# Monthly Progressive Test

## Class: XII

## Subject: PCMB

**Test Booklet No.: MPT04**

**Test Date:** | 2 | 4 | 0 | 7 | 2 | 0 | 2 | 4 |

**Time: 180 mins**

**Full Marks: 200**

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### Important Instructions :

1. The Test is of 180 mins duration and the Test Booklet contains 100 multiple choice questions of single correct option only. There are four sections with four subjects. You have to attempt all 100 questions (Candidates are advised to read all 100 questions). Questions 1 to 25 contain Physics, Questions 26 to 50 contain Chemistry, Questions 51 to 75 contain Mathematics, Questions 76 to 100 contain Biology.

2. Each question carries 2 marks. For each correct response, the candidate will get 2 marks. There is no negative mark for wrong response. The maximum mark is 200.

3. Use Blue / Black Ball point Pen only for writing particulars marking responses on Answer Sheet.

4. Rough work is to be done in the space provided for this purpose in the Test Booklet only.

5. On completion of the test, the candidate must handover the Answer Sheet to the invigilator before leaving the Room / Hall. The candidates are allowed to take away this Test Booklet with them.

6. The CODE for this Booklet is Off Line MPT0424072024.

7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your UID No. anywhere else except in the specified space. Use of white fluid for correction is NOT permissible on the Answer Sheet. **Do not scrible or write on or beyond discrete bars of OMR Sheet at both sides**.

8. Each candidate must show on-demand his/her Registration document to the Invigilator.

9. No candidate, without special permission of the Centre Superintendent or Invigilator, would leave his/her seat.

10. Use of Electronic Calculator/Cellphone is prohibited.

11. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.

12. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.

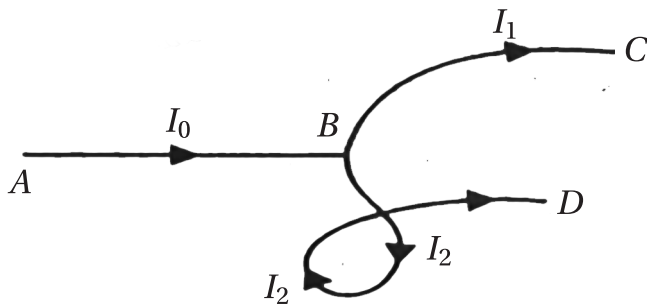13. There is no scope for altering response mark in Answer Sheet.

## Physics

**1.** The electric field (applied) $\vec{E}$ inside a current carrying conductor of current density $\vec{J}$. If $\rho$ is the resistivity of conductor the $\vec{E}$

Ⓐ $\rho\vec{J}$ 　　　Ⓑ $\dfrac{\vec{J}}{\rho}$ 　　　Ⓒ $\vec{J}$ 　　　Ⓓ None of the above

**2.** Due to stretching of conducting wire of length $l$, if $R$ is the resistance, then $R \propto$

Ⓐ $l$ 　　　Ⓑ $l^2$ 　　　Ⓒ $\dfrac{1}{l}$ 　　　Ⓓ $\dfrac{1}{l^2}$

**3.** If a conducting wire is stretched, then its resistance $R \propto$ ($r$ = radius of wire)

Ⓐ $r^{-2}$ 　　　Ⓑ $r$ 　　　Ⓒ $r^{-4}$ 　　　Ⓓ $r^3$

**4.** For small change in length during stretching of conducting wire of length $l$ and resistance $R$, $\dfrac{\Delta R}{R} =$

Ⓐ $\dfrac{\Delta l}{l}$ 　　　Ⓑ $\dfrac{2\Delta l}{l}$ 　　　Ⓒ $\dfrac{3\Delta l}{l}$ 　　　Ⓓ $1.5\dfrac{\Delta l}{l}$

**5.** For a small change in radius during stretching of conduction wire of resistance $R$ and radius $r$, for $\dfrac{\Delta R}{R} =$

