29/03/2024

Phase-I
CODE-B

Aakash
Medical | IIT-JEE | Foundations

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FINAL TEST SERIES for NEET-2024

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

Topics covered :

Physics : Gravitation, Mechanical Properties of Solids, Mechanical Properties of Fluids, Thermal Properties of Matter
Chemistry : Equilibrium, Redox Reactions, The *p*-Block Elements (Group-13 & 14)
Botany : Cell: The Unit of Life, Cell Cycle and Cell Division
Zoology : Breathing and Exchange of Gases, Body Fluids and Circulation

Instructions :

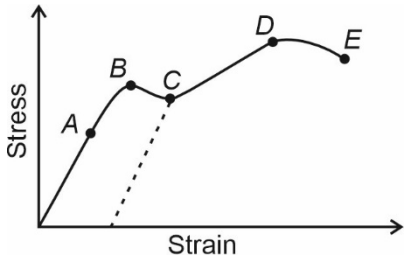
(i) There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15.
(ii) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from the total score. Unanswered / unattempted 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. Stress-strain graph of a metallic wire is given below. In the diagram point *B* is



(1) Proportional limit
(2) Elastic limit
(3) Breaking stress
(4) Fracture point

2. A body floats in water with 40% of its volume outside water. When same body floats in an oil, 60% of its volume remains outside the oil. The relative density of oil is
(1) 0.9 (2) 1.0
(3) 1.2 (4) 1.5

3. A satellite is revolving around the Earth in an orbit of radius r with time period T. If the satellite is revolving around the earth in an orbit of radius $r + \Delta r$ ($\Delta r << r$) with time period $T + \Delta T$($\Delta T << T$), then $\frac{\Delta T}{T}$ is
(1) $\frac{3}{2}\frac{\Delta r}{r}$ (2) $\frac{2}{3}\frac{\Delta r}{r}$
(3) $\frac{\Delta r}{r}$ (4) $\frac{2\Delta r}{r}$

4. Heat required to convert 10 g of ice at –10°C to water at 20°C is

(1) 250 cal (2) 2916 cal

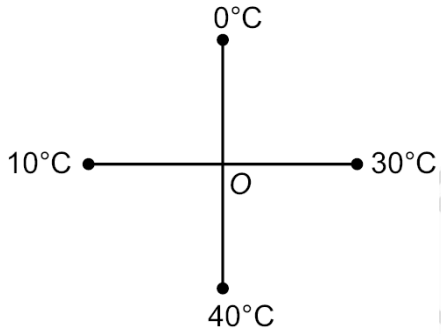
(3) 850 cal (4) 1050 cal

5. A wire of length 2*L* and radius 2*R* is pulled by applying a force *F*. Another wire of same material length *L* and radius *R* is pulled by applying same force *F*. The ratio of their elongation is

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

(3) $\frac{1}{3}$ (4) $\frac{1}{5}$

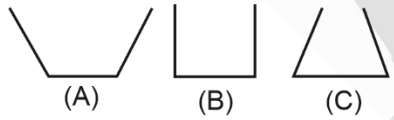
6. Four identical rods are arranged as shown in the figure. The temperature of the junction *O* in steady state is



(1) 25°C (2) 20°C

(3) 35°C (4) 40°C

7. Three vessels shown in the figure, have same base area. Equal volumes of a liquid are poured in the three vessels. The force on the base due to liquid will be



(1) Maximum in vessel A

(2) Maximum in vessel B

(3) Maximum in vessel C

(4) Equal in all the vessels

8. A metal rod of Young's modulus '*Y*' and coefficient of thermal expansion 'α' is held at its two ends such that its length remains invariant. If its temperature is raised by 'θ', the thermal stress developed in it is

(1) $\frac{Y}{\alpha\theta}$ (2) $Y\alpha\theta$

(3) $\frac{1}{Y\alpha\theta}$ (4) $\frac{\alpha\theta}{Y}$

9. If v_e is the escape velocity when a particle is fired from the surface of Earth, then the escape velocity if the same particle is fired from the centre of Earth will be

(1) $\sqrt{\frac{3}{2}}v_e$ (2) $\frac{3}{2}v_e$

(3) $\frac{2}{3}v_e$ (4) $\sqrt{\frac{2}{3}}v_e$

10. A body is projected vertically upwards from the surface of the earth with a speed equal to $\frac{1}{4}$th of escape velocity from surface of earth. Maximum height attained by the body from the surface of the earth will be (*R*-Radius of earth)

(1) $\frac{16}{15}R$ (2) $\frac{R}{4}$

(3) $\frac{4R}{15}$ (4) $\frac{R}{15}$

11. A uniform spherical shell gradually shrinks maintaining its shape. The gravitational potential at the centre

(1) Decreases (2) Increases

(3) Remains constant (4) Oscillates

12. In order to shift a body of mass *m* from a circular orbit of radius 3*R* to a higher orbit of radius 4*R* around the earth, the work done is

(1) $\frac{5GmM}{12R}$ (2) $\frac{GmM}{12R}$

(3) $\frac{GmM}{24R}$ (4) $\frac{5GmM}{18R}$

Space for Rough Work

13. Equal masses of two substances of densities 2ρ and 4ρ are mixed together. The density of the mixture would be

(1) 3ρ (2) $2\sqrt{2}\rho$

(3) $\frac{8\rho}{3}$ (4) $\frac{3\rho}{2}$

14. A cuboidal container has a square bottom of side '*d*'. To what height should it filled with a liquid so that the force exerted by the liquid on one face of the container equal to force exerted on the bottom?

(1) $h = \frac{d}{2}$ (2) $h = d$

(3) $h = 2d$ (4) $h = 4d$

15. A wire of length *L*, area *A* have Young's modulus *Y*. Force constant of a spring (*k*) is analogous to

(1) $\frac{YA}{L}$ (2) $\frac{YL}{A}$

(3) $\frac{AL}{Y}$ (4) ALY

16. A small mass *m* of water at a temperature θ (in °C) is poured on a large mass *M* of ice at 0°C. If *C* is the specific heat of water and *L* is the latent heat of fusion of ice, then the mass of ice melted will be given by

(1) $\frac{ML}{mC}$ (2) $\frac{mC\theta}{ML}$

(3) $\frac{MC\theta}{L}$ (4) $\frac{mC\theta}{L}$

17. When two bodies are separated by a distance, the gravitational force between them is *F*. If distance is increased by 50%, then gravitational force becomes

(1) $\frac{F}{4}$ (2) $\frac{4F}{9}$

(3) F (4) $\frac{F}{2}$

18. Two particles of masses 4 kg and 8 kg are kept at $x = -2$ m and $x = 4$ m respectively. Then the net gravitational force acting on a third particle of mass 1 kg kept at origin is

(1) G (2) $2G$

(3) $\frac{G}{2}$ (4) $\frac{G}{4}$

19. The radius and acceleration due to gravity of moon are $\frac{1}{4}$ times and $\frac{1}{5}$ times of earth. The ratio of mass of earth to mass of moon is

(1) 100 : 1 (2) 80 : 1

(3) 200 : 1 (4) 40 : 1

20. Time period (*T*) of revolution of satellite revolving near Earth surface is equal to

(1) $2\pi\sqrt{\frac{R}{g}}$ (2) $2\pi\sqrt{\frac{g}{R}}$

(3) $2\pi\sqrt{2gR}$ (4) $2\pi\sqrt{\frac{2R}{g}}$

21. The value of *G*

(1) Depends upon the mass of bodies

(2) Depends upon the medium between the bodies

(3) Depends upon the temperature of bodies

(4) Doesn't depend on any of the above factor

22. The dimensional formula of water equivalent is

(1) $[ML^2T^{-2}]$ (2) $[M^1L^0T^0]$

(3) $[M^0L^0T^0]$ (4) $[ML^2T^{-2}K^{-1}]$

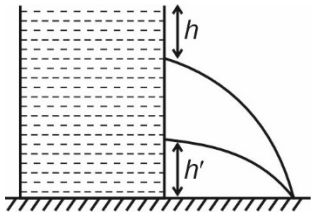
23. Surface tension of soap solution is 4×10^{-2} N/m. If soap bubble of radius 10 cm is blown, then the amount of work done is

(1) 3.2π mJ (2) 32π mJ

(3) 1.6π mJ (4) 16π mJ

Space for Rough Work

24. A tank is filled with water and two holes *A* and *B* are made in it as shown in figure. For getting same range, ratio of $\frac{h'}{h}$ is



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

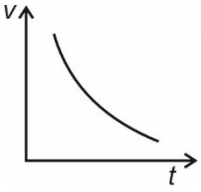
(3) $\frac{1}{3}$ (4) 1

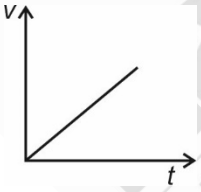
25. A 20 cm long capillary tube is dipped in water. The water rises up to 8 cm. If the entire arrangement is put in a freely falling elevator, the length of water column in the capillary tube will be

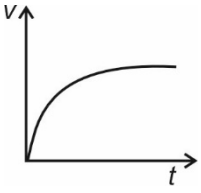
(1) 8 cm (2) 10 cm

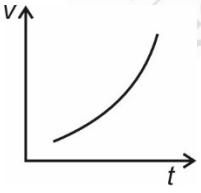
(3) 4 cm (4) 20 cm

26. A spherical ball is dropped in a deep sea having viscous water. Which among the following curve correctly represent the speed of ball (*v*) as a function of time (*t*)?

(1) 

(2) 

(3) 

(4) 

27. Two rods of lengths L_1 and L_2 are made of materials whose coefficients of linear expansion are α_1 and α_2. If the difference of length of two rods is independent of temperature, then

(1) $\frac{L_1}{L_2}=\frac{\alpha_1}{\alpha_2}$ (2) $\frac{L_1}{L_2}=\frac{\alpha_2}{\alpha_1}$

(3) $\frac{L_1}{L_2}=\frac{\alpha_1^2}{\alpha_2^2}$ (4) $\frac{L_1^2}{L_2^2}=\frac{\alpha_2}{\alpha_1}$

28. **Assertion (A):** The shape of small liquid drop is spherical.

Reason (R): The pressure inside the drop is greater than outside the drop.

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

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

(3) (A) is correct but (R) is incorrect.

(4) (A) is incorrect but (R) is correct.

29. If potential energy of a satellite in its orbit is *U,* then total energy of the satellite in this orbit is (assuming potential energy at infinity to be zero)

(1) $-\frac{U}{2}$ (2) $-U$

(3) $-2U$ (4) $\frac{U}{2}$

30. A container filled with hot water cools from 60°C to 50°C in 4 minutes and 40°C to 30°C in 8 minutes. The approximate temperature of surrounding is (use average method)

(1) 10°C (2) 15°C

(3) 20°C (4) 30°C

31. The semi-major axis of planet *A* is four times of the semi-major axis of the planet *B*. The ratio of time periods of revolutions of planets around the sun is

(1) 4 : 1 (2) 1: 6

(3) 2 : 1 (4) 8 : 1

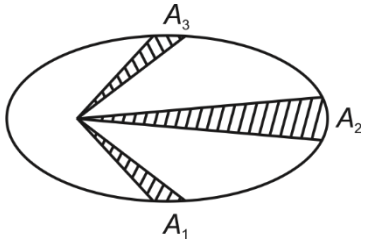
Space for Rough Work

32. A 1000 kg elevator is pulled up by a uniform metallic wire that has maximum safe stress equal to 2×10^6 N/m^2. If the diameter of the wire is 0.1 m, then the maximum safe acceleration of the elevator will be [take $g = 10$ ms^{-2}]

(1) 1.9 m/s^2 (2) 16 m/s^2

(3) 5.7 m/s^2 (4) 21 m/s^2

33. A planet moving around the sun sweeps area A_1 in 3 days, A_2 in 6 days and A_3 in 2 days. The relation between A_1, A_2 and A_3 is



(1) $A_1 = A_2 = A_3$ (2) $2A_1 = A_2 = 3A_3$

(3) $4A_1 = A_2 = 6A_3$ (4) $A_1 = 2A_2 = 3A_3$

34. The time period of revolution of a satellite in circular orbit around the planet is independent of

(1) Mass of satellite (2) Mass of planet

(3) Radius of orbit (4) All of these

35. There is a small hole of area A at the bottom of cylindrical vessel. Water is filled up to a height h and water flows out in t second. If water is filled to a height $4h$, it will flow out in time equal to

(1) t (2) $4t$

(3) $2t$ (4) $\frac{t}{4}$

SECTION - B

36. A faulty thermometer reads 5°C as melting point of ice and 99°C as steam point. The correct temperature in °F when this faulty thermometer reads 52°C is

(1) 142°F (2) 130°F

(3) 117°F (4) 122°F

37. A rubber balloon has 300 g of water in it. Its weight in water will be (neglect the weight of balloon)

(1) 300 g (2) Zero

(3) 200 g (4) 100 g

38. **Statement (A) :** Steel is more elastic than rubber.

Statement (B) : Air is more compressible than water.

