

Subject	Topic	Mock Test - 03	Date
C + P + B	Complete Syllabus	NEET - CT	17 th May
		N-20250417	2026

Max. Marks: 720

Duration: 3 Hours

- This paper consists of 180 questions with 3 parts of Chemistry, Physics and Biology
 - Chemistry: (Q. No. 1 to 45) Multiple Choice Questions with one correct answer. A correct answer carries 4 Marks. A wrong answer carries a penalty of 1 mark.
 - Physics: (Q. No. 46 to 90) Multiple Choice Questions with one correct answer. A correct answer carries 4 Marks. A wrong answer carries a penalty of 1 mark.
 - Biology: (Q. No. 91 to 180) Multiple Choice Questions with one correct answer. A correct answer carries 4 Marks. A wrong answer carries a penalty of 1 mark.
- The OMR sheet NEET-2026-180Q is to be used
- Use of calculators and log tables is prohibited
- Darken the appropriate bubble using a pen in the OMR sheet provided to you. Once entered, the answer cannot be changed. Any corrections or modifications will automatically draw a penalty of 1 mark
- No clarification will be entertained during the examination. Doubts in the paper can be reported to the coordinator after the exam
- If the details in the OMR Sheet are not filled, If the OMR sheet is mutilated, torn, white Ink used, the circles filled and scratched, then the OMR sheet will not be graded

All the best!!

Useful Data

At. Wt.:

$N = 14; O = 16; H = 1; S = 32; Cl = 35.5; Mn = 55; Na = 23; C = 12; Ag = 108; K = 39; Fe = 56; Pb = 207$

Physical Constants:

$h = 6.626 \times 10^{-34} \text{ Js}, N_a = 6.022 \times 10^{23} \text{ mol}^{-1}, c = 2.998 \times 10^8 \text{ ms}^{-1}, m_e = 9.1 \times 10^{-31} \text{ kg}, R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$

Chemistry

Multiple Choice Questions with one correct answer. A correct answer carries 4 marks. A wrong answer carries a penalty of 1 mark. 45 x 4 = 180

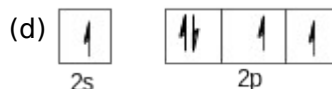
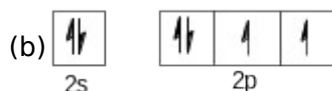
1. How many gram-atoms of hydrogen are present in 8.5 g of NH_3 ?
 (a) 1.5 (b) 0.50 (c) 0.080 (d) none of these

Sol: 17 g of NH_3 has 3 g atoms of hydrogen

\therefore 8.5 g of NH_3 will have 1.5 g atoms of H

Ans: (a)

2. Which of the following violates the Aufbau principle?



Sol: $2p$ cannot be filled before $2s$

Ans: (d)

3. The value of ΔG for the process, $H_2O(s) \rightarrow H_2O(l)$ at 1 atm and 260 K is
 (a) < 0 (b) $= 0$ (c) > 0 (d) unpredictable

Sol: The process of melting of ice is non-spontaneous at 1 atm below 273 K.

Ans: (c)

4. The enthalpy change for a given reaction at 298 K is $-x \text{ J mol}^{-1}$. If the reaction occurs spontaneously at 298 K, the entropy change at that temperature

- (a) Can be negative but numerically larger than $x/298$
 (b) Can be negative but numerically smaller than $x/298$
 (c) Cannot be negative

(d) Cannot be positive

Sol: It is because of the fact that for spontaneity, the value of $\Delta G = (\Delta H - T\Delta S)$ should be < 0 .

If ΔS is $-ve$, the value of $T\Delta S$ shall have to be less than ΔH or the value of ΔS has to be

less than $\frac{\Delta H}{T}$ i.e., $\frac{x}{298}$.

Ans: (b)

5. For the reaction, $PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g)$, the position of equilibrium can be shifted to the right by

(a) doubling the volume

(b) increasing the temperature

(c) addition of Cl_2 at constant volume

(d) addition of equimolar quantities of PCl_3 and PCl_5

Sol: According to Le -Chatelier's principle when concentration of reactant increases, the equilibrium

shifts in favour of forward reaction.

Ans: (c)

6. If pH of a saturated solution of $Ba(OH)_2$ is 12, the value of its K_{sp} is

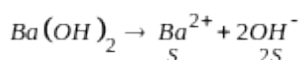
(a) $4.00 \times 10^{-6} M^3$ (b) $4.00 \times 10^{-7} M^3$ (c) $5.00 \times 10^{-6} M^3$ (d) $5.00 \times 10^{-7} M^3$

Sol: Given, pH of $Ba(OH)_2 = 12$

$$\therefore [H^+] = [1 \times 10^{-12}]$$

$$\text{and } [OH^-] = \frac{1 \times 10^{-14}}{1 \times 10^{-12}} \left[\because [H^+][OH^-] = 1 \times 10^{-14} \right]$$

$$= 1 \times 10^{-2} \text{ mol/L}$$



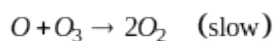
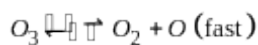
$$K_{sp} = [Ba^{2+}][OH^-]^2 = [s][2s]^2$$

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

$$= 0.5 \times 10^{-6} = 5.0 \times 10^{-7} \text{ M}^3$$

Ans: (d)

7. The chemical reaction, $2\text{O}_3 \rightarrow 3\text{O}_2$, proceeds as follows



The rate law expression should be

(a) $r = k'[\text{O}_3]^2$ (b) $r = k'[\text{O}_3]^2[\text{O}_2]^{-1}$ (c) $r = k'[\text{O}_3][\text{O}_2]$ (d) Unpredictable

Sol:

From the step (ii),

$$\text{Rate, } r = k[\text{O}][\text{O}_3]$$

For fast reaction,

$$K_c = \frac{[\text{O}_2][\text{O}]}{[\text{O}_3]} \quad \text{or} \quad [\text{O}] = \frac{K_c[\text{O}_3]}{[\text{O}_2]}$$

On putting the value of $[\text{O}]$ in Eq. (i). we get

$$\text{Rate, } r = k \cdot \frac{K_c[\text{O}_3]}{[\text{O}_2]}[\text{O}_3]$$

$$\text{Or } = k \cdot K_c [\text{O}_3]^2 [\text{O}_2]^{-1} = k' [\text{O}_3]^2 [\text{O}_2]^{-1}$$

Ans: (b)

8. In the sequence of reactions, $A \xrightarrow{k_1} B \xrightarrow{k_2} C \xrightarrow{k_3} D$ $k_3 > k_2 > k_1$, then the rate determining step of the reaction is

(a) $A \rightarrow B$ (b) $B \rightarrow C$ (c) $C \rightarrow D$ (d) $A \rightarrow D$

Sol: $A \xrightarrow{k_1} B \xrightarrow{k_2} C \xrightarrow{k_3} D$

$$\because k_3 > k_2 > k_1.$$

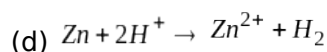
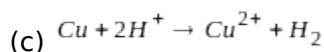
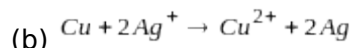
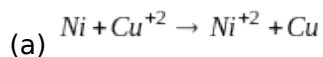
As k_1 is smallest (Slowest), hence $A \rightarrow B$ is the rate determining step of the reaction.

Ans: (a)

9. Given

$$E_{(\text{Ni}^{2+}/\text{Ni})}^0 = -0.25\text{V}, E_{(\text{Cu}^{2+}/\text{Cu})}^0 = 0.34\text{V}, E_{(\text{Ag}^+/\text{Ag})}^0 = 0.80\text{V}, E_{(\text{Zn}^{2+}/\text{Zn})}^0 = -0.76\text{V}$$

Which of the following reactions under standard conditions will not take place in the specified direction?



Sol: For reaction (1), $E_{cell}^0 = 0.34 - (-0.25) = +0.59V$

For reaction (2), $E_{Cell}^0 = 0.80 - (0.34) = 0.46 V$

For reaction (3), $E_{Cell}^0 = 0 - (0.34) = -0.34V$

For reaction (4), $E_{Cell}^0 = 0 - (-0.76) = 0.76V$

Hence, reaction (3) will not take place as

$$E_{cell}^0 = -ve$$

Ans: (c)

10. The excess pressure that is applied to the solution to prevent the passage of solvent into it through a semipermeable membrane is referred to as

(a) Partial pressure of the solute

(b) Vapour pressure of the solvent

(c) Osmotic pressure of the solution

(d) None of these

Sol: Osmotic pressure of the solution.

Ans: (c)

11. Which of the following statement is true:

(A) PH_5 , NCl_5 and $BiCl_5$ do not exist

(B) I_3^+ has bent shape

(C) XeF_4 is a non polar molecule

(D) CO and C_2^{2-} do not have same bond order.

(a) A, B, D

(b) A, B, C

(c) B, C, D

(d) B, C

Sol: CO and C_2^{2-} bond order is 3.

Ans: (b)

12. Which of the following order is correct?

(a) $CO_2 < CO_3^{2-}$ (O - C - O Bond Angle)

(b) $NH_2^- > NH_3$ (H - N - H Bond Angle)

(c) $BeCl_2 < SnCl_2$ (dipole moment)

(d) $H_2O > H_2O_2$ (Boiling point)

Sol: $BeCl_2$ - symmetrical molecule $\mu = 0$

Ans: (c)

13. Determine the oxidation number of Xe atom in Ba_2XeO_6

(a) +8 (b) -8 (c) +5 (d) -7

Sol: Let the oxidation number of Xe be 'a', then $2 \times 2 + a + 6 \times (-2) = 0$
Hence, $a = +8$

Ans: (a)

14. Which one of the following is not an isomer of 3-methylbut-1-yne?

(a) Pent-1-yne (b) Pent-2-yne
(c) 2-Methylbuta-1,3-diene (d) Buta-1,3-diene

Sol: 3-methylbut-1-yne has 5 carbon atoms, buta-1,3-diene has 4 carbon atoms.

Ans: (d)

15. Which of the following is incorrect?

(a) $CH_3 - O - \overset{+}{C}H_2$ is more stable than $CH_3 - \overset{+}{C}H_2$
(b) $(CH_3)_2\overset{+}{C}H$ is more stable than $CH_3 - CH_2 - \overset{+}{C}H_2$
(c) $CH_2 = \overset{+}{C}H - \overset{+}{C}H_2$ is more stable than $CH_3 - CH_2 - \overset{+}{C}H_2$
(d) $CH_2 = \overset{+}{C}H$ is more stable than $CH_3 - \overset{+}{C}H_2$

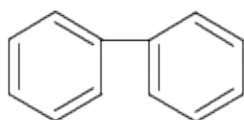
Sol: $CH_2 = \overset{+}{C}H$ is less stable than $CH_3 - \overset{+}{C}H_2$

Ans: (d)

16. In which of the following hyperconjugation is not possible?

(a) Toulene (b) Cyclohexene
(c) 3,3,3-Trideutiro propene (d) Biphenyl

Sol: biphenyl



Ans: (d)

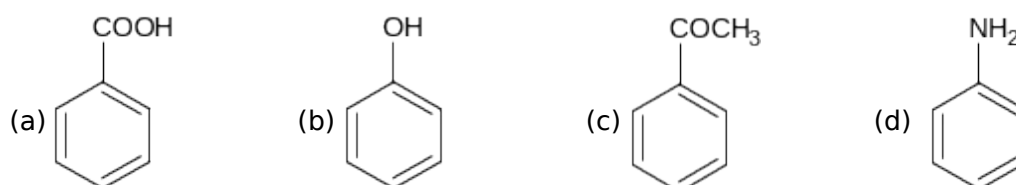
17. Which of the following statement is correct?