Ⓐ $\dfrac{-\Delta r}{r}$ 　　　Ⓑ $-2\dfrac{\Delta r}{r}$ 　　　Ⓒ $-3\dfrac{\Delta r}{r}$ 　　　Ⓓ $-4\dfrac{\Delta r}{r}$

**6.** $R = \rho \cdot \dfrac{l}{A}$ the formula is

Ⓐ False 　　　Ⓑ True 　　　Ⓒ May be true 　　　Ⓓ None of these

**7.** —|ⱶ10 Volt—|ⱶ6 Volt $\equiv$ —|ⱶ$E$ (Volt)

Then $E =$

Ⓐ 2 Volt 　　　Ⓑ 4 Vol 　　　Ⓒ 3 Volt 　　　Ⓓ 1 Volt

**8.** The SI unit of emf of a cell is

Ⓐ Volt 　　　　　　Ⓑ J/C

Ⓒ both Ⓐ and Ⓑ are correct 　　　Ⓓ None of these

**9.**



$I_0 =$

Ⓐ $I_1$      Ⓑ $I_1 + I_2$      Ⓒ $I_2$      Ⓓ None of these

**10.** Direction of conventional current is

Ⓐ direction of flow of positive charge      Ⓑ direction of flow of electrons

Ⓒ both Ⓐ and Ⓑ are correct      Ⓓ none of these

**11.** If $q = 2t$ Coulomb (where $t$ is in s), then current in the circuit is

Ⓐ 2 A      Ⓑ 1 A      Ⓒ 1.5 A      Ⓓ 2.5 A

**12.** Under the influence of an external electric field $E$ applied across the end of a conductor, the acceleration of each electron is

Ⓐ $-eE/m$      Ⓑ $-mE/e$      Ⓒ $E/m$      Ⓓ $eE$

■ **Assertion Reason based Questions (13–14):**

**Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

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

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

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

**13. Assertion :** A current carrying conductor is not charged.

**Reason :** At any instant, number of proton is equal to number of electron.

Ⓐ a      Ⓑ b      Ⓒ c      Ⓓ d

**14. Assertion :** In conductor, free electrons cannot constitute a current.

**Reason :** Inside conductor, free electrons move randomly.

Ⓐ a      Ⓑ b      Ⓒ c      Ⓓ d

■ **Case Study Based Questions (Q. No. 15) :**

**Read the passage given below and answer the following questions.**

After long use of cells, due to internal chemical products, cells internal resistance $r$ ($\Omega$) increases, since $V = E - i \cdot r$, so there is decrease in terminal potential difference.

**15.** Terminal $\rho \cdot d$ of discharging cell is $V = E - i \cdot r$. Is it true

Ⓐ True      Ⓑ False      Ⓒ May be true      Ⓓ We can't say

**16.** If 0.5 J of work is done in moving a negative charge of –0.5 C between two points, the potential difference is

Ⓐ +10 V      Ⓑ +5 V      Ⓒ –1 V      Ⓓ –5 V

**17.** The magnitude of electrical potential energy of the given charge configuration is
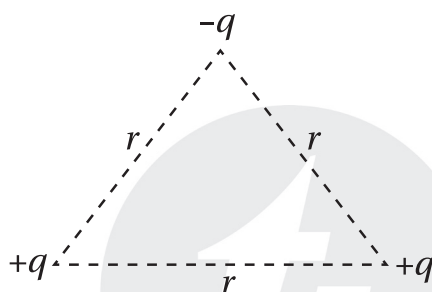


Ⓐ $kq^2/r$      Ⓑ $kq^2/2r$      Ⓒ Zero      Ⓓ None of these

**18.** The electric potential $V$ is constant in a region. The $\vec{E}$ in that region $|\vec{E}| =$

Ⓐ 0      Ⓑ Positive      Ⓒ Negative      Ⓓ None of these

**19.** A metallic solid sphere is placed in a uniform electric field. Which path, the lines of force follow as shown in figure?
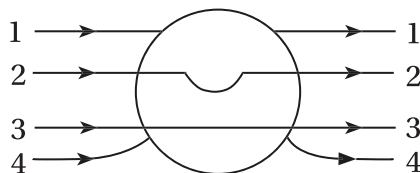


