $\vec{v} = \vec{r} \times \vec{\omega}$

(3) $\vec{v} = \frac{\vec{r}}{\vec{\omega}}$ (4) $\vec{v} = \frac{\vec{\omega}}{\vec{r}}$

37. A 4 μF capacitor is charged by a 60 V battery. After disconnecting the battery it is connected to another 4 μF capacitor having charge 240 μC. The energy lost in the process of charge sharing if similar polarity plates are connected with each other will be

(1) 3.6 mJ (2) 7.2 mJ

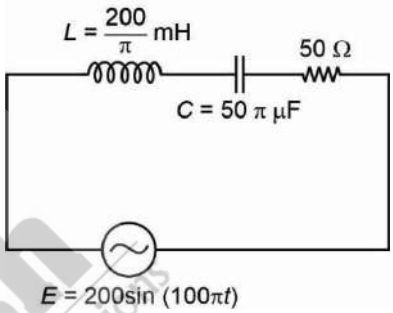
(3) 1.8 mJ (4) Zero

38. The escape velocity from a planet is v_e. A tunnel is dug along the diameter of the planet. If a small body of mass m is dropped into this tunnel then the kinetic energy of the body when it passes through the centre of the planet is

(1) $\frac{1}{2}mv_e^2$ (2) $\frac{1}{4}mv_e^2$

(3) mv_e^2 (4) Zero

39. Column I contains quantities and column II contains the values of these quantities corresponding to a series LCR circuit connected to an AC source given below.



Match the entries in column I & column II and tick the correct option.

	Column I		Column II
(A)	Capacitive reactance (in ohm)	(P)	One
(B)	Impedance (in ohm)	(Q)	Fifty
(C)	Peak value of current (in A)	(R)	Twenty
(D)	Power factor (unitless)	(S)	Four

(1) A → R; B → S; C → Q; D → P

(2) A → R; B → Q; C → S; D → P

(3) A → S; B → Q; C → R; D → P

(4) A → S; B → R; C → Q; D → P

Space for Rough Work

40. In YDSE using a monochromatic light of wavelength λ, the path difference corresponding to any point having half of the maximum intensity (n is any integer)

(1) $(2n+1)\frac{\lambda}{2}$

(2) $(2n+1)\frac{\lambda}{4}$

(3) $(2n+1)\frac{\lambda}{8}$

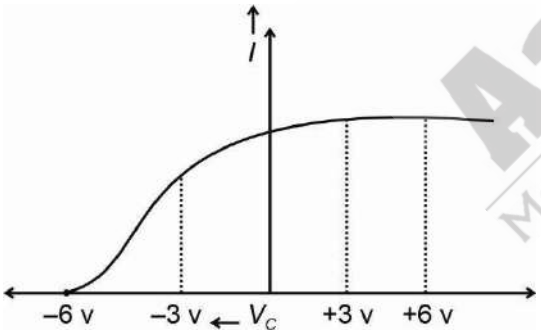
(4) $(2n+1)\frac{\lambda}{16}$

41. Two wires are made up of same material and have same lengths. The first wire has circular cross-section of radius a and the other wire has square cross-section of side length $\frac{a}{2}$. The ratio of resistivity of first wire to the second wire is

(1) $2\pi : 1$ (2) $1 : 1$

(3) $1 : \pi$ (4) $1 : 2$

42. Photoelectric emission from a metal surface is analysed experimentally. A variation of photocurrent with collector potential is plotted as shown below. If incident light of wavelength 1550 Å is used then work function of the metal is



(1) 6 eV (2) 2 eV

(3) 4 eV (4) Zero

43. A microscope is focused on an ink mark on the top of a table. If we place a glass slab (μ = 1.5) of 6 cm thick on it, how should the microscope be moved to focus the ink spot again?

(1) 2 cm upward

(2) 1 cm upward

(3) 2 cm downward

(4) 1 cm downward

44. If an object is placed 30 cm infront of a concave mirror of focal length 20 cm, the image will be

(1) Diminished, upright, virtual

(2) Enlarged, inverted and virtual

(3) Diminished, inverted, real

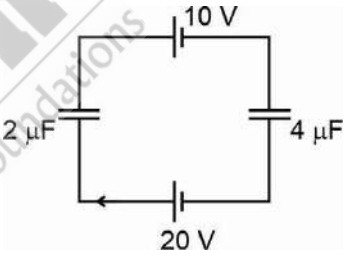
(4) Enlarged, inverted and real

45. The potential energy of system of two equal positive point charges of 1 μC each held 1 m apart in air is

(1) 9×10^{-2} J (2) 9×10^{-3} J

(3) 9×10^{-4} J (4) 9×10^{3} J

46. What is the potential difference across 2 μF capacitor in the circuit shown?



(1) $\frac{10}{3}$ V (2) $\frac{40}{3}$ V

(3) $\frac{20}{3}$ V (4) 10 V

47. In closed organ pipe if the frequency of 3rd overtone is 1400 Hz then fundamental frequency for same length of open organ pipe will be

(1) 600 Hz (2) 800 Hz

(3) 400 Hz (4) 300 Hz

Space for Rough Work

48. **Assertion (A):** The smaller the wavelength of a photon, the more energy it has.

Reason (R): The smaller the wavelength of a photon, the less momentum it has.

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

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

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

(4) Both (A) and (R) are false

49. A 1 kg ball drops vertically on a floor hitting with a speed of 20 ms^{-1}. It rebounds with an initial speed of 10 ms^{-1}. If the ball was in contact for only 0.02 seconds, the force exerted on the floor by the ball is

(1) 500 N (2) 1500 N

(3) 2500 N (4) 3000 N

50. The dimension of $\frac{B^2}{2\mu_0}$ where μ_0 is permeability of free space and B is magnetic field, is

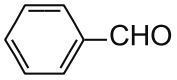
(1) MLT^{-2} (2) $ML^{-1}T^{-2}$

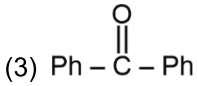
(3) ML^2T^{-2} (4) $ML^{-2}T^{-1}$

CHEMISTRY

SECTION - A

51. Positive Fehling's test is given by

(1)  (2) $CH_3 - CHO$

(3)  (4) $Ph - COOH$

52. The most basic compound in aqueous solution is

(1) CH_3NH_2 (2) $(CH_3)_2NH$

(3) NH_3 (4) $(CH_3)_3N$

53. Given below are two statements: one is labelled as Assertion (A) and other is labelled as Reason (R).

Assertion (A): In the titration of HCl and NaOH, phenolphthalein is used as a suitable indicator.

Reason (R): Phenolphthalein is pink coloured in acidic medium.

In the light of above statements, choose the correct answer.

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

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

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

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

54. The number of angular nodes and radial nodes in 3*p* orbital are respectively

(1) 0 and 1 (2) 1 and 0

(3) 1 and 1 (4) 3 and 1

55. Identify the option with correct number and types of bonds in orthophosphorous acid

(a) One P–O–P bond (b) Two P – OH bonds

(c) One P – H bond (d) One P=O bond

Choose the correct answer.

(1) (a) and (c) only (2) (b), (c) and (d) only

(3) (a), (b) and (d) only (4) (a) and (d) only

56. The reduction potential of hydrogen electrode at pH = 5 will be [consider $P_{H_2} = 1$ bar , T = 298 K]

(1) 0.3 V (2) –0.3 V

(3) +0.414 V (4) 0.06 V

57. The sodium fusion extract of an organic compound on acidification with acetic acid and addition of lead acetate solution gives a black precipitate. The organic compound contains

(1) Nitrogen

(2) Halogen

(3) Sulphur

(4) Phosphorous

Space for Rough Work

58. Which of the following is expected to be coloured in aqueous solutions?
(1) Sc^{3+} (2) Ti^{4+}
(3) Cr^{3+} (4) Cu^{+}

59. In hydrogen atom, the de Broglie wavelength of an electron in the fourth Bohr orbit is
(1) 423.2 pm (2) 211.6 pm
(3) 211.6 π pm (4) 423.2 π pm

60. Pick out the correct statement with respect to $[Co(CN)_6]^{3-}$.
(1) It is sp^3d^2 hybridised and octahedral
(2) It is sp^3 hybridised and tetrahedral
(3) It is d^2sp^3 hybridised and octahedral
(4) It is dsp^2 hybridised and square planar

61. Consider the following statements

Statement I: Phenol is converted to benzene on heating with zinc dust.

Statement II: Phenol is oxidized to benzoquinone on reaction with chromic acid.

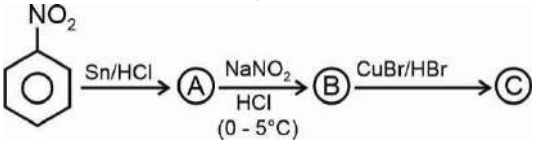
In the light of above statements, choose the correct answer from the options given below.
(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

62. Match List-I with List-II.

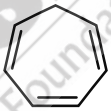
	List-I (Vitamin)		**List-II (Deficiency disease)**
(a)	Vitamin A	(i)	Convulsions
(b)	Vitamin B_6	(ii)	Pernicious anaemia
(c)	Vitamin B_{12}	(iii)	Xerophthalmia
(d)	Vitamin E	(iv)	Increased fragility of RBC's

Choose the correct answer from the options given below.
(1) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
(2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
(3) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
(4) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)

63. Consider the following reaction



Select the correct option for the above reaction sequence.
(1) Compound A is $PhCH_2NH_2$
(2) Compound B is Ph $\overset{+}{N}_2\overset{-}{Cl}$
(3) Compound C is meta-directing for electrophilic substitution reaction.
(4) Compound 'C' is 

64. Which of the following will react with NaOH most readily?
(1)  (2) 
(3)  (4) 

65. Which of the following compounds does not give iodoform test?
(1) C_2H_5OH (2) CH_3CHO
(3) CH_3COCH_3 (4) CH_3OH

66. Given below are two statements: one is labelled as Assertion (A) and other is labelled as Reason (R).

Assertion (A): The solubility of salts of weak acids like acetate increases at lower pH.

Reason (R): At lower pH the concentration of the anion decreases due to its protonation.

In the light of above statements, choose the correct answer.

Space for Rough Work

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) (A) is false but (R) is true
(3) (A) is true but (R) is false
(4) Both (A) and (R) are true but (R) is not the correct explanation of (A)

67. Which one of the following pairs of species has the same bond order?
(1) O_2, N_2 (2) O_2, O_2^{2-}
(3) NO^+, CO (4) N_2, O_2^-

68. Select correct statement about Boric acid (H_3BO_3).
(1) It is insoluble in hot water
(2) It is a Lewis acid
(3) It is an Arrhenius acid
(4) It is a tribasic acid

69. Compound that does not liberate nitrogen gas on heating is
(1) $Ba(N_3)_2$ (2) $(NH_4)_2Cr_2O_7$
(3) $(NH_4)_2SO_4$ (4) NH_4NO_2

70. Two liquids A and B are mixed in a molar ratio of 1 : 3. If $P_A^o = 100$ mmHg and $P_B^o = 400$ mmHg, then the mole fraction of A in vapour phase is
(1) $\frac{1}{13}$ (2) $\frac{3}{13}$
(3) $\frac{4}{13}$ (4) $\frac{10}{13}$

71. Sucrose on hydrolysis gives
(1) D-(+)-Glucose and D-(+)-Glucose
(2) D-(+)-Glucose and D-(–)-Fructose
(3) D-(–)-Fructose and D-(–)-Fructose
(4) D-(–)-Glucose and D-(+)-Fructose

72. Consider the following reaction sequence

Butan-2-ol $\xrightarrow[\text{(iii) } CO_2, H_3O^+]{\text{(i) } SOCl_2 \text{ (ii) Mg, dry ether}}$ B (Product)

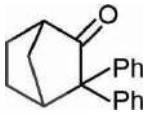
The product 'B' will be
(1) Butanoic acid
(2) 2-Methylbutanoic acid
(3) Pentanoic acid
(4) 3-Methylpentanoic acid

73. In two molal solution that contains 0.8 mole of a solute there is
(1) 800 mL of solvent (2) 100 g of solvent
(3) 400 g of solvent (4) 400 mL of solvent

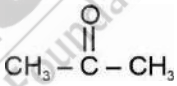
74. Number of oxygen atom(s) shared by one SiO_4^{4-} unit in a Pyrosilicate is
(1) 1 (2) 2
(3) 3 (4) 4