- (a) F^- is a smallest anion of the Periodic table
- (b) Metallic radii of Mn is greater than Cr due to weak metallic bonding in Mn
- (c) 2nd Ionisation potential of Li is maximum among 2nd period elements.
- (d) All of these

Sol: All are correct statements

Ans: (d)

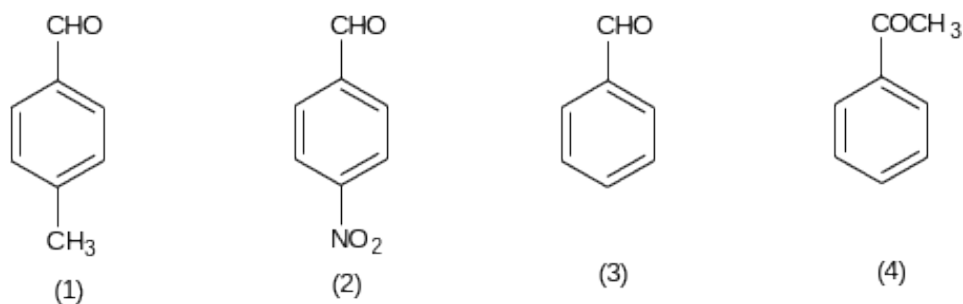
18. Water insoluble organic compound dissolves in NaOH but is insoluble in $NaHCO_3$. The compound is



Sol: Phenol is insoluble in $NaHCO_3$

Ans: (b)

19. The correct order of reactivity towards nucleophilic addition for the following compounds is



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

Sol: $2 > 3 > 1 > 4$

Ans: (d)

20. Element P, Q, R and S belong to the same group. The oxide of P is acidic, oxide of Q and R are amphoteric while the oxide of S is basic. Which of the following elements is the most electropositive?

- (a) P
- (b) Q
- (c) R
- (d) S

Sol: If the element is more electropositive, oxide will be basic.

Ans: (d)

21. If two substances A and B have $P_A^\circ : P_B^\circ = 1:2$ and have mole fraction in solution 1 : 2 then mole fraction of A in vapour phase will be:

- (a) 0.33 (b) 0.25 (c) 0.20
(d) 0.52

Sol:
$$Y_A = \frac{X_A P_A^\circ}{X_A P_A^\circ + X_B P_B^\circ}$$

$$= \frac{1}{1 + \frac{X_B P_B^\circ}{X_A P_A^\circ}} = \frac{1}{1 + \frac{2}{1} \times \frac{2}{1}} = \frac{1}{5} = 0.2$$

Ans: (c)

22. The elements ${}_{30}\text{Zn}$, ${}_{48}\text{Cd}$ and ${}_{80}\text{Hg}$ belong to

- (a) 10th group (b) 11th group (c) 12th group (d) 13th group

Sol: Atomic number $30 = 2 + 8 + 8 + 12$. Thus, it belongs to 12th group.

Ans: (c)

23. What hybridization is expected on the central atom of each of the following molecules?

- i) BeH_2 ii) CH_2Br_2 iii) PF_6^- iv) BF_3
- (a) sp^2, sp, sp^3, sp^2 (b) sp, sp^3, sp^3d, sp^2 (c) sp, sp^3, sp^3d^2, sp^2 (d) sp^2, sp, sp^2, sp^3

Sol: sp, sp^3, sp^3d^2, sp^2

Ans: (c)

24. The resistance of 1 N solution of acetic acid is 250 ohm, when measured in a cell with the cell constant 1.15 cm^{-1} . The equivalent conductance (in $\text{ohm}^{-1}\text{cm}^2\text{eq}^{-1}$) of 1 N acetic acid solution is:

- (a) 4.6 (b) 9.2 (c) 18.4 (d) 0.023

Sol:
$$\Lambda_{\text{eq}} = \frac{\kappa \times 1000}{N} = \frac{1}{R} \times \frac{l}{A} \times \frac{1000}{N}$$

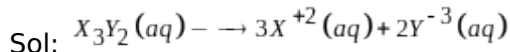
Or
$$\Lambda_{\text{eq}} = \frac{1}{250} \times 1.15 \times \frac{1000}{1} = 4.6 \text{ ohm}^{-1}\text{cm}^2\text{eq}^{-1}$$

Ans: (a)

25. 2 m aqueous solution of an electrolyte X_3Y_2 is 25% ionized. The boiling point of the solution is

(K_b for $H_2O = 0.52 \text{ K kg/mol}$)

- (a) 390.2 K (b) 394.04 K (c) 405.2 K (d) 375.08 K



$$i = 1 - \alpha + n\alpha = 1 - 0.25 + 5 \times 0.25 = 2$$

$$\Delta T_b = i \times K_b \times m$$

$$= 2 \times 0.52 \times 2$$

$$= 2.08$$

$$T_b = 373 + 2.08 = 375.08$$

Ans: (d)

26. If 54 g of silver is deposited during an electrolysis reaction then how much aluminium will be deposited by the same amount of electric current:

- (a) 2.7 g (b) 4.5 g (c) 27 g (d) 5.4 g

Sol: $\frac{W_{Ag}}{W_{Al}} = \frac{\text{Eq. mass of Ag}}{\text{Eq. mass of Al}}$

$$\frac{54}{W_{Al}} = \frac{108}{1} \times \frac{3}{27} = 12$$

$$W_{Al} = \frac{54}{12} = 4.5 \text{ g}$$

Ans: (b)

27. Which among the following is most acidic?

- (a) Na_2O (b) MgO (c) Al_2O_3 (d) CaO

Sol: oxide of Aluminium

Ans: (c)

28. Assertion (A): The aqueous solution of Na_3PO_4 is alkaline in nature.

Reason (R): Na_3PO_4 in its aqueous solution undergoes anionic hydrolysis.

- (a) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 (b) (A) is correct but (R) is not correct
 (c) (A) is incorrect but (R) is correct

(d) Both (A) and (R) are correct but (R) is the correct explanation of (A)

Sol: Both (A) and (R) are correct but (R) is the correct explanation of (A)

Ans: (d)

29. The highest magnetic moment is shown by the transition metal ion with outer electronic configuration

- (a) $3d^2$ (b) $3d^5$ (c) $3d^7$ (d) $3d^9$

Sol: Configuration $3d^5$ has five unpaired electrons which shows highest magnetic moment.

Ans: (b)

30. The correct IUPAC name of the complex $[Co(en)_2(H_2O)(NO_2)]SO_4$ is

- (a) Aquabis-(ethane-1,2-diamine)nitrito-O-cobalt (III) sulphate
 (b) Bis-(ethane-1,2-diamine)aquanitrocobalt (III) sulphate
 (c) Aquabis-(ethylenediamine)nitrocobalt (II) sulphate
 (d) Aquabis-(ethane-1,2-diamine)nitrito-N-cobalt (III) sulphate

Sol: As per the rule.

Ans: (d)

31. If 'X' is ionization energy of hydrogen atom then the energy required for excitation of Li^{2+} ion electron from 2nd excited state to 5th excited state is -

- (a) $\frac{3X}{4}$ (b) $\frac{4}{3X}$ (c) $\frac{X}{12}$ (d) $\frac{12}{X}$

Sol: $(I.E)_H = - (E_1)_H = X$

$$\Delta E = (E_6 - E_3)_H \times Z^2 = 9 \left[\frac{-X}{36} - \left(\frac{-X}{9} \right) \right] = \frac{3X}{4}$$

Ans: (a)

32. Among the following sets of bases, which set of bases is present in DNA and RNA?

- (a) Adenine, uracil, thymine (b) Adenine, guanine, cytosine
 (c) Adenine, guanine, uracil (d) Adenine, guanine, thymine

Sol: Thymine is present only in DNA.

Uracil is present only in RNA

Ans: (b)

33. Four element have following first ionisation energy in kJ/mol 559 , 558, 589 and 577. The elements are Al, Ga, In and Tl (not in order) which of the element has the ionisation energy of 559 kJ/mol:

- (a) Al (b) Ga (c) In (d) Tl

Sol: *Ga* due to transitional contraction has more IE than *Al*.

Ans: (b)

34. A six co-ordinate complex (A) with molecular formula $CrCl_3 \cdot 6H_2O$ has green colour. 1L of 0.1M solution of the complex on treatment with excess of silver nitrate solution gives 28.7g of silver chloride precipitate. Which of the following isomeric complex of A will have greater molar conductance than A?

- (a) $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$ (b) $[Cr(H_2O)_6]Cl_3$
 (c) $[Cr(H_2O)_4Cl_2]Cl \cdot 2H_2O$ (d) None of these

Sol: No. of moles of AgCl = $\frac{28.7}{143.5} = 0.2$

The number of moles of the complex = 0.1

The number of chloride ions outside the co-ordination sphere = 2

The formula of A = $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$

The isomer with greater molar conductance than A = $[Cr(H_2O)_6]Cl_3$

Ans: (b)

35. The electronic configuration of Tantalum (Ta) is [At no : 73]

- (a) $[Xe]6s^2 5d^1 4f^0$ (b) $[Xe]6s^2 5d^2 4f^{14}$ (c) $[Xe]6s^2 5d^3 4f^{14}$ (d) $[Xe]6s^2 5d^4 4f^{14}$

Sol: Tantalum $Ta(73) : [Xe]4f^{14} 5d^3 6s^2$

Ans: (c)

36. Which of the following carbohydrate is a reducing sugar?

- (a) Maltose (b) Glucose (c) Galactose (d) All of these

Sol: All are reducing sugar.

Due to ring structure α and β methyl glucosides can be formed.

Ans: (d)

37. 0.1 molal aqueous solution of *NaBr* freezes at $-0.335^\circ C$ at atmospheric pressure, k_f for water is $1.86^\circ C$. The percentage of dissociation of the salt in solution is

- (a) 90 (b) 80 (c) 58 (d) 98

Sol: $0 - (-0.335) = 1.86(1 + \alpha)0.1$

$1 + \alpha = \frac{0.335}{1.86 \times 0.1} = 1.8$; $\alpha = 0.8 = 80\%$

Ans: (b)

38. Polarisation is the distortion of the shapes of an anion by an adjacently placed cation. Which of the following statements is correct?

- (a) Maximum polarisation is brought by a cation of high charge
- (b) Minimum polarisation is brought by a cation of low radius
- (c) A large cation is likely to bring about a large degree of polarisation
- (d) Polarisation power of cation is less than that of anion

Sol: Polarisation power $\propto + \text{ive charge} \propto \frac{1}{\text{Size of cation}}$

Ans:(a)

39. Question:



The above change can be effected by

- I. $KMnO_4 / H^+$
- II. $[Ag(NH_3)_2]OH$
- III. Br_2 / H_2O

- (a) II, III
- (b) I, II, III
- (c) I, II
- (d) Only II

Sol: Only Tollen's reagent can bring about the oxidation of $-CHO \rightarrow -COOH$ without affecting the $C=C$ bond.

Ans: (d)

40. Benzoyl chloride is prepared from benzoic acid by

- (a) Cl_2, hv
- (b) SO_2Cl_2
- (c) $SOCl_2$
- (d) Cl_2, H_2O

Sol: $SOCl_2$

Ans: (c)

41. $2.4g$ of pure Mg (at. Mass =24) is dropped in $100 mL$ of $1 M HCl$. Which of the following statement is wrong?