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

(1) Both Statement (A) and Statement (B) are correct

(2) Both Statement (A) and Statement (B) are incorrect

(3) Statement (A) is correct and Statement (B) is incorrect

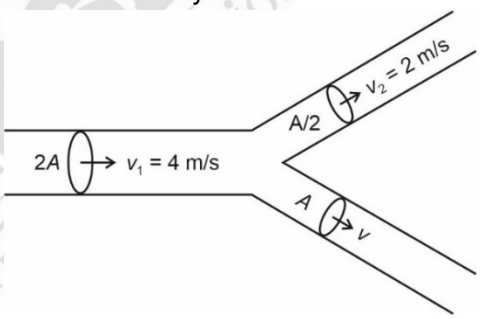
(4) Statement (A) is incorrect and Statement (B) is correct

39. Blood is flowing at the rate of 100 cm^3/s in a capillary of cross sectional area 0.1 m^2. The velocity of flow is

(1) 1 mm/s (2) 4 mm/s

(3) 0.5 mm/s (4) 2 mm/s

40. An incompressible liquid flows through a horizontal tube as shown in the following figure. Then the velocity v of the fluid is



(1) 3 m/s (2) 4 m/s

(3) 7 m/s (4) 1 m/s

41. Two bodies A and B of same surface area have temperature in the ratio 2 : 1 respectively. If their emissivity is in the ratio of 1 : 4, then rate of heat emission will be in the ratio

(1) 1 : 8 (2) 4 : 1

(3) 1 : 1 (4) 1 : 2

Space for Rough Work

42. When a substance changes from one state to another then
(1) Energy may be absorbed
(2) Energy may be released
(3) Temperature changes
(4) Both (1) and (2)

43. The velocity of efflux from a small hole made at bottom of a container, as a function of height y of water level in the tank is
(1) Straight line (2) Parabola
(3) Ellipse (4) Hyperbola

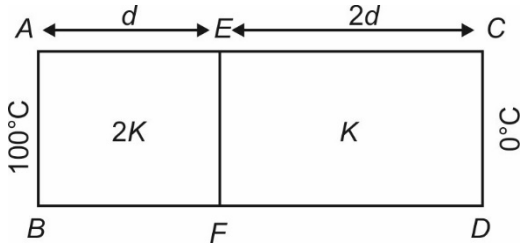
44. Two soap bubbles of different radii are connected by a tube then
(1) Air flows from bigger bubble to smaller bubble till their size becomes equal.
(2) Air flows from smaller bubble to larger bubble till their size are interchanged.
(3) There is no flow of air
(4) Air flows from smaller bubble to larger bubble

45. Match the column I and column II and choose the correct option among the following.

	Column-I		**Column-II**
A.	Capillaries of smaller radii	(P)	Flat meniscus
B.	Angle of contact is 90°	(Q)	Greater height acquired by liquid in capillary tube
C.	Angle of contact is obtuse	(R)	Meniscus will be downward concave

(1) A→Q, B→P, C→R
(2) A→P, B→Q, C→R
(3) A→P, B→R, C→Q
(4) A→R, B→P, C→Q

46. Heat is conducted across a composite block of two slabs of equal area and having thickness d and $2d$. Their thermal conductivities are $2k$ and k respectively. If two faces of composite rod are maintained at temperature 100°C and 0°C as shown in the figure and there is no heat loss from the rod, then temperature of the junction (in °C) will be



(1) 20 (2) 50
(3) 60 (4) 80

47. Time periods of revolutions of two satellites are 4 hours and 32 hours. The ratio of their orbital radii will be
(1) $\frac{1}{16}$ (2) 8
(3) 24 (4) $\frac{1}{4}$

48. Air is streaming past a horizontal airplane wing such that its speed is 120 m/s over the upper surface and 90 m/s at the lower surface. If the density of air is 1.3 kg/m^3 and the wing is 10 m long and has an average width of 2 m, then the difference of the pressure on the two sides of the wing is
(1) 4095.0 pascal (2) 409.50 pascal
(3) 40.950 pascal (4) 4.0950 pascal

49. Compressibility of a liquid is 4×10^{-8} N^{-1} m^2. If 2 litre of this liquid is subjected to an extra pressure of 2×10^6 N/m^2, then the decrease in volume of the liquid will be
(1) 1.414 cc (2) 421 cc
(3) 160 cc (4) 3.69 cc

50. If 20 g of water at 30°C is mixed with one of following samples of water. The final temperature will be maximum when the sample is
(1) 20 g of water at 40°C
(2) 40 g of water at 35°C
(3) 10 g of water at 50°C
(4) 4 g of water at 80°C

Space for Rough Work

CHEMISTRY

SECTION - A

51. The change in oxidation number of carbon in the following reaction is

$CH_4(g) + 4Cl_2(g) \longrightarrow CCl_4(l) + 4HCl(g)$

(1) +4 to –4 (2) –4 to 0

(3) –4 to +4 (4) 0 to +4

52. Which will make acidic buffer?

(1) 0.1 M, 50 mL NaOH + 0.1 M, 40 mL CH_3COOH

(2) 0.1 M, 50 mL NH_4OH + 0.1 M, 40 mL CH_3COOH

(3) 0.1 M, 50 mL NH_4OH + 0.1 M, 60 mL HCl

(4) 0.1 M, 40 mL NaOH + 0.1 M, 60 mL HCN

53. For the reversible reaction

$2A_2(g) + B(s) \rightleftharpoons X_2(g), \Delta_r H = +Q\ kJ$

The equilibrium will shift in forward direction by

(1) Decreasing the pressure

(2) Increasing the temperature

(3) Removal of $A_2(g)$

(4) Addition of B(s)

54. In which of the following solution, AgCl has minimum solubility?

(1) 0.02 M NaCl (2) 0.005 M NaCl

(3) 0.01 M NaCl (4) 0.01 M $AgNO_3$

55. Equilibrium constant of a gaseous reaction depends on

(1) Molar concentrations of reactants and products

(2) Density of gas

(3) Temperature

(4) Partial pressure

56. 10 mL of a solution having pH = 4 is added with 990 mL of 0.1 M NaCl solution, pH of resulting solution is nearly

(1) 4 (2) 5.5

(3) 6 (4) 6.5

57. A solution of pH 2.0 is more acidic than a solution of pH 6.0 by a factor of

(1) 100 (2) 1000

(3) 4000 (4) 10000

58. Which of the following is a Lewis acid?

(1) OH^- (2) NH_3

(3) BI_3 (4) H_2O

59. Consider the following statements

(a) The value of equilibrium constant is independent of initial concentrations of the reactants and products.

(b) The equilibrium constant for the reverse reaction is equal to the inverse of the equilibrium constant for the forward reaction.

(c) If $K_c > 10^3$, products predominate over reactants which means the reaction proceeds nearly to completion.

The correct statements are

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

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

60. A solution containing 0.1 M NH_4OH and 0.1 M NH_4Cl has pH = 9. pK_b of NH_4OH will be

(1) 5 (2) 9

(3) 6 (4) 7

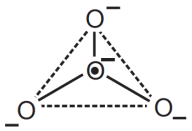
Space for Rough Work

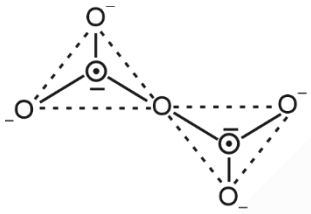
61. Match column I with column II and choose the correct option.

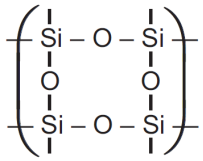
	Column-I (Compound)		Column-II (Oxidation state of central atom)
a.	C_3O_2	(i)	+6
b.	H_2SO_5	(ii)	+2
c.	Br_3O_8	(iii)	Zero
d.	OF_2	(iv)	+4

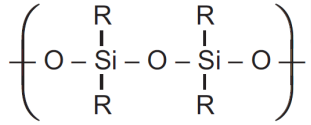
(1) a(iii), b(i), c(iv), d(ii)
(2) a(ii), b(i), c(iii), d(iv)
(3) a(iv), b(i), c(ii), d(iii)
(4) a(i), b(ii), c(iii), d(iv)

62. The correct structure of pyrosilicate among the following is

(1) 

(2) 

(3) 

(4) 

63. In CrO_5, number of oxygen atoms involved in peroxy linkage is
(1) 2 (2) 3
(3) 4 (4) 5

64. Consider the following reactions

$$B_2H_6 + NH_3 \longrightarrow (x) \xrightarrow{\Delta} (y) + H_2$$

In the above reaction the product (x) and (y) respectively are
(1) $[BH_2(NH_3)_2]^+[BH_4]^-$ and $B_3N_3H_6$
(2) $B_3N_3H_6$ and $[BH_2(NH_3)_2]^+[BH_4]^-$
(3) $BH_3 \cdot NH_3$ and H_3BO_3
(4) $B_3N_3H_6$ and B_2O_3

65. Consider the following statements.
Statement (I): Diborane undergoes reactions with Lewis bases (L) to give borane adduct BH_3L.
$B_2H_6 + 2NMe_3 \rightarrow 2BH_3 \cdot NMe_3$
$B_2H_6 + 2CO \rightarrow 2BH_3 \cdot CO$
Statement (II): $B_3N_3H_6$ is known as inorganic benzene.
In the light of the above statements, choose the most appropriate answer from the options given below.
(1) Statement (I) is correct but statement (II) is incorrect.
(2) Statement (I) is incorrect but statement (II) is correct.
(3) Both statements (I) and (II) are correct.
(4) Both statements (I) and (II) are incorrect.

66. The ratio of number of moles of $KMnO_4$ required to oxidize 0.1 mol I^- ion in acidic medium to neutral medium is
(1) 1 : 1 (2) 2 : 1
(3) 1 : 10 (4) 1 : 5

67. Which among the following reactions are disproportionation reaction?
(a) $P_4(s) + 3OH^-(aq) + 3H_2O(l) \rightarrow PH_3(g) + 3H_2PO_2^-(aq)$
(b) $Br_2(l) + 2I^-(aq) \rightarrow 3Br^-(aq) + I_2(s)$
(c) $Cl_2(g) + 2OH^-(aq) \rightarrow ClO^-(aq) + Cl^-(aq) + H_2O(l)$
The correct option is
(1) (a) and (b) only (2) (b) and (c) only
(3) (a) and (c) only (4) (a), (b) and (c)

Space for Rough Work

68. The correct order of density in group 14 elements is

(1) C < Si < Ge < Sn < Pb

(2) Si < C < Ge < Sn < Pb

(3) C < Si < Sn < Ge < Pb

(4) C < Si < Ge < Pb < Sn

69. Consider the following statements

Statement (I): Buckminsterfullerene contains twenty six-membered rings and twelve five-membered rings.

Statement (II): In Buckminsterfullerene, all carbon atoms are sp^2 hybridised.

Choose the correct option.

(1) Both statement (I) and statement (II) are correct

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

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

(4) Both statement (I) and statement (II) are incorrect

70. If standard reduction potential of three redox couples Pb^{2+}/Pb, Mg^{2+}/Mg and Zn^{2+}/Zn are –0.13 V, –2.36 V and –0.76 V respectively. The correct order of reducing power is

(1) Pb > Zn > Mg (2) Zn > Pb > Mg

(3) Mg > Zn > Pb (4) Zn > Mg > Pb

71. Which among the following is not a redox reaction?

(1) $NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O$

(2) $N_2 + O_2 \longrightarrow 2NO$

(3) $Zn + 2HCl \longrightarrow ZnCl_2 + H_2$

(4) $Mg + 2H_2O \xrightarrow{\Delta} Mg(OH)_2 + H_2$

72. Addition of helium gas to the given equilibrium reaction at constant volume will

$CO(g) + Cl_2(g) \rightleftharpoons COCl_2(g)$

(1) Has no effect on equilibrium

(2) Change the equilibrium constant value

(3) Shift the equilibrium in forward direction

(4) Shift the equilibrium in backward direction

73. pH of 0.01 M Calcium acetate solution is (pK_a of CH_3COOH = 4.74)

(1) 4.42 (2) 8.37

(3) 10.37 (4) 7.25

74. Hydrolysis of sucrose gives,

Sucrose + $H_2O \rightleftharpoons$ Glucose + Fructose

The value of $\Delta G°$ at 300 K is

(Given: K_c for the reaction is 2×10^{13})

(1) +76.4 kJ mol^{-1} (2) –7.64 kJ mol^{-1}

(3) +7.64 kJ mol^{-1} (4) –76.4 kJ mol^{-1}

75. Which among the following element does not show catenation?

(1) Pb (2) Sn

(3) Ge (4) Si

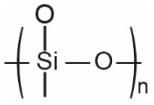
76. Which among the following species is least likely to exist?

(1) SiF_6^{2-} (2) $[GeCl_6]^{2-}$

(3) $[Sn(OH)_6]^{2-}$ (4) $[B(OH)_6]^{2-}$

77. Which of the following statement is not true about silicones?

(1) They are hydrophilic in nature

(2) Silicones consist of  chain

(3) They have high thermal stability, high dielectric strength

(4) They are used as electrical insulator

Space for Rough Work

78. Read the following statements and select the correct option.

Assertion (A): Lead is not affected by water.