Ⓐ 1      Ⓑ 2      Ⓒ 3      Ⓓ 4

**20.** When battery across the plates of charged capacitor is put off and dielectric slab is introduced in between the plates of the capacitors, then charge on plate

Ⓐ Increases      Ⓑ Decreases      Ⓒ Remains same      Ⓓ None of these

**21.** Magnetic field ($B$) at the centre of the circular coil of radius $R$ and current $I$ is

Ⓐ $\left(\dfrac{\mu_0}{4\pi}\right)\left(\dfrac{2\pi I}{R}\right)$      Ⓑ $\dfrac{\mu_0}{4\pi}\left(\dfrac{2I}{R}\right)$      Ⓒ $\dfrac{2\pi I}{R}$      Ⓓ $\dfrac{2I}{R}$

**22.** Magnetic field induction ($B$) at the centre $O$ of the circular arc of central angle $\theta$ and radius $R$, carrying a current $I$ is

Ⓐ $\left(\dfrac{\theta}{2\pi}\right)\left(\dfrac{\mu_0}{4\pi}\right)\left(\dfrac{2\pi I}{R}\right)$

Ⓑ $\dfrac{\mu_0}{4\pi}\left(\dfrac{I}{R}\right)(\theta)$

Ⓒ Both Ⓐ and Ⓑ are correct

Ⓓ None of these

**23.** The magnetic field lines due to straight conductor carrying current are in the form of

Ⓐ Concentric ellipse

Ⓑ Concentric square

Ⓒ Concentric circle

Ⓓ None of these

**24.** If a charge of + one coulomb while moving at right angle to a magnetic field with a velocity of 1 m/s experiences a force of 1 newton, at that point magnetic field of induction is

Ⓐ 2 tesla          Ⓑ 1 tesla          Ⓒ 1.5 tesla          Ⓓ 2.5 tesla

**25.** If current through a circular coil flows anticlockwise direction then the direction of magnetic field induction at the centre of the circular current loop is perpendicular to the plane of coil directed as (while looking from top)

Ⓐ inwards          Ⓑ outwards          Ⓒ may be inward          Ⓓ we can't say

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**Chemistry**

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**26.** $CaCl_2$ is electrolysed at molten state and by passing 20 ampere current for 96.5 minute. What mass of calcium in gm is formed [Ca = 40] ?

Ⓐ 12 gm          Ⓑ 6 gm          Ⓒ 30 gm          Ⓓ 24 gm

**27.** At 25°C, the equivalent conductance values at infinite dilution of $NH_4Cl$, $NaOH$, $NaCl$ are 130, 217, 109 $ohm^{-1}.cm^2.equivalent^{-1}$ respectively. What is the equivalent conductance of $NH_4OH$ ?

Ⓐ 235 $ohm^{-1}.cm^2.equivalent^{-1}$

Ⓑ 238 $ohm^{-1}.cm^2.equivalent^{-1}$

Ⓒ 245 $ohm^{-1}.cm^2.equivalent^{-1}$

Ⓓ 218 $ohm^{-1}.cm^2.equivalent^{-1}$

**28.** $SN^1$ reaction is the most favourable for which compound ?

Ⓐ $CH_3CH(Br)CH_2CH_3$

Ⓑ $(CH_3)_3CBr$

Ⓒ $(CH_3)_2C(Br)C_2H_5$

Ⓓ $(C_2H_5)_2C(CH_3)Br$

**29.** The C – Cl bond of $C_6H_5Cl$ in comparison to the C – Cl bond in methyl chloride is

Ⓐ larger and stronger

Ⓑ larger and weaker

Ⓒ shorter and weaker

Ⓓ shorter and stronger

**30.** $CH_3CH_2CH = CH_2 \xrightarrow{HBr} X \xrightarrow[\text{KOH}]{\text{alcoholic}}$ products  The correct major product is