- (a) 1.12 L of hydrogen is produced at S.T.P
- (b) 0.05 mol of magnesium is left behind
- (c) HCl is the limiting reagent
- (d) 0.005 mol of magnesium is left behind

Sol: $Mg + 2HCl \rightarrow MgCl_2 + H_2$

$$\text{Mol of HCl} = 100 \times 1 \times 10^{-3} = 0.1$$

$$\text{Mol of Mg} = \frac{2.4}{24} = 0.1$$

$$= 0.1 - 0.05 = 0.05$$

HCl is L.R

$$0.05 = 1.12L H_2 \text{ at STP}$$

Ans: (d)

42. Calculate the approximate wavelength in nanometre of a quantum of light with frequency of $8 \times 10^{15} \text{ s}^{-1}$. The given value of Planck's constant is 6.6×10^{-34} . The velocity of light is $3.0 \times 10^8 \text{ ms}^{-1}$

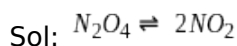
- (a) 3.2×10^7 (b) 2.5×10^{-25} (c) 5×10^{-18} (d) 40

Sol: $\lambda = \frac{c}{\nu} = \frac{3 \times 10^8}{8 \times 10^{15}} = 3.75 \times 10^{-8} \text{ m} = 37.5 \text{ nm}$

Ans: (d)

43. For the reaction, $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ the degree of dissociation at equilibrium is 0.4 at a pressure of 1 atm. The value of K_p is

- (a) 0.64 atm (b) 0.60 atm (c) 0.19 atm (d) 0.762 atm



At $t = 0$ 1

$$K_p = \frac{(P_{NO_2})^2}{(P_{N_2O_4})} = \frac{4\alpha^2}{1 - \alpha^2} \times P$$

$$K_p = \frac{4 \times (0.4)^2}{1 - (0.4)^2} \times 1 \quad \therefore K_p = 0.762 \text{ atm}$$

Ans: (d)

44. Which of the following given pair is a conjugated acid base pair?

- (a) HCl, NaOH (b) NH_4Cl, NH_4Br (c) H_2SO_4, HSO_4^- (d) KCN, KOH

Sol: Conjugated acid base pair is having difference of proton, $H_2SO_4 \rightleftharpoons H^+ + HSO_4^-$

Ans: (c)

45. Among the elements with atomic number 9, 12, 16 and 36 which is highly electropositive?

- (a) Element with atomic number 9 (b) Element with atomic number 12

(c) Element with atomic number 16

(d) Element with atomic number 36

Sol: At. No - 9 \rightarrow F

At. No - 12 \rightarrow Mg \rightarrow electropositive

At. No - 16 \rightarrow S

At. No - 36 \rightarrow Kr

Ans: (b)

Physics

Multiple Choice Questions with one correct answer. A correct answer carries 4 marks. A wrong answer carries a penalty of 1 mark. 45 x 4 = 180

46. Three liquids of densities ρ_1, ρ_2 and ρ_3 (with $\rho_1 > \rho_2 > \rho_3$), having the same value of surface tension T, rise to the same height in three identical capillaries.

(a) $\frac{\pi}{2} > \theta_1 > \theta_2 > \theta_3 \geq 0$

(b) $0 \leq \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$

(c) $\frac{\pi}{2} < \theta_1 < \theta_3 < \theta_2 < \pi$

(d) $\pi > \theta_3 > \theta_1 > \theta_2 > \frac{\pi}{2}$

Sol: Capillary rise, $h = \frac{2T \cos \theta}{r \rho g}$

For given value of T and r, $h \propto \frac{\cos \theta}{\rho}$

Also, $h_1 = h_2 = h_3$

$$\frac{\cos \theta_1}{\rho_1} = \frac{\cos \theta_2}{\rho_2} = \frac{\cos \theta_3}{\rho_3}$$

Or $\frac{\cos \theta_1}{\rho_1} = \frac{\cos \theta_2}{\rho_2} = \frac{\cos \theta_3}{\rho_3}$

Since, $\rho_1 > \rho_2 > \rho_3$, so $\cos \theta_1 > \cos \theta_2 > \cos \theta_3$

For $0 \leq \theta < \frac{\pi}{2}$, $\theta_1 < \theta_2 < \theta_3$

Hence, $0 \leq \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$

Ans: (b)

47. A cylindrical capacitor has charge Q and length L. If both the charge and the length of the capacitor are doubled by keeping the other parameters fixed, then the energy stored in the capacitor

(a) remains same

(b) increases two times

(c) decreases two times

(d) increases four times

Sol: Energy of a charged capacitor,

$$E = \frac{1}{2} \frac{Q^2}{C} \propto \frac{Q^2}{C} \quad \dots (i)$$

For a cylindrical capacitor,

$$C = \frac{2\pi\epsilon_0 L}{\log_e \left(\frac{b}{a} \right)} \propto L \quad \dots (ii)$$

where L = length of the cylinder

a and b = radii of inner and outer coaxial cylinders respectively

From (i) and (ii),

$$E \propto \frac{Q^2}{L}$$

So, if Q , L double, E becomes twice.

Ans: (b)

48. The displacement x of a particle varies with time t as $x = ae^{-\alpha t} + be^{\beta t}$, where a, b, α and β are positive constants. The velocity of the particle will

(a) be independent of β

(b) drop to zero, when $\alpha = \beta$

(c) decrease with time

(d) increase with time

Sol: $x = ae^{-\alpha t} + be^{\beta t}$

$$\frac{dx}{dt} = -\alpha ae^{-\alpha t} + \beta be^{\beta t}$$

$$\Rightarrow v = \beta be^{\beta t} - \alpha ae^{-\alpha t}$$

As t increases, $e^{-\alpha t}$ decreases and $e^{\beta t}$ increases.

So, v will increase with time

Ans: (d)

49. An ideal gas at 27°C is compressed adiabatically to $\frac{8}{27}$ of its original volume. If $\gamma = \frac{5}{3}$, then the rise in temperature is

(a) 450 K

(b) 375 K

(c) 675 K

(d) 405 K

Sol: $TV^{\gamma-1} = \text{constant}$

$$(300)V^{\frac{5}{3}-1} = T_2 \left(\frac{8V}{27} \right)^{\frac{5}{3}-1}$$

$$300 = T_2 \left(\frac{8}{27} \right)^{\frac{2}{3}} ; \quad 300 = T_2 \left(\frac{4}{9} \right)$$

$$\Rightarrow T_2 = 675 \text{ K}$$

Rise in temperature = $(675 - 300) \text{ K} = 375 \text{ K}$

Ans: (b)

50. If a ball is thrown vertically upwards with a speed u , the distance covered by it during the last t seconds of its ascent is

- (a) ut (b) $\frac{1}{2}gt^2$ (c) $ut - \frac{1}{2}gt^2$ (d) $(ut + gt)t$

Sol: Let total height = H

Total time of ascent = T

So, $H = uT - \frac{1}{2}gT^2$

Distance covered by ball in time $(T - t)_{\text{sec}}$ is

$$y = u(T - t) - \frac{1}{2}g(T - t)^2$$

So, distance covered by ball in last t_{sec}

$$h = H - y = \left[uT - \frac{1}{2}gT^2 \right] - \left[u(T - t) - \frac{1}{2}g(T - t)^2 \right]$$

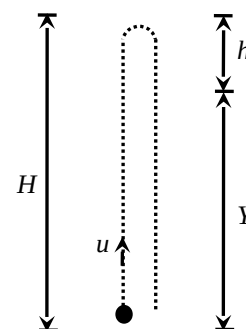
By putting $T = \frac{u}{g}$ and solving, we will get, $h = \frac{1}{2}gt^2$

Alternatively:

Distance travelled in last t seconds of upward journey = distance travelled in first t seconds

of downward journey $= \frac{1}{2}gt^2$

Ans: (b)



51. If a diamagnetic substance is brought near the north or the south pole of a bar magnet, it is

- (a) attracted by both poles
 (b) repelled by both poles
 (c) repelled by north pole but attracted by south pole
 (d) attracted by north pole but repelled by south pole

Sol: Diamagnetic substance creates an induced magnetic field which is opposite to the applied magnetic field and thus there is repulsion on both north and south pole.

Ans: (b)

52. The ratio of the acceleration due to gravity on two planets P_1 and P_2 is K_1 . The ratio of their respective radii is K_2 . The ratio of their respective escape velocities is

- (a) $\sqrt{K_1 K_2}$ (b) $\sqrt{2K_1 K_2}$ (c) $\sqrt{\frac{K_1}{K_2}}$ (d) $\sqrt{\frac{K_2}{K_1}}$

Sol: Since escape velocity from the surface of a planet can be written as $v_e = \sqrt{2gR}$

$$\frac{v_{ep_1}}{v_{ep_2}} = \sqrt{\frac{2g_{p_1} R_{p_1}}{2g_{p_2} R_{p_2}}} = \sqrt{K_1 K_2}$$

Ans: (a)

53. Find the torque about the origin when a force of $3\hat{j}N$ acts on a particle whose position vector is $2\hat{k}m$

- (a) $6\hat{j} Nm$ (b) $-6\hat{i} Nm$ (c) $6\hat{k} Nm$ (d) $6\hat{i} Nm$

Sol: Torque is the moment of Force applied.

$$\tau = r \times F$$

$$\tau = 2\hat{k} \times 3\hat{j}$$

$$\tau = -6\hat{i} Nm$$

Ans: (b)

54. Path difference between two wavefronts emitted from coherent sources is $2.1\mu m$. Phase difference between the wavefronts at that point is 7.692π rad. Wavelength of light emitted by source will be

- (a) 5385 \AA (b) 5600 \AA (c) 5460 \AA (d) 5892 \AA

Sol: Phase difference, $\phi = \frac{2\pi x}{\lambda}$ or $\lambda = \frac{2\pi x}{\phi} = 2 \times \pi \times \frac{2.1 \times 10^{-6}}{7.692\pi} = 5460 \times 10^{-10} \text{ m}$

Ans: (c)

55. A current loop in a magnetic field

- (a) can be in equilibrium in two orientations, both the equilibrium states are unstable.
- (b) can be in equilibrium in two orientations, one stable while the other is unstable.
- (c) experiences a torque whether the field is uniform or non-uniform in all orientations.

(d) can be in equilibrium in one orientation.

Sol: A current loop in a magnetic field is in equilibrium in two orientations one is stable and another unstable.

When a current loop is placed in a magnetic field it experiences a torque. It is given by

$$\tau = M \times B = MB \sin \theta$$

Where, M is the magnetic moment of the loop and B is the magnetic field.

If $\theta = 0^\circ \Rightarrow \tau = 0$ (stable equilibrium)

If $\theta = 180^\circ \Rightarrow \tau = 0$ (unstable equilibrium)

Ans: (b)

56. One mole of an ideal monatomic gas undergoes a process described the equation $PV^3 = \text{constant}$. The heat capacity of the gas during this process is

- (a) $\frac{3}{2}R$ (b) $\frac{5}{2}R$ (c) $2R$ (d) R

Sol: Process described by the equation,

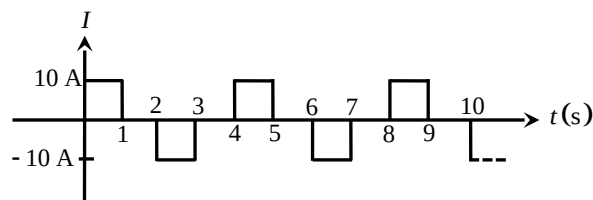
$$PV^3 = \text{constant}$$

For a polytropic process, $PV^\alpha = \text{constant}$

$$C = C_V + \frac{R}{1 - \alpha} = \frac{3}{2}R + \frac{R}{1 - 3} = R$$

Ans: (d)

57. The variation of an alternating current (i) versus time (t) is shown in figure. The rms current is



- (a) $5\sqrt{2}$ A (b) 5 A (c) 10 A (d) $\frac{5}{\sqrt{2}}$ A

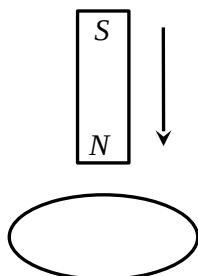
Sol:
$$i_{\text{rms}}^2 R = \frac{1}{T} \int_0^T i^2 R dt = \frac{1}{T} \left[\int_0^1 (10)^2 R dt + \int_1^2 (0)^2 R dt + \int_2^3 (-10)^2 R dt + \int_3^4 (0)^2 R dt \right]$$

Here, time period $T = 4$ seconds.

$$i_{\text{rms}}^2 = \frac{(10)^2(1) + (0)^2(1) + (-10)^2(1) + (0)^2(1)}{4}; \quad i_{\text{rms}} = \sqrt{\frac{10^2 + 0^2 + 10^2 + 0^2}{4}} = 5\sqrt{2} \text{ A}$$

Ans: (a)

58. The north pole of a magnet is falling on a metallic ring as shown in the figure. The direction of induced current, if looked from upside into the ring will be



- (a) anti-clockwise
- (b) clockwise
- (c) clockwise or anti-clockwise depending on radius of the ring
- (d) no induced current

Sol: As north pole approaches the ring, downward flux through ring increases. From Lenz's law magnetic field produced by ring should oppose this change. This happens when current in it flows in anti-clockwise direction.