Reason (R): In case of lead, a protective oxide film formation takes place.

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

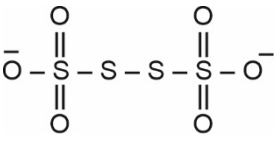
(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).

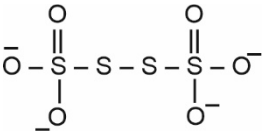
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).

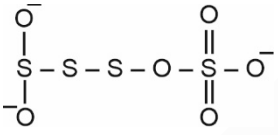
(3) (A) is correct but (R) is incorrect.

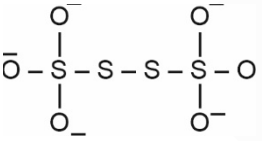
(4) (A) is incorrect but (R) is correct.

79. The correct structure of tetrathionate ion is

(1) 

(2) 

(3) 

(4) 

80. If x_2y is 40% dissociated according to the following reaction, $2x_2y(g) \rightleftharpoons 2x_2(g) + y_2(g)$, then the total pressure of the gaseous mixture at equilibrium will be (K_P = equilibrium constant of the reaction)

(1) $\frac{27}{2}K_P$ (2) $\frac{45}{4}K_P$

(3) $27\,K_P^{1/2}$ (4) $49\,K_P$

81. Read the following statements and select the correct option.

Assertion : At equilibrium, concentration of reactants and products become constant.

Reason : A catalyst does not alter the value of equilibrium constant of a reaction.

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

(1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion

(2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion

(3) Assertion is true statement but Reason is false

(4) Both Assertion and Reason are false statements

82. Read the following statements and select the correct option.

Assertion (A) : F_2 does not undergoes disproportionation reaction.

Reason (R) : Fluorine does not show any positive oxidation state.

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

(1) Both assertion (A) and reason (R) are correct statements, and reason (R) is the correct explanation of the assertion (A).

(2) Both assertion (A) and reason (R) are correct statements, but reason (R) is not the correct explanation of the assertion (A).

(3) Assertion (A) is correct, but reason (R) is incorrect statement.

(4) Assertion (A) is incorrect, but reason (R) is correct statement.

83. In the following balanced equation

$$xHNO_3 + yH_2S \longrightarrow pNO + qS + zH_2O$$

x and q respectively are

(1) 2, 2 (2) 3, 2

(3) 2, 4 (4) 2, 3

Space for Rough Work

84. $E^{o}_{Ag^{+}/Ag} = 0.8\ V$ and $E^{o}_{Zn^{2+}/Zn} = -0.76\ V$. When these electrodes are connected to construct a working cell, then value of E^{o}_{cell} will be

(1) 1.56 V (2) –1.56 V

(3) 0.04 V (4) –0.04 V

85. Nitrogen atom exhibits more than one oxidation state in

(1) NH_4NO_3 (2) N_2H_4

(3) N_2O_5 (4) N_2O_4

SECTION - B

86. Which of the following compounds is used to convert alcohols directly into gasoline?

(1) ZSM-5 (2) Silicones

(3) Boranes (4) Silica gel

87. Which of the following mixtures cannot form a buffer?

(1) CH_3COOH and CH_3COONa

(2) NH_4OH and NH_4Cl

(3) NaCl and HCl

(4) H_2CO_3 and Na_2CO_3

88. For a given reaction,

$$X_2(g) + Y_2(g) \rightleftharpoons X_2Y_2(g) + \text{Heat}$$

formation of $X_2Y_2(g)$ is favoured at

(1) High pressure and high temperature

(2) Low pressure and low temperature

(3) High pressure and low temperature

(4) Low pressure and high temperature

89. pH of the resulting solution when equal volumes of 0.1 M HCl and 0.2 M NaOH are mixed is [Take log5 = 0.7]

(1) 3.2 (2) 9.4

(3) 11.5 (4) 12.7

90. Consider the following statements

Statement (I): Boric acid acts as a Lewis acid by accepting electrons from a hydroxyl ion.

Statement (II): On heating, orthoboric acid above 370 K forms metaboric acid, HBO_2 which on further heating yields boric oxide, B_2O_3.

The correct option is

(1) Both statement (I) and statement (II) are correct

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

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

(4) Both statement (I) and statement (II) are incorrect

91. For a chemical reaction of the type

$A + 2B \rightleftharpoons 2C,\ K_1 = 4 \times 10^4$

$2D \rightleftharpoons E,\ K_2 = 3 \times 10^4$

Equilibrium constant for the reaction is

$$C + 2D \rightleftharpoons \frac{1}{2}A + B + E$$

(1) 3.5×10^4 (2) 2×10^6

(3) 1.5×10^2 (4) 7×10^4

92. Which of the following will act as Bronsted acid only?

(1) HCO_3^- (2) NH_3

(3) H_2O (4) H_2CO_3

93. Number of moles of Fe^{2+} ions oxidized by 1 mole of $Cr_2O_7^{2-}$ ion in acidic medium is

(1) 2 (2) 3

(3) 4 (4) 6

94. What will be the solubility of $Ni(OH)_2$ solution? (Given : K_{sp} of $Ni(OH)_2$ is 2×10^{-15})

(1) 5.46×10^{-5} M (2) 7.94×10^{-6} M

(3) 8.25×10^{-7} M (4) 1.12×10^{-8} M

Space for Rough Work

95. Select an incorrect statement among the following.
(1) Si, Ge and Sn have nearly equal electronegativities
(2) Entropy of graphite is more than diamond
(3) CO forms a complex with haemoglobin
(4) SnO and PbO are basic in nature

96 In the following questions, a statement of assertion (A) is followed by a statement of reason (R).
Assertion (A) : CCl_4 is not hydrolysed by water.
Reason (R) : In CCl_4, the central atom do not have vacant *d*-orbitals.
In light of the above statements, choose the correct answer from the options given below.
(1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Both Assertion and Reason are false statements

97. Colour of bead formed when CoO is heated with glassy bead is
(1) Red (2) Yellow
(3) Green (4) Blue

98. Which of the following oxides is amphoteric?
(1) CO_2 (2) SnO_2
(3) SiO_2 (4) GeO_2

99. Match column-I with column-II.

	Column-I (Silicate)		**Column-II (Formula)**
a.	Pyrosilicate	(i)	SiO_4^{4-}
b.	Orthosilicate	(ii)	$(Si_2O_5)_n^{2n-}$
c.	Chain Silicate	(iii)	$Si_2O_7^{6-}$
d.	Sheet Silicate	(iv)	$(SiO_3)_n^{2n-}$

The correct option is
(1) a(iv), b(i), c(iii), d(ii)
(2) a(i), b(ii), c(iii), d(iv)
(3) a(iii), b(i), c(iv), d(ii)
(4) a(iv), b(iii), c(ii), d(i)

100. The correct order of bond enthalpy is
(1) Sn – Sn > Ge – Ge > Si – Si > C – C
(2) C – C > Ge – Ge > Si – Si > Sn – Sn
(3) C – C > Si – Si > Ge – Ge > Sn – Sn
(4) Si – Si > C – C > Sn – Sn > Ge – Ge

BOTANY

SECTION - A

101. The membrane of RBCs of human have protein and lipid content respectively in the ratio of approximately
(1) 35% and 40%
(2) 62% and 30%
(3) 52% and 40%
(4) 40% and 52%

102. Select the **correct** statement about the plasma membrane.
(1) Neutral solutes move across the membrane by the process of active transport only
(2) It is a bi layer of proteins in which lipids are embedded
(3) Water may move across the membrane from higher concentration to lower concentration
(4) Unlike eukaryotes membrane of a bacterium is selectively permeable

Space for Rough Work

103. Identify the **wrongly** matched pair.
(1) Rough ER – Detoxification of drugs
(2) Smooth ER – Specialised in the synthesis of lipids and steroids
(3) Rough ER – Present in the cells which are actively involved in protein synthesis and secretion
(4) Smooth ER – Associated with muscle contraction by release and uptake of Ca^{2+} ions

104. Read the following Assertion (A) and Reason (R) statements and select the **correct** option.
Assertion (A): Interphase is also called the resting phase.
Reason (R): In interphase, cells are metabolically inactive.
(1) Both (A) and (R) are false
(2) (A) is true but (R) is false
(3) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(4) Both (A) and (R) are true and (R) is the correct explanation of (A)

105. Assuming the chromosome number of onion root cell as 16, then how many chromosomes will this cell have at G_1 phase, S phase and M phase respectively?
(1) 16, 32, 32 respectively
(2) 16, 16, 16 respectively
(3) 16, 32, 16 respectively
(4) 32, 32, 16 respectively

106. Duplication of centrioles occurs in the
(1) Cytoplasm
(2) Endoplasmic reticulum
(3) Chloroplast
(4) Nucleus

107. Read the following statements and select the **correct** option.
Statement A : In plant cells Golgi apparatus is made up of unconnected units called dictyosomes.
Statement B : A number of proteins synthesised by ribosomes of ER are modified in cisternae of Golgi apparatus.
(1) Statement A is correct but statement B is incorrect
(2) Statement A is incorrect but statement B is correct
(3) Both statements A and B are correct
(4) Both statements A and B are incorrect

108. Acrosome of the sperm is modified
(1) Lysosome (2) Mitochondria
(3) Vacuole (4) Golgi apparatus

109. Which of the following feature is **not** similar in chloroplast and mitochondria?
(1) Double membrane-bound organelle
(2) Presence of 80S ribosomes
(3) Synthesise ATP
(4) Presence of circular dsDNA

110. In some organisms karyokinesis is not followed by cytokinesis as a result of which (i) condition arises leading to the formation of (ii) .
Choose the correct option for (i) and (ii).
(1) (i) Multicellular, (ii) syncytium
(2) (i) Multinucleate, (ii) syncytium
(3) (i) Uninucleate, (ii) Coenocyte
(4) (i) Unicellular, (ii) Cell plate

Space for Rough Work

111. Identify the different stages of cell cycle from the features given below and choose the correct option.
(a) In oocytes of some vertebrates, this stage can last for months or years.
(b) Bivalent chromosomes align on the equatorial plate.
(c) The chromosomes cluster at pole, nucleolus and the nuclear membrane reappear.

	A	B	C
(1)	Diakinesis	Metaphase-II	Anaphase II
(2)	Diplotene	Metaphase-II	Telophase-I
(3)	Diakinesis	Metaphase-II	Telophase-I
(4)	Diplotene	Metaphase-I	Telophase

112. Some dividing cells exit the cell cycle and enter vegetative inactive stage, this process occurs at the end of
(1) G_1 phase (2) S phase
(3) G_2 phase (4) M phase

113. The regulation of osmotic expansion of a cell which is kept in water is chiefly carried out by
(1) Ribosomes (2) Plastids
(3) Centriole (4) Vacuoles

114. Match the following columns and select the **correct** options.

	Column-I		Column-II
a.	Thylakoids	(i)	Infolding of inner membrane in mitochondria
b.	Centriole	(ii)	Highly extended and elaborate nucleoprotein fibers
c.	Chromatin	(iii)	It form basal body of cilia or flagella
d.	Cristae	(iv)	Flat membranous sacs in stroma

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

115. Read the following statements and select the **correct** option.
Statement A : Polar molecules require a carrier protein of the membrane to facilitate their transport across the membrane.
Statement B : Movement of few ions or molecules across the plasma membrane is energy dependent process.
(1) Only statement A is correct
(2) Both statements A and B are incorrect
(3) Both statements A and B are correct
(4) Only statement B is correct

116. Plasmodesmata is responsible for
(1) Connecting the cytoplasm of neighbouring animal cells.
(2) Connecting the cytoplasm of neighbouring plant cells.
(3) Holding the different neighbouring plant cells together
(4) Holding the different neighbouring animal cells together

117. Which stage of mitosis is best for studying the morphology of chromosomes?
(1) Prophase (2) Metaphase
(3) Anaphase (4) Telophase

118. Mitotic apparatus is composed of
(1) One aster together with chromosomes
(2) Centrosome along with microtubules
(3) Two asters together with spindle fibres
(4) Two microtubules together with chromatin

Space for Rough Work

119. Read the following **Assertion (A)** and **Reason (R)** and choose the **correct** option.

Assertion (A) : Concentration of ions and other molecules are significantly higher in the vacuole than in the cytoplasm of plant cell.

Reason (R) : In plants, the tonoplast facilitates the transport of a number of ions and other molecules against concentration gradient into the vacuole.