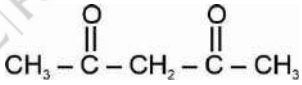
75. Identify disproportionation reaction among the following.
(1) $CH_4 + 4Cl_2 \rightarrow CCl_4 + 4HCl$
(2) $2F_2 + 2OH^- \rightarrow 2F^- + OF_2 + H_2O$
(3) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
(4) $2NO_2 + 2OH^- \rightarrow NO_2^- + NO_3^- + H_2O$

76. Which of the following compounds show tautomerism?

(a) 

(b) 

(c) 

(d) 

Choose the correct option.
(1) (c) and (d) only (2) (a) and (b) only
(3) (a), (b) and (c) only (4) (a), (b) and (d) only

77. For a reversible reaction $A(s) \rightleftharpoons 2B(g) + C(g)$, if at T(K) equilibrium pressure is P then K_p will be
(1) P^3 (2) $\frac{4}{27}P^3$
(3) $\frac{P^3}{27}$ (4) $\frac{P^3}{9}$

Space for Rough Work

78. In Carius tube for sulphur estimation, if 0.482 g of an organic compound gave 0.960 g of Barium sulphate then the percentage of sulphur in the compound is approximately (Molar mass of $BaSO_4$ = 233 g mol^{-1})
(1) 42% (2) 27%
(3) 19% (4) 38%

79. In which of the following reactions, K_C and K_P are equal?
(1) $3H_2(g) + N_2(g) \rightleftharpoons 2NH_3(g)$
(2) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$
(3) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
(4) $2C(s) + O_2(g) \rightleftharpoons 2CO(g)$

80. Equivalent weight of H_2SO_4 in the reaction
$H_2SO_4 + NaOH \rightarrow NaHSO_4 + H_2O$ will be (if molecular mass of H_2SO_4 is M)
(1) M (2) $\frac{M}{2}$
(3) $\frac{M}{3}$ (4) $\frac{2M}{3}$

81. Ozonolysis products of a reactant 'X' are acetone and butan-2-one, then 'X' will be
(1) 3-Ethyl-2-methylbut-2-ene
(2) 3-Methyl-2-propylprop-2-ene
(3) 2,3-Dimethylpent-2-ene
(4) 3,4-Diethylbut-1-ene

82. Given below are two statements.
Statement I: For an ideal solution, Δ_{mix} H = 0 and Δ_{mix} V = 0.
Statement II: Mixture of n-hexane and n-heptane is a non-ideal solution.
In the light of above statements choose the most appropriate answer from the options given below.
(1) Both the statement I and statement II are correct
(2) Both the statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

83. Given below are two statements.
Statement I: The acidic strength of monosubstituted nitrophenol is lower than phenol.
Statement II: o-nitrophenol is more acidic than m-nitrophenol.
In the light of above statements choose the correct option.
(1) Statement I is correct but statement II is incorrect
(2) Statement I is incorrect but statement II is correct
(3) Both statement I and statement II are correct
(4) Both statement I and statement II are incorrect

84. Match List-I with List-II.

	List-I (Species)		**List-II (Shape)**
(a)	SF_4	(i)	See-Saw
(b)	SO_2	(ii)	Linear
(c)	I_3^-	(iii)	Bent
(d)	ClF_3	(iv)	T-shape

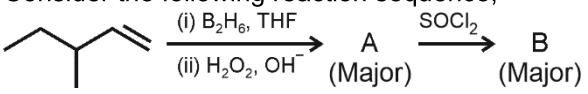
Choose the correct answer from the options given below.
(1) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
(2) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)
(3) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
(4) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

85. Among the following reactions, the reaction that proceeds through an electrophilic substitution, is
(1) $CH_2 = CH_2 + Br_2 \xrightarrow{CCl_4} CH_2(Br) - CH_2(Br)$
(2) $CH_3CH_2CH_2CH_3 \xrightarrow[\text{Or heat}]{Cl_2/UV\ light} CH_3CH_2CHClCH_3$
(3) $C_6H_5Cl \xrightarrow[(ii)\ H^+]{(i)\ NaOH,\ 623\ K,\ 300\ atm} C_6H_5OH$
(4) $C_6H_6 + Cl_2 \xrightarrow{anhyd.\ AlCl_3} C_6H_5Cl + HCl$

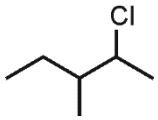
Space for Rough Work

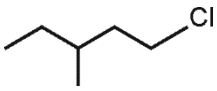
SECTION - B

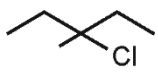
86. Consider the following reaction sequence,

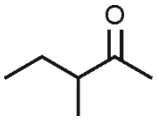


Major product B is

(1) 

(2) 

(3) 

(4) 

87. The equilibrium constant of the reaction, $Cu(s) + 2Ag^+(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$ E^o = 0.46 V at 298 K approximately is

(1) 3.92×10^{15} (2) 4.92×10^{16}

(3) 2.08×10^{14} (4) 1.92×10^{17}

88. Maximum number of atoms are present in

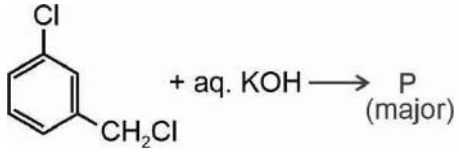
(1) 0.1 mol $C_6H_{12}O_6$ (2) 0.2 mol $C_{12}H_{22}O_{11}$

(3) 0.3 mol $Na_2C_2O_4$ (4) 0.1 mol H_2O

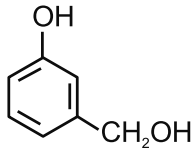
89. Total number of electrons in Na atom for which azimuthal quantum number (l) is 1, is

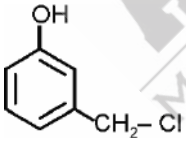
(1) 10 (2) 9

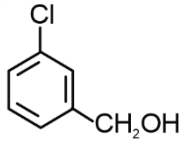
(3) 6 (4) 7

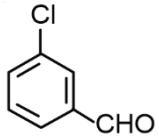
90. 

Major product (P) of the above reaction is

(1) 

(2) 

(3) 

(4) 

91. Excess of brown fumes are evolved when a salt is heated with copper turnings and concentrated sulphuric acid. The salt contains

(1) Sulphate ions (2) Nitrate ions

(3) Nitrite ions (4) Carbonate ions

92. Match List-I with List-II.

	List-I (Complexes)		**List-II (Type of Isomerism)**
(a)	$[Co(NH_3)_5NO_2]Br_2$ and $[Co(NH_3)_5ONO]Br_2$	(i)	Ionisation Isomerism
(b)	$[Cr(NH_3)_6][Co(CN)_6]$ and $[Co(NH_3)_6]$ $[Cr(CN)_6]$	(ii)	Coordination Isomerism
(c)	$[Co(H_2O)_5(SO_4)]Br$ and $[Co(H_2O)_5Br]$ SO_4	(iii)	Linkage Isomerism
(d)	$[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2.H_2O$	(iv)	Solvate Isomerism

Choose the correct answer from the options given below.

(1) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

(2) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

(3) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

(4) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

93. Given below are the two statements

Statement I: For irreversible expansion of an ideal gas under isothermal condition, $\Delta U = 0$ and $\Delta S_{total} \neq 0$.

Statement II: For free expansion of an ideal gas under isothermal condition, $q = 0$, $\Delta T = 0$ and $w = 0$.

In the light of above statements, choose the correct answer.

(1) Statement I is correct but statement II is incorrect

(2) Both statement I and statement II are correct

(3) Both statement I and statement II are incorrect

(4) Statement I is incorrect but statement II is correct

Space for Rough Work

94. The molar entropy change for the melting of ice at 0°C is 5.260 cal/(mol K). The enthalpy of fusion of water is

(1) 0.563 kcal/mol

(2) 2.765 kcal/mol

(3) 1.436 kcal/mol

(4) 13.982 kcal/mol

95. In a zero order reaction for every 10° rise of temperature the rate is doubled. If the temperature is increased from 10°C to 80°C, the rate of the reaction will become

(1) 256 times

(2) 128 times

(3) 32 times

(4) 512 times

96. In the collision theory of chemical reaction, $e^{-E_a/RT}$ represents

(1) The fraction of molecules with energies equal to or less than E_a

(2) The collision frequency of reactants A and B

(3) Steric factor

(4) The fraction of molecules with energies equal to or greater than E_a

97. The incorrect statement among the following is

(1) Enantiomers are non-superimposable mirror images of each other

(2) A racemic mixture shows zero optical rotation

(3) S_N2 reaction yields 1 : 1 mixture of both enantiomers

(4) The product obtained by S_N2 reaction of haloalkane having chirality at the reactive site shows inversion of configuration.

98. Elimination reaction of 2-Bromobutane to form But-2-ene as major product is

(a) β-elimination reaction

(b) Follows Zaitsev rule

(c) Dehydrohalogenation reaction

(d) Dehydration reaction

Choose the correct option among the following.

(1) (a), (c) and (d) only (2) (a), (b) and (d) only

(3) (a), (b) and (c) only (4) (b), (c) and (d) only

99. The correct order of the decreasing ionic radii among the following isoelectronic species is

(1) $Al^{3+} > Mg^{2+} > F^- > O^{2-}$

(2) $O^{2-} > Mg^{2+} > F^- > Al^{3+}$

(3) $O^{2-} > F^- > Mg^{2+} > Al^{3+}$

(4) $Al^{3+} > F^- > O^{2-} > Mg^{2+}$

100. Given below are two statements: one is labelled as Assertion (A) and other is labelled as Reason (R).

Assertion (A): Many copper (I) compounds are unstable in aqueous solution and undergo disproportionation.

Reason (R): The $\Delta_{Hyd}H^{\ominus}$ of $Cu^{2+}(aq)$ is much more negative than Cu^+ which more than compensates for the second ionisation enthalpy of Cu.

In the light of above statements, choose the correct answer.

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

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

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

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

Space for Rough Work

BOTANY

SECTION-A

101. Identify the statements which is **not** true for the cellular structure in which both light and dark reactions of photosynthesis occur.
(1) It has flat membranous tubules connecting the thylakoids of different grana
(2) Chlorophyll pigments are present in dissolved state in its stroma
(3) Its inner membrane is relatively less permeable to substance than outer membrane
(4) Stroma contains enzyme required for the synthesis of carbohydrates and proteins

102. *Paramoecium* differs from *Trypanosoma* as the former
(1) Causes sleeping sickness disease
(2) Has two types of nuclei
(3) Captures their prey by putting out their pseudopodia
(4) Causes a disease which has a staggering effect on human population

103. Select the **incorrect** match.
(1) Psilopsida – *Psilotum*
(2) Lycopsida – *Selaginella*
(3) Pteropsida – *Dryopteris*
(4) Sphenopsida – *Adiantum*

104. Read the following assertion (A) and reason (R) statements and choose the **correct** option.
Assertion (A): *Polytrichum* exhibit haplo-diplontic life cycle.
Reason (R): In bryophytes, the short-lived multicellular sporophyte is totally or partially dependent on the gametophyte for its anchorage and nutrition.
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are false
(3) Both (A) and (R) are true but (R) is not a correct explanation of (A)
(4) (A) is true but (R) is false

105. Ray florets of sunflower
(1) Have five stamens
(2) Is devoid of both male and female reproductive structures
(3) Have basal placentation
(4) Have superior ovary

106. Consider the following floral characteristics.
a. Gynoecium have axile placentation.
b. Corolla have valvate aestivation.
c. Gynoecium occupies the highest position while other floral parts are situated below it.
d. Carpels are fused.
Which of the given characters is/are **true** for the flowers of that plant which produces colchicine?
(1) a, b and c only (2) a, c and d only
(3) c only (4) b and d only

107. Read the following statements.
Statement A: Heartwood comprises of dead elements with highly lignified walls.
Statement B: The peripheral region of the secondary xylem is involved in the conduction of water.
In the light of above statements choose the **correct** option.
(1) Only statement A is correct
(2) Only statement B is correct
(3) Both statements A and B are correct
(4) Both statements A and B are incorrect

Space for Rough Work

108. Match the list I with list II.

	List I		List II
(A)	Commonly found in the fruit walls of nuts	(i)	Collenchyma
(B)	It provides mechanical support to the growing parts of plants	(ii)	Meristematic tissue
(C)	This plant tissue have different types of cells	(iii)	Sclereids
(D)	Has cells with active cell division	(iv)	Vascular tissue

Select the **correct** answer from the options given below.