Ans: (a)

59. Given that $\vec{A} + \vec{B} + \vec{C} = 0$. Out of three vectors, two are equal in magnitude and magnitude of third vector is $\sqrt{2}$ times that of either of the other two. Then the angle between vectors are given by

- (a) $45^\circ, 45^\circ, 90^\circ$
- (b) $90^\circ, 135^\circ, 135^\circ$
- (c) $30^\circ, 60^\circ, 90^\circ$
- (d) $45^\circ, 60^\circ, 90^\circ$

Sol: Let, $|A| = |B| = x$

Then $|C| = \sqrt{2}x$

Now $A + B = -C$

$$(A + B) \cdot (A + B) = (-C) \cdot (-C)$$

$$2(A \cdot B) + A^2 + B^2 = C^2$$

$$2AB \cos \theta + x^2 + x^2 = 2x^2 \Rightarrow \cos \theta = 0,$$

hence $\theta = 90^\circ$

⇒ Angle between A and B is 90°

Again $A + C = -B$

$$(A + C) \cdot (A + C) = (-B) \cdot (-B)$$

$$A^2 + C^2 + 2AC \cos \theta = B^2$$

$$3x^2 + 2 \cdot x \sqrt{2} x \cos \theta = x^2, \cos \theta = \frac{-2}{2\sqrt{2}} = \frac{-1}{\sqrt{2}}$$

$\theta = 135^\circ$ i.e. Angle between A and C is 135°

Similarly, angle between B and C is θ_2

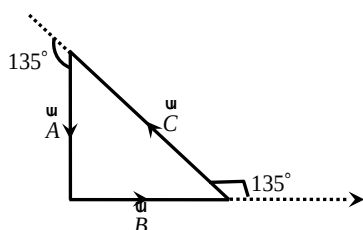
$$B + C = -A$$

$$B^2 + C^2 + 2BC \cos \theta = A^2$$

$$\cos \theta = \frac{-2}{2\sqrt{2}} = \left(\frac{-1}{\sqrt{2}} \right)$$

$$\theta_2 = 135^\circ$$

Alternative solution:



A, B, C form a triangle as shown.

Ans: (b)

60. One litre of oxygen at a pressure of 1 atm and two litres of nitrogen at a pressure of 0.5 atm , are introduced into a vessel of volume 1 L . If there is no change in temperature, the final pressure of the mixture of gas (in atm) is

- (a) 1.5 (b) 1 (c) 2 (d) 4

Sol: Ideal gas equation is given by

$$PV = nRT \quad \dots (i)$$

For oxygen, $P = 1 \text{ atm}, V = 1 \text{ L}, n = n_{O_2}$

Therefore, Eq. (i) becomes

$$\therefore 1 \times 1 = n_{O_2} RT$$

$$n_{O_2} = \frac{1}{RT}$$

For nitrogen $P = 0.5 \text{ atm}, V = 2 \text{ L}, n = n_{N_2}$

$$\therefore 0.5 \times 2 = n_{N_2} RT \quad \Rightarrow \quad n_{N_2} = \frac{1}{RT}$$

For mixture of gas

$$P_{\text{mix}} V_{\text{mix}} = n_{\text{mix}} RT$$

Here, $n_{\text{mix}} = n_{O_2} + n_{N_2} \quad \therefore \frac{P_{\text{mix}} V_{\text{mix}}}{RT} = \frac{1}{RT} + \frac{1}{RT}$

$$P_{\text{mix}} V_{\text{mix}} = 2 \Rightarrow P_{\text{mix}} = \frac{2}{V_{\text{mix}}} = 2 \text{ atm}$$

Ans: (c)

61. Two metal rods 1 and 2 of same lengths have same temperature difference between their ends. Their thermal conductivities are K_1 and K_2 and cross sectional areas A_1 and A_2 respectively. If the rate of heat conduction in 1 is four times that in 2, then

(a) $K_1 A_1 = 4K_2 A_2$ (b) $K_1 A_1 = 2K_2 A_2$ (c) $4K_1 A_1 = K_2 A_2$ (d) $K_1 A_1 = K_2 A_2$

Sol: Let L be length of each rod. Rate of heat flow in rod 1 for the temperature difference ΔT is

$$H_1 = \frac{K_1 A_1 \Delta T}{L}$$

Rate of heat flow in rod 2 for the same difference ΔT is

$$H_2 = \frac{K_2 A_2 \Delta T}{L}$$

As per question, $H_1 = 4H_2$

$$\frac{K_1 A_1 \Delta T}{L} = 4 \frac{K_2 A_2 \Delta T}{L} \Rightarrow K_1 A_1 = 4K_2 A_2$$

Ans: (a)

62. In Young's double slit experiment, the intensities at two points P_1 and P_2 on the screen are I_1 and I_2 respectively. If P_1 is located at the central bright fringe and P_2 is located at a

distance equal to a quarter of fringe width from P_1 , then $\frac{I_1}{I_2}$ is:

(a) 2 (b) $\frac{1}{2}$ (c) 4 (d) 16

Sol: P_1 is at central maxima. So $I_1 = 4I_0$

For P_2 , path difference, $\Delta x = d \sin \theta \approx d \tan \theta = \frac{dy}{D}$

Here $y = \frac{\beta}{4} = \frac{\lambda D}{4d} \Rightarrow \Delta x = \frac{dy}{D} = d \left(\frac{\lambda D}{4d} \right) \frac{1}{D} = \frac{\lambda}{4}$

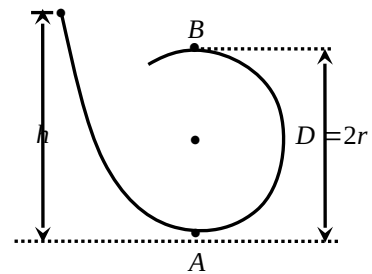
Phase difference, $\Delta \phi = \frac{2\pi \Delta x}{\lambda} = \frac{2\pi \lambda}{4\lambda} = \frac{\pi}{2}$; $I_2 = I_0 + I_0 + 2\sqrt{I_0 I_0} \cos\left(\frac{\pi}{2}\right) = 2I_0$

Hence, $\frac{I_1}{I_2} = 2$

Ans: (a)

63. A body slides down on a frictionless track which ends in a circular loop of diameter D . The minimum height h in terms of D , so that the body may just complete the circular loop, is

- (a) $h = \frac{5}{2}D$
- (b) $h = \frac{3}{2}D$
- (c) $h = \frac{5}{4}D$
- (d) $h = 2D$



Sol: By conservation of energy, $\frac{1}{2}mv^2 = mgh$

$v = \sqrt{2gh}$... (i)

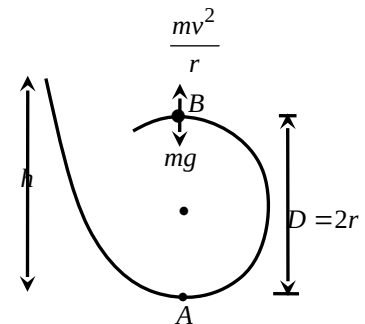
For looping the loop, the velocity at lower point A must be greater than $\sqrt{5gr}$

$v_{\min} = \sqrt{5gr} = \sqrt{\frac{5gD}{2}}$... (ii)

From equation (i) and (ii), $2gh = \frac{5gD}{2}$

$h = \frac{5D}{4}$

Ans: (c)



64. When an α^- particle of mass m moving with velocity v bombards on a heavy nucleus of charge Ze . Its distance of closest approach from the nucleus depends on m as

- (a) $\frac{1}{m^2}$
- (b) $\frac{1}{m}$
- (c) m^2
- (d) $\frac{1}{\sqrt{m}}$

Sol: At closest distance of approach, the kinetic energy of the particle will convert completely into electrostatic potential energy

$$\text{Kinetic energy} = \frac{1}{2}mv^2$$

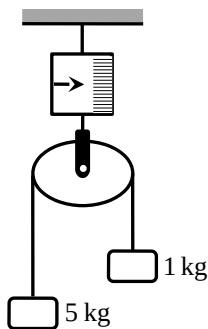
$$\text{Potential energy} = \frac{KQq}{r}$$

$$\therefore \frac{1}{2}mv^2 = \frac{KQq}{r}$$

$$\Rightarrow r \propto \frac{1}{m}$$

Ans: (b)

65. In the figure, a smooth pulley of negligible weight is suspended by a spring balance. Masses of 1 kg and 5 kg are attached to the opposite ends of a string passing over the pulley and move with some acceleration. During their motion, the spring balance reads a weight of



- (a) 6 kg wt (b) Less than 6 kg wt (c) More than 6 kg wt (d) Less than 1 kg wt

Sol: Spring balance reading is equal to $2T$, where T = tension in the string

$$T = \frac{2m_1m_2}{m_1 + m_2} = \frac{2 \times 5 \times 1}{6} = \frac{5}{3} \text{ kg wt}$$

$$\text{reading of spring balance} = 2T = 2 \times \frac{5}{3} = \frac{10}{3} \text{ kg wt} < 6 \text{ kg wt}$$

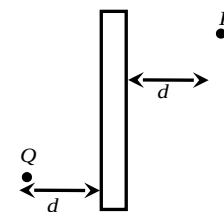
Ans: (b)

66. Two points P and Q are at equal distance d from a large conducting plate having uniform charge density σ . P and Q lie on the opposite sides of the plate. The line joining P and Q is not normal to the plate. Then, the potential difference between P and Q is

- (a) $\frac{\sigma}{\epsilon_0}d$ (b) $\frac{\sigma}{2\epsilon_0}d$ (c) Zero (d) $\frac{\sigma}{4\epsilon_0}d$

Sol:

Electric field on both sides of the plate is of equal magnitude, $\frac{\sigma}{\epsilon_0}$, but it will point in opposite directions. Electric potential decreases as we move away on either side of the plate. Since, P and Q are equidistant from the plate, by using $V = Ed$, we get $V_P = V_Q$



Ans: (c)

67. An inductor of inductance 2 mH is connected to a 220 V, 50 Hz ac source. Let the inductive reactance in the circuit is X_1 . If a 220 V dc source replace the ac source in the circuit, then the inductive reactance in the circuit is X_2 , X_1 and X_2 respectively are: (In case of D.C. current, X_2 at steady state)

- (a) 0.628 Ω , infinity (b) 6.28 Ω , zero (c) 6.28 Ω , infinity (d) 0.628 Ω , zero

Sol: We know, for A.C, source

$$XL = \omega L$$

$$= 2\pi f(L)$$

$$= 100\pi(2 \times 10^{-3})$$

$$= 0.2\pi \Omega = 0.628\Omega$$

For D.C. source

The inductor behaves as a closed circuit offering no resistance at all (at steady state) as

$$\omega = 0 \text{ (For D.C.)}$$

$$\therefore XL = 0 \Omega$$

Ans: (d)

68. Water rises upto a height h in a capillary tube of certain diameter. This capillary tube is replaced by a similar tube of half the diameter. Now water will rise to a height of

- (a) $4h$ (b) $3h$ (c) $2h$ (d) $\frac{h}{2}$

Sol: From capillary tube experiment, we know that

$$h = \frac{2S \cos \theta}{r \rho g} \quad \text{i.e.} \quad h \propto \frac{1}{r}$$

$$\therefore \frac{h'}{h} = \frac{r}{r/2} = 2 \quad \text{or} \quad h' = 2h$$

Ans: (c)

69. A metallic wire of length L is fixed between two rigid supports. If the wire is heated through a temperature difference ΔT , then the frequency of transverse vibration is proportional to [Given: Y = Young's modulus of the material of the rod, ρ = density of the rod, α = thermal

coefficient of linear expansion of the rod, and $\frac{FL}{AY} = \Delta l$]

- (a) $\frac{\rho}{\sqrt{Y\alpha}}$ (b) $\sqrt{\frac{\rho\alpha}{Y}}$ (c) $\alpha\sqrt{\frac{Y}{\rho}}$ (d) $\sqrt{\frac{Y\alpha}{\rho}}$

Sol: Let T be the tension in rod. Then $\frac{TL}{A\Delta l} = Y$

But $\Delta l = L\alpha\Delta\theta$

$$\Rightarrow T = YA\alpha\Delta\theta$$

$$v = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{YA\alpha\Delta\theta}{\rho A}} = \sqrt{\frac{Y\alpha\Delta\theta}{\rho}}$$

Frequency of transverse vibration,

$$f = \frac{v}{\lambda} \propto \frac{v}{L}$$

$$\Rightarrow f \propto \sqrt{\frac{Y\alpha\Delta\theta}{\rho}} \frac{1}{L}$$

Ans: (d)

70. The binding energy of deuteron is 2.2 MeV and that of ${}^4_2\text{He}$ is 28 MeV. If two deuterons are fused to form one ${}^4_2\text{He}$, then the energy released or absorbed is

- (a) 30.2 MeV (b) 25.8 MeV (c) 23.6 MeV (d) 19.2 MeV

Sol: ${}^2_1\text{H} + {}^2_1\text{H} \rightarrow {}^4_2\text{He} + \text{energy}$

Energy released / absorbed = B.E. of ${}^4_2\text{He} - 2(\text{B.E. of } {}^2_1\text{H}) = 28 - 2(2.2) = 28 - 4.4 = 23.6 \text{ MeV}$.