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

120. The correct sequence of phases of cell cycle is
(1) Post-mitotic gap phase → DNA synthesis → Pre-mitotic gap phase → Mitosis
(2) Pre-mitotic gap phase → DNA synthesis → Post mitotic gap phase → Mitosis
(3) DNA synthesis → Post-mitotic gap phase → Mitosis → Pre-mitotic gap phase
(4) Post-mitotic gap phase → Mitosis → DNA synthesis → Pre mitotic gap phase

121. Higher plant cells and animal cells are different as the former possess all, **except**
(1) Plastids (2) Central vacuoles
(3) Cell walls (4) Centrioles

122. Match column I with column II w.r.t. prokaryotic cell and choose the **correct** option.

	Column I		**Column II**
a.	Mesosomes	(i)	Infoldings of cell membrane
b.	Pili	(ii)	Helps in attachment with substratum
c.	Fimbriae	(iii)	Involved in DNA transfer between two cells
d.	Chromatophores	(iv)	Contain pigments

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

123. Which of the following scientists explained that "new cells are formed from pre-existing cells"?
(1) Matthias Schleiden (2) Rudolf Virchow
(3) Theodore Schwann (4) Robert Brown

124. In animal cells, cytokinesis occurs through
(1) Cell plate formation
(2) Furrow formation in cell wall
(3) Furrow formation in plasma membrane
(4) Formation of phragmoplast

125. Cells remain metabolically active but no longer proliferate in which of the given phase/stage of cell cycle?
(1) Mitotic phase (2) Synthesis phase
(3) Quiescent stage (4) Gap 1 phase

126. The stage of cell division in which exchange of genetic material between non-sister chromatids of homologous chromosomes occurs is also characterised by
(1) Dissolution of synaptonemal complex
(2) Terminalisation of chiasmata
(3) Clear appearance of chiasmata
(4) Involvement of recombinase enzyme

127. Choose the **correct** one for acrocentric chromosome.
(1) It appears I shaped during anaphase
(2) The centromere is situated close to its end forming one extremely short and one very long arm.
(3) The centromere is slightly away from the middle of the chromosome.
(4) Two equal arms are present

Space for Rough Work

128. In a Golgi body, the maturing face is
(1) Concave and also called trans face
(2) Not interconnected with cis face
(3) Receiving face and receives vesicles from ER
(4) Convex and closely appressed with ER

129. Cytoskeleton helps in all, **except**
(1) Cell division
(2) Mechanical support
(3) Motility
(4) Photophosphorylation

130. Eukaryotic flagella and cilia are similar to each other as both
a. Have '9 + 2' organisation of microtubules
b. Are surrounded by membrane
c. Help in movement
d. Are hair-like outgrowths and work as oars
Choose the correct one(s).
(1) Only a and b (2) Only c
(3) Only a and d (4) Only a, b and c

131. If pollen grain has 12 pg of DNA then what amount of DNA would have been there in pollen mother cell at G_2 phase?
(1) 12 pg (2) 48 pg
(3) 24 pg (4) 36 pg

132. Select the **incorrect** statement w.r.t. isobrachial chromosomes.
(1) They are metacentric chromosomes
(2) The centromere is present at the centre in these chromosomes
(3) These chromosomes have two equal arms
(4) They appear L – shaped during anaphase

133. All of the following features are true for lipids of plasma membrane, **except**
(1) Tails are hydrophobic
(2) Polar heads are towards the inner sides
(3) Lipids form a bilayer
(4) Major lipids are phospholipids

134. Which structure of bacteria confer resistance towards antibiotics?
(1) Mesosome (2) Plasmid
(3) Nucleoid (4) Nucleus

135. Nuclear membrane is absent in
(1) *Volvox* (2) *Chlamydomonas*
(3) *Anabaena* (4) Yeast

SECTION - B

136. State **true (T)** or **false (F)** for the given statements and choose the **correct** option.
(a) Centrioles are made up of nine pairs of evenly spaced peripheral fibrils of tubulin protein.
(b) Some chromosomes exhibit non-staining secondary constriction at a fixed location, creating a small fragment known as satellite
(c) The inner membrane of nuclear envelope encloses the nucleoplasm and the chromatin material.
(d) The cristae of mitochondria contains components for ATP and protein synthesis.

	(a)	(b)	(c)	(d)
(1)	T	F	F	T
(2)	F	T	T	T
(3)	T	F	T	T
(4)	F	T	T	F

137. The ribosomes of the chloroplast are composed of two subunits, those are
(1) 60 S smaller subunit and 40 S larger subunit
(2) 40 S larger subunit and 30 S smaller subunit
(3) 50 S smaller subunit and 40 S larger subunit
(4) 50 S larger subunit and 30 S smaller subunit

Space for Rough Work

138. Select the **wrongly** matched pair.
(1) Leptotene – Condensation and coiling of chromatin fibres
(2) Zygotene – Homologous chromosomes start pairing together
(3) Pachytene – Four chromotids of each bivalent become distinct and clearly appear as tetrads
(4) Diplotene – Nucleolus disappears and the nuclear envelope disintegrates

139. The number and ploidy level of cells formed from a diploid cell at the end of meiosis II is respectively
(1) Two and diploid (2) Four and haploid
(3) Two and haploid (4) Four and diploid

140. $G_1 \rightarrow S$ transition is carried out by
(1) Cyclins only
(2) Maturation promoting factor
(3) G_1 cyclin and cdc2 kinase
(4) Mitotic cyclin and cdc2 kinase

141. Which one of the following structures is/are primarily responsible for cell plate mediated cytokinesis in plant cells?
(1) Kinetochores
(2) Golgi derived vesicles
(3) Actin and myosin
(4) Centriole and centromere

142. At the end of _____ Golgi complex, ER nucleolus and nuclear envelope disappear.
Choose the **correct** option to fill in the blank.
(1) Telophase (2) Prophase
(3) Metaphase (4) Anaphase

143. The longest phase of meiotic cell division is
(1) Prophase I (2) Metaphase I
(3) Prophase II (4) Metaphase II

144. A polysome contains
(1) Many ribosomes and a single m-RNA
(2) Single ribosome and many m-RNAs
(3) Single ribosome and single m-RNA
(4) Many ribosomes and many m-RNAs

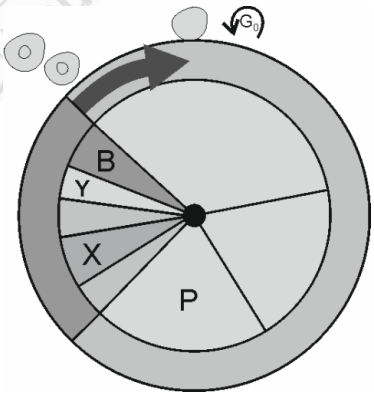
145. Attachment of spindle fibres to kinetochores of chromosomes is seen in
(1) Prophase (2) Anaphase
(3) Metaphase (4) Telophase

146. Which structure perform the function of mitochondria in bacteria?
(1) Chromatophores (2) Flagella
(3) Mesosome (4) Inclusion bodies

147. Microtubules are not constituents of
(1) Cilia (2) Spindle fibres
(3) Nucleosome (4) Centriole

148. Which among the following is a function of Golgi complex?
(1) Formation of secretory vesicles
(2) Majorly involved in protein synthesis
(3) Activation of amino acid
(4) Synthesis of lipids and steroids

149. Refer the given schematic presentation of cell cycle.



Which one of the following is **incorrectly** matched w.r.t. stage(s) of cell cycle?

Space for Rough Work

(1) P – Duplication of Golgi body.
(2) X – All the chromosomes align themselves at equator.
(3) Y – Reappearance of ER, nucleolus in daughter cells.
(4) B – Last phase of karyokinesis

150. Chromosomes form A metaphasic plate(s) in metaphase I, and B metaphasic plate(s) in metaphase II.
Choose the correct option for A and B.
(1) A-2, B-1 (2) A-2, B-2
(3) A-1, B-1 (4) A-1, B-2

ZOOLOGY

SECTION - A

151. Which of the following is considered as a secondary lymphoid organ as well as graveyard of human RBCs?
(1) Pancreas (2) Red bone marrow
(3) Spleen (4) Thymus

152. Read the following features w.r.t. a formed element.
(i) Cell fragments produced from megakaryocytes
(ii) Normal count in a healthy adult man is 1,500,00 -3,500,00 mm^{-3} of blood
(iii) Its deficiency can cause clotting disorders
All the above features are true for
(1) Lymphocyte (2) Erythrocyte
(3) Thrombocyte (4) Monocytes

153. Semilunar valves forced open during
(1) Ventricular systole
(2) Atrial systole
(3) Ventricular diastole
(4) Joint diastole

154. Glottis is the opening of
(1) Pharynx (2) Larynx
(3) Oral cavity (4) Oesophagus

155. Read the following statements.
Statement A : A portal vein does not carry blood directly to the heart but forms a network of capillaries in another or intermediate organ before reaching the heart.
Statement B : Two portal systems are present in humans.
Select the **correct** option.
(1) Both statements A and B are correct
(2) Only statement A is correct
(3) Only statement B is correct
(4) Both statements A and B are incorrect

156. Total Lung Capacity (TLC) is not _____.
Complete the sentence by choosing the **correct** option.
(1) The total volume of air accommodated in the lungs at the end of a forced inspiration.
(2) Represented as RV + ERV + TV + IRV
(3) Measured by using a spirometer
(4) Ranges between 5100 – 5800 mL in a normal adult human

157. During normal respiration, every 4000 mL of deoxygenated blood delivers approximately _____ mL of CO_2 to the alveoli in humans under normal physiological conditions. Select the option which fills the blank **correctly**.
(1) 4 (2) 160
(3) 50 (4) 30

Space for Rough Work

158. Match column I and column II with respect to mode of respiration in the following organisms.

	Column I		Column II
a.	Poriferans	(i)	Branchial respiration
b.	Fishes	(ii)	Pulmonary respiration
c.	Humans	(iii)	Simple diffusion through the body surface
d.	Earthworm	(iv)	Cutaneous respiration

Select the **correct** option.

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

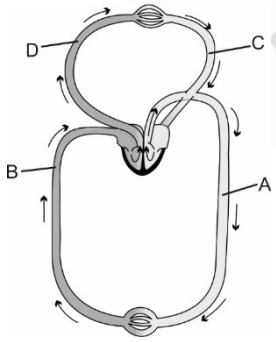
159. Read the following statements and choose the **correct** option.

Statement X: The pleural fluid lubricates the pleural membranes so that they may slide over each other without friction during inspiration only.

Statement Y: The conducting part of respiratory system brings the temperature of the incoming air, upto the body temperature.

(1) Both statements X and Y are correct
(2) Both statements X and Y are incorrect
(3) Only statement X is correct
(4) Only statement Y is correct

160. In the diagram given below, identify A, B, C and D.



Choose the **correct** option.

	A	B	C	D
(1)	Vena cava	Dorsal aorta	Pulmonary vein	Pulmonary artery
(2)	Vena cava	Dorsal aorta	Pulmonary artery	Pulmonary vein
(3)	Dorsal aorta	Vena cava	Pulmonary vein	Pulmonary artery
(4)	Dorsal aorta	Vena cava	Pulmonary artery	Pulmonary vein

161. If the chordae tendinae attached to the tricuspid valve gets severely damaged, it will result in

(1) Reduced outflow of blood to the pulmonary artery
(2) Increased backflow of blood from the aorta
(3) Reduced backflow of blood from the left ventricle to left atrium
(4) Reduced outflow of blood to the aorta

162. The valves present in veins allow only unidirectional flow of blood to prevent

(1) Forward flow of blood
(2) Backward flow of blood
(3) Increased flow of blood
(4) Decreased flow of blood

163. If the heart of a human is removed from the body and kept outside as it is, then

(1) It will beat continuously for many days as it is myogenic
(2) It will keep on beating continuously as it is neurogenic
(3) It will immediately stop beating as all neural signals are cut
(4) It will keep on beating for a while as it is myogenic

Space for Rough Work

164. SAN is located at the right upper corner of the right atrium and it generates maximum number of action potentials. The presence of which of the following allow these impulses to spread rapidly within the heart tissue?
(1) Tight junctions
(2) Interventricular septum
(3) Communication junctions
(4) Atrio-ventricular septum

165. Minute volume of respiration is calculated by
(1) Tidal volume × (Breathing rate + Heart rate)
(2) Tidal volume × Breathing rate
(3) Vital capacity × Breathing rate
(4) Breathing rate × Heart rate

166. A person starts running in a park that increases heart rate and then relaxes by sitting down that eventually brings the increased heart rate to normal state. Which of the following gets activated respectively in the above two cases?
(1) Sympathetic nervous system, parasympathetic nervous system
(2) Parasympathetic nervous system, sympathetic nervous system
(3) Sympathetic nervous system, sympathetic nervous system
(4) Somatic nervous system, peripheral nervous system

167. In mammals, all of the following are involved in pulmonary circulation, **except**
(1) Left atrium (2) Right ventricle
(3) Pulmonary artery (4) Left ventricle

168. **Assertion (A):** Closed type of blood circulatory system is more advantageous than open type of blood circulatory system.
Reason (R): The flow of blood is more precisely regulated as blood is always circulated through a closed network of blood vessels.
In the light of above statements select the correct option.
(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.

169. For an experiment, three body fluid samples were taken from a healthy adult man in tubes A, B, and C. By mistake, these three tubes were not labeled properly. In tube A, blood clotting was not seen. In tube B, a straw colour coagulum was found. In tube C, red colour coagulum was observed.
Select the **correct** option.