	A	B	C	D
(1)	(iii)	(iv)	(i)	(ii)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(iv)	(iii)	(i)	(ii)
(4)	(iv)	(i)	(ii)	(iii)

109. Which of the following are components of ribosomes?
(1) DNA, RNA and proteins
(2) Proteins and tRNA
(3) Proteins and DNA
(4) rRNA and proteins

110. Select the **correct** set of cell organelles which do **not** contain deoxyribonucleic acid.
(1) Mitochondria and chloroplast
(2) Lysosome and vacuole
(3) Chloroplast and nucleus
(4) Ribosome and mitochondria

111. Match the following columns and choose the **correct** option.

	Column-I		Column-II
a.	Zoological parks	(i)	Quick source of reference in taxonomical studies
b.	Museum	(ii)	*Ex-situ* conservation strategy of plants
c.	Herbarium	(iii)	*Ex-situ* conservation strategy of animals
d.	Botanical garden	(iv)	Collection of preserved plants and animals

(1) a(iv), b(iii), c(ii), d(i) (2) a(ii), b(iv), c(i), d(iii)
(3) a(i), b(iii), c(iv), d(ii) (4) a(iii), b(iv), c(i), d(ii)

112. During replication, the two strands of DNA is not separated in its entire length because,
(1) It requires more than one origin of replication
(2) It requires very high energy
(3) DNA polymerase polymerises only in one direction
(4) There is formation of lagging strands only

113. Which of the given chromosomes are said to be heterobrachial?
a. Metacentric chromosome
b. Sub-metacentric chromosome
c. Acrocentric chromosome
d. Telocentric chromosome
(1) a and b (2) b and c
(3) a and c (4) a and d

114. During transcription, the enzyme that facilitate the opening of DNA helix is
(1) DNA gyrase (2) DNA ligase
(3) RNA polymerase (4) DNA polymerase

115. Which of the given events occur during S-phase of cell cycle?
a. DNA replication
b. Tubulin protein synthesis
c. Duplication of centrioles
d. Duplication of Golgi body
(1) a and b
(2) a and c
(3) b and d
(4) b and c

116. Select the **incorrect** statement w.r.t. root cap.
(1) It is a thimble-like structure
(2) It is unicellular
(3) It protects the tender apex of root
(4) It is made up of parenchymatous cells

Space for Rough Work

117. All enzymes w.r.t. Krebs cycle are soluble in mitochondrial matrix, **except** one enzyme that
(1) Is found in the inter-membrane space of mitochondria
(2) Catalyses a reaction in TCA cycle, during which FAD molecule is reduced to $FADH_2$
(3) Converts Succinyl CoA to Succinic acid
(4) Is found attached to outer membrane of mitochondria

118. Match the given columns w.r.t. various events in mitosis and select the **correct** option.

	Column-I		**Column-II**
a.	Prophase	(i)	Best phase to study shapes of chromosome
b.	Metaphase	(ii)	Formation of two daughter nuclei
c.	Anaphase	(iii)	Condensation of chromatin material takes place
d.	Telophase	(iv)	Best phase to study morphology of chromosomes

(1) a(iv), b(ii), c(iii), d(i) (2) a(iii), b(iv), c(ii), d(i)
(3) a(ii), b(iii), c(i), d(iv) (4) a(iii), b(iv), c(i), d(ii)

119. Read the following statements and state **true (T)** or **false (F)** for them.
A : China rose and cotton belongs to the same plant family Malvaceae.
B : *Rhizophora* shows vertically upward growing root that help to get light for photosynthesis.
Choose the **correct** option.

	A	**B**
(1)	T	T
(2)	T	F
(3)	F	T
(4)	F	F

120. In which of the given population interactions, none of the interacting species are benefitted?
(A) Competition (B) Predation
(C) Protocooperation (D) Amensalism
The **correct** ones are
(1) (A) and (D) (2) (B) and (C)
(3) (A) and (C) (4) (B) and (D)

121. Select the **incorrectly** matched pair.
(1) *Aspergillus* – Produces conidia
(2) *Rhizopus* – Exhibit dikaryophase
(3) *Mucor* – Presence of coenocytic mycelium
(4) *Penicillium* – Produces ascospores

122. Consider the following cross
PpQq × PpQq
What are the chances of occurrence of a progeny with PPQq genotype?
(1) 1/4 (2) 1/2
(3) 1/8 (4) 1/16

123. Which among the following is an autosomal dominant trait?
(1) Phenylketonuria (2) Myotonic dystrophy
(3) α Thalassemia (4) Haemophilia

124. Read the following statements of assertion (A) and reason (R) and choose the **correct** option.
Assertion (A): An individual affected with sickle cell anaemia shows change in the shape of RBC from biconcave disc to elongated sickle like structure under low oxygen tension.
Reasons (R): A mutant haemoglobin molecule in sickle cell anaemia of the affected individual undergoes polymerisation under low oxygen tension.
(1) (A) is true but (R) is false
(2) Both (A) and (R) are false
(3) Both (A) and (R) are true but (R) is not a correct explanation of (A)
(4) Both (A) and (R) are true and (R) is the correct explanation of (A)

125. In a polynucleotide chain, 3′ – 5′ phosphodiester linkage joins
(1) Nitrogenous base and pentose sugar
(2) Two nucleotides
(3) Two complementary nitrogenous bases
(4) A phosphate group to a nucleoside

Space for Rough Work

126. Mark the **correct** sequence of events takes place during the DNA fingerprinting?
(1) Digestion of DNA → DNA isolation → Autoradiography → Blotting → Electrophoresis
(2) Autoradiography → DNA cutting into fragments → Blotting → Electrophoresis
(3) Isolation of DNA → Digestion of DNA → Electrophoresis → Blotting → Hybridisation using VNTR probe → Autoradiography
(4) Blotting → DNA cutting into fragments → Isolation of DNA → Electrophoresis → Autoradiography

127. Match the column I with column II and select the **correct** option.

	Column I		Column II
a.	Ladybird beetle	(i)	Pathogens that attack arthropods
b.	Dragonflies	(ii)	Controls aphids
c.	Baculoviruses	(iii)	Controls mosquitoes
d.	*Bacillus thuringiensis*	(iv)	Controls butterfly caterpillars

(1) a(iii), b(i), c(ii), d(iv) (2) a(ii), b(iii), c(i), d(iv)
(3) a(ii), b(i), c(iv), d(iii) (4) a(iii), b(iv), c(ii), d(i)

128. David Tilman's performed long term ecosystem experiments and showed that
(1) Increased diversity contributed to higher productivity
(2) Key species drive major ecosystem functions
(3) A stable community shows much variation in productivity
(4) Within a region species richness increased with increasing explored area

129. Which among the following is **not** a sub-species of tiger?
(1) Bali
(2) Caspian
(3) Thylacine
(4) Javan

130. Read the following statements and states them as **true (T)** or **false (F)** then choose the **correct** option.
A. Of the incident solar radiation less than 2% of it is PAR.
B. Death of organism is the beginning of the detritus food chain.
C. Each trophic level has a certain mass of living material at a particular time called as standing state.

	A	B	C
(1)	T	T	T
(2)	T	F	F
(3)	F	F	T
(4)	F	T	F

131. All of the following are adaptations seen in plants to ensure self pollination, **except**
(1) Cleistogamy (2) Dioecy
(3) Bud pollination (4) Homogamy

132. Which of the given traits of pea plant will express in homozygous as well as in heterozygous condition?
(A) Round seed (B) White flower
(C) Inflated pod (D) Terminal flower
The **correct** ones are
(1) (A) and (B) (2) (B) and (C)
(3) (A) and (C) (4) (B) and (D)

133. *Lac y* gene in *lac* operon
(1) Is constitutive gene
(2) Produces a biochemical called repressor protein
(3) Codes for permease that increases permeability of cell to β-galactosides
(4) Produces β-galactosidase that degrades lactose

134. Transverse section of dicot root shows
(1) Endodermis in the form of starch sheath
(2) Large and well developed pith
(3) Thick walled parenchymatous cells of pericycle
(4) Usually more than six vascular bundles

Space for Rough Work

135. All of the following features are exhibited by flowers pollinated by abiotic agent, **except**
(1) Have light weight pollen grains
(2) Pollen grains are surrounded by mucilaginous covering
(3) Necessarily produce nectar
(4) Flowers are packed into inflorescence

SECTION-B

136. In bacterial cells, mesosomes help in all of the following, **except**
(1) Formation of cell wall
(2) Secretion process
(3) Transfer of nucleoid from one cell to another cell
(4) Increase the surface area of plasma membrane

137. Consider the following statements
a. CO_2 is the major limiting factor for photosynthesis.
b. Dark reactions being enzymatic are temperature independent.
c. For every CO_2 molecule entering into Calvin cycle, 3 molecules of ATP and 2 molecules of NADH are required.

The **incorrect** statements are
(1) All a, b and c (2) a and b only
(3) b and c only (4) a and c only

138. Read the following statements of assertion (A) and reason (R) and choose the **correct** option.

Assertion (A): Meiosis and fertilisation are responsible for maintaining chromosome number constant from generation to generation.

Reason (R): Meiosis reduces the chromosome number to half in the gametes and it get restored in the zygote by the process of fertilisation.
(1) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(2) Both (A) and (R) are true and (R) is the correct explanation of (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

139. Select the **mismatched** pair.
(1) Gibberellins – Promotes bolting in plants with rosette habit
(2) Cytokinin – Stimulates lateral shoot growth
(3) Abscisic acid – Promotes root hair formation
(4) Auxin – Responsible for apical dominance

140. The generative cell of the pollen grain
(1) Has a large irregularly shaped nucleus
(2) Forms the pollen tube
(3) Is spindle shaped with dense cytoplasm and a nucleus
(4) Has abundant food reserve

141. Which of the given is referred as complex IV in ETS?
(1) Cytochrome *c* oxidase complex
(2) Cytochrome bc_1 complex
(3) NADH dehydrogenase
(4) Ubiquinone

142. Select the **incorrect** match w.r.t. phytohormones and their composition.
(1) Indole compounds – IAA
(2) Terpenes – N^6-furfurylaminopurine
(3) Adenine derivative – Kinetin
(4) Derivatives of carotenoids – ABA

143. Which of the given mathematical equation represents species-area relationships on logarithmic scale?
(1) $S = CA^Z$
(2) $\text{Log } S = \text{Log } C + Z \text{ Log } A$
(3) $Nt = N_0 \cdot e^{rt}$
(4) $\frac{dt}{dN} = rN\left(\frac{K-N}{K}\right)$

144. Which of the following are found in *Equisetum*?
A. Motile male gametes
B. Rhizome
C. Prothallus
D. Homospory
(1) A and B only (2) A, B and C only
(3) C and D only (4) All A, B, C and D

Space for Rough Work

145. Flocs are formed during secondary treatment of sewage. They are made up of
(1) Aerobic bacteria and fungal filaments
(2) Anaerobic bacteria and algal filaments
(3) Algal and fungal filaments
(4) Cyanobacteria and methanogens

146. In a typical dihybrid cross performed by Mendel, what will be the probability of plants which are homozygous for both the traits in F_2 generation?
(1) 6.25% (2) 12.5%
(3) 25% (4) 50%

147. Keel is seen in the flowers of
(1) Lily
(2) *Trifolium*
(3) Potato
(4) Chilli

148. In a Krebs cycle
(1) A molecule of GTP is synthesized during conversion of succinyl CoA to succinic acid
(2) $NADH + H^+$ is reduced to NAD^+ at three steps
(3) Two substrate level phosphorylation reactions take place
(4) Only one decarboxylation reaction takes place

149. Which of the following is **not** a pyrimidine?
(1) Cytosine (2) Uracil
(3) Guanine (4) Thymine

150. Pyramid of energy is
(1) Inverted for tree ecosystem
(2) Spindle shaped for pond ecosystem
(3) Always upright and follows ten percent law of energy transfer
(4) Inverted for DFC

ZOOLOGY

SECTION - A

151. In a human female, all of the given structures are paired, **except**
(1) Labia minora (2) Vagina
(3) Fallopian tube (4) Labia majora

152. How many of the structures given in the box below are present in the head region of a cockroach?

Ocellus, Mandible, Filiform antennae, Tegmina, Hypopharynx

Select the **correct** option.
(1) Four
(2) Three
(3) Five
(4) Two

153. When a person is sweating profusely, it may lead to
(1) Activation of osmoreceptors that stimulate the synthesis of ADH in neurohypophysis
(2) Activation of JG cells to inhibit the release of renin which converts angiotensinogen to angiotensin II
(3) Release of aldosterone from adrenal medulla
(4) Activation of osmoreceptors that stimulate hypothalamus to release vasopressin from posterior pituitary

154. Relaxation of skeletal muscles induced by masking of actin filaments occurs, when Ca^{++} are pumped back into
(1) Sarcomere
(2) Sarcoplasmic cisternae
(3) Sarcoplasm
(4) Sarcolemma

155. The feature not exhibited by *Struthio* is
(1) Oviparity
(2) Air sacs for exchange of gases between body cells and atmosphere
(3) Fully ossified bones
(4) Presence of beak

Space for Rough Work

156. Match column I and column II w.r.t. secondary metabolites.

Column I		Column II
a. Polymeric substance	(i)	Cellulose
b. Pigment	(ii)	Curcumin
c. Drug	(iii)	Codeine
d. Lectin	(iv)	Carotenoid
	(v)	Concanavalin A

Choose the **correct** option.