Ans: (c)

71. Which of the following pairs have same dimensional formula?

- (a) Angular momentum, Torque (b) Torque, Work
(c) Planck constant, Boltzmann constant (d) Gas constant, Pressure

Sol: Torque and Work have same dimensional formula $= ML^2T^{-2}$.

Ans: (b)

72. A converging lens having magnitude of focal length as f_1 is kept coaxially in contact with a converging lens having magnitude of focal length as f_2 . The focal length of the combination would be:

- (a) $\frac{f_1 f_2}{f_2 - f_1}$ (b) $\frac{f_1 + f_2}{f_1 f_2}$ (c) $\frac{f_1 - f_2}{f_1 f_2}$ (d) $\frac{f_1 f_2}{f_1 + f_2}$

Sol: We have to consider sign convention as only magnitude of focal length is given.

If f_1 is focal length of convex (converging) lens and f_2 is focal length of concave (diverging) lens. Then their equivalent focal length F would be

$$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{-f_2} = \frac{f_2 - f_1}{f_1 f_2} \left[\because \frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} \right] \therefore F = \frac{f_1 f_2}{f_2 + f_1}$$

Ans: (d)

73. A projectile is thrown with a velocity $u = 20 \text{ m/s} \pm 5\%$ at an angle 60° . If the projectile comes back on the ground at the same level, then which of following cannot be possible answer for range? Consider $g = 10 \text{ m/s}^2$

- (a) 34.6 m (b) 37.5 m (c) 32.0 m (d) 39.0 m

$$R = \frac{u^2 \sin 2\theta}{g}$$

Sol: Range of projectile,

for $\theta = 60^\circ$, $R = \frac{20^2 \sin 120^\circ}{g} = 20\sqrt{3} = 34.64 \text{ m}$

for % error $\frac{\Delta R}{R} = \frac{2\Delta u}{u}$

$\Delta R = \frac{2 \times 5}{100} \times 20\sqrt{3} = 2\sqrt{3} = 3.464 \text{ m}$ So, range $R = 34.64 \pm 3.46 \text{ m}$

$R_{\min} = 31.2 \text{ m}$ and $R_{\max} = 38.1 \text{ m}$

Ans: (d)

74. The resistance of a straight conductor does depend on

- (a) length (b) temperature
(c) material (d) Option (a), (b) and (c) all are correct

Sol: Resistance of a conductor

$$R = \frac{\rho l}{A} \quad \dots (i)$$

As ρ depends on the material,
so R depends on the material.

According to the given formula in Eq. (i), it depends on length. Moreover resistance \propto temperature.

If R_0 = resistance of conductor at 0°C ,

R_t = resistance of conductor at $t^\circ\text{C}$,

and α, β = temperature coefficient of resistance, then

$$R_t = R_0(1 + \alpha t + \beta t^2)$$

The resistance of a straight conductor does not depend on shape of cross-section.

Ans: (d)

75. A ball is dropped from height H on to a horizontal surface. If the coefficient of restitution is e , then the total time after which it comes to rest is

(a) $\sqrt{\frac{2H}{g}} \left(\frac{1-e}{1+e} \right)$ (b) $\sqrt{\frac{2H}{g}} \left(\frac{1+e}{1-e} \right)$ (c) $\sqrt{\frac{2H}{g}} \left(\frac{1+e^2}{1-e^2} \right)$ (d) $\sqrt{\frac{2H}{g}} \left(\frac{1-e^2}{1+e^2} \right)$

Sol: The time it takes for the ball to fall from a height is given by $t = \sqrt{\frac{2H}{g}}$

Speed just before first collision, $u = \sqrt{2gH}$

Speed just after first collision, $u_1 = eu = e\sqrt{2gH}$

$$\text{Height reached after first collision} = \frac{u_1^2}{2g} = \frac{(eu)^2}{2g} = e^2 \frac{u^2}{2g} = e^2 H$$

The height up to which the ball bounces after the n^{th} collision from the floor is $H_n = e^{2n}H$

$$t = \sqrt{\frac{2H}{g}} + 2\sqrt{\frac{2H_1}{g}} + 2\sqrt{\frac{2H_2}{g}} + \dots \infty$$

$$t = \sqrt{\frac{2H}{g}} (1 + 2e + 2e^2 + \dots \infty)$$

$$t = \sqrt{\frac{2H}{g}} [1 + (2e + 2e^2 + \dots \infty)]$$

$$= \sqrt{\frac{2H}{g}} \left[1 + \frac{2e}{1-e} \right]$$

$$t = \sqrt{\frac{2H}{g}} \left(\frac{1+e}{1-e} \right)$$

Ans: (b)

76. An electromagnetic wave of frequency 1×10^{14} Hz is propagating along z -axis. The amplitude of the electric field is 4 V/m. If $\epsilon_0 = 8.8 \times 10^{-12} \text{ C}^2 / \text{N} \cdot \text{m}^2$, then the average energy density of electric field will be

- (a) $35.2 \times 10^{-12} \text{ J/m}^3$ (b) $35.2 \times 10^{-10} \text{ J/m}^3$ (c) $35.2 \times 10^{-11} \text{ J/m}^3$ (d) $704 \times 10^{-13} \text{ J/m}^3$

Sol: $f = 10^{14} \text{ Hz}$

$E_0 = 4 \text{ V/m}$

$\epsilon_0 = 8.8 \times 10^{-12} \text{ C}^2 / \text{N} \cdot \text{m}^2$

Energy density of electric field $= \frac{1}{2} \cdot \frac{1}{2} \epsilon_0 E_0^2$

$= \frac{1}{2} \cdot \frac{1}{2} \times 16 \times 8.8 \times 10^{-12} \text{ J/m}^3 = 35.2 \times 10^{-12} \text{ J/m}^3$

Ans: (a)

77. Photons of energy of 6 eV are incident on a material surface whose work function is 4 eV . The minimum kinetic energy of the emitted photoelectrons is

- (a) Zero (b) 1 eV (c) 2 eV (d) 10 eV

Sol: $\frac{1}{2} m v_{\text{max}}^2 = hf - \phi_0 = hf - hf_0$

The kinetic energy of the emitted photoelectrons is distributed from zero to the maximum value.

Minimum kinetic energy of emitted photoelectron is zero.

Ans: (a)

78. The equation of a simple harmonic wave is given by

$$y = 3 \sin \frac{\pi}{2} (50t - x)$$

where x and y are in metres and t is in seconds. The ratio of maximum particle velocity to the wave velocity is

- (a) 2π (b) $\frac{3}{2}\pi$ (c) 3π (d) $\frac{2}{3}\pi$

Sol: $y = 3\sin\frac{\pi}{2}(50t - x)$

$y = 3\sin\left(25\pi t - \frac{\pi}{2}x\right)$ on comparing with the standard wave equation.

$y = a\sin(\omega t - kx)$

Wave velocity $v = \frac{\omega}{k} = \frac{25\pi}{\pi/2} = 50 \text{ m/sec}$

The velocity of particle

$v_p = \frac{dy}{dt} = 75\pi \cos\left(25\pi t - \frac{\pi}{2}x\right)$

$v_{p\max} = 75\pi$

Then $\frac{v_{p\max}}{v} = \frac{75\pi}{50} = \frac{3\pi}{2}$

Ans: (b)

79. A long string with a charge of λ per unit length passes through an imaginary cube of edge

$\frac{l}{\sqrt{3}}$. The maximum possible flux of the electric field through the cube will be:

- (a) $\frac{\lambda l}{\epsilon_0}$ (b) $\frac{\sqrt{2}\lambda l}{\epsilon_0}$ (c) $\frac{6\lambda l^2}{\epsilon_0}$ (d) $\frac{\sqrt{3}\lambda l}{\epsilon_0}$

Sol: The string is placed at diagonal for l_{\max}

$\lambda = \frac{q_{\max}}{l_{\max}}$

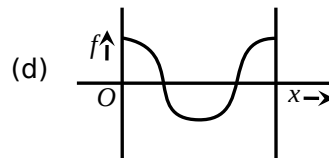
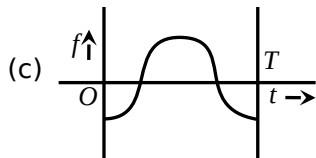
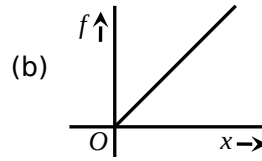
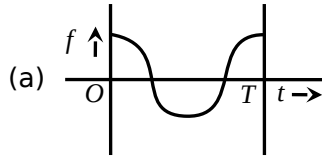
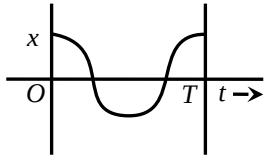
$\therefore q_{\max} = l_{\max} \lambda = \sqrt{3} \times \frac{l}{\sqrt{3}} \times \lambda = l\lambda$

\therefore Max possible flux of electric field through cube

$(\phi_E)_{\max} = \frac{l\lambda}{\epsilon_0}$

Ans: (a)

80. A body is performing simple harmonic motion of amplitude A and time period T . The figure shows position-time graph of the body. At any time t , acceleration of the body is f , then which of the following graphs is/are appropriate?



Sol: Since initial phase is $\frac{\pi}{2}$ as per the given graph.

Using the equation of position of SHM

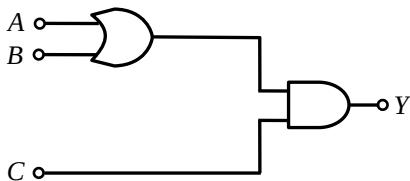
$$x = A \sin \left(\omega t + \frac{\pi}{2} \right) \Rightarrow x = A \cos \omega t$$

$$\Rightarrow \text{acceleration } f = \frac{d^2x}{dt^2} = -A\omega^2 \cos \omega t$$

Which is represented in option third.