	A	B	C
(1)	Lymph	Blood	Serum
(2)	Serum	Plasma	Blood
(3)	Plasma	Serum	Blood
(4)	Blood	Lymph	Serum

170. All of the following are false w.r.t inspiration, **except**
(1) Decrease in the volume of the thoracic chamber
(2) Decrease in the intra-pulmonary pressure less than the atmospheric pressure
(3) Contraction of internal inter-costal muscles
(4) Relaxation of external inter-costal muscles

171. In humans, under normal physiological conditions, nearly 70% of ventricles get filled with blood during
(1) Ventricular systole
(2) Joint diastole
(3) Atrial systole
(4) Ventricular diastole

Space for Rough Work

172. All of the following play important role in blood clotting, **except**
(1) Fibrins (2) Thrombokinase
(3) Calcium ions (4) Albumins

173. Following arrangement of blood groups are compatible, **except**

	Donor's blood group	Recipient's blood group
(1)	A^+	AB^+
(2)	O^-	O^+
(3)	O^+	B^-
(4)	B^-	AB^+

174. Select the **incorrect** match.
(1) Inter-atrial septum – Thin and muscular wall between the left and the right atria
(2) Inter-ventricular septum – Thick-walled and separates the left and the right ventricles
(3) Atrio-ventricular septum – Muscular, thin walled and separates the left atrium and left ventricle
(4) Pericardium – Double walled membranous bag around heart

175. If the heart rate of a person is 100 beats per minute, what would be his cardiac output if end diastolic volume and end systolic volume in left ventricle are 100 mL and 50 mL respectively?
(1) 6.5 L (2) 5 L
(3) 8 L (4) 7.5 L

176. In a hypothetical scenario where A, B and C are three gases, whose order of
(a) Solubility is A > B > C
(b) Partial pressure is A > C > B
All three gases are allowed to pass through the same diffusion membrane which is diffusible for them. According to this, select the correct option.
(1) All three gases will diffuse at the same rate
(2) Gas 'B' will diffuse at the fastest rate
(3) Gas 'C' will diffuse at the fastest rate
(4) Gas 'A' will diffuse at the fastest rate

177. The diffusion membrane in human respiratory system is composed of all of the following layers, **except**
(1) Acellular basement substance present in between the cellular layer of alveoli and capillaries
(2) Thin squamous epithelium of alveoli
(3) Cellular basement substance present in between the lining of alveoli and capillaries
(4) The endothelium of alveolar capillaries

178. Select the incorrect statement.
(1) In fishes, oxygenated blood do not pass through chambers of the heart.
(2) In amphibians, ventricle pumps out mixed blood.
(3) There is complete double circulation present in all reptiles.
(4) There is no mixing of oxygenated and deoxygenated blood in ventricles of mammals.

179. The partial pressure of CO_2 in alveoli and O_2 in tissues of humans is equal to partial pressure of
(1) O_2 in deoxygenated blood
(2) O_2 in oxygenated blood
(3) CO_2 in tissues
(4) O_2 in atmospheric air

180. The factors such as high pO_2, low pCO_2, lesser H^+ concentration and lower temperature are all favourable for the formation of
(1) Bicarbonates
(2) Carboxyhaemoglobin
(3) Carbamino-haemoglobin
(4) Oxyhaemoglobin

Space for Rough Work

181. Receptors which recognize changes in CO_2 and H^+ concentration in blood and accordingly send necessary signals to the respiratory rhythm centre are associated with
(1) Lungs (2) Pulmonary artery
(3) Carotid artery (4) Pulmonary vein

182. Each haemoglobin molecule can carry a maximum of how many molecules of oxygen?
(1) Four (2) Eight
(3) Two (4) Six

183. Match column I with column II.

	Column I		Column II
a.	TV	(i)	1100 to 1200 mL
b.	IRV	(ii)	1000 to 1100 mL
c.	ERV	(iii)	Approx. 500 mL
d.	RV	(iv)	2500 to 3000 mL

Select the **correct** option w.r.t. a healthy human under normal physiological conditions.

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

184. Correct route of passage of air in human respiratory tract is
(1) Nasal chamber $\rightarrow$ Larynx $\rightarrow$ Trachea $\rightarrow$ Pharynx $\rightarrow$ Bronchi
(2) Nasal chamber $\rightarrow$ Trachea $\rightarrow$ Pharynx $\rightarrow$ Larynx $\rightarrow$ Bronchi
(3) Nasal chamber $\rightarrow$ Larynx $\rightarrow$ Pharynx $\rightarrow$ Trachea $\rightarrow$ Bronchi
(4) Nasal chamber $\rightarrow$ Pharynx $\rightarrow$ Larynx $\rightarrow$ Trachea $\rightarrow$ Bronchi

185. Read the following statements and choose the **correct** option.
Statement A: Thoracic chamber is anatomically an air-tight chamber.
Statement B: We can alter pulmonary volume directly, without causing any change in the thoracic volume.
(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

SECTION - B

186. Which of the following blood vessels has thickest tunica media?
(1) Capillary (2) Aorta
(3) Hepatic vein (4) Hepatic portal vein

187. Arrange the following steps of respiration in humans in **correct** order.
(a) Diffusion of gases across alveolar membrane
(b) Pulmonary ventilation
(c) Diffusion of O_2 and CO_2 between blood and tissues
(d) Utilisation of O_2 by the cells for catabolic reactions
(e) Transport of gases by the blood
Select the correct option.
(1) b $\rightarrow$ a $\rightarrow$ e $\rightarrow$ c $\rightarrow$ d (2) b $\rightarrow$ d $\rightarrow$ a $\rightarrow$ c $\rightarrow$ e
(3) a $\rightarrow$ b $\rightarrow$ c $\rightarrow$ e $\rightarrow$ d (4) e $\rightarrow$ d $\rightarrow$ c $\rightarrow$ a $\rightarrow$ b

188. Select the **incorrect** match w.r.t. features of formed elements present in humans under normal physiological conditions.
(1) RBCs – Average life span of 120 days
(2) Haemoglobin – 12-16 gms/100 mL of blood
(3) WBCs – Averages 600-800 mm^{-3} of blood
(4) Platelets – Involved in coagulation of blood

Space for Rough Work

189. How many of the following components given in the box below are present in lymph?

Lymphocytes, Nutrients, RBCs, Hormones, Fats

Select the correct option.

(1) Two (2) Five
(3) Three (4) Four

190. Hepatic portal system in humans exist between
(1) Liver and heart
(2) Liver and intestine
(3) Kidney and lower limbs
(4) Hypothalamus and adenohypophysis

191. In a healthy adult man, which of the following remains unchanged during strenuous exercise?
(1) Stroke volume
(2) Cardiac output
(3) Sequence of events in a cardiac cycle
(4) Duration of cardiac cycle

192. In normal ECG, QRS complex represents depolarisation of ventricles which initiates the
(1) Ventricular diastole
(2) Ventricular systole
(3) Filling of ventricles
(4) Atrial systole

193. How many double circulations are approximately completed by an adult human heart per minute?
(1) 8 (2) 72
(3) 36 (4) 16

194. Which of the following is an allergic disease characterised by difficulty in breathing causing wheezing due to inflammation of bronchi and bronchioles?
(1) Emphysema (2) Bronchitis
(3) Asthma (4) Pneumonia

195. Select the structure among the following that does **not** participate in gaseous exchange but possesses 'C' shaped cartilaginous rings.
(1) Alveolus
(2) Terminal bronchiole
(3) Alveolar duct
(4) Tertiary bronchus

196. The carbon dioxide is transported as carbamino-haemoglobin
(1) With the help of WBCs present in blood
(2) With the help of RBCs present in blood
(3) In dissolved form in oxygenated blood
(4) In dissolved form in deoxygenated blood

197. Enzyme carbonic anhydrase causes dissociation of H_2CO_3 into H^+ and HCO_3^- into blood
(1) At alveolar level
(2) At tissue level
(3) Present mainly in pulmonary vein
(4) Present mainly in pulmonary artery

198. Trachea in man is a straight tube which divides at the level of
(1) 5^{th} thoracic vertebra
(2) 7^{th} thoracic vertebra
(3) 12^{th} thoracic vertebra
(4) 5^{th} cervical vertebra

199. Thoracic chamber is formed ventrally by ___X___ and dorsally by ___Y___. Choose the option that fills the blanks correctly.

	X	Y
(1)	Vertebral column	Sternum
(2)	Inter-costal muscles	Diaphragm
(3)	Sternum	Vertebral column
(4)	Diaphragm	Backbone

Space for Rough Work

200. Activity of AV node allows the atria to empty completely before the ventricles contract. How does it facilitate this function?
(1) Impulses travel faster at AV node than SAN
(2) Impulses are delayed for about 0.1 second before spreading to the heart apex
(3) Impulses are originated from AV node non-rhythmically
(4) Impulses are promoted at AV node and there is increment in the strength of contraction of the atria

❑ ❑ ❑

Scan the QR Code for Detailed Video Solutions
(*Video will be available to access post 8 p.m. on 29th March, 2024 onwards)

Coping Mechanism for Stress Tips from our NEET Toppers

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Space for Rough Work

29/03/2024

Phase-I
CODE-B

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FINAL TEST SERIES for NEET-2024

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

Answers

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

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

Answers and Solutions

PHYSICS

SECTION - A

1. Answer (2)

Point *B* is elastic limit

2. Answer (4)

Let *V* is volume of body and ρ is density of oil.

For equilibrium in water

$$Vdg = \frac{60}{100}V \times \rho_w \times g \text{ ... (i)}$$

For equilibrium in oil

$$Vdg = \frac{40}{100}V \times \rho \times g \quad \text{... (ii)}$$

Equate (i) and (ii)

$$\frac{60}{100}V \times \rho_w \times g = \frac{40}{100}V \times \rho \times g$$

$$\frac{\rho}{\rho_w} = \frac{3}{2} = 1.5 \Rightarrow \text{ R.D. = 1.5}$$

3. Answer (1)

$T^2 = kr^3$

$$2\frac{\Delta T}{T} = 3\frac{\Delta r}{r}$$

$$\frac{\Delta T}{T} = \frac{3}{2}\frac{\Delta r}{r}$$

4. Answer (4)

$$Q = mc_{ice}\Delta T + mL + mc_w\Delta T$$

= 10 × 0.5 × 10 + 10 × 80 + 10 × 1 × 20

= 50 + 800 + 200 = 1050 cal

5. Answer (1)

$$\Delta L = \frac{F.L}{AY} \Rightarrow \frac{\Delta L_1}{\Delta L_2} = \frac{L_1}{L_2} \times \frac{A_2}{A_1}$$

$$\frac{\Delta L_1}{\Delta L_2} = \frac{2L}{L} \times \left(\frac{R}{2R}\right)^2$$

$$= 2 \times \frac{1}{4} = \frac{1}{2}$$

6. Answer (2)

$$\theta = \frac{30° + 40° + 10° + 0°}{4} = 20°\text{C}$$

7. Answer (3)

Height of liquid level will be maximum in vessel *C* so the pressure at the base due to liquid will be maximum in vessel '*C*'.

As the base area of all three vessels is same, the maximum force on the base will be maximum for vessel '*C*'.