(1) a(ii), b(iii), c(iv), d(i)
(2) a(i), b(iv), c(ii), d(v)
(3) a(i), b(iii), c(iv), d(v)
(4) a(i), b(ii), c(iv), d(v)

157. Choose the **incorrect** statement w.r.t. oxyhaemoglobin.

(1) Increase in hydrogen ion concentration at the tissue site favors its dissociation.
(2) Its formation is primarily related to partial pressure of O_2.
(3) Its concentration is increased during carbon monoxide poisoning.
(4) The oxyhaemoglobin dissociation curve is sigmoid in shape.

158. In response to A blood pressure, aldosterone causes B of C from DCT. Choose the option that fills the blanks **correctly**.

	A	B	C
(1)	High	Secretion	K^+
(2)	Low	Reabsorption	K^+
(3)	High	Secretion	Na^+
(4)	Low	Reabsorption	Na^+

159. The total number of metatarsals in one limb of an adult man is

(1) Equal to the number of lumbar vertebrae in an adult man
(2) More than the number of metacarpals in one limb of man
(3) Less than the number of floating ribs in an adult man
(4) Equal to the number of false ribs in an adult man

160. Select the **incorrect** statement.

(1) *Myxine* exhibits open type of blood circulation.
(2) In *Carcharodon*, notochord is persistent throughout the life.
(3) *Pterophyllum* exhibits external fertilisation.
(4) In *Hyla*, tympanum represents the ear.

161. Read the following statements A and B w.r.t bioreactors and choose the correct option.

Statement A: Bioreactors provide the optimum conditions for achieving the desired product.

Statement B: Bioreactors are well suited for large-scale production of microorganisms under aseptic conditions.

(1) Both statements A and B are correct
(2) Both statements A and B are incorrect
(3) Only statement A is correct
(4) Only statement B is correct

162. Arrange the following lung volumes/capacities in increasing order according to their numerical values in a healthy adult man.

a. Tidal volume
b. Residual volume
c. Expiratory capacity
d. Vital capacity

Choose the **correct** option.

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

Space for Rough Work

163. Given below are four statements regarding human blood circulatory system:
(a) Arteries are thick-walled and have narrow lumen as compared to veins.
(b) Angina is acute chest pain due to reduced blood circulation to the brain.
(c) Person with blood group AB can donate blood to person with any blood group.
(d) Calcium ions play a very important role in blood clotting.
Which of the above statements are correct?
(1) (a) and (d) (2) (a) and (b)
(3) (b) and (c) (4) (c) and (d)

164. If a female wants to postpone her menstruation for few days then which of the following hormones she should take?
(1) Estrogen
(2) Progesterone
(3) Synthetic oxytocin
(4) Follicle stimulating hormone

165. Choose the **incorrect** match.
(1) Chitin - Polymer of N-acetyl glucosamine
(2) Inulin - Polymer of fructose
(3) Lipids - Polymer of fatty acids
(4) Starch - Polymer of glucose

166. Select the **incorrect** option w.r.t. general features of cyclostomes.
(1) Presence of sucking and circular mouth
(2) Absence of paired fins
(3) Body devoid of scales
(4) Shows endoparasitism

167. Which peptide chain is removed from proinsulin during its conversion into mature insulin?
(1) Chain B and chain C
(2) Only chain A
(3) Only chain C
(4) Chain A and chain C

168. Which one of the following is not true for *Rana*?
(1) They are homeotherms.
(2) Their feet have webbed digits.
(3) They exhibit both cutaneous and pulmonary respiration.
(4) Their tongue is bilobed.

169. The correct order of different stages of embryonic development w.r.t. humans among the following is
(1) 2-cell stage → 4-cell stage → Morula → Blastocyst
(2) 2-cell stage → 4-cell stage → Blastocyst → Morula
(3) 4-cell stage → 8-cell stage → Gastrula → Morula
(4) 3-cell stage → 7-cell stage → Blastocyst → Morula

170. Closure of semilunar valves occur at the beginning of **'X'** whereas closure of tricuspid valve occurs at the beginning of **'Y'**. Identify '**X**' and '**Y**' and select the correct option.

	X	Y
(1)	Atrial diastole	Atrial systole
(2)	Joint diastole	Atrial systole
(3)	Ventricular systole	Atrial diastole
(4)	Joint diastole	Ventricular systole

171. Consider the following statements.
a. Allows passage of small amounts of urea into the medullary interstitium
b. Selective secretion of H^+ and K^+
The above mentioned functions are performed by
(1) PCT
(2) DCT
(3) Loop of Henle
(4) Collecting duct

Space for Rough Work

172. Juxta medullary nephrons in humans can be differentiated from cortical nephrons on the basis of all of the following, **except**
(1) Former participates in counter current mechanism
(2) Vasa recta is highly reduced or absent in latter
(3) Latter comprise the major portion of the total nephrons
(4) Latter produce more concentrated urine than former

173. Select the correct option w.r.t. HIV.
(1) T_H cells act like a HIV-factory
(2) Viral DNA is converted into viral RNA by reverse transcriptase
(3) It is an enveloped virus
(4) HIV infection spreads by merely touching the infected person

174. In a monomeric antibody, the number of intrachain and interchain disulphide bonds respectively are
(1) Four, Twelve (2) Twelve, Four
(3) Twelve, Six (4) Six, Twelve

175. The hormone which attains peak twice during a 28 days menstrual cycle in a healthy female
(1) Is progesterone
(2) Is a pituitary hormone
(3) Acts *via* second messengers
(4) Interacts with intracellular receptors

176. Consider the following features.
a. Body is covered by calcareous shell and does not show metameric segmentations.
b. Feather-like gills are present in the mantle cavity.
Choose the **correct** set of organisms which exhibit the above features.
(1) *Octopus* and *Limulus*
(2) *Pila* and *Dentalium*
(3) *Pinctada* and *Laccifer*
(4) *Nereis* and *Aplysia*

177. In the structure of an antibody, antigen binding sites are present in close proximity of
(1) N terminal of each light and heavy chain
(2) C terminal of heavy and light chain
(3) C terminal of only the heavy chain
(4) N terminal of only the light chain

178. The velocity of an enzyme catalysed chemical reaction rises at first but it becomes constant after a certain concentration of substrate because
(1) All the enzymes bind only to non-specific substrates
(2) As the reaction proceeds, enzymes are used up completely in the chemical reaction
(3) All the active sites of the enzymes are completely occupied on increasing the substrate concentration
(4) Chemical reaction always stops after a particular time period

179. How many cells given below are haploid in nature?

Gamete mother cell, Primary spermatocyte, Primary oocyte, Secondary spermatocyte, Ovum, Spermatid

Select the **correct** option.
(1) Two (2) Three
(3) Four (4) Five

180. In RNAi, there is silencing of the target mRNA due to
(1) ssRNA (2) dsRNA
(3) dsDNA (4) ssDNA

181. In gene therapy, periodic infusion of genetically engineered lymphocytes is required for the treatment of ADA deficiency, as
(1) They get damaged after genetic engineering
(2) They are mortal cells
(3) All the cDNA is used up together at once after their insertion
(4) Life span of lymphocytes gets altered after genetic engineering

Space for Rough Work

182. Select the **incorrect** match among the following with respect to organisms and their respiratory organs.

(1) *Planaria* – Body surface
(2) *Pheretima* – Moist cuticle
(3) Prawn – Lungs
(4) *Periplaneta americana* – Tracheal tubes

183. If a student wish to isolate the genetic material of HIV from an infected host cell.

Which among the following must not be used by him?

(1) Amylase (2) Protease
(3) Ribonuclease (4) Lipase

184. The role of oxygen in the regulation of respiratory rhythm is quite insignificant and changes in CO_2 and H^+ concentration in blood are recognized by receptors present in

(1) Vena cava and aorta
(2) Coronary artery and pulmonary vein
(3) Aortic arch and carotid artery
(4) Pulmonary artery and vena cava

185. In ZIFT, embryos upto which cell stage is transferred into the fallopian tube?

(1) 16 blastomeres (2) 8 blastomeres
(3) 64 blastomeres (4) 32 blastomeres

SECTION - B

186. In electrophoretic apparatus, the separated DNA fragments can be visualised only after staining the DNA with __X__ followed by exposure to __Y__ .

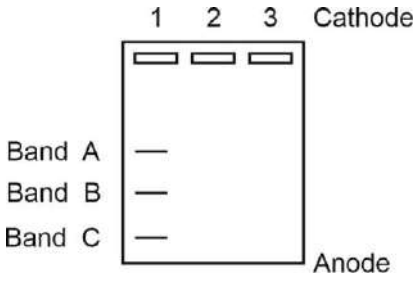
Identify 'X' and 'Y' and select the **correct** option.

	X	**Y**
(1)	Bromophenol blue	UV radiations
(2)	Ethidium bromide	UV radiations
(3)	Aniline blue	Visible light
(4)	Ethidium bromide	Visible light

187. The order of three different linear fragments of DNA on the basis of their sizes is as follows:

P > Q > R

After performing agarose gel electrophoresis, the obtained positions of these three DNA fragments are shown in lane 1.



Select the **correct** option w.r.t. the gel image.

(1) Band A – Represents 'Q' DNA fragment
(2) Band B – Represents DNA fragment having larger size than DNA fragment in band A
(3) Band C – Represents the smallest DNA fragment
(4) Band A and B – Represent DNA fragments of same size

188. Upon arrival of a stimulus, the polarised state of a resting neuronal membrane is reversed mainly by

(1) Rapid efflux of K^+ into extracellular fluid *via* voltage gated channels
(2) Activation of $Na^+ – K^+$ pump
(3) Rapid influx of Na^+ into axoplasm *via* voltage gated channels
(4) Influx of K^+ into axoplasm

Space for Rough Work

189. Match column I with column II w.r.t. joints and their location in humans.

	Column I		Column II
a.	Fibrous joint	(i)	Between adjacent vertebrae
b.	Cartilaginous joint	(ii)	Between atlas and axis
c.	Pivot joint	(iii)	Between flat skull bones
d.	Saddle joint	(iv)	Between carpal and metacarpal of thumb

Select the **correct** option.

(1) a(ii), b(iii), c(iv), d(i) (2) a(iii), b(i), c(ii), d(iv)

(3) a(i), b(ii), c(iii), d(iv) (4) a(iv), b(iii), c(ii), d(i)

190. Which of the following techniques should be used to amplify the DNA (present in very low amount) obtained from bloodstains at a crime scene?

(1) Autoradiography (2) PCR

(3) ELISA (4) Urine analysis

191. Select the **correct** match among the following.

	Disease	Nature of disease	Causative agent
(1)	Gonorrhoea	Viral	Human papilloma virus
(2)	Genital warts	Viral	*Neisseria gonorrhoeae*
(3)	Trichomoniasis	Protozoan	*Trichomonas vaginalis*
(4)	Syphilis	Protozoan	*Treponema pallidum*

192. A patch of nodal tissue present in the lower left corner of the right atrium close to the atrio-ventricular septum is known as

(1) AVN (2) SAN

(3) Bundle of His (4) Purkinje fibres

193. Which of the following ions play the most crucial role in exocytosis of synaptic vesicles at the chemical synapse?

(1) Na^+

(2) K^+

(3) Ca^{2+}

(4) Cl^-

194. Which of the following set of diseases are transmitted by insect vector?

(1) Typhoid, Plague, Tuberculosis

(2) Diphtheria, Measles, Small pox

(3) Ringworm, Amoebiasis, Filariasis

(4) Malaria, Filariasis, Dengue

195. In a population of 200 individuals, 32 individuals are suffering from a disease caused by homozygous recessive condition. If the population is in Hardy-Weinberg equilibrium, what will be the number of heterozyogous individuals?

(1) 16

(2) 48

(3) 96

(4) 72

196. **Assertion (A):** Pineal gland is located on dorsal side of the forebrain.

Reason (R): Pineal gland secretes melatonin, which plays a very important role in the regulation of diurnal rhythm of our body.

In the light of above statements, choose the correct answer from the options given below.