    Ⓐ $CH_3CH_2CH = CH_2$
        Ⓑ $H_3CCH = CHCH_3$

    Ⓒ $H_3CCH = C = CH_2$
        Ⓓ $H_2C = CH - CH = CH_2$

**31.** Propene takes part in oxymercuration demercuration reaction. Correct statement about the product is

    Ⓐ Compound is optically active

    Ⓑ It is a secondary alcohol

    Ⓒ It is less water soluble than its positional isomer

    Ⓓ After oxidation reaction, it forms an aldehyde

**32.** Which is true for lead storage battery ?

    Ⓐ At the time of discharging, Pb is reduced and $PbO_2$ is oxidised

    Ⓑ At the time of charging, $H_2SO_4$ is reduced and $PbO_2$ is produced

    Ⓒ At the time of charging, Pb is formed and $H_2SO_4$ is reduced

    Ⓓ $H_2SO_4$ suffers neither oxidation nor reduction

**33.** Consider the given data $E^\circ_{(A^+/A)} = -0.18\,v, E^\circ_{(B^+/B)} = -1.06\,v, E^\circ_{(D^+/D)} = -0.54\,v$

    The correct statement is

    Ⓐ Metal A, B, D can release $H_2$ gas from dilute HCl solution

    Ⓑ Metal D can release metal B when it reacts with aqueous solution of the salt $B_2SO_4$

    Ⓒ Metal A is stronger reducing agent than metal D

    Ⓓ A correct cell representation is $D\,|\,D^+\,||\,B^+\,|\,B$

**34.** A direct current deposits 54 gm of silver (atomic mass = 108) during electrolysis. What mass of aluminium (atomic mass = 27) in gm would be deposited from $AlCl_3$ solution by the same amount of electricity ?

    Ⓐ 2.7 gm
        Ⓑ 9 gm
        Ⓒ 4.5 gm
        Ⓓ 18 gm

**35.** Silver fluoride in acetone is the correct reagent of which reaction ?

    Ⓐ Swarts reaction
        Ⓑ Sandmayer reaction

    Ⓒ Hunsdiecker reaction
        Ⓓ Finkelstein reaction

**36.** Which compound has the highest boiling point ?

    Ⓐ Chlorobenzene
        Ⓑ 1, 2-dichlorobenzene

    Ⓒ 1, 3-dichlorobenzene
        Ⓓ 1, 4- dichlorobenzene

**37.** Which of the following has the highest boiling point ?

  Ⓐ propan-1,2,3-triol      Ⓑ propan-1,2-diol

  Ⓒ propanol      Ⓓ propan-2-ol

*Question 38 to 40 are based on the given paragraph. Read the paragraph carefully and select the correct answer*

$SN^2$ reaction becomes favourable when the alkyl group is small or less crowded. In this mechanism, inversion of configuration occurs. In this reaction, the solvents are acetone, dimethyl sulphoxide (DMSO), dimethyl formamide (DMF).

**38.** Among the given compounds, which takes part in $SN^2$ reaction most spontaneously ?

  Ⓐ $C_6H_5Br$      Ⓑ $CH_3Br$

  Ⓒ $(CH_3)_3CI$      Ⓓ $CH_3CH(Br)CH_2CH_3$

**39.** (1R)-$CH_3CH(D)(Br)$ reacts with KOH in acetone medium. The correct product will be

  Ⓐ (1R)-$CH_3CH(D)(OH)$ only      Ⓑ (1S)-$CH_3CH(D)(OH)$ only

  Ⓒ (a) major, (b) minor      Ⓓ (b) major, (a) minor

**40.** Which of the following molecule reacts with NaOH in DMF at the fastest rate ?

  Ⓐ $H_2C = CHBr$      Ⓑ $C_6H_5CH_2Br$

  Ⓒ $H_2C = CH – CH_2Br$      Ⓓ $H_3CCH_2CH_2CH_2Br$

**41.** When sugar is added to water then boiling point of the solution is higher than that of pure water. This is due to