Ans: (c)

81. To get an output 1 from the circuit shown in the figure, the input must be



- (a) $A=0, B=1, C=0$ (b) $A=1, B=0, C=0$ (c) $A=1, B=0, C=1$ (d) $A=1, B=1, C=0$

Sol: The Boolean expression for the given combination is output $Y = (A+B) \cdot C$

Hence, $A=1, B=0, C=1$

or other combinations can be $A=1, B=1, C=1$ and $A=0, B=1, C=1$

Ans: (c)

82. An electron is accelerated under a potential difference of 64 V , the de-Broglie wavelength

associated with electron is $\left[e = -1.6 \times 10^{-19} \text{ C}, m_e = 9.1 \times 10^{-31} \text{ kg}, h = 6.623 \times 10^{-34} \text{ Js} \right]$

- (a) 1.53 Å (b) 2.53 Å (c) 3.35 Å (d) 4.54 Å

Sol: Modified equation of de-Broglie wavelength $\lambda = \frac{h}{\sqrt{2meV}}$

$$\lambda = \frac{12.27 \text{ \AA}}{\sqrt{V}} = \frac{12.27}{\sqrt{64}} = 1.534 \text{ \AA}$$

Ans: (a)

83. A body of mass $m = 10^{-2} \text{ kg}$ is moving in a medium and experiences a frictional force $F = -kv^2$

. Its initial speed is $v_0 = 10 \text{ ms}^{-1}$. After 10 s, its kinetic energy is $\frac{1}{8}mv_0^2$. Then the value of k will be:

- (a) $10^{-1} \text{ kg m}^{-1}\text{s}^{-1}$ (b) $10^{-3} \text{ kg m}^{-1}$ (c) $10^{-3} \text{ kg s}^{-1}$ (d) $10^{-4} \text{ kg m}^{-1}$

Sol: After 10 sec, $\frac{1}{2}mv^2 = \frac{1}{8}mv_0^2 \Rightarrow v = \frac{v_0}{2} = 5 \text{ m/sec}$;

$$a = -\frac{kv^2}{m} \Rightarrow \frac{dv}{dt} = -\frac{kv^2}{m} \Rightarrow \int_{10}^5 \frac{dv}{v^2} = -\frac{k}{m} \int_0^{10} dt ; \quad -\frac{1}{5} + \frac{1}{10} = \frac{-k}{10^{-2}} \times 10 ; \quad k = 10^{-4} \text{ kg m}^{-1}$$

Ans: (d)

84. The engine of a car produces an acceleration of 6 ms^{-2} in the car. If this car pulls another car of the same mass, then the acceleration would be

- (a) 6 ms^{-2} (b) 12 ms^{-2} (c) 3 ms^{-2} (d) 1.5 ms^{-2}

Sol: Let, mass of car = m

Force applied by engine = $6m$

When two cars are pulled, $(m + m)a = 6m$

or $2ma = 6m$ or $a = 3 \text{ ms}^{-2}$

Ans: (c)

85. An electron jumps from third excited state of He^+ ion to its ground state and the photon thus emitted is incident on a photosensitive metal plate of work function 4.50 eV . If the ionization potential of hydrogen atom in ground state is 13.60 eV , then the stopping potential would be

- (a) 12.45 eV (b) 22.15 eV (c) 37.50 eV (d) 46.50 eV

Sol: $\Delta E = 13.6 \times 4 \left(\frac{1}{1^2} - \frac{1}{4^2} \right) = 51 \text{ eV}$

$\Delta E = h\nu = \phi + V_{\text{stopping}} \quad \therefore V_{\text{stopping}} = 51 - 4.50 = 46.50 \text{ eV}$

Ans: (d)

86. In an A.C. circuit V and I are given by

$V = 100 \sin(100t) \text{ volt}, \quad I = 100 \sin\left(100t + \frac{\pi}{3}\right) \text{ A}$

then power dissipated in the circuit is

- (a) 10^4 W (b) 10 W (c) 2500 W (d) 5 W

Sol: $P = \frac{I_0}{\sqrt{2}} \frac{V_0}{\sqrt{2}} \cos(\phi_1 - \phi_2) = \frac{100 \times 100}{2} \cos\left(\frac{\pi}{3}\right) = \frac{5000}{2} = 2500 \text{ W}$

Ans: (c)

87. A bar magnet is released from rest along the axis of a very long vertical copper tube. After some time the magnet will

- (a) move down with almost constant speed
 (b) move down with an acceleration equal to g
 (c) move down with an acceleration greater than g
 (d) oscillate inside the tube

Sol: When a bar magnet is released from rest along the axis of a very long vertical copper tube, it will move down with an almost constant other some time.

As the magnet falls, it moves through the copper tube, inducing eddy currents in the tube. These eddy currents, in turn, create an opposing magnetic field that opposes the motion of the magnet. The opposing force generated by the eddy currents acts as a damping force, which slows down the magnet's acceleration. Eventually, the magnet reaches a terminal velocity, at which point the gravitational force pulling the magnet downward is balanced by the opposing force from the eddy currents.

At this terminal velocity, the magnet moves down with an almost constant speed.

Ans: (a)

88. What is the nature of the wave front associated with a beam of light coming out from tubelight?

- (a) Plane (b) Spherical (c) Cylindrical (d) Elliptical

Sol: Tubelight forms cylindrical wave front

Ans: (c)

89. If a thin prism of glass $\left(\mu_g = \frac{3}{2}\right)$ having 2° as the angle of prism is dipped into water $\left(\mu_w = \frac{4}{3}\right)$ then minimum deviation of light produced by prism will be

- (a) $\frac{1^\circ}{2}$ (b) $\frac{1^\circ}{4}$ (c) 2° (d) $\frac{1^\circ}{5}$

Sol: $\delta = (\mu - 1)A$

$$= \left(\frac{3}{2} \times \frac{3}{4} - 1\right)A \quad \delta = \frac{1}{8} \times A = \frac{1}{8} \times 2 = \frac{1^\circ}{4}$$

Ans: (b)

90. When viewed in white light soap bubbles show colours because of

- (a) Interference (b) Diffraction (c) Scattering (d) Dispersion

Sol: Due to interference phenomena

Ans: (a)

Biology

Multiple Choice Questions with one correct answer. A correct answer carries 4 marks. A wrong answer carries a penalty of 1 mark. 90 x 4 = 360

91. The most important function of inflorescence is to help in

- (a) Increasing length of plant
- (b) Attracting animals for cross pollination
- (c) Dispersal of seeds
- (d) Release of nectar

Sol: Attracting animals for cross pollination

Ans: (b)

92. DNA replication occurs during

- (a) Prophase
- (b) Metaphase
- (c) Anaphase
- (d) Interphase

Sol: Interphase

Ans: (d)

93. Housefly belongs to the family

- (a) Hominidae
- (b) Muscidae
- (c) Anacardiaceae
- (d) Felidae

Sol: Muscidae

Ans: (b)

94. How many of the following statements are correct?

- (1) Conjoint vascular bundles are not present in monocot stem.
- (2) Casparian strips of endodermis are made of cutin
- (3) Pith is large and well developed in monocot roots.
- (4) Trichome helps in promoting water loss due to transpiration.

- (a) One
- (b) Two
- (c) Three
- (d) Four

Sol: One

Ans:(a)

95. Which part would be most suitable for raising virus-free plants for micropropagation?

- (a) Bark
- (b) Vascular tissue
- (c) Meristem
- (d) Node

Sol: Meristem

Ans: (c)

96. _____ donot grow in polluted areas.

- (a) Bacteria
- (b) Fungi
- (c) Lichens
- (d) Bryophytes

Sol: Lichens

Ans: (c)

97. Which of the following organisms are decomposers?

- (a) Pteris (b) Bacteria (c) Saprophytic fungi (d) Both (b) and (c)

Sol: Both (b) and (c)

Ans: (d)

98. In Griffith experiment

- (a) R-strain transformed to S-strain and became virulent
 (b) R-strain transformed to S-strain and lost virulence
 (c) S-strain transformed to R-strain and became virulent
 (d) S-strain transformed to R-strain and lost virulence

Sol: R-strain transformed to S-strain and became virulent

Ans:(a)

99. If in a pond there are 20 lotus plants last year and through reproduction 8 new plants are added, taking the current population to 28 , calculate the birth rate.

- (a) 4 offsprings per year (b) 0.4 offsprings per lotus per year
 (c) 2.5 offsprings per lotus per year (d) 25 offsprings per year.

Sol: 0.4 offspring per lotus per year

Ans:(b)

100. Pear shaped biflagellate zoospores are found in

- (a) Chlorophyceae (b) Phaeophyceae (c) Rhodophyceae (d) Both (a) and (b)

Sol: Phaeophyceae

Ans: (b)

101. The inflorescence with ray florets and disc florets is seen in

- (a) Malvaceae (b) Solanaceae (c) Asteraceae (d)

Fabaceae

Sol: Asteraceae

Ans: (c)

102. UTR is/are

- (i) Untranslated region of mRNA
 (ii) It present only at 5' end
 (iii) They are required for efficient translation process
 (iv) It present only at 3' end
 (a) i, ii, iii are correct (b) i, ii, iii and iv are correct
 (c) i, iii, iv are correct (d) i, iii are correct

Sol: i, iii are correct

Ans: (d)

103. Any species growing exponentially under unlimited resource conditions can reach enormous population density in short time, then the population growth curve will be
(a) Hyperbola (b) 'J' shaped (c) 'S' shaped (d) None of these
Sol: 'J' shaped
Ans: (b)
104. Classification based on evolutionary relationships between different organisms is called
(a) Artificial system (b) Natural system (c) Phylogenetic system (d) None of the above
Sol: Phylogenetic system
Ans: (c)
105. Nucellar embryos are
(a) Amphimictic diploids (b) Apomictic diploids
(c) Apomictic haploids (d) Pentaploids
Sol: Apomictic diploids
Ans: (b)
106. Butyric acid is produced by
(a) *Aspergillus niger* (b) *Acetobacter aceti* (c) *Clostridium butylicum* (d) *Lactococcus*
Sol: *Clostridium butylicum*
Ans: (c)
107. Which of the following hormone, in combination with auxin, stimulates cell division in plants and determines the course of differentiation mainly
(a) Ethylene (b) IAA (c) Gibberellins (d) Cytokinins
Sol: Cytokinins
Ans: (d)
108. The cells that are found in between the xylem and phloem of dicot root are
(a) Parenchyma (b) Collenchyma (c) Chlorenchyma (d) Sclerenchyma
Sol: Parenchyma
Ans: (a)
109. Isolated protoplasts from two different varieties of plants, each having a desirable character can be fused to get hybrid protoplasts. These hybrids are called as
(a) Somaclones (b) Somatic hybrids (c) Gametic hybrids (d) Cytoplasmic hybrids
Sol: Somatic hybrids
Ans: (b)

110. Reduction of NAD does not occur in which of the following?

- (a) isocitric acid \rightarrow α -ketoglutaric acid (b) Malic acid \rightarrow Oxaloacetic acid
 (c) Pyruvic acid \rightarrow Acetyl co-A (d) Succinic acid \rightarrow Fumaric acid

Sol: Succinic acid \rightarrow Fumaric acid

Ans:(d)

111. Which one of the following pair is not correctly matched?

- (a) Abscisic acid - Stomatal closure (b) Gibberellic acid - Leaf fall
 (c) Cytokinin - Cell division (d) 2, 4 - D - herbicide

Sol: Gibberellic acid - Leaf fall

Ans:(b)

112. 3-PGA is first stable product in

- (a) Carbon-reduction cycle (b) Photorespiration
 (c) Light reaction (d) All of these

Sol: Carbon-reduction cycle

Ans: (a)

113. In plants glucose is derived from

- (a) Lipase (b) Sucrose
 (c) Storage carbohydrates (d) Both (b) and (c)

Sol: Both (b) and (c)

Ans: (d)

114. The oxidation of one NADH_2 yields

- (a) 18 ATP (b) 6 ATP (c) 3 ATP (d) 2 ATP

Sol: 3 ATP

Ans: (c)

115. Biofertilizers include

- (a) Nitrogen fixing bacteria (b) Nitrogen fixing cyanobacteria
 (c) Mycorrhiza (d) All of these

Sol: All of these

Ans: (d)

116. In DNA molecule, which of the following base pair is present?

- (a) Cytosine and adenine (b) Adenine and thymine
 (c) Adenine and guanine (d) Cytosine and thymine

Sol: Adenine and thymine

Ans: (b)