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

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

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

(4) Both (A) and (R) are false

Space for Rough Work

197. Match the column A with column B and choose the correct option.

	Column A		Column B
a.	Squamous epithelium	(i)	Inner lining of intestine
b.	Cuboidal epithelium	(ii)	Walls of blood vessels
c.	Columnar epithelium	(iii)	Fallopian tubes
d.	Ciliated epithelium	(iv)	Proximal convoluted tubules

(1) a(i), b(iii), c(ii), d(iv) (2) a(ii), b(iv), c(i), d(iii)
(3) a(iv), b(iii), c(ii), d(i) (4) a(ii), b(iii), c(i), d(iv)

198. In human females, the secondary oocyte is released from the ovary
(1) Before the formation of first polar body
(2) After the formation of first polar body
(3) Before the formation of primary oocyte
(4) After fertilisation of ovum and sperm

199. All of the following do not cause rapid population growth, **except**
(1) Increase in maternal mortality rate
(2) Increase in infant mortality rate
(3) Increase in number of people in reproducible age
(4) Increase in death rate

200. How many of the contraceptives given in the box below is/are copper releasing IUDs?

Lippes loop, Multiload 375, Cu7, Progestasert, LNG-20

Select the **correct** option.
(1) Two (2) Three
(3) Four (4) One

❑ ❑ ❑

Space for Rough Work

Edition: 2024-25

30/04/2024

Phase-I
CODE-B

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FINAL TEST SERIES for NEET-2024

MM : 720 **Test - I2** **Time : 3 Hrs. 20 Mins.**

Answers

1. (1)	41. (2)	81. (3)	121. (2)	161. (1)
2. (3)	42. (2)	82. (3)	122. (3)	162. (3)
3. (3)	43. (1)	83. (2)	123. (2)	163. (1)
4. (4)	44. (4)	84. (1)	124. (4)	164. (2)
5. (2)	45. (2)	85. (4)	125. (2)	165. (3)
6. (4)	46. (3)	86. (2)	126. (3)	166. (4)
7. (1)	47. (3)	87. (1)	127. (2)	167. (3)
8. (2)	48. (3)	88. (2)	128. (1)	168. (1)
9. (2)	49. (2)	89. (3)	129. (3)	169. (1)
10. (2)	50. (2)	90. (3)	130. (4)	170. (4)
11. (1)	51. (2)	91. (2)	131. (2)	171. (4)
12. (2)	52. (2)	92. (2)	132. (3)	172. (4)
13. (4)	53. (3)	93. (2)	133. (3)	173. (3)
14. (2)	54. (3)	94. (3)	134. (3)	174. (2)
15. (3)	55. (2)	95. (2)	135. (3)	175. (4)
16. (3)	56. (2)	96. (4)	136. (3)	176. (2)
17. (4)	57. (3)	97. (3)	137. (3)	177. (1)
18. (2)	58. (3)	98. (3)	138. (2)	178. (3)
19. (3)	59. (4)	99. (3)	139. (3)	179. (2)
20. (4)	60. (3)	100. (1)	140. (3)	180. (2)
21. (1)	61. (1)	101. (2)	141. (1)	181. (2)
22. (2)	62. (1)	102. (2)	142. (2)	182. (3)
23. (4)	63. (2)	103. (4)	143. (2)	183. (3)
24. (3)	64. (1)	104. (3)	144. (4)	184. (3)
25. (2)	65. (4)	105. (3)	145. (1)	185. (2)
26. (3)	66. (1)	106. (2)	146. (3)	186. (2)
27. (4)	67. (3)	107. (3)	147. (2)	187. (3)
28. (3)	68. (2)	108. (2)	148. (1)	188. (3)
29. (4)	69. (3)	109. (4)	149. (3)	189. (2)
30. (2)	70. (1)	110. (2)	150. (3)	190. (2)
31. (3)	71. (2)	111. (4)	151. (2)	191. (3)
32. (2)	72. (2)	112. (2)	152. (1)	192. (1)
33. (3)	73. (3)	113. (2)	153. (4)	193. (3)
34. (1)	74. (1)	114. (3)	154. (2)	194. (4)
35. (2)	75. (4)	115. (2)	155. (2)	195. (3)
36. (1)	76. (1)	116. (2)	156. (2)	196. (1)
37. (4)	77. (2)	117. (2)	157. (3)	197. (2)
38. (2)	78. (2)	118. (4)	158. (4)	198. (2)
39. (2)	79. (2)	119. (2)	159. (1)	199. (3)
40. (2)	80. (1)	120. (1)	160. (1)	200. (1)

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Answers and Solutions

PHYSICS

SECTION-A

1. Answer (1)

$y = 4\sin(4t + \pi/3) \Rightarrow \omega = 4$

$v = 4 \times \cos(4t + \pi/3) \times 4 = 16\cos(4t + \pi/3)$

at $t = T/4$

$$v = 16\cos\left(\frac{4.T}{4} + \frac{\pi}{3}\right) = 16\cos\left(\frac{2\pi}{4} + \frac{\pi}{3}\right)$$

$$= 16\cos\left(\frac{\pi}{2} + \frac{\pi}{3}\right)$$

$$= 16\left(\frac{-\sqrt{3}}{2}\right) = -8\sqrt{3} \text{ cm s}^{-1}$$

K.E. = $\frac{1}{2}mv^2$

$$= \frac{1}{2} \times 64 \times 3 \times 1 \times 10^{-4}$$

$= 96 \times 10^{-4}$ J = 9.6 mJ

2. Answer (3)

Fundamental frequency of closed organ pipe

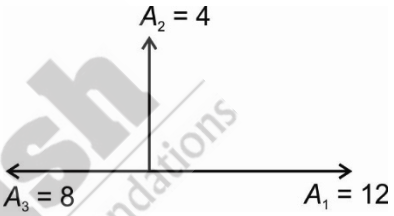
$$f_1 = \frac{v}{4l_1}$$

Fundamental frequency of open organ pipe

$$f_2 = \frac{v}{2l_2}$$

$$f_1 = f_2 \Rightarrow \frac{l_1}{l_2} = \frac{1}{2}$$

3. Answer (3)



$$\vec{A}_{net} = \vec{A}_1 + \vec{A}_2 + \vec{A}_3$$

$$A_{net} = \sqrt{4^2 + 4^2} = 4\sqrt{2} \text{ unit}$$

4. Answer (4)

We know, acceleration = $-\frac{F}{m} = -\frac{\mu mg}{m} = -\mu g$

$\therefore \quad v^2 - u^2 = 2as$

$-u^2 = -2\mu gd$

$u = \sqrt{2\mu gd}$

$\therefore$ Initial momentum $p = mu = m\sqrt{2\mu gd}$

5. Answer (2)

We know,

ammeter reading $I = \frac{\varepsilon}{R + r + R_A} = \frac{10}{2 + 8 + 10}$

$$I = \frac{10}{20} = 0.5 \text{ A}$$

6. Answer (4)

We know,

A has unit m while kx is dimensionless

$\therefore$ k has unit m^{-1}

Also, ωt is dimensionless

$\therefore$ ω has unit s^{-1}

Hence, $\frac{Ak}{\omega}$ has unit $\frac{(m)\left(m^{-1}\right)}{s^{-1}}$ = second.

7. Answer (1)

We know,

$u_x = 10 + 20\cos37° = 26$ m/s

$u_y = 20\sin37° = 12$ m/s

$\therefore$ Range $R = \frac{2u_x \times u_y}{g} = \frac{2(26)(12)}{10}$

$R = 62.4$ m

8. Answer (2)

The action-reaction forces must act on different bodies along the same line of action in the opposite direction.

9. Answer (2)

Young's modulus is the measure of elasticity.

$\frac{Y_A}{Y_B} = \frac{\tan45°}{\tan60°} = \frac{1}{\sqrt{3}}$

10. Answer (2)

Since only half the ice is melt thus the temperature of both melted ice and water will be equal to melting point of ice (0°C) as both of them are in equilibrium.

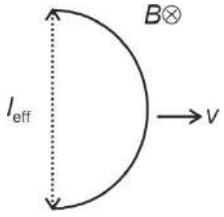
11. Answer (1)

Convex mirror forms image at its focus of a very distant object.

For a mirror, $R = 2f$

$\therefore$ $R = 2 \times 10$ cm $= 20$ cm

12. Answer (2)



$l = \pi R \Rightarrow R = \frac{l}{\pi}$ ...(i)

$\varepsilon = Bl_{eff}v = B \times 2R \times v = \frac{2Blv}{\pi}$

13. Answer (4)

We know,

$\frac{V_{out}}{V_{in}} = \frac{60}{300}$

$V_{out} = \frac{V_{in}}{5} = \frac{10^4}{5}$

For an ideal transformer

$P_{in} = P_{out} = 300 \times 10^3$

$V_{out}\, I_{out} = 300 \times 10^3$

$\frac{10^4}{5} I_{out} = 300 \times 10^3$

$I_{out} = 150$ A

14. Answer (2)

$F = \frac{kq_1q_2}{r^2}$

1st case

$18 = \left|\frac{k \times 3 \times 6}{r^2}\right|$ ...(i)

2nd case

$q_1 = 3 - 4 = -1$, $q_2 = 6 - 4 = 2$

$F' = \left|\frac{k \times (-1) \times 2}{r^2}\right|$ ...(ii)

$\frac{18}{F'} = \frac{18}{2} \Rightarrow F' = 2$ N (Attractive)

15. Answer (3)

$\phi_E = \int \vec{E}.\overrightarrow{dA}$

For constant electric field

$\phi_E = \vec{E} \cdot \vec{A}$

$\phi_E = \left(2\hat{i} + 3\hat{j} - 4\hat{k}\right)\frac{N}{C}.\left(4\ cm^2\hat{k}\right)$

$\phi_E = -4 \times 4 \times 10^{-4}\left(\frac{N\,m^2}{C}\right) = -16 \times 10^{-4}\frac{N\,m^2}{C}$

16. Answer (3)

1 μF and 3 μF are in parallel combination.

$\therefore$ $C_1 = 1 + 3 = 4$ μF

Then, the capacitors are in series combination

$\therefore$ $\frac{1}{C_{eq}} = \frac{1}{1} + \frac{1}{4} + \frac{1}{2}$

$\frac{1}{C_{eq}} = \frac{4+1+2}{4} \Rightarrow C_{eq} = \frac{4}{7}$ μF

17. Answer (4)

We know,

Energy of incident photons $E = \frac{hc}{\lambda} = \frac{12400}{3100}$eV

$E = 4$ eV

Here work function, ϕ > Energy incident E

$\therefore$ Photoelectrons will not be ejected

Hence, kinetic energy = 0

18. Answer (2)

$$B = \frac{\mu_0}{4\pi}\frac{2\pi I a^2}{\left(r^2 + a^2\right)^{3/2}}$$

$$B_{centre} = \frac{\mu_0 I}{2\pi a}$$

$\therefore$ The graph will be continuous.

19. Answer (3)

Speed in Bohr's model

$$v_n = \frac{v_0}{n}$$

$$v \propto \frac{1}{n}$$

$$v_3 = \frac{v_0}{3}$$

20. Answer (4)

Linear fringe width (β) = $\frac{\lambda D}{d}$

&

Angular fringe width = $\frac{\lambda}{d}$.

21. Answer (1)

Electromagnetic waves have energy and carry momentum.

EM waves are transverse in nature.

22. Answer (2)

In vacuum, all component of light have same velocity.

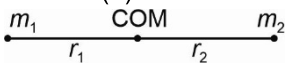
23. Answer (4)

K.E. about fixed axis = $\frac{1}{2}I\omega^2$

$$= \frac{1}{2} \times \frac{mR^2}{2}\omega^2$$

$$= \frac{mR^2\omega^2}{4}$$

24. Answer (3)



$$\Rightarrow r_1 = \frac{m_2}{m_1 + m_2}r \quad \& \; r_2 = \frac{m_1}{m_1 + m_2}r$$

$$\Rightarrow \frac{r_1}{r_2} = \frac{m_2}{m_1}$$

25. Answer (2)

W.D. (w) = $FS\cos\theta$

$25\sqrt{3}$ J = 10 × 5 × $\cos\theta$

$$\cos\theta = \frac{\sqrt{3}}{2}$$

θ = 30°

26. Answer (3)

Insulators have maximum energy band gap among the given options.