8. Answer (2)

$$\Delta L = \frac{FL}{AY} = L\alpha\theta$$

$$\Rightarrow \frac{F}{A} = Y\alpha\theta$$

9. Answer (1)

If a particle is fired from centre of Earth

$$\frac{-3GMM}{2R} + \frac{1}{2}mv^2 = 0$$

$$v = \sqrt{\frac{3GM}{R}} = \sqrt{\frac{3}{2}\frac{2GM}{R}} = \sqrt{\frac{3}{2}}\,v_e$$

10. Answer (4)

From conservation of energy

$U_i + K_i = U_f + K_f$

$$\frac{-GMm}{R} + \frac{1}{2}mv^2 = \frac{-GMm}{(R+h)}$$

$$\Rightarrow \quad \frac{-GMm}{R} + \frac{1}{2} \times \frac{2GMm}{16 \times R} = \frac{-GMm}{R+h}$$

$$\Rightarrow \quad \frac{1}{R+h} = \frac{15}{16R}$$

$$h = \frac{R}{15}$$

11. Answer (1)

$$V = -\frac{GM}{R}$$

On decreasing R gravitational potential V decreases

12. Answer (3)

$$U_i = -\frac{GMm}{6R}$$

$$U_f = -\frac{GMm}{8R}$$

$W = U_f - U_i$

$$= \frac{-GMm}{8R} + \frac{GMm}{6R}$$

$$= \frac{-3GMm + 4GMm}{24R}$$

$$= \frac{GMm}{24R}$$

13. Answer (3)

$$V_1 = \frac{m}{2\rho}$$

$$V_2 = \frac{m}{4\rho}$$

$$V_1 + V_2 = \frac{2m}{\rho_{mix}}$$

$$\frac{m}{2\rho} + \frac{m}{4\rho} = \frac{2m}{\rho_{mix}}$$

$$\frac{2+1}{4\rho} = \frac{2}{\rho_{mix}}$$

$$\rho_{mix} = \frac{8\rho}{3}$$

14. Answer (3)

Force exerted on the side $= \frac{\rho gh}{2} A_1$

Force exerted on the bottom = ρghA_2

$$\rho ghd^2 = \frac{\rho gh \; h \cdot d}{2d}$$

$$h = 2d$$

15. Answer (1)

$$Y = \frac{FL}{A\Delta L}$$

$$F = \frac{YA}{L}\Delta L$$

Hence, $K = \frac{YA}{L}$

16. Answer (4)

Heat gained = Heat lost

$mC\theta = m_1 L$

$$m_1 = \frac{mC\theta}{L}$$

17. Answer (2)

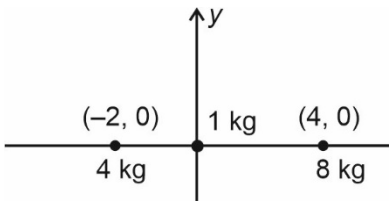
$$F = \frac{GM_1M_2}{d^2}$$

$$F_1 = \frac{GM_1M_2}{\left(d + \frac{d}{2}\right)^2}$$

$$= \frac{4GM_1M_2}{9d^2}$$

$$= \frac{4}{9}F$$

18. Answer (3)



$$\left|\vec{F}_{net}\right| = \left|\frac{4G}{(2)^2} - \frac{8G}{(4)^2}\right|$$

$$= \left|G - \frac{G}{2}\right|$$

$$= \frac{G}{2}$$

19. Answer (2)

$$g = \frac{GM}{R^2}$$

$$\frac{g_e}{g_m} = \frac{M_e}{M_m} \times \frac{R_m^2}{R_e^2}$$

$$4 = \frac{M_e}{M_m} \times \left(\frac{1}{5}\right)^2$$

$$\frac{M_e}{M_m} = 80 : 1$$

20. Answer (1)

$$T = 2\pi\sqrt{\frac{R^3}{GM}}$$

$$T = 2\pi\sqrt{\frac{R^2}{GM} \times R}$$

$$T = 2\pi\sqrt{\frac{R}{g}}$$

21. Answer (4)

G is the universal constant.

22. Answer (2)

The dimensional formula of water equivalent is $[M^1L^0T^0]$

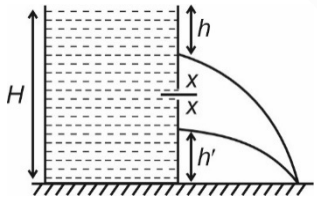
23. Answer (1)

$W = S\Delta A$

$= 4 \times 10^{-2} \times 4\pi\,(10)^2 \times 10^{-4} \times 2$

$= 16\pi \times 10^{-4}\ \text{J} \times 2 = 3.2\pi\ \text{mJ}$

24. Answer (4)



$$\sqrt{\frac{2h'}{g}} \quad \sqrt{2g(H-h')}$$

$$= \sqrt{\frac{2(H-h)}{g}} \quad \sqrt{2gh}$$

$$h' = h \Rightarrow \frac{h'}{h} = 1$$

25. Answer (4)

Water fills the tube entirely in gravity free condition.

26. Answer (3)

Speed of the body initially increases and then attained a constant value.

27. Answer (2)

According to the question,

$\Delta L_1 = \Delta L_2$

As we know, $\alpha = \frac{\Delta L}{L\Delta\theta}$

$$L_1\alpha_1\Delta\theta = L_2\alpha_2\Delta\theta$$

$$\frac{L_1}{L_2} = \frac{\alpha_2}{\alpha_1}$$

28. Answer (2)

Due to surface tension shape of small liquid drop is spherical and pressure inside the drop is greater than outside.

29. Answer (4)

Potential energy $U = \frac{-GMm}{r}$

Total energy $E = \frac{-GMm}{2r}$

$$= \frac{U}{2}$$

30. Answer (2)

Assuming the temperature of surrounding be t°C

Case-I

$$\frac{(60-50)}{4\ \text{min}} = k(55-t) \ldots(1)$$

Again, Case-II

$$\frac{(40-30)}{8\ \text{min}} = k(35-t) \ldots(2)$$

$$\frac{(1)}{(2)} = \frac{\frac{10}{4}}{\frac{10}{8}} = \frac{(55-t)}{(35-t)}$$

$\Rightarrow$ $2(35 - t) = 55 - t$

$\Rightarrow$ $70 - 2t = 55 - t$

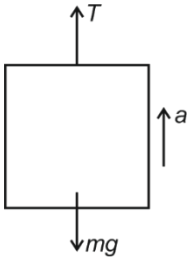
$\Rightarrow$ $t = 15^\circ$C

31. Answer (4)

$T^2 \propto R^3$

$$\Rightarrow \frac{T_A}{T_B} = \left(\frac{R_A}{R_B}\right)^{3/2} = \left(\frac{4}{1}\right)^{3/2} = 8$$

32. Answer (3)



$T = m(g + a)$

$\frac{T}{A}$ = maximum stress

$$2\times10^6 = \frac{m(g+a)}{\pi\left(\frac{0.1}{2}\right)^2}$$

$$\frac{2\times10^6\times\pi\times\left(\frac{0.1}{2}\right)^2}{1000} - 10 = a$$

$a = 5.7$ m/s^2

33. Answer (2)

$$\frac{\Delta A}{\Delta t} = \text{constant}$$

$$\Rightarrow \frac{A_1}{3} = \frac{A_2}{6} = \frac{A_3}{2}$$

$\Rightarrow 2A_1 = A_2 = 3A_3$

34. Answer (1)

$$v = \sqrt{\frac{GM}{R}}$$

$$T = \frac{2\pi R}{v} = \frac{2\pi}{\sqrt{GM}}R^{3/2}$$

35. Answer (3)

Time required to emptied the tank, $t = \frac{A}{A_0}\sqrt{\frac{2H}{g}}$

$$\therefore \frac{t_2}{t_1} = \sqrt{\frac{H_2}{H_1}} = \sqrt{\frac{4h}{h}} = 2 \therefore t_2 = 2t$$

SECTION - B

36. Answer (4)

$$\frac{T°\text{C} - \text{Ice point}}{\text{Steam Point} - \text{ice point}} = \frac{F-32}{180}$$

$$\frac{52-5}{99-5} = \frac{F-32}{180}$$

$$\frac{47}{94} = \frac{F-32}{180}$$

$$\frac{1}{2} = \frac{F-32}{180}$$

$F = 122°$F

37. Answer (2)

Inside the water

Weight = Upthrust

$\therefore$ Apparent weight = 0

38. Answer (1)

Water is more elastic than air and air is more compressible than water.

39. Answer (1)

$$\frac{dv}{dt} = Av$$

$100 \times 10^{-6} = 0.1v$

$$v = \frac{100\times10^{-6}}{1\times10^{-1}}$$

$v = 10^{-3}$

= 1 mm/s

40. Answer (3)

Applying equation of continuity

$$2Av_1 = \frac{A}{2}v_2 + Av$$

$2 \times 4 = 1 + v$

$v = 7$ m/s

41. Answer (2)

Rate of heat emission

$$\frac{dQ}{dt} = \sigma AT^4$$

$$\frac{\left(\frac{dQ}{dt}\right)_1}{\left(\frac{dQ}{dt}\right)_2} = \frac{e_1}{e_2}\times\frac{A_1}{A_2}\times\frac{T_1^4}{T_2^4}$$

$$= \frac{1}{4}\times\frac{2^4}{1}$$

= 4 : 1

42. Answer (4)

When a substance changes from one state to another then energy may be absorbed or released but temperature remains same.

43. Answer (2)

$$v = \sqrt{2gy}$$

44. Answer (4)

Smaller bubble will have air at higher pressure in comparison to larger bubble and thus air will flow from it to larger bubble.

45. Answer (1)

$$h = \frac{2T\cos\theta}{fgr}$$

If angle of contact is zero, meniscus will be flat.

Angle of contact will be obtuse for mercury glass pair and meniscus will be downward concave.

46. Answer (4)

Heat flowing through AB should be equal to heat passing from CD

$H_1 = H_2$

$$\frac{K_1A_1\Delta T_1}{l_1} = \frac{K_2A_2\Delta T_2}{l_2}$$

$$\frac{2KA(100-T)}{d} = \frac{KA(T-0)}{2d}$$

$4(100 - T) = T$

$400 = 5T$

$T = 80$

Hence the temperature of the junction *EF* is 80ºC.

47. Answer (4)

$T^2 \propto R^3$

$$\frac{R_1}{R_2} = \left(\frac{T_1}{T_2}\right)^{2/3}$$

$$= \left(\frac{4}{32}\right)^{2/3} = \left(\frac{1}{8}\right)^{2/3} = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

48. Answer (1)

From the Bernoulli's theorem

$$P_1 - P_2 = \frac{1}{2}\rho(v_2^2 - v_1^2) = \frac{1}{2}\times 1.3 \times [(120)^2 - (90)^2]$$

= 4095 N/m^2

49. Answer (3)

$$\frac{1}{K} = \left|\frac{\frac{\Delta P}{\Delta V}}{V}\right|$$

$$\Rightarrow \frac{1}{4\times 10^{-8}} = \frac{2\times 10^6}{\Delta V}\times 2\times 10^{-3}$$

$\Delta V = 4 \times 10^{-8} \times 2 \times 10^6 \times 2 \times 10^{-3}$

$= 1.6 \times 10^{-4}$ m^3

= 160 cc

50. Answer (4)

Assume temperature in equilibrium is θ

Heat lost = Heat gain

$4 \times 1[80 - \theta] = 20 \times 1 (\theta - 30)$

$80 - \theta = 5\theta - 150$

$6\theta = 230$

$$\theta = \frac{230}{6} = 38.3^\circ C$$

CHEMISTRY

SECTION - A

51. Answer (3)

$$\overset{-4+1}{CH_4}(g) + 4\overset{0}{Cl_2}(g) \longrightarrow \overset{+4-1}{CCl_4}(l) + 4\overset{+1\ -1}{HCl}(g)$$

52. Answer (4)

	NaOH	+ HCN	⟶	NaCN	+ H_2O
(i)	4 mmol	6 mmol		0	
(f)	0	2 mmol		4 mmol	

Since final mixture contains weak acid (HCN) and its salt (NaCN) with strong base, so it will act as an acidic buffer.

53. Answer (2)

Endothermic reactions move forward on increasing the temperature.

54. Answer (1)

Due to common ion effect the solubility of AgCl is minimum in 0.02 M NaCl.

55. Answer (3)

K_{eq} only changes with reaction temperature.

56. Answer (3)

NaCl solution is only diluting the acidic solution and does not produce any H^+ ions.

$$[H^+]_2 = [H^+]_1 \times \frac{10}{1000} = 10^{-6}$$

$\therefore$ pH = – log (10^{-6}) = 6

57. Answer (4)

Initial pH = 2, $[H^+] = 10^{-2}$

Final pH = 6.0, $[H^+] = 10^{-6}$

Hence, $[H^+]$ reduced by a factor of 10^{-4}

So, acidic character decreases by a factor of 10^4

58. Answer (3)

B has empty *p*-orbital in BI_3, hence can act as Lewis acid

59. Answer (4)

If $K_c > 10^3$, products predominate over reactants *i.e.* if K_c is very large, the reaction proceeds nearly to completion.

60. Answer (1)

In case of basic buffer

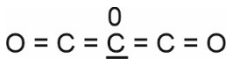
$$pOH = pK_b + \log\frac{[NH_4Cl]}{[NH_4OH]}$$

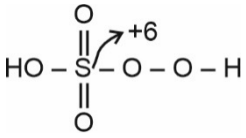
pOH = 14 – pH

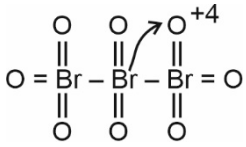
$$5 = pK_b + \log\frac{0.1}{0.1}$$

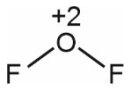
$pK_b = 5$

61. Answer (1)

C_3O_2 

H_2SO_5 

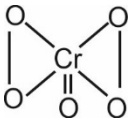
Br_3O_8 

OF_2 

62. Answer (2)

In pyrosilicates, one oxygen atom is shared between two SiO_4^{4-} tetrahedron.