  Ⓐ Increase in the escaping character of water

  Ⓑ Increase in the extent of hydrogen bonding in the solvent

  Ⓒ Increase in the solute - solvent interaction in the system

  Ⓓ Decrease in the conductivity of water

**42.** Find out the correct statement

  Ⓐ Neither standard reduction potential nor resistance is an extensive property

  Ⓑ Both standard reduction potential nor resistance are extensive properties

  Ⓒ Standard reduction potential is intensive property while resistance is extensive property

  Ⓓ Standard reduction potential is extensive property while resistance is intensive property

**43.** What is the correct $[10.(E_{cell})]$ value of the given representation $A\,|\,A^+\,||\,B^+\,|\,B$ is

Given that $E^{\circ}_{(A^+/A)} = -1.35\ \text{volt},\ E^{\circ}_{(B^+/B)} = +0.45\ \text{volt}$

Ⓐ 19 　　　 Ⓑ 9 　　　 Ⓒ 18 　　　 Ⓓ 17

**44.** In the reaction $2A + B \longrightarrow products$ the concentration of reactant *A* is tripled and that for *B* is halved. What is the change in the rate of the reaction ?

Ⓐ decreases by 4.5 times 　　　 Ⓑ increases by 4.5 times

Ⓒ decreases by 5.5 times 　　　 Ⓓ increases by 5.5 times

**45.** Consider the reaction $4A + xB \longrightarrow 2C + 5D$. If rate of reaction with respect to A is $4.8 \times 10^{-3}$ and with respect to B is $3.6 \times 10^{-3}$. What is the value of **'x'** ?