27. Answer (4)

R_{eq} = 20 Ω

$$i = \frac{4}{20} = \frac{1}{5}\text{A}$$

28. Answer (3)

At constant volume, $C_V = \frac{5R}{2}$

$\therefore f = 5$

So, $\gamma = 1 + \frac{2}{f} = 1 + \frac{2}{5} = \frac{7}{5}$

29. Answer (4)

At constant pressure,

$W.D. = P\Delta V$

&

$PV = nRT$

$$P = \frac{nRT}{v}$$

v_f = 2 V

$$W = \frac{nRT}{v} \times V$$

$= nRT$

= 1 × 2 × 300

W = 600 cal

30. Answer (2)

Magnetic induction at centre due to arc is given by

$$B_0 = \frac{\mu_0}{4\pi}\frac{i}{r}\theta$$

$$= \frac{\mu_0}{4\pi}\frac{i}{r}\left(\frac{3\pi}{2}\right)$$

$$= \frac{3}{8}\frac{\mu_0 i}{r}$$

31. Answer (3)

$\chi = \mu_r - 1$

χ = 5460 – 1

= 5459

32. Answer (2)

Angular momentum of electron in n^{th} orbit is given by

$$L = \frac{nh}{2\pi}$$

$$L = 4 \times \frac{h}{2\pi}$$

$$= \frac{2h}{\pi}$$

33. Answer (3)

Nuclear density is same for all nucleus and radius $R = R_0A^{1/3}$.

34. Answer (1)

1 M.S.D. = 1 mm

20 V.S.D. = 18 M.S.D.

$\Rightarrow$ 1 V.S.D = $\frac{18}{20}$ M.S.D.

L.C. = 1 M.S.D. – 1 V.S.D.

= 1 M.S.D. – $\frac{18}{20}$ M.S.D.

= $\frac{2}{20}$ M.S.D

= 0.1 × 1 mm

= 0.1 mm

35. Answer (2)

Capacitance of an isolated conducting sphere of radius R is given by $C = 4\pi\varepsilon_0 R$.

SECTION - B

36. Answer (1)

$\vec{v} = \vec{\omega} \times \vec{r}$

37. Answer (4)

We know,

Common potential $V_c = \frac{q_1 + q_2}{c_1 + c_2}$

$V_c = \frac{(240 + 240)\mu C}{(4 + 4)\mu F}$

$\therefore \quad V_c = 60$ V

Thus, no charge sharing will take place and hence there will be no loss of energy.

38. Answer (2)

$v_e = \sqrt{2gR}$

At centre $K_e = \frac{1}{2}mv^2 = -\frac{GMm}{R} + \frac{3}{2}\frac{GMm}{R}$

$K = \frac{2gmR}{4} = \frac{1}{4}mv_e^2$

39. Answer (2)

We know,

$X_L = \omega L = (100\ \pi)\frac{200}{\pi} \times 10^{-3} = 20\ \Omega$

$X_C = \frac{1}{\omega C} = \frac{10^6}{100\ \pi\ 50\ \pi} = 20\ \Omega$

$\therefore X_L = X_C$

Hence, $Z = R = 50\ \Omega$

$\cos\phi = \frac{Z}{R} = \frac{50}{50} = 1$

Also, $I_0 = \frac{E_0}{Z} = \frac{200}{50} = 4$ A

40. Answer (2)

$I = I_{max}\cos^2\left(\frac{\phi}{2}\right)$

$\Rightarrow \quad \frac{1}{2}I_{max} = I_{max}\cos^2\left(\frac{\phi}{2}\right)$

$\cos\left(\frac{\phi}{2}\right) = \frac{1}{\sqrt{2}} \Rightarrow \frac{\phi}{2} = (2n+1)\frac{\pi}{4}$

$\phi = (2n+1)\frac{\pi}{2}$

$\frac{2\pi}{\lambda}\Delta x = (2n+1)\frac{\pi}{2} \Rightarrow \Delta x = (2n+1)\frac{\lambda}{4}$

41. Answer (2)

Resistance $R = \frac{\rho l}{A}$

If material of wires are same then $\rho_1 = \rho_2$

$\therefore\ \rho_1 : \rho_2 = 1 : 1$

42. Answer (2)

Here stopping potential = 6 V

using $eV_0 = h\nu - \phi$

$6\text{ eV} = \frac{12400}{1550}\text{ eV} - \phi$

$\phi = 8\text{ eV} - 6\text{ eV} = 2\text{ eV}$

43. Answer (1)

Shift $S = t\left(1 - \frac{1}{\mu}\right)$

$= 6\left(1 - \frac{2}{3}\right)$

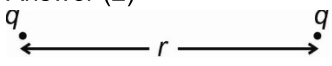
= 2 cm

and shift is in the direction of incident rays.

44. Answer (4)

Object is placed between f and $2f$.

45. Answer (2)



$U = \frac{Kq^2}{r}$

$= \frac{9 \times 10^9 \times \left(10^{-6}\right)^2}{1}$

$= 9 \times 10^9 \times 10^{-12}$

$= 9 \times 10^{-3}$ J

$U = 9$ mJ

46. Answer (3)

By KVL,

$$20-\frac{q}{2}-10-\frac{q}{4}=0$$

$$10=\frac{3}{4}q$$

$$q=\frac{40}{3}\mu F$$

$$V_{2\mu F}=\frac{40}{3\times 2}=\frac{20}{3}\ V$$

47. Answer (3)

In closed organ pipe,

3rd overtone = $7f_0 = 1400$

$f_0 = 200$ Hz

$$f_0=\frac{V}{4\ell}$$

For open organ pipe of same length

$$F_0=\frac{V}{2\ell}=2\times\frac{V}{4\ell}=2\times 200=400\ Hz$$

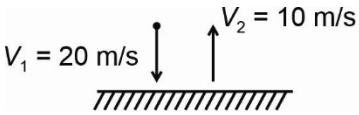
48. Answer (3)

Energy of photon $E=\frac{hc}{\lambda}$

&

Wavelength of photon $\lambda=\frac{h}{P}$

49. Answer (2)



$$|F|=\frac{|\Delta P|}{\Delta t}=\frac{1(20+10)}{0.02}=\frac{30}{0.02}$$

= 1500 N

50. Answer (2)

Energy density $\left(\frac{dU}{dV}\right)=\frac{B^2}{2\mu_0}$

So, its dimension is $ML^{-1}T^{-2}$.

CHEMISTRY

SECTION - A

51. Answer (2)

Fehling's test is given by only aliphatic aldehydes.

CH_3CHO gives +ve Fehling's test.

52. Answer (2)

The basic strength of alkyl amines in aqueous solution is decided on the basis of inductive effect, solvation effect and steric hindrance of the alkyl group so, the correct order of basicity is:

$(CH_3)_2NH > (CH_3)NH_2 > (CH_3)_3N > NH_3$

53. Answer (3)

Phenolphthalein is pink coloured in basic medium.

54. Answer (3)

Angular nodes = l

Radial nodes = n – l – 1

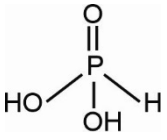
3*p*, angular nodes = 1

Radial nodes = 3 – 1 – 1

= 1

55. Answer (2)

Orthophosphorous acid has

(H_3PO_3) 

Two P–OH bonds

One P–H bond

One P=O bond

56. Answer (2)

$$H^+ + e^- \rightarrow \frac{1}{2}H_2(g)$$

$$E^\circ_{cell}=E^\circ-\frac{0.0591}{n}\log\frac{P_{H_2}}{(H^+)^2}$$

$$=0-\frac{0.0591}{2}\log\frac{1}{(10^{-5})^2}$$

$E_{cell} = -0.3$ V

57 Answer (3)

$$Pb^{2+}+S^{2-}\longrightarrow \underset{\text{(black ppt)}}{PbS}$$

58. Answer (3)

- Sc^{3+}, Ti^{4+} contain $3d^0$ configuration
- Cu^+ contains $3d^{10}$ configuration
- Cr^{3+} contains $3d^3$ configuration

d – *d* transition is possible only for d^1 to d^9 (d^5 low spin complex)

59. Answer (4)

$$\lambda=\frac{2\pi r}{n}$$

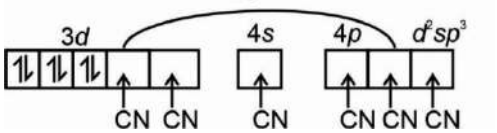
$$r_4=52.9\times\frac{16}{1}\ pm$$

$$\lambda=\frac{2\pi\times 52.9\times 16}{4}$$

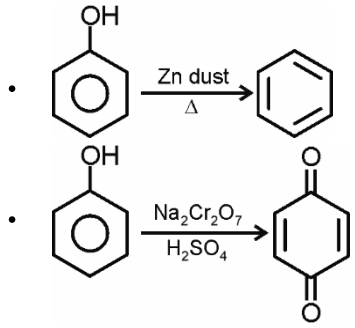
$\lambda = 423.2\ \pi$ pm

60. Answer (3)

$[Co(CN)_6]^{3-}$ – d^2sp^3 hybridised and octahedral



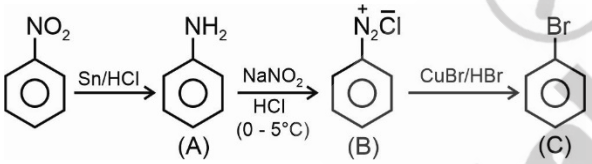
61. Answer (1)



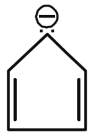
62. Answer (1)

(Vitamin)	(Deficiency disease)
Vitamin A	Xerophthalmia
Vitamin B_6	Convulsions
Vitamin B_{12}	Pernicious anaemia
Vitamin E	Increased fragility of RBC's

63. Answer (2)



64. Answer (1)



is an aromatic species

65. Answer (4)

- When iodine and sodium hydroxide are added to a compound that contains either a methyl ketone or a secondary alcohol with methyl group at alpha position give positive iodoform test example: Acetaldehyde, Methyl ketones, Ethanol etc.

66. Answer (1)

At lower pH the concentration of anion decreases as it gets protonated. This is turn increases solubility of the salt, so that $K_{sp} = Q_{sp}$.

67. Answer (3)

$$\text{Bond order} = \frac{1}{2}(N_b - N_a)$$

Where N_b = Number of electrons in bonding orbitals and N_a = Number of electrons in antibonding orbitals.

NO^+ and CO both have 14 electrons each hence will have the same bond order i.e. 3.

68. Answer (2)

H_3BO_3 is Lewis acid because of incomplete octet (Vacant Orbital)

69. Answer (3)

$$(NH_4)_2SO_4 \xrightarrow{\Delta} NH_3(g)\uparrow + H_2SO_4$$

70. Answer (1)

$$P_A = P°_A X_A \Rightarrow P_A = \frac{1}{4} \times 100 = 25 \text{ mmHg}$$

$$P_B = \frac{3}{4} \times 400 = 300 \text{ mmHg}$$

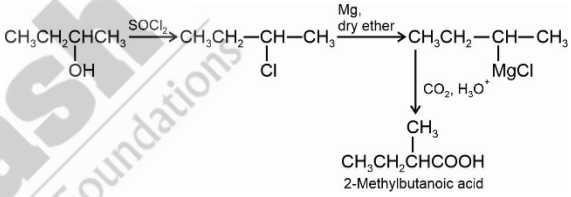
Mole fraction of A in vapour phase (y_A)

$$= \frac{25}{25+300} = \frac{25}{325} = \frac{1}{13}$$

71. Answer (2)

Sucrose on hydrolysis gives D-(+)-Glucose and D-(–)-Fructose

72. Answer (2)



73. Answer (3)

2 molal contains 0.8 mole of solute

$$2 = \frac{0.8}{\text{Mass of solvent (kg)}}$$

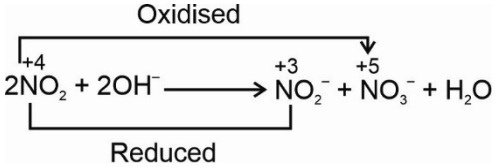
Mass of solvent = 0.4 × 1000 = 400 g

74. Answer (1)

In pyrosilicate two units share one oxygen atom.

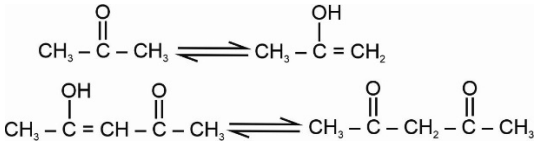
75. Answer (4)

When same element oxidises and reduces during a chemical reaction, then the reaction is called as disproportionation reaction.