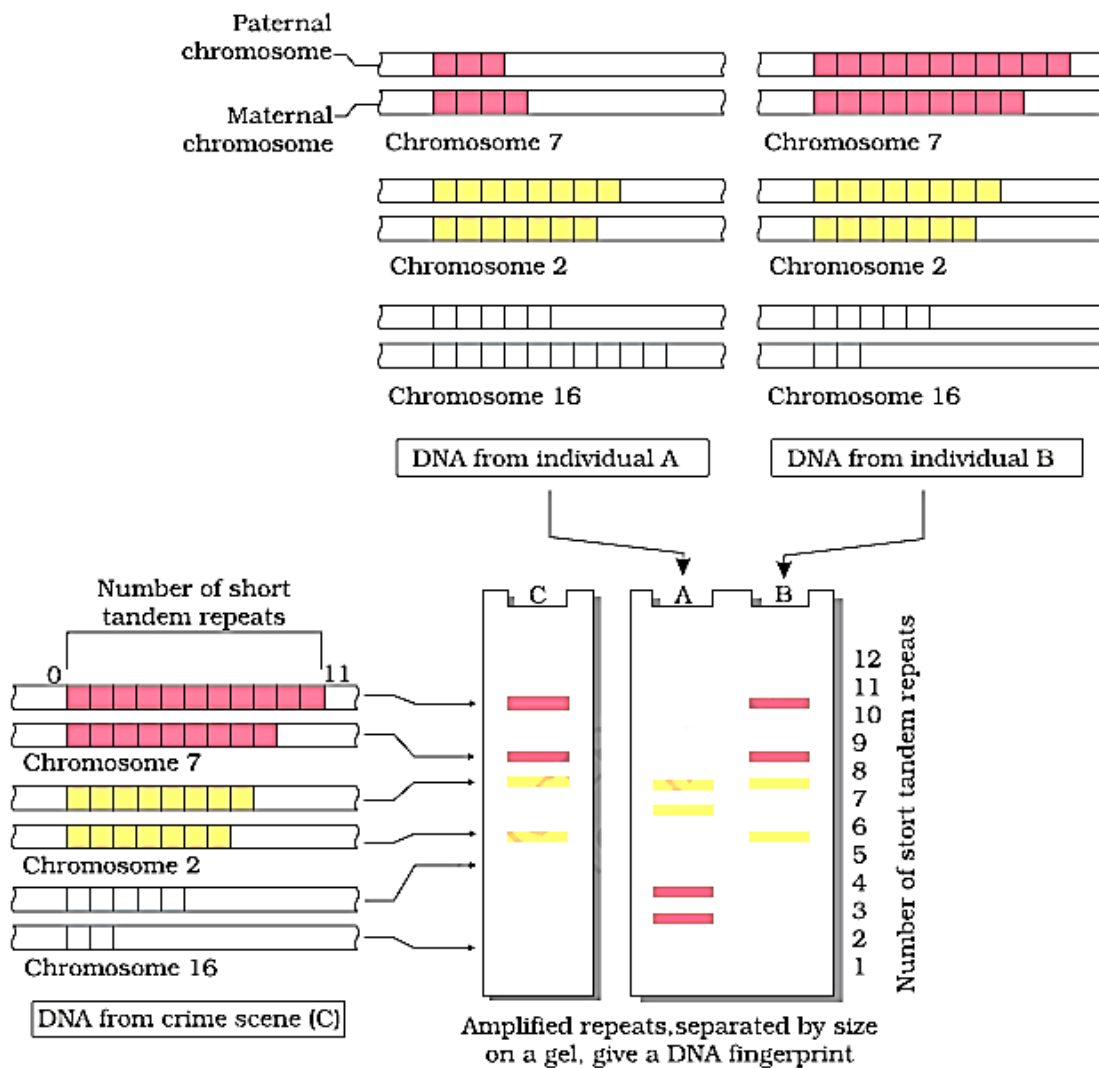
117. Identify the incorrect statement regarding Bt-cotton.

- (a) Bt toxin gene has been cloned from the bacteriophage
- (b) It releases toxin that causes swelling in the gut of insect that ingest its leaves
- (c) It is a transgenic plant
- (d) cryIAc and cryII Ab genes are introduced to make them resistant against bollworms.

Sol: Bt toxin gene has been cloned from the bacteriophage

Ans: (a)

118. In the given figure if 'C' is the DNA collected from crime site and 'A' & 'B' are samples from suspects, then who is the criminal?



- (a) B
- (b) A
- (c) Both A and B
- (d) None of these

Sol: B

Ans: (a)

119. To calculate the current 'r' value for human population we need to know about
 (a) Birth rate (b) Death rate (c) Carrying capacity (d) Both (a) and (b)

Sol: Both (a) and (b)

Ans:(d)

120. _____ hasten fruit ripening in tomatoes and apples .
 (a) Auxin (b) ABA (c) Ethephon (d) Gibberallins.

Sol: Ethephon

Ans: (c)

121. Match the column;

	Column - I		Column - II
A	$\phi \times 174$ DNA	(i)	3.3×10^9 bp
B	λ - phage DNA	(ii)	4.6×10^6 bp
C	E.coli DNA	(iii)	48502 bp
D	Haploid content of human DNA	(iv)	5386 bases

(a) A =(iv), B =(iii), C=(ii), D =(i)

(b) A =(i), B =(ii), C=(iii), D =(iv)

A =(ii), B =(iii), C =(iv), D =(i)

(d) A =(i), B =(iv), C =(ii), D =(iii)

(c)

Sol: A =(iv), B =(iii), C =(ii), D =(i)

Ans:(a)

122. The cell wall of plants consists of
 (a) Lignin, suberin, protein and lipid
 (b) Hemicellulose, cellulose, tubulin and lignin
 (c) Lignin, hemicellulose, pectin and lipid
 (d) Proteins, hemicellulose, pectin and cellulose

Sol: Proteins, hemicellulose, pectin and cellulose

Ans: (d)

123. Biological Oxygen demand (BOD) is a measure of
 (a) Industrial waste poured into water bodies
 (b) Extent which water is polluted with organic compounds
 (c) Amount of carbon monoxide inseparably combined with haemoglobin
 (d) Amount of oxygen needed by green plants during night

Sol: Extent which water is polluted with organic compounds

Ans: (b)

124. Choose the incorrect match.

- (a) Parthenocarpic fruit -Seedless fruit
- (b) Wall of fruit - Testa
- (c) Edible part of apple and strawberry - Thalamus
- (d) Fleshy part of Guava fruit - Ovary

Sol: Wall of fruit - Testa

Ans: (b)

125. Eli Lilly, an American company prepared two DNA sequences corresponding to A and B, chains of human insulin, and introduced them in plasmids of E. coli to produce insulin chains. Chain A and B were produced separately, extracted and combined by creating

- (a) Peptide bonds
- (b) Ionic bonds
- (c) H-bonds
- (d) Disulphide

bonds

Sol: Disulphide bonds

Ans: (d)

126. Mycorrhizae help in the absorption of

- (a) Calcium
- (b) Metals
- (c) Phosphorous
- (d) None of these

Sol: Phosphorous

Ans: (c)

127. In some seeds, remnants of nucellus are persistent. Example for such seed is

- (a) Black pepper
- (b) Mango
- (c) Apple
- (d) Maize

Sol: Black pepper

Ans: (a)

128. Choose the correct option regarding agarose gel electrophoresis,

- (a) DNA migrates towards the negative electrode
- (b) DNA can be viewed without staining.
- (c) Large molecules migrate faster than smaller molecules
- (d) Ethidium bromide can be used to visualize the DNA

Sol: Ethidium bromide can be used to visualize the DNA

Ans:(d)

129. The total number of species, that are known and described in ranges between

- (a) 0.5- 1.0 million
- (b) 1.1- 1.2million
- (c) 1.7 - 1.8 million
- (d) 2.5- 3.0 million

Sol: 1.7 - 1.8 million

Ans: (c)

130. Inside the pollengrain, the bigger cell with abundant food reserve and irregularly shaped nucleus is

- (a) Generative cell (b) Vegetative cell (c) Both (a) and (b) (d) None of the above

Sol: Vegetative cell

Ans: (b)

131. The segment of DNA coding for a polypeptide is

- (a) Cistron (b) Recon (c) Muton (d) Proton

Sol: Cistron

Ans: (a)

132. At present we know more than _____A_____ restriction enzymes that have been isolated from over _____B_____ strains of bacteria.

- (a) 230 and 900 (b) 900 and 230 (c) 200 and 930
(d) 930 and 200

Sol: 900 and 230

Ans: (b)

133. The diagnosis that is based on antigen-antibody interaction is

- (a) Serum analysis (b) ELISA (c) PCR (d) MRI

Sol: ELISA

Ans: (b)

134. Ecosystem is a self-sufficient, self-maintaining dynamic system in which there is a

- (a) non-cyclic unidirectional flow of energy
(b) Cyclic exchange of nutrients
(c) communities and abiotic components function together
(d) all of these

Sol: all of these

Ans: (d)

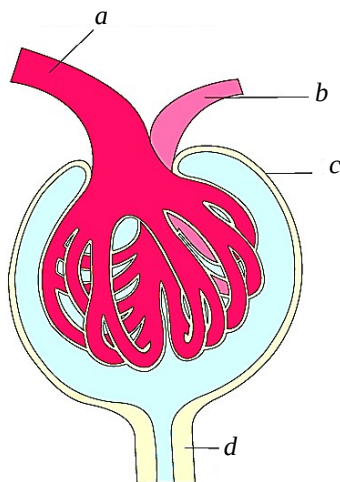
135. Which is not true for monerans?

- (a) They reproduce by mitosis and under favourable conditions by producing spores.
(b) Bacteria are the sole members of kingdom Monera
(c) Most of them have cell walls
(d) They are prokaryotic

Sol: They reproduce by mitosis and under favourable conditions by producing spores.

Ans: (a)

136. Recognise the figure.



- (1) 'a' is the fine bran
- (2) 'b' carried blood towards the glomerulus
- (3) 'c' is the tuft of capillaries formed by the 'a'
- (4) 'd' is a highly coiled network of renal tubule

Which of the following is correct?

- (a) 1 and 2
- (b) 2 and 3
- (c) 3 and 4
- (d) 4 only

Sol: 4 only

Ans: (d)

137. Statement 1: In frog, the alimentary canal is short and length of intestine is reduced
Statement 2: Frog is carnivorous in nature

- (a) Both statements 1 and 2 are correct
- (b) Statement 1 is incorrect but statement 2 is correct
- (c) Statement 1 is correct but statement 2 is incorrect
- (d) Both statements 1 and 2 are incorrect

Sol: Both statements 1 and 2 are correct

Ans: (a)

138. The clitoris is a tiny finger-like structure, which lies at:

- (a) the upper junction of the two labia minora above the urethral opening.
- (b) the upper junction of the two labia minora below the urethral opening
- (c) the lower junction of the two labia minora above the urethral opening
- (d) the lower junction of the two labia minora below the urethral opening

Sol: the upper junction of the two labia minora above the urethral opening.

Ans: (a)

139. In the measurement of the blood pressure the denominator and numerator represents
- (a) Resting and pumping pressure respectively
 - (b) Pumping and resting pressure respectively
 - (c) Systolic and diastolic pressure respectively
 - (d) Both (b) and (c)

Sol: Resting and pumping pressure respectively

Ans: (a)

140. Which of the following contraceptive devices is having a common mechanism of action?
- (a) Vaults and Lippes loop
 - (b) CuT and Multiload ³⁷⁵
 - (c) Progestasert and Cervical caps
 - (d) Diaphragm and Lippes loop

Sol: CuT and Multiload ³⁷⁵

Ans:(b)

141. Read the given statements carefully.

- (i) Innate immunity is specific type of defence that is present at the time of birth
- (ii) Malignant malaria is caused by *Plasmodium falciparum*
- (iii) Malaria could be confirmed by Widal test
- (iv) Active immunity is slow and takes time to give its full effective response
- (v) Saliva in the mouth acts as physiological barrier for pathogens

Which of the above statements are correct?

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

Sol: (ii), (iv) and (v)

Ans: (a)

142. Read the following statements and find out the incorrect statement(s).

- (i) Humans are sexually reproducing and viviparous
- (ii) Transfer of sperm in female genital tract (vagina) is called ejaculation
- (iii) There are remarkable differences between the reproductive events in the male and in the female.
- (iv) Sperm formation continues even in old men, but formation of ovum ceases in women around the age of fifteen years.
- (v) The male and female reproductive systems are located in the pelvic region.

- (a) (i), (iii) and (iv)
- (b) (ii), (iii) and (v)
- (c) (ii) and (iv) only
- (d) (ii) only

Sol: (ii) and (iv) only

Ans: (c)

143. Which of the following has the maximum % of the total cellular mass?

- (a) Protein
- (b) Carbohydrate
- (c) Lipid
- (d) Nucleic acid

Sol: Protein

Ans:(a)

144. Which of the following statements is correct?

- (a) The ascending limb of loop of Henle is impermeable to water
- (b) The descending limb of loop of Henle is impermeable to water
- (c) The ascending limb of loop of Henle is permeable to water
- (d) The descending limb of loop of Henle is permeable to electrolytes

Sol: The ascending limb of loop of Henle is impermeable to water

Ans:(a)

145. A person breathing normally at rest takes in and expels approximately half a litre of air during each respiratory cycle. This is called

- (a) Inspiratory reserve volume
- (b) Tidal volume
- (c) Expiratory reserve volume
- (d) Vital capacity

Sol: Tidal volume

Ans: (b)

146. Which of the following is incorrect in relation to the catecholamines

- (a) These are called emergency hormones or hormones of fight or flight
- (b) These hormones increase the heart beat, the strength of heart contraction and the rate of respiration
- (c) They inhibit the lipolysis and proteolysis
- (d) They increase alertness, pupillary dilation, piloerection (raising of hairs) and sweating.