Ⓐ 4 　　　 Ⓑ 2 　　　 Ⓒ 3 　　　 Ⓓ 5

**46.** $C_2H_5COOH \xrightarrow[\Delta]{Ag_2O} X \xrightarrow{Br_2} Y$

Correct statement about compound Y is —

Ⓐ Boiling point of 'Y' is higher than its higher homolog

Ⓑ Compound 'Y' always take part in $SN^1$ reactions

Ⓒ Compound 'Y' is highly soluble in water

Ⓓ Compound 'Y' has only primary carbon atoms

**47.** Consider the positional isomers of molecular formula $C_3H_6Br_2$ and select the correct statements

(I) All isomers are $sp^3$ hybridised

(II) 3 positional isomers are possible with this molecular formula

(III) Among all the isomers, only one is optically active

Ⓐ I, II, III 　　　 Ⓑ II, III 　　　 Ⓒ I, III 　　　 Ⓓ I, II

**Question number 48 to 50 are ASSERTION-REASON based questions. Select the correct option**

**OPTION A :** Both assertion and reason is correct and reason is the correct explanation of assertion

**OPTION B :** Both assertion and reason is correct and reason is not the correct explanation of assertion

**OPTION C :** Assertion is correct statement but reason is wrong statement

**OPTION D :** Assertion is wrong statement but reason is correct statement

**48. Assertion :** Iodobenzene reacts with $NaNH_2$ to form aniline more spontaneously than chlorobenzene

**Reason :** Dipole moment of chlorobenzene is higher than iodobenzene

**49. Assertion :** 2,4,6-trinitrochlorobenzene raects with NaOH more spentaneously than 4-nitrochlorobenzene

**Reason :** Boiling point of 4- nitrochlorobenzene is higher than 2, 4, 6 - trinitrochlorobenzene

**50. Assertion :** KCl and $NH_4Cl$ cannot be used in salt bridge of a cell containing $Ag^+$, $Hg_2^{2+}$, $Tl^+$ ions

**Reason :** Cell will be destroyed due to precipitation of metal chlorides

## Mathematics

**51.** Suppose $f$ is a real function and $c$ is a point in its domain. The derivative of $f$ at $c$ is defined by

Ⓐ $\lim\limits_{h \to 0} \dfrac{f(c+h)-f(c)}{h}$

Ⓑ $\lim\limits_{h \to 0} \dfrac{f(c-h)-f(c)}{h}$

Ⓒ $\lim\limits_{h \to 0} \dfrac{f(c-h)-f(-c)}{h}$

Ⓓ none of these

**52.** We say that a function $f$ is differentiable at a point $c$ in its domain if

Ⓐ $\lim\limits_{h \to 0^-} \dfrac{f(c+h)-f(c)}{h}$ and $\lim\limits_{h \to 0^+} \dfrac{f(c+h)-f(c)}{h}$ are equal but not finite

Ⓑ $\lim\limits_{h \to 0^-} \dfrac{f(c+h)-f(c)}{h}$ and $\lim\limits_{h \to 0^+} \dfrac{f(c+h)-f(c)}{h}$ are finite and equal

Ⓒ $\lim\limits_{h \to 0^-} \dfrac{f(c+h)-f(c)}{h} \neq \lim\limits_{h \to 0^+} \dfrac{f(c+h)-f(c)}{h}$

Ⓓ all of the above

**53.** According to chain rule if $f = V(u(x))$ and $u(x) = t$

Ⓐ $\dfrac{df}{dx} = \dfrac{dv}{dx} \cdot \dfrac{dx}{dt}$

Ⓑ $\dfrac{df}{dx} = \dfrac{dv}{dx} \cdot \dfrac{du}{dx}$

Ⓒ $\dfrac{df}{dx} = \dfrac{dv}{dt} \cdot \dfrac{dt}{dx}$

Ⓓ none of these

**54.** Let $f(x) = \sin(x^2)$ then $f'(x)$

Ⓐ $2\cos x^2$　Ⓑ $\cos x^2$　Ⓒ $2x \sin x^2$　Ⓓ $2x \cos x^2$

**55.** Find $\dfrac{dy}{dx}$ if $y^x = \pi^e$

Ⓐ $\dfrac{dy}{dx} = \dfrac{-y\log_e^y}{x}$  Ⓑ $\dfrac{dy}{dx} = \dfrac{y\log_e^y}{x}$  Ⓒ $\dfrac{dy}{dx} = \dfrac{x\log_e^y}{y}$  Ⓓ $\dfrac{dy}{dx} = \dfrac{x\log_e^x}{y}$

**56.** The rate of change of the area of a circle with respect to its radius r at r = 6 cm is

Ⓐ $10\pi$ cm  Ⓑ $12\pi$ cm  Ⓒ $8\pi$ cm  Ⓓ $11\pi$ cm

**57.** Find the intervals in which the function $f$ given by $f(x) = \sin x + \cos x,\ 0 \le x \le 2\pi$ is decreasing

Ⓐ $\left[0, \dfrac{\pi}{4}\right)$  Ⓑ $\left(\dfrac{\pi}{4}, \dfrac{5\pi}{4}\right)$  Ⓒ $\left[\dfrac{5\pi}{4}, 2\pi\right]$  Ⓓ none of these

**58.** The set of points where $f(x) = \dfrac{x}{4+|x|}$ is differentiable is

Ⓐ $(-\alpha, \alpha)$  Ⓑ $(0, \alpha)$  Ⓒ $(-\alpha, 0) \cup (0, \alpha)$  Ⓓ none of these