76. Answer (1)

Only (c) and (d) show keto-enol tautomerism



77. Answer (2)

$A(s) \rightleftharpoons 2B(g) + C(g)$

$2p' \quad p'$

$P_T = 2p' + p' = P$

$p' = \frac{P}{3}$

$K_P = \left[P_B^2 \times P_C\right] = \left[2\frac{P}{3}\right]^2\left[\frac{P}{3}\right] = \frac{4}{27}P^3$

78. Answer (2)

$\%\ \text{of S} = \frac{32 \times 0.960 \times 100}{233 \times 0.482} = 27.35\% \simeq 27\%$

79. Answer (2)

$K_p = K_c(RT)^{\Delta n_g}$

for $K_p = K_c$; $\Delta n_g = 0$

$H_2(g) + I_2(g) \rightleftharpoons 2HI\ (g)$

$\Delta n_g = n_P - n_R = 2 - 2 = 0$

So, $K_p = K_c$

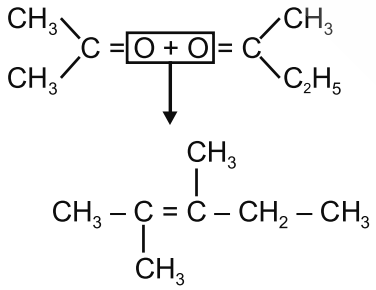
80. Answer (1)

$H_2SO_4 + NaOH \rightarrow NaHSO_4 + H_2O$

$\text{Equivalent weight} = \frac{M}{n_f}$

$= \frac{M}{1}$

81. Answer (3)



82. Answer (3)

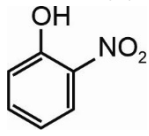
For ideal solutions

$\Delta_{mix} H = 0$ and $\Delta_{mix} V = 0$

Mixture of n-hexane and

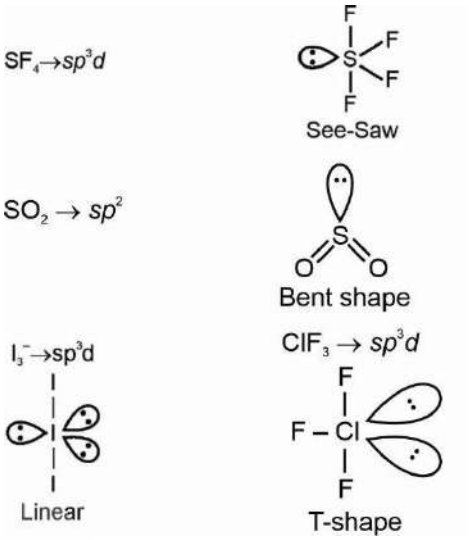
n-heptane is an ideal solution

83 Answer (2)

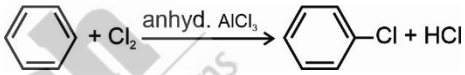


- Nitro group has electron withdrawing tendency. It can withdraw electrons both by –I effect and –R effect. Thus the acidic strengths of monosubstituted nitrophenol is higher than phenol.
- Nitro group present at o-position will have strong –R effect while nitro group present at m-position will induce only –I effect

84. Answer (1)



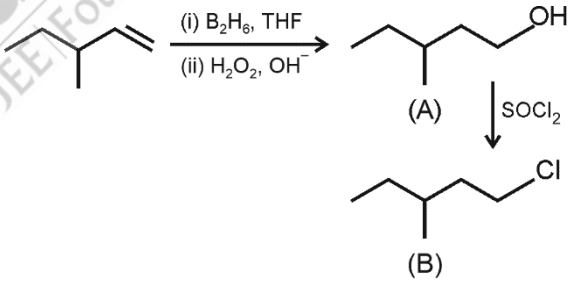
85. Answer (4)



Is an electrophilic substitution reaction

SECTION - B

86. Answer (2)



87. Answer (1)

Number of electron exchange in the reaction

$Cu(s) + 2Ag^+(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$ is 2

$E^\circ_{cell} = \frac{0.0591}{2}\log K_c = 0.46$

$\log K_c = \frac{0.46 \times 2}{0.0591} = 15.6$

$K_c = 3.92 \times 10^{15}$

88. Answer (2)

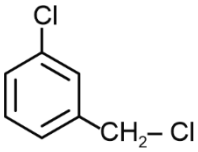
0.2 mol $C_{12}H_{22}O_{11}$

$\Rightarrow 0.2 \times 45 = 9\ \text{mol} = 9 \times N_A$ atoms

89. Answer (3)

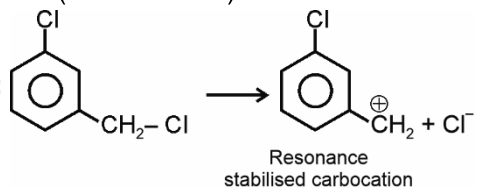
Na	:	[11]	:	$1s^2$	$2s^2$	$2p^6$	$3s^1$
Azimuthal quantum no. (l)				0	0	1	0

90. Answer (3)



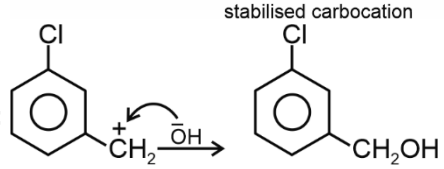
This substrate participates in nucleophilic substitution reaction by S_N1 mechanism because of a solvent (Protic solvent)

Step 1:



Resonance stabilised carbocation

Step 2:



91. Answer (2)

$$2NaNO_3 + 4H_2SO_4 + 3Cu \longrightarrow \underset{\text{(Blue)}}{3CuSO_4} + 4H_2O + 2NO$$

$$+ Na_2SO_4$$

$$2NO + O_2 \longrightarrow \underset{\text{(Brown fumes)}}{2NO_2}$$

92. Answer (2)

$[Co(NH_3)_5NO_2]Br_2$ and $[Co(NH_3)_5ONO]Br_2$ = Linkage Isomerism

$[Cr(NH_3)_6]$ $[Co(CN)_6]$ and $[Co(NH_3)_6]$ $[Cr(CN)_6]$ = Coordination Isomerism

$[Co(H_2O)_5(SO_4)]$ Br and $[Co(NH_3)_5Br]SO_4$ = Ionisation Isomerism

$[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2.H_2O$ = Solvate Isomerism

93. Answer (2)

In isothermal condition, $\Delta U = 0$

For irreversible expansion, $\Delta S_{total} \neq 0$

For free expansion of ideal gas in isothermal condition

$q = \Delta T = w = 0$

94. Answer (3)

$$\Delta S = \frac{\Delta H_f}{T_f}$$

$\Delta H_f = \Delta S \times T_f = 5.260 \times 273 = 1.436$ kcal/mol

95. Answer (2)

$$\frac{r'}{r} = (2)^{\left(\frac{80-10}{10}\right)}$$

$$\frac{r'}{r} = (2)^{\left(\frac{70}{10}\right)}$$

$$\frac{r'}{r} = (2)^7 = 128 \text{ times}$$

96. Answer (4)

Rate = $Z_{AB}\ e^{-E_a/RT}$

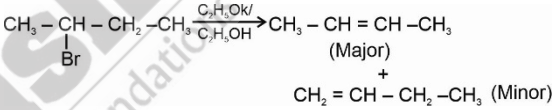
Z_{AB} = collision frequency of reactants A & B.

$e^{-E_a/RT}$ = fraction of molecules with energies equal to or greater than E_a

97. Answer (3)

S_N1 reaction yields 1 : 1 mixture of both enantiomers.

98. Answer (3)



Major product is Zaitsev product and reaction undergoes via β-elimination and dehydrohalogenation

99. Answer (3)

For isoelectronic species cations with greater positive change have smaller radii.

Anions with greater negative change have larger radii.

100. Answer (1)

$$2Cu^+ \longrightarrow Cu^{2+} + Cu$$

Stability of $Cu^{2+}(aq)$ rather than $Cu^+(aq)$ is due to such more negative $\Delta_{Hyd}H^{\ominus}$ of $Cu^{2+}(aq)$ than Cu^+, which compensates for the second ionisation enthalpy of Cu.

BOTANY

SECTION - A

101. Answer (2)

In chloroplast, chlorophyll pigments are located within the thylakoid membrane.

102. Answer (2)

Ciliated protozoans are actively moving aquatic organisms because of presence of thousands of cilia.

It is exemplified by *Paramoecium* and it has two types of nuclei.

103. Answer (4)

Equisetum belongs to class Sphenopsida.

Adiantum belongs to class Pteropsida.

104. Answer (3)

Bryophyte shows haplo-diplontic life cycle, where both the sporophyte and gametophyte are multicellular.

Its haploid gametophyte alternates with the short lived multicellular sporophyte totally or partially dependent on the gametophyte for its anchorage and nutrition.

105. Answer (3)

In ray florets of sunflower, androecium is absent. They have inferior ovary and have basal placentation.

106. Answer (2)

Colchicine is obtained from *Colchicum autumnale* and it belongs to Liliaceae family.

Flowers of *Colchicum* plant have perianth in valvate aestivation and ovary is superior.

107. Answer (3)

The peripheral region of the secondary xylem, is lighter in colour and is known as the sapwood. It is involved in the conduction of water and minerals from root to leaf.

The innermost region of the stem comprises of deed element with highly lignified walls and is called heartwood.

108. Answer (2)

Sclereids are commonly found in the fruit walls of nuts.

Collenchyma provides mechanical support to the growing parts of plants.

Vascular tissues are complex tissue and it is made up of a different types of cells.

Meristematic tissue has actively dividing cells.

109. Answer (4)

Ribosomes are composed of ribonucleic acid (RNA) and proteins and are not bounded by any membrane.

110. Answer (2)

Both chloroplast and mitochondria contain their own DNA.

111. Answer (4)

Zoological park $\rightarrow$ *Ex-situ* conservation strategy for animals.

Museum $\rightarrow$ Collection of preserved plants and animals.

Herbarium $\rightarrow$ Quick source of reference in taxonomic studies.

Botanical garden $\rightarrow$ *Ex-situ* conservation strategy for plants.

112. Answer (2)

For long DNA molecules, since the two strands of DNA cannot be separated in its entire length due to very high energy requirement the replication occur within a small opening of DNA helix.

113. Answer (2)

When two arms of chromosomes are not identical in length, these are said to be heterobrachial chromosomes. Sub-metacentric and acrocentric chromosomes are heterobrachial.

114. Answer (3)

RNA polymerase facilitates the opening of DNA helix during transcription.

115. Answer (2)

During S-phase, DNA replication begins in nucleus and centrioles duplicate in the cytoplasm.

116. Answer (2)

Root cap is multicellular and is made up of parenchymatous cells.

117. Answer (2)

All enzymes involved in TCA cycle are soluble in mitochondrial matrix, except succinate dehydrogenase (SDH) which is found attached to inner mitochondrial membrane.

Succinate dehydrogenase catalyses the formation of fumaric acid from succinic acid. During this reaction, FAD^+ molecules is reduced to $FADH_2$.

118. Answer (4)

In telophase, nuclear envelope develops around the chromatin clusters at each pole forming two daughter nuclei.

Condensation of chromatin material occurs in prophase.

During metaphase, chromosomes are thickest and shortest and hence it is easy to study their morphology. Anaphase is best stage to study shape of chromosome.

119. Answer (2)

Rhizophora shows vertically upward growing roots that help to get oxygen for respiration.

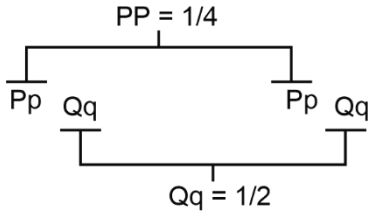
120. Answer (1)

In competition and amensalism, none of the interacting species are benefitted.

121. Answer (2)

Dikaryophase is found in members of Basidiomycetes and Ascomycetes. *Rhizopus* is the member of Zygomycetes.

122. Answer (3)



The genotype of progeny is PPQq, so the chances of its occurrence is $\frac{1}{4}\times\frac{1}{2}$ = 1/8.

123. Answer (2)

Myotonic dystrophy is an autosomal dominant disorder.

124. Answer (4)

In sickle cell anaemia the mutant haemoglobin molecules of affected individual undergoes polymerisation under low oxygen tension causing change in the shape of RBC from biconcave disc to elongated sickle cell structure.

125. Answer (2)

Two nucleotides are linked through 3′ – 5′ phosphodiester linkage to form a dinucleotide.

126. Answer (3)

The steps in the DNA fingerprinting are as follows

Isolation of DNA

↓

Digestion of DNA by restriction endonucleases

↓

Separation of DNA fragment by electrophoresis

↓

Blotting

↓

Hybridisation using labelled VNTR probe

↓

Detection of hybridised DNA fragments by autoradiography

127. Answer (2)

Dragonflies and ladybird beetle are used to control mosquitoes and aphids respectively. Baculoviruses are pathogens that attack insects and other arthropods. *Bacillus thuringiensis* is effective against butterfly caterpillar.