63. Answer (3)



64. Answer (1)

$$3B_2H_6 + 6NH_3 \longrightarrow 3[BH_2(NH_3)_2]^+[BH_4]^- \xrightarrow{\text{Heat}} 2B_3N_3H_6 + 12H_2$$

65. Answer (3)

$$3B_2H_6 + 6NH_3 \rightarrow 3[BH_2(NH_3)_2]^+[BH_4]^- \xrightarrow{\Delta} 2B_3N_3H_6 + 12H_2$$

66. Answer (3)

In acidic medium

$$2MnO_4^- + 10I^- + 16H^+ \rightarrow 2Mn^{2+} + 8H_2O + 5I_2$$

10 mole I^- required = 2 mole MnO_4^-

0.1 mole I^- required = $\frac{2}{10} \times 0.1$ = 0.02 mole MnO_4^-

In neutral medium

$$2MnO_4^- + H_2O + I^- \rightarrow 2MnO_2 + 2OH^- + IO_3^-$$

1 mole I^- required = 2 mole MnO_4^-

0.1 mole I^- required = $\frac{2}{1} \times 0.1$ = 0.2 mole MnO_4^-

$\Rightarrow$ 0.02 : 0.2

$\Rightarrow$ 1 : 10

67. Answer (3)

In a disproportionation reaction an element in one oxidation state is simultaneously oxidised and reduced.

$$\overset{0}{P_4}(s) + 3OH^-(aq) + 3H_2O(l) \rightarrow \overset{-3}{PH_3}(g) + H_2\overset{+1}{P}O_2^-(aq)$$

$$\overset{0}{Cl_2}(g) + 2OH^-(aq) \rightarrow \overset{+1}{Cl}O^-(aq) + \overset{-1}{Cl}^-(aq) + H_2O(l)$$

68. Delete

The correct order of density in group 14 element is Si < C < Ge < Sn < Pb

69. Answer (1)

- Buckminsterfullerene contains twenty six-membered rings and twelve five- membered rings.
- All the carbon atoms are equal and they undergo sp^2 hybridisation.

70. Answer (3)

The species will be good reducing agent whose oxidation potential is high.

Redox couple	E°/V
Pb^{2+}/Pb	–0.13 V
Mg^{2+}/Mg	–2.36 V
Zn^{2+}/Zn	–0.76 V

$\therefore$ Correct order of reducing power, Mg > Zn > Pb

71. Answer (1)

For the reaction,

$$NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$$

Since there is no change in oxidation number.

72. Answer (1)

Addition of inert gas at constant volume does not change the partial pressure or the molar concentrations of the substance involved in the reaction.

73. Answer (2)

For salt of weak acid and strong base

$$pH = \frac{1}{2}[pK_w + pK_a + \log C]$$

0.01 M $(CH_3COO)_2$ Ca solution

$$pH = \frac{1}{2}[14 + 4.74 + \log 10^{-2}]$$

$$= \frac{1}{2}[18.14 - 2]$$

$$= \frac{1}{2} \times 16.74 = 8.37$$

74. Answer (4)

$\Delta G° = -RT \ln K$

$\Delta G° = -8.314\ JK^{-1}\ mol^{-1} \times 300\ K \times 2.303 \times \log(2 \times 10^{13})$

$\Delta G° = -7.64 \times 10^4\ J\ mol^{-1}$

$= -76.4\ kJ\ mol^{-1}$

75. Answer (1)

Lead does not show catenation.

Catenation : C >> Si > Ge $\simeq$ Sn

76. Answer (4)

The species like, SiF_6^{2-}, $[GeCl_6]^{2-}$ and $[Sn(OH)_6]^{2-}$ exist where the hybridisation of central atom is sp^3d^2.

77. Answer (1)

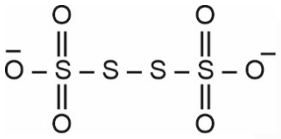
Silicones are hydrophobic in nature.

78. Answer (1)

- Lead is unaffected by water, probably because of a protective oxide film formation.

79. Answer (1)

The correct structure of tetrathionate ions is



80. Answer (1)

$$\underset{P}{2x_2y(g)} \rightleftharpoons \underset{O}{2x_2(g)} + \underset{O}{y_2(g)}$$

$$P - \frac{2P}{5} \qquad \frac{2P}{5} \qquad \frac{P}{5}$$

$$K_P = \frac{\left(\frac{2P}{5}\right)^2\left(\frac{P}{5}\right)}{\left(\frac{3P}{5}\right)^2}$$

$$= \frac{\frac{4P^2}{25} \times \frac{P}{5}}{\frac{9P^2}{25}}$$

$$K_P = \frac{4P}{45}$$

$$P = \frac{45}{4}K_P$$

Total pressure at equilibrium = $P - \frac{2P}{5} + \frac{2P}{5} + \frac{P}{5}$

$\Rightarrow \quad P + \frac{P}{5} = \frac{6P}{5}$

$= \frac{6}{5} \times \frac{45}{4}K_P$

Total pressure at equilibrium = $\frac{27}{2}K_P$

81. Answer (2)

A catalyst does not alter the equilibrium constant of a reaction.

82. Answer (1)

F_2 does not show any positive oxidation state, that's why F_2 does not undergo disproportionation reaction.

83. Answer (4)

$2HNO_3 + 3H_2S \longrightarrow 2NO + 3S + 4H_2O$

84. Answer (1)

$E^o_{cell} = E^o_{cathode} - E^o_{anode}$

$E^o_{cell} = 0.8 - (-0.76) = 1.56\ V$

85. Answer (1)

NH_4NO_3 is composed of NH_4^+ and NO_3^-, N have –3 and +5 oxidation states respectively.

SECTION - B

86. Answer (1)

ZSM-5 used to convert alcohols directly into gasoline.

87. Answer (3)

HCl is a strong acid and NaCl is a salt of strong acid and strong base. Therefore, mixture of NaCl and HCl is not a buffer.

88. Answer (3)

- Exothermic reaction is favoured by low temperature.
- Increase in pressure shift equilibrium towards lesser number of gaseous moles.

89. Answer (4)

Let the volume of each solution be 1 L.

$$\underset{(NaOH)}{M_1V_1} - \underset{(HCl)}{M_2V_2} = M_3V_3$$

$$\frac{0.2 \times L - 0.1 \times L}{2\ L} = M_3$$

$$\frac{0.2 - 0.1}{2} = M_3$$

$\frac{0.1}{2} = M_3$

$0.05 = M_3 = [NaOH]_{left}$

$\therefore \quad [OH^-] = 0.05\ M$

$[OH^-] = 5 \times 10^{-2}$

$pOH = -\log(5 \times 10^{-2})$

$= 2 - \log 5$

$= 1.3$

$pH = 14 - 1.3$

$= 12.7$

90. Answer (1)

- Boric acid is a monobasic, Lewis acid.

$B(OH)_3 + 2H_2O \rightarrow [B(OH)_4]^- + H_3O^+$

- $H_3BO_3 \xrightarrow{\Delta} HBO_2 \xrightarrow{\Delta} B_2O_3$

91. Answer (3)

$A + 2B \rightleftharpoons 2C,\ K_1 = 4 \times 10^4$ ...(1)

On reversing eq. (1) and divide by 2

$C \rightleftharpoons \frac{1}{2}A + B$ ...(2)

$K_1' = \left(\frac{1}{4 \times 10^4}\right)^{1/2}$

$= \frac{1}{2 \times 10^2}$

$2D \rightleftharpoons E,\ K_2 = 3 \times 10^4$

$C + 2D \rightleftharpoons \frac{1}{2}A + B + E$

$K_{net} = \frac{3 \times 10^4}{2 \times 10^2} = 1.5 \times 10^2$

92. Answer (4)

H_2CO_3 can act as bronsted acid only.

93. Answer (4)

$Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \longrightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$

94. Answer (2)

$Ni(OH)_2(s) \rightleftharpoons \underset{s}{Ni^{2+}}(aq.) + \underset{2s}{2OH^-}(aq.)$

$K_{sp} = (s)^1 (2s)^2 = 4s^3$

$s^3 = \frac{2 \times 10^{-15}}{4} = 500 \times 10^{-18}$

$s = 7.94 \times 10^{-6}\ M$

95. Answer (4)

EN of Si, Ge and Sn is 1.8.

SnO and PbO are amphoteric in nature.

96. Answer (1)

Due to the absence of vacant *d*-orbitals in carbon, the central atom cannot accommodate the lone pair of electrons from oxygen atom of water molecule.

97. Answer (4)

$CoO + \text{Glassy bead} \longrightarrow \underset{\text{(Blue bead)}}{Co(BO_2)_2}$

98. Answer (2)

CO_2, SiO_2, GeO_2 are acidic, SnO_2 is amphoteric.

99. Answer (3)

	(Silicate)	(Formula)
(i)	Orthosilicate	SiO_4^{4-}
(ii)	Pyrosilicate	$Si_2O_7^{6-}$
(iii)	Chain Silicate	$(SiO_3)_n^{2n-}$
(iv)	Sheet Silicate	$(Si_2O_5)_n^{2n-}$

100. Answer (3)

Bond	Bond enthalpy/kJ mol^{-1}
C – C	348
Si – Si	297
Ge – Ge	260
Sn – Sn	240

BOTANY

SECTION - A

101. Answer (3)

In human beings, the membrane of the erythrocyte (RBC) has approximately 52% protein and 40%. lipids.

102. Answer (3)

Neutral solute may move across the membrane by the process of simple diffusion.

It is mainly composed of lipids and proteins.

Water may move across the plasma membrane from higher to lower concentration. Movement of water by diffusion is called osmosis.

103. Answer (1)

One of the function of smooth endoplasmic reticulum (SER) is detoxification of drugs.

104. Answer (2)

Interphase, though called the resting phase, is the time during which the cell is preparing for division by undergoing both cell growth and DNA replication in an orderly manner.

105. Answer (2)

Each cell in G_1 phase, after S phase and after M phase will have 16 chromosomes.

106. Answer (1)

In animal cells, during the S phase, DNA replication begins in the nucleus, and the centriole duplicates in the cytoplasm.

107. Answer (3)

Golgi apparatus in plant cells are called dictyosomes. Proteins are modified in cisternae of Golgi.

108. Answer (4)

Acrosome of the sperm is modified Golgi apparatus.

109. Answer (2)

Mitochondria and chloroplasts have 70S ribosome.

110. Answer (2)

In some organisms karyokinesis is not followed by cytokinesis as a result of which multinucleate condition arises leading to the formation of syncytium.

111. Answer (4)

In oocytes of some vertebrates, diplotene can last for months or years.

In metaphase-I, the bivalent chromosomes align on the equatorial plant.

During telophase, chromosomes cluster at pole. Nucleus, Golgi complex and ER reform.

112. Answer (1)

Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G_0). This process occurs at the end of G_1 phase.

113. Answer (4)

Osmotic expansion of cells kept in water is regulated by vacuoles.

114. Answer (2)

Thylakoids are flat membranous sacs in stroma of chloroplast.

Centrioles help in the formation of basal bodies which give rise to cilia and flagella. Chromatin is highly extended and elaborate nucleoprotein fibre.

Cristae are infoldings in mitochondria.

115. Answer (3)

As the polar molecules cannot pass through the nonpolar lipid bilayer, they require a carrier protein of the membrane to facilitate their transport across membrane.

A few ions or molecules are transported across the membrane against their concentration gradient, such transport is an energy dependent process.

116. Answer (2)

The cell wall and middle lamella may be transversed by plasmodesmata which connect the cytoplasm of neighbouring plant cells.

117. Answer (2)

Metaphase is the stage at which morphology of chromosomes is more easily studied.

118. Answer (3)

The two asters together with spindle fibres forms mitotic apparatus.

119. Answer (3)

In plants, the tonoplast facilitates the transport of a number of ions and other materials against concentration gradient into the vacuole, hence their concentration is significantly higher in the vacuole than in the cytoplasm.

120. Answer (1)

The correct sequence of phases of cell cycle is

G_1 (Post-mitotic gap phase) $\rightarrow$ S (DNA synthesis) $\rightarrow$

G_2 (Pre-mitotic gap phase) $\rightarrow$ M (Mitosis)

121. Answer (4)

Centrioles are absent in higher plant cells.

122. Answer (3)

A special membranous structure is the mesosome which is formed by the invagination of the plasma membrane into the cell. Pili are involved in mating process. In some bacteria, fimbriae helps in attaching the bacteria to the substratum. Chromatophores (membranous extensions) contain pigments

123. Answer (2)

Rudolf Virchow explained that new cells are formed from pre-existing cells.

124. Answer (3)

Cytokinesis is achieved by the formation of a furrow, which moves centripetally in animal cell and divides the cell into two halves.

125. Answer (3)

Quiescent stage is also known as G_0 phase.

126. Answer (4)

Crossing over is exchange of genetic material between the non-sister chromatids of homologous chromosomes and it occurs during pachytene stage. Crossing over involves activity of recombinase enzyme.

127. Answer (2)

In acrocentric chromosome, the centromere is situated close to its end forming one extremely short and one very long arm.

128. Answer (1)

Maturing face is concave or trans face. Cis face is convex and receives vesicles from ER.

129. Answer (4)

Cytoskeleton in a cell is involved in many functions such as mechanical support, motility, maintenance of the shape of the cell.

130. Answer (4)

Cilia work as oars.

131. Answer (2)

Pollen is haploid and pollen mother cell is diploid.

$$\underset{24\text{ pg}}{G_1} \rightarrow \underset{48\text{ pg}}{S} \rightarrow \underset{48\text{ pg}}{G_2} \rightarrow \underset{24\text{ pg}}{MI} \rightarrow \underset{12\text{ pg}}{MII}$$

132. Answer (4)

Pollen (metacentric) chromosome appears V – shaped during anaphase.