Sol: They inhibit the lipolysis and proteolysis

Ans: (c)

147. Note the following.

- (A) Right side of the heart
- (B) Left side of the heart
- (C) Pulmonary arteries
- (D) Pulmonary veins

Only oxygenated blood passes through

- (a) A and C
- (b) B and C
- (c) A and D
- (d) B and D

Sol: B and D

Ans: (d)

148. Select the incorrect match

(a)

Saheli	This is an oral contraceptive for females containing a non-steroidal preparation. It is a 'once a month' pill
--------	---

(b)

Male and Female condoms	Condoms are barriers made of thin rubber/latex sheath. These are applied just before coitus.
-------------------------	--

(c)

Lactational amenorrhea	It is based on the fact that ovulation and therefore the cycle do not occur during the period of intense lactation following parturition.
------------------------	---

(d)

MTPs	These are considered relatively safe during the first trimester i.e, upto 12 weeks of pregnancy.
------	--

Sol:

Saheli	This is an oral contraceptive for females containing a non-steroidal preparation. It is a 'once a month' pill
--------	---

Ans: (a)

149. How many of the given statements are incorrect?

- A. Nucleolus and nuclear membrane disappear in prophase.
- B. Synaptonemal complex formation occurs during zygotene.
- C. The enzyme responsible for crossing over in pachytene is recombinase.
- D. Chiasmata formation occurs in diakinesis.

(a) One

(b) Two

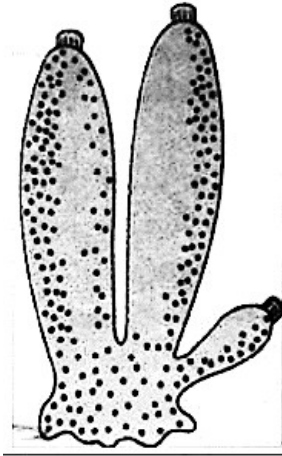
(c) Three

(d) Four

Sol: One

Ans:(a)

150. Identify the organism and the Phylum to which it belongs in the following diagram?



- (a) *Sycon*, Porifera (b) *Euspongia*, Porifera (c) *Spongilla*, Annelida (d)

Sycon, Annelida

Sol: *Sycon*, Porifera

Ans: (a)

151. Read the following statements about biodiversity and state the one which is false.

- (a) Western Ghats have a greater amphibian species diversity than the Eastern Ghats
 (b) Alpine meadows has a greater ecosystem diversity than a Scandinavian country like

Norway

- (c) Among animals, insects are the most species-rich taxonomic group
 (d) New York has more bird species than Columbia

Sol: New York has more bird species than Columbia

Ans: (d)

152. Read the following statements and find out the incorrect statement about frog.

- (a) In frog, external ears are absent
 (b) Ear is an organ of hearing as well as balancing
 (c) In male, testes are adhered to the upper part of kidneys by a double fold of peritoneum called mesothelium
 (d) Vasa efferentia are 10-12 in number that arise from testes.

Sol: In male, testes are adhered to the upper part of kidneys by a double fold of peritoneum called mesothelium

Ans: (c)

153. Most suitable reason why SA node act as pacemaker for heart.

- (a) It is located in the right atrium.
 (b) It is made up of neural tissue
 (c) It is first to generate the nerve impulse.

(d) It can generate the maximum number of action potentials per unit time.

Sol: It can generate the maximum number of action potentials per unit time.

Ans:(d)

154. Inspiration can occur if the intra-pulmonary pressure is -----A----- than the atmospheric pressure. Inspiration is initiated by the contraction of diaphragm which increases the volume of thoracic chamber in the -----B-----axis.

(a)

A	B
More	Antero-posterior

(b)

	Antero-posterior
--	------------------

A	B
Less	Antero-posterior

(c)

A	B
More	Dorso-ventral

(d)

A	B
Less	Dorso-ventral

Sol:

A	B
Less	Antero-posterior

Ans:(b)

155. Among the following sets of hormones, which one contain only peptide hormones?

- (a) Epinephrine, cortisol, pituitary hormones
- (b) TSH, hypothalamic hormones, estradiol
- (c) Insulin, progesterone, cortisol
- (d) Insulin, glucagon, prolactin

Sol: Insulin, glucagon, prolactin

Ans: (d)

156. What is the other name for “incomplete dominance”?

- (a) Blending inheritance
- (b) Co-dominance
- (c) Pseudo-dominance
- (d) All the above

Sol: Blending inheritance

Ans: (a)

157. With respect to the sodium-potassium pump, what changes will be observed when one molecule of ATP is used during the process?

- (a) 3 ions of Na^+ are pumped out and 2K^+ are taken in
- (b) 3 ions of Na^+ are taken in and 2K^+ are pumped out
- (c) 2 ions of Na^+ are thrown out and 3K^+ are absorbed
- (d) 3 ions of K^+ are absorbed, 3Na^+ are pumped out.

Sol: 3 ions of Na^+ are pumped out and 2K^+ are taken in

Ans: (a)

158. Experimental evidence in favour of chemical origin of life was provided by

- (a) I. Oparin and J.B.S. Haldane
- (b) Urey and Miller
- (c) Both (a) and (b)
- (d) None of these

Sol: Urey and Miller

Ans:(b)

159. Select one word for the statement.

- (A) If F_1 resembled both the parents
- (B) If F_1 did not resemble either of the two parents and was in between the two
- (C) If F_1 resembled either of the two parents
- (a) A-incomplete dominance, B-co-dominance, C-dominance
- (b) A-dominance, B-co-dominance, C-incomplete dominance
- (c) A-co-dominance, B-dominance, C-incomplete dominance
- (d) A-co-dominance, B-incomplete dominance, C-dominance

Sol: A-co-dominance, B-incomplete dominance, C-dominance

Ans: (d)

160. According to the 2011 census, the population growth rate in India was?

- (a) Less than 2%
- (b) 3- 4%
- (c) Negative
- (d) More than 5%

Sol: Less than 2%

Ans:(a)

161. Bones become fragile in

- (a) Osteoporosis
- (b) Gout
- (c) Arthritis
- (d) None of these

Sol: Osteoporosis

Ans: (a)

162. Immunity developed by vaccination
- | | |
|---|--|
| (a) Natural acquired passive immunity | (b) Natural acquired active immunity |
| (c) Artificial acquired active immunity | (d) Artificial acquired passive immunity |

Sol: Artificial acquired active immunity

Ans: (c)

163. I. Thin thread like chromosomes with beaded appearance.

II. Appearance of recombination nodules.

III. Formation of bivalents/tetrads.

IV. Terminalisation of chiasmaia.

V. Appearance of chiasmata.

Identify the different stages with respect to the above given features and select the correct option.

- | |
|---|
| (a) I-Leptotene, II-Zygotene, III-Pachytene, IV-Diplotene, V-Diakinesis |
| (b) I-Leptotene, II-Zygotene, III-Pachytene, IV-Diakinesis, V-Diplotene |
| (c) I-Leptotene, II-Pachytene, III-Zygotene, IV-Diakinesis, V-Diplotene |
| (d) I-Leptotene, II-Pachytene, III-Diplotene, IV-Zygotene, V-Diakinesis |

Sol: I-Leptotene, II-Pachytene, III-Zygotene, IV-Diakinesis, V-Diplotene

Ans: (c)

164. In IUCN Red List (2004), extinction of 784 species includes

- | |
|--|
| (a) 338 vertebrates, 359 invertebrates and 78 plants |
| (b) 359 vertebrates, 338 invertebrates and 87 plants |
| (c) 338 vertebrates, 359 invertebrates and 87 plants |
| (d) 359 vertebrates, 338 invertebrates and 78 plants |

Sol: 338 vertebrates, 359 invertebrates and 87 plants

Ans: (c)

165. Which of the following statements are true/false?

I. In Torpedo, the electric organs are capable of generating strong electric shock

II. Claspers are found in cartilaginous fishes

III. Amphibian skin is moist and has thick scales

IV. Birds are poikilothermous animals

V. The most unique mammalian characteristic is the presence of milk producing mammary glands by which the young ones are nourished

- | | |
|---|--|
| (a) I, II and III are true; IV, V are false | (b) I, II and V are true; III, IV are false |
| (c) I, III and V are true; II, IV are false | (d) I, II, and IV are true; III, V are false |

170. A patient comes to the clinic with a genetic disorder characterized by a webbed neck and the presence of rudimentary ovaries. This person most likely has autosomes along with
 (a) two X and one Y sex chromosomes (b) only one sex chromosome which is X

(c) three 21st chromosomes (d) three X chromosomes

Sol: only one sex chromosome which is X

Ans: (b)

171. What is the source of gonadotropin-releasing hormone

(a) Hypothalamus (b) Anterior lobe of pituitary
 (c) Posterior lobe of pituitary (d) Intermediate lobe of pituitary

Sol: Hypothalamus

Ans:(a)

172. Metagenesis is seen in

(a) Sycon (b) Obelia (c) *Ascaris lumbricoides* (d) *Periplaneta americana*

Sol: Obelia

Ans: (b)

173. Match the columns I and II, and choose the correct combination from the options given.

Column I		Column II	
(A)	Opioids	(1)	Snorting and injection
(B)	Cannabinoids	(2)	Inhalation and oral ingestion
(C)	Coka alkaloids	(3)	Snorting

(a) A-1, B-2, C-3 (b) A-3, B-2, C-1
 (c) A-2, B-1, C-3 (d) A-1, B-3, C-2

Sol: A-1, B-2, C-3

Ans: (a)

174. The infectious stage of *Plasmodium* that enter the human body is:

(a) Male gametocytes (b) Trophozoites (c) Sporozoites (d)

Female gametocytes

Sol: Sporozoites

Ans: (c)

175. Which one of the following is not a property of cancerous cells, whereas the remaining three are?

- (a) They compete with normal cells for vital nutrients
- (b) They do not remain confined in the area of formation
- (c) They divide in an uncontrolled manner
- (d) They show contact inhibition

Sol: They show contact inhibition

Ans: (d)

176. Select the incorrect statements regarding AIDS from the following

- I. AIDS is not a congenital disease and was first reported in 1981.
- II. AIDS can be successfully treated using anti-retroviral drugs
- III. Macrophages act as a viral factory as it leads to the continuous production of new viral particles.
- IV. In AIDS, a decrease in B-lymphocyte count is seen.

- (a) II and IV
- (b) I and III
- (c) I and II
- (d) III and IV

Sol: II and IV

Ans: (a)

177. Which of the following is incorrect about the Homo habilis?

- (a) It is considered to be evolved after Australopithecus
- (b) It was the first hominid
- (c) Cranial capacity was around 650– 800cc
- (d) It was absolutely carnivorous

Sol: It was absolutely carnivorous

Ans: (d)

178. The colonization of tropical Pacific Islands by humans is said to have led to the extinction of more than

- (a) 1,200 species of native birds
- (b) 1,300 species of native birds
- (c) 1,400 species of native birds
- (d) 2,000 species of native birds

Sol: 2,000 species of native birds

Ans: (d)

179. Increases in body temperature makes oxygen haemoglobin dissociation curve:

- (a) parabolic
- (b) hyperbolic
- (c) shift to right
- (d) shift to left

to left

Sol: shift to right

Ans: (c)

180. Which of the following options correctly represents the lungs conditions in asthma and emphysema respectively?

- (a) Increased respiratory surface; Inflammation of bronchioles
- (b) Increased number of bronchioles; Increased respiratory surface
- (c) Inflammation of bronchioles; Decreased respiratory surface
- (d) Decreased respiratory surface; Inflammation of bronchioles

Sol: Inflammation of bronchioles; Decreased respiratory surface

Ans: (c)

Answer Keys:

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