128. Answer (1)

David Tilman's long term ecosystem experiments using outdoor plot showed that in his experiments, increased diversity contributed to higher productivity.

129. Answer (3)

Thylacine is not a subspecies of tiger.

130. Answer (4)

Of the incident solar radiation less than 50% of it is photosynthetically active radiation (PAR). Plants capture only 2-10% of the PAR. Each trophic level has a certain mass of living material at a particular time is called standing crop.

131. Answer (2)

Dioecy promotes xenogamy in plants.

132. Answer (3)

Round seed and inflated pod of pea plant are dominant traits. Therefore, they express in both homozygous as well as in heterozygous conditions.

133. Answer (3)

Lac y gene in *lac* operon codes for permease that increases permeability of the cell to β-galactosides.

134. Answer (3)

Pericycle consists of thick walled parenchymatous cells in dicot root.

135. Answer (3)

Pollen grains are surrounded by mucilagenous covering in flowers that are pollinated by water.

Flowers pollinated by abiotic agent do not produce nectar and are not very colourful.

SECTION - B

136. Answer (3)

Mesosome in bacteria is involved in DNA replication and distribution to daughter cell.

137. Answer (3)

Dark reaction being enzymatic are temperature controlled. For every CO_2 molecule entering into Calvin cycle, 3 molecules of ATP and two molecules of NADPH are required.

138. Answer (2)

Meiosis reduces the chromosomes number to half in the gametes, so that fertilisation restores the original diploid number in the zygote.

139. Answer (3)

Ethylene promotes root growth and root hair formation.

140. Answer (3)

Generative cell floats in the cytoplasm of vegetative cell. It divides by mitosis to form two male gametes.

It is spindle shaped with dense cytoplasm and a nucleus.

141. Answer (1)

In ETS, cytochrome *c* oxidase complex containing cytochrome *a* and a_3 and two copper centres is referred as complex IV.

142. Answer (2)

Gibberellins are composed of terpenes.

143. Answer (2)

log S = log C + Z log A represents species – area relationship on log scale.

144. Answer (4)

Equisetum is a pteridophyte. It is homosporous and produces motile male gametes. Its thalloid gametophyte is prothallus.

145. Answer (1)

Flocs are masses of aerobic bacteria associated with fungal filaments.

146. Answer (3)

Genotypes of plants which are homozygous for both the traits in F_2 generation w.r.t Mendelian dihybrid cross are as follows

RRYY, rryy, RRyy, rrYY

Among 16 individuals, 4 are homozygous for both the traits in F_2 generation.

Therefore, probability = $\frac{4}{16} \times 100 \Rightarrow 25\%$

147. Answer (2)

Trifolium is a member of family Fabaceae.

Keel is characteristic feature of the flowers of Fabaceae family.

148. Answer (1)

In Krebs cycle NAD^+ is reduced to NADH + H^+. Only one substrate level phosphorylation takes place and two decarboxylation reactions occur.

149. Answer (3)

Guanine is a purine.

150. Answer (3)

Pyramid of energy is always upright in any ecosystem.

ZOOLOGY

SECTION - A

151. Answer (2)

Vagina is an unpaired structure. Labia minora are paired folds of tissue under the labia majora.

Fallopian tube is also a paired structure.

152. Answer (1)

Ocellus, filiform antennae, mandibles as well as hypopharynx are present in the head region of cockroach. Tegmina arises from mesothorax.

153. Answer (4)

An excessive loss of fluid from the body can activate osmoreceptors which stimulate the hypothalamus to release ADH from neurohypophysis.

154. Answer (2)

The process of formation and breaking of cross bridge continues till the Ca^{++} are pumped back to the sarcoplasmic cisternae resulting in the masking of actin filaments. This causes relaxation of skeletal muscles.

155. Answer (2)

Air sacs connected to lungs supplement respiration but do not participate in exchange of gases between atmosphere and body cells.

156. Answer (2)

Polymeric substance $\Rightarrow$ Cellulose

Alkaloid $\Rightarrow$ Codeine

Drug $\Rightarrow$ Curcumin

Lectin $\Rightarrow$ Concanavalin A

Pigment $\Rightarrow$ Carotenoid

157. Answer (3)

Carbon monoxide binds with haemoglobin molecule at the same site as oxygen does. Thus, in CO poisoning, oxyhaemoglobin concentration is reduced.

158. Answer (4)

Aldosterone is secreted by adrenal cortex in response to low blood pressure and blood volume. Aldosterone causes reabsorption of Na^+ and water from the distal parts of the renal tubule.

159. Answer (1)

Number of metacarpals in one hindlimb of an adult man = 5

Number of lumbar vertebrae in an adult man = 5

Number of false ribs in an adult man = 6

Number of floating ribs = 4

160. Answer (1)

Myxine (Hag fish) belongs to the class Cyclostomata and possesses closed type of blood circulation.

161. Answer (1)

Bioreactors are used for large scale production and provide optimum conditions for multiplication of microorganisms.

162. Answer (3)

TV = 500 mL, Residual volume = 1100 – 1200 mL

Expiratory reserve volume = 1000 – 1100 mL

Vital capacity = 4600 mL

So, correct increasing order of lung volumes / capacities is a < b < c < d

163. Answer (1)

Angina is acute chest pain due to reduced blood circulation to cardiac muscles. People with AB^+ blood group are universal recipients.

164. Answer (2)

High levels of progesterone help to maintain endometrium and prevent menstrual bleeding.

Synthetic oxytocin given to a pregnant woman, induces labor.

165. Answer (3)

Lipids are not polymeric compounds.

166. Answer (4)

All living members of the class Cyclostomata are ectoparasites on some fishes. Their body is devoid of scales and paired fins.

167. Answer (3)

The C peptide is not present in mature insulin and is removed during conversion of proinsulin into insulin.

168. Answer (1)

Frogs are poikilotherms, which means they are not able to regulate their internal body temperature.

169. Answer (1)

The mitotic division starts as the zygote moves through the isthmus of oviduct towards uterus and forms 2, 4, 8, 16 daughter cells called blastomeres. The embryo with 8 to 16 blastomeres is called a morula which continues to divide and transforms into the blastocyst.

170. Answer (4)

Closure of semilunar valves occurs at the beginning of ventricular diastole whereas closure of tricuspid valve occurs at the beginning of ventricular systole.

171. Answer (4)

Collecting duct extends from the cortex of the kidney to the inner parts of the medulla. This segment allows passage of small amounts of urea into the medullary interstitium to keep up the osmolarity. It also plays a role in the maintenance of pH and ionic balance of body by the selective secretion of H^+ and K^+.

172. Answer (4)

Longer loop of Henle contributes in production of more concentrated/hypertonic urine and is a characteristic of juxtamedullary nephrons.

Cortical nephrons have shorter loop of Henle.

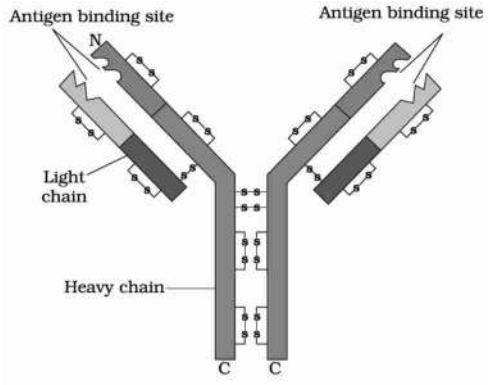
Vasa recta is highly reduced or absent in cortical nephrons.

173. Answer (3)

Macrophages act as HIV-factory. Viral RNA is converted into viral DNA by enzyme reverse transcriptase.

HIV infection does not spread by mere touch or physical contact.

174. Answer (2)



Total intrachain bonds = 12

Total interchain bonds = 4

175. Answer (4)

The ovarian hormone which shows two peaks during a menstrual cycle is estrogen which is steroidal in nature and interacts with its intracellular receptors.

176. Answer (2)

The above given features are exhibited by molluscs. *E.g.*, *Pila* (Apple snail), *Dentalium* (Tusk shell).

177. Answer (1)

Antigen binding sites are present at N terminal of each light and heavy chain of an antibody.

178. Answer (3)

V_{max} is achieved after certain concentration of substrate because all the active sites of enzymes are fully occupied on increasing substrate concentration.

179. Answer (2)

Secondary spermatocyte, ovum and spermatid have 23 chromosomes and are haploid in nature.

180. Answer (2)

The introduction of DNA is such that it produces both sense and anti-sense RNA in the host cells. These two RNAs being complementary to each other forms a double stranded RNA (dsRNA) that initiates RNAi and thus, silence the specific mRNA of the nematode.

181. Answer (2)

A functional ADA cDNA (using a retroviral vector) is introduced into lymphocytes from the blood of the patient, which are subsequently returned to the patient. However, as these cells are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes.

182. Answer (3)

Prawn is an aquatic arthropod.

Planaria is a flatworm and exchange O_2 with CO_2 by simple diffusion over their entire body surface.

Earthworms use their moist cuticle and insects have a network of tubes (tracheal tubes) to transport atmospheric air within the body.

183. Answer (3)
The genetic material of HIV is two ssRNA molecules. During its isolation, treatment with ribonuclease must not be done as ribonuclease will digest RNA.

184. Answer (3)
Receptors associated with aortic arch and carotid artery can recognise changes in CO_2 and H^+ concentration and send necessary signals to the rhythm centre for remedial actions.

185. Answer (2)
The zygote or early embryos (with upto 8 blastomeres) could be transferred into the fallopian tube known as ZIFT – Zygote Intra Fallopian Transfer.

SECTION - B

186. Answer (2)
The separated DNA fragments can be visualised only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiations.
Bromophenol blue is the tracking dye used in agarose gel electrophoresis. It is used to monitor the progress of migration of DNA towards anode.

187. Answer (3)
The smaller the DNA fragment, the farthest it moves from cathode. The largest DNA fragment is in band A.

188. Answer (3)
The polarity of the neuronal membrane gets reversed during depolarisation.
Depolarisation of a resting neuronal membrane occurs due to the rapid influx of Na^+ into axoplasm.

189. Answer (2)
Fibrous joints do not allow any movement. This type of joint is shown by the flat skull bones. In cartilaginous joints, the bones involved are joined together with the help of cartilages. The joint between the adjacent vertebrae in the vertebral column is of this type.

190. Answer (2)
PCR can detect very low amount of DNA and amplify it. It involves three steps: Denaturation $\rightarrow$ Annealing $\rightarrow$ Extension.
ELISA is based on the principle of antigen-antibody interaction. When DNA is present in significant amount, hybridisation using probe complementary to DNA of interest can be used to detect the DNA.

191. Answer (3)
Gonorrhoea and syphilis are bacterial diseases.
Trichomoniasis is a protozoan disease.

192. Answer (1)
AVN is the mass of nodal tissue, seen in the lower left corner of the right atrium close to the atrio-ventricular septum.

193. Answer (3)
The elevated concentration of calcium ions causes exocytosis of synaptic vesicles.

194. Answer (4)
Malaria, filariasis and dengue are transmitted by mosquitoes.

195. Answer (3)
Frequency of recessive individuals

$$q^2 = \frac{32}{200}$$

$q^2 = 0.16$

So, $q = 0.4$

As per Hardy-Weinberg principle,

$p + q = 1$

$\therefore \quad p = 1 - q = 1 - 0.4 = 0.6$

and frequency of heterozygous individuals = $2pq$

$= 2 \times 0.6 \times 0.4 = 0.48 = 48\%$

So,

Total number of heterozygous individuals

$$= \frac{48 \times 200}{100} = 96$$

196. Answer (1)
Pineal gland regulates 24 hour rhythm of the body, menstrual cycle in females, sleep-wake cycle, metabolism and sexual behaviour in animals.

197. Answer (2)
Simple squamous epithelium is present on the inner lining of blood vessels and alveoli. Cuboidal epithelium is present in the inner lining of renal tubules.

198. Answer (2)
Entry of sperm into the cytoplasm of the ovum induces the completion of the meiotic division of the secondary oocyte. The second meiotic division is unequal and results in the formation of a second polar body and a haploid ovum.

199. Answer (3)
A rapid decline in death rate, maternal mortality rate, infant mortality rate as well as increase in number of people in reproducible age are probable reasons for rapid population growth.

200. Answer (1)
Copper releasing IUDs are CuT, Cu7 and multiload 375.
Lippes loop is a non-medicated IUD. Progestasert and LNG-20 are hormone releasing IUDs.

❑ ❑ ❑

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