133. Answer (2)

Lipids of plasma membrane contain polar heads towards the outer sides and non-polar tails towards inner sides.

134. Answer (2)

Plasmid DNA confers unique phenotypic character to bacteria. One such character is resistance to antibiotics.

135. Answer (3)

Prokaryotes have nucleoid. *Volvox*, *Chlamydomonas* and yeast are eukaryotic organisms.

In *Anabaena*, no nuclear membrane is present.

SECTION - B

136. Answer (4)

Centrioles are made up of nine evenly spaced peripheral fibrils of tubulin protein.

The matrix of mitochondria contains components for protein synthesis.

137. Answer (4)

The ribosomes of the chloroplasts are 70S ribosomes consist of 30S smaller subunit and 50S larger subunit.

138. Answer (4)

By the end of diakinesis nucleolus disappear and nuclear envelope also breaks down.

139. Answer (2)

Four haploid cells are formed at the end of meiosis II.

140. Answer (3)

G_1 to S transition is carried out by G_1 cyclin + cdc2 kinase.

141. Answer (2)

The Golgi derived vesicles take part in formation of cell plate.

142. Answer (2)

At the end of prophase, Golgi complex, ER, nucleolus and nuclear envelope disappear.

143. Answer (1)

Prophase I is divided into five sub phases.

The longest phase of reduction division is prophase I.

144. Answer (1)

Several ribosomes when attach to a single mRNA and form a chain then it is called polyribosomes or polysome.

145. Answer (3)

In metaphase, spindle fibres attach to kinetochores.

146. Answer (3)

Mesosomes are infoldings of plasma membrane present in some bacteria. They are involved in respiration as they contain respiratory enzymes.

147. Answer (3)

Nucleosome are composed of DNA and proteins.

148. Answer (1)

Golgi complex is involved in modification of proteins and lipids.

149. Answer (4)

In the given figure:

P $\rightarrow$ G_2 phase

X $\rightarrow$ Metaphase

Y $\rightarrow$ Telophase

B $\rightarrow$ Cytokinesis

150. Answer (1)

Chromosomes form two parallel plates in metaphase I and one plate in metaphase II.

ZOOLOGY

SECTION - A

151. Answer (3)

Destruction of RBCs occur in spleen, so spleen is called 'graveyard' of RBCs. Also, it is one of the secondary lymphoid organ in humans.

152. Answer (3)

Platelets are also known as thrombocytes, formed within red bone marrow from megakaryocytes.

153. Answer (1)

Semilunar valves remain open during ventricular contraction, so that blood from right and left ventricle flow into pulmonary artery and aorta respectively.

154. Answer (2)

During swallowing, glottis can be covered by epiglottis to prevent the entry of food into the larynx.

155. Answer (1)

A unique vascular connection exists between the digestive tract and liver called hepatic portal system. The hepatic portal vein carries blood from intestine to the liver before it is delivered to the systemic circulation.

Hypophyseal and hepatic portal system are present in humans.

156. Answer (3)

Total Lung Capacity (TLC) is total volume of air accommodated in the lungs at the end of a forced inspiration. It includes RV, ERV, TV and IRV.

157. Answer (2)

Every 100 mL of deoxygenated blood delivers nearly 4 mL of CO_2 to the alveoli.

$\therefore$ 4000 mL of deoxygenated blood delivers nearly 160 mL of CO_2 to the alveoli.

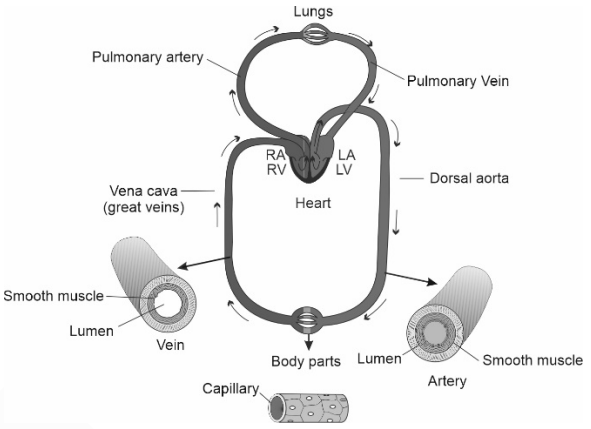
158. Answer (2)

Lower invertebrates like sponges exchange O_2 with CO_2 by simple diffusion over their entire body surface. Earthworms use their moist cuticle for the same. Specialised vascularised structures called gills (branchial respiration) are used by fishes whereas humans use lungs (pulmonary respiration).

159. Answer (4)

Fluids present in between the pleural membranes reduce friction during breathing.

160. Answer (3)



Vena cava and pulmonary artery carry deoxygenated blood whereas pulmonary vein and aorta carry oxygenated blood.

161. Answer (1)

Tricuspid valve is present between right atrium and right ventricle and if the chordae tendineae attached to it gets damaged, it will result in reduced outflow to pulmonary artery as the blood would regurgitate back from right ventricle to right atrium.

162. Answer (2)

The valves present in the blood vessels allow unidirectional flow of blood to prevent backflow of blood.

163. Answer (4)

Human heart is made up of cardiac muscles. A specialised cardiac musculature called the nodal tissue is distributed in the heart and is autoregulated. It means normal activities of the heart are regulated intrinsically. Nodal tissue like SAN and AV node does not require neural signals for stimulation and hence only stops when ATP and O_2 is limited in the cardiac musculature.

164. Answer (3)

SA node has ability to generate electrical impulses. Cardiac muscle cells are electrically coupled through gap junctions (communication junctions), through which impulses from the SA node spread rapidly within the heart tissue.

165. Answer (2)

A healthy man can inspire and expire approximately 6000 to 8000 mL of air per minute. Minute volume of respiration = Tidal volume × Breathing rate.

166. Answer (1)

Sympathetic nervous system (part of ANS) can increase the rate of heart beat, the strength of ventricular contraction and thereby the cardiac output. Parasympathetic neural signals (another components of ANS) decrease the rate of heart beat, speed of conduction of action potential and thereby the cardiac output. Hence, when a person starts running in a park, sympathetic nervous system gets activated and when he relaxes by sitting down parasympathetic neural system gets activated.

167. Answer (4)

The pulmonary circulation starts by the pumping of deoxygenated blood by the right ventricle which is carried *via* pulmonary artery to the lungs, where it is oxygenated and returned to the left atrium *via* pulmonary vein.

168. Answer (1)

Annelids and chordates have a closed circulatory system in which the blood pumped by the heart, is always circulated through a closed network of blood vessels. This pattern is considered to be more advantageous as the flow of blood can be more precisely regulated.

169. Answer (2)

Serum is plasma without clotting factors. Lymph is a colourless fluid having specialised lymphocytes which are responsible for the immune responses of the body. Blood is a red colour liquid having clotting factors. Plasma is straw coloured viscous fluid which has clotting factors.

170. Answer (2)

Inspiration is initiated by

(a) The contraction of diaphragm

(b) The contraction of external inter-costal muscles

These results in increase in the volume of thoracic chamber and decreases the intra-pulmonary pressure less than the atmospheric pressure.

171. Answer (2)

Atrial systole increases the flow of blood into the ventricles by about 30%. Rest 70% of ventricles get filled with blood during joint diastole.

172. Answer (4)

Albumins help in osmotic balance but not in blood clotting.

173. Answer (3)

Blood Group	Antigens on RBCs	Antibodies in Plasma	Donor's Group
A	A	Anti-B	A, O
B	B	Anti-A	B, O
AB	A, B	Nil	AB, A, B, O
O	Nil	Anti-A, B	O

In O^+ blood group, Rh antigens are present but in B^- blood group Rh antigens are absent.

174. Answer (3)

The atrium and the ventricle of the same side are separated by a thick fibrous tissue called the atrio-ventricular septum.

175. Answer (2)

Cardiac output = Heart rate × Stroke volume

= 100 × (EDV – ESV)

= 100 × (100 mL – 50 mL)

= 100 × 50 mL

= 5000 mL = 5 L

176. Answer (4)

Factors that affect the rate of diffusion of gases are :

(1) **Solubility and partial pressure of a gas** are directly proportional to the rate of diffusion.

(2) More the **thickness of the membrane**, lesser will be the rate of diffusion of a gas across it.

177. Answer (3)

The diffusion membrane is made up of three major layers namely, the thin squamous epithelium of alveoli, the endothelium of alveolar capillaries and the acellular basement substance present in between them.

178. Answer (3)

In amphibians and reptiles (except crocodiles), there is the presence of incomplete double circulation because the blood gets mixed up in the single ventricle.

179. Answer (1)

Respiratory Gas	Atmospheric Air	Alveoli	Blood (Deoxygenated)	Blood (Oxygenated)	Tissues
pO_2	159	104	40	95	40
pCO_2	0.3	40	45	40	45

180. Answer (4)

In the tissues, where low pO_2, high pCO_2, high H^+ concentration and higher temperature exist, the conditions are favourable for dissociation of oxygen from oxyhaemoglobin.

181. Answer (3)

Receptors associated with aortic arch and carotid artery can recognize changes in CO_2 and H^+ concentration and send necessary signals to the rhythm centre for remedial actions.

182. Answer (1)

Each haemoglobin molecule can carry a maximum of four molecules of O_2.

183. Answer (3)

TV : Volume of air inspired or expired during a normal respiration. It is approx. 500 mL.

IRV: Additional volume of air, a person can inspire by a forcible inspiration. This averages 2500 mL to 3000 mL.

ERV: Additional volume of air, a person can expire by a forcible expiration. This averages 1000 mL to 1100 mL.

RV: Volume of air remaining in the lungs even after a forcible expiration. This averages 1100 mL to 1200 mL.

184. Answer (4)

Correct route of passage of air in human respiratory tract is

Nostrils $\rightarrow$ Nasal chamber $\rightarrow$ Pharynx $\rightarrow$ Larynx $\rightarrow$ Trachea $\rightarrow$ Primary bronchi $\rightarrow$ Secondary bronchi $\rightarrow$ Tertiary bronchi $\rightarrow$ Initial bronchioles $\rightarrow$ Terminal bronchioles $\rightarrow$ Alveoli.

185. Answer (1)

The anatomical set up of lungs in thorax is such that any change in the volume of the thoracic cavity will be reflected in the lung (pulmonary) cavity. Such an arrangement is essential for breathing, as we cannot directly alter the pulmonary volume.

SECTION - B

186. Answer (2)

Tunica media is thickest in arteries in comparison to corresponding veins.

187. Answer (1)

Respiration involves the following steps

(i) Breathing or pulmonary ventilation.

(ii) Diffusion of gases across alveolar membrane.

(iii) Transport of gases by the blood.

(iv) Diffusion of O_2 and CO_2 between blood and tissues.

(v) Utilisation of O_2 by the cells for catabolic reactions and resultant release of CO_2.

188. Answer (3)

Leucocytes are colourless due to lack of haemoglobin. In normal individuals, WBCs averages 6000 to 8000 mm^{-3} of blood.

189. Answer (4)

Lymph is a colourless fluid containing specialised lymphocytes. It is also an important carrier for nutrients, hormones, *etc*.

190. Answer (2)

Hepatic portal system in humans exists between liver and intestine.

191. Answer (3)

Stroke volume and cardiac output increase while duration of cardiac cycle decreases during strenuous exercise.

192. Answer (2)

In a standard ECG, the QRS complex represents the depolarisation of the ventricles which initiates the ventricular contraction (ventricular systole). The contraction starts shortly after Q-wave and marks the beginning of the ventricular systole.

193. Answer (2)

Humans have a complete double circulation, *i.e.*, two circulatory pathways, namely, pulmonary and systemic are present. Average heart rate is 72 beats min^{-1}.

194. Answer (3)

Asthma is an allergic disorder which is characterised by difficulty in breathing with wheezing sound due to inflammation of bronchi and bronchioles.

195. Answer (4)

The part starting with the external nostrils up to the terminal bronchioles constitute the conducting part whereas the alveoli and their ducts form the respiratory or exchange part of the respiratory system.

196. Answer (2)

About 20-25 per cent of CO_2 is carried by haemoglobin as carbamino-haemoglobin whereas 70% of it is carried as bicarbonate. About 7% of CO_2 is carried in a dissolved state through plasma.

197. Answer (2)

At tissue level the following reaction proceeds in the forward direction.

(CA = Carbonic anhydrase)

$$CO_2 + H_2O \overset{CA}{\rightleftharpoons} H_2CO_3 \overset{CA}{\rightleftharpoons} H^+ + HCO_3^-$$

198. Answer (1)

Trachea is a straight tube extending up to mid-thoracic cavity, which divides at the level of 5th thoracic vertebra into a right and left primary bronchi.

199. Answer (3)

Thoracic chamber is formed ventrally by the sternum, dorsally by the vertebral column, laterally by the ribs and on lower side by the dome shaped diaphragm.

200. Answer (2)

The cells of nodal tissue present at lower left corner of the right atrium forms a delay point called AV node. Here, the impulses are delayed for about 0.1 second before spreading to the heart apex. This delay allows the atria to empty completely before the ventricles contract.

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