**59.** If $y = \cos^{-1}\left(\dfrac{2\cos x - 3\sin x}{\sqrt{13}}\right)$, then $\dfrac{dy}{dx}$ is

Ⓐ Zero  Ⓑ Constant = 1  Ⓒ Constant ≠ 1  Ⓓ none of these

**60.** The interval in which $y = x^2 e^x$ is decreasing is

Ⓐ $(-\infty, \infty)$  Ⓑ $(-\infty, -2)$  Ⓒ $(0, \alpha)$  Ⓓ $(-2, 0)$

**Assertion Reason based Questions (61 – 62):**

**Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

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

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

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

**61. Assertion (A):** Every continuous function is differentiable.

**Reason (R):** Every differentiable function is continuous

Ⓐ a  Ⓑ b  Ⓒ c  Ⓓ d

**62. Assertion (A) :** If $y = \tan^{-1}\left(\dfrac{\cos x + \sin x}{\sin x - \cos x}\right), \dfrac{-\pi}{4} < x < \dfrac{\pi}{4}$, then $\dfrac{dy}{dx} = -1$

**Reason (R) :** $\dfrac{\cos x + \sin x}{\sin x - \cos x} = \tan\left(x + \dfrac{\pi}{4}\right)$

Ⓐ a      Ⓑ b      Ⓒ c      Ⓓ d

**Case study based Questions (63 – 65):**

Students of class XII went for a summer camp near $K_2$ with their school teachers. While exploring the place they saw V-(not exactly) shape mountains, their math teacher told them this shape follows some mathematical function given by

$f(x) = |x - 3| + |x - 4|$

**63.** Right hand derivative of $f(x)$ at $x = 3$ is

Ⓐ 2      Ⓑ –2      Ⓒ 0      Ⓓ 1

**64.** Left hand derivative of $f(x)$ at $x = 4$ is

Ⓐ 2      Ⓑ –2      Ⓒ 0      Ⓓ 1

**65.** Choose the correct statement:

Ⓐ $f(x)$ is differentiable at $x = 3$ but not $x = 4$

Ⓑ $f(x)$ is differentiable at $x = 4$ but not $x = 3$

Ⓒ $f(x)$ is not continuous at $x = 3$ and 4

Ⓓ $f(x)$ is continuous at $x = 3$ and 4 but not differentiable at $x = 3$ and $x = 4$

**66.** The value of $\tan^{-1}1 + \tan^{-1}2 + \tan^{-1}3$ is

Ⓐ 0      Ⓑ $\dfrac{\pi}{4}$      Ⓒ $\pi$      Ⓓ $\dfrac{5\pi}{4}$

**67.** Let $A = \{1, 2, 3, 4,.... n\}$. How many bijective function $f: A \rightarrow A$ can be defined?

Ⓐ $\dfrac{\pi}{2}$      Ⓑ $\lfloor n-1$      Ⓒ $\lfloor n$      Ⓓ $n$

**68.** If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then the value of $|adj\, A|$ is

Ⓐ $a^3$      Ⓑ $a^6$      Ⓒ $a^9$      Ⓓ $a^{27}$

**69.** If $A = \begin{bmatrix} 1 & 2 & x \\ 3 & -1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} y \\ x \\ 1 \end{bmatrix}$ be such that $AB = \begin{bmatrix} 6 \\ 8 \end{bmatrix}$ then

Ⓐ $y = 2x$      Ⓑ $y = -2x$      Ⓒ $y = x$      Ⓓ $y = -x$

**70.** If $f(x)=\begin{cases} x & , \quad \text{if } x \text{ is rational} \\ 1-x & , \quad \text{if } x \text{ is irrational} \end{cases}$ then

    Ⓐ $f$ is only right continuous at $x=\dfrac{1}{2}$      Ⓑ $f$ is only left continuous at $x=\dfrac{1}{2}$

    Ⓒ $f$ is continuous at $x=\dfrac{1}{2}$      Ⓓ $f$ is discontinuous at all points

## Case study based Questions (71 – 73):

A farmer wants to fence a rectangular field that is adjacent to a river. He needs to use fencing only on three sides of the rectangle (the two shorter sides and one longer side opposite the river). He has 300 meters of fencing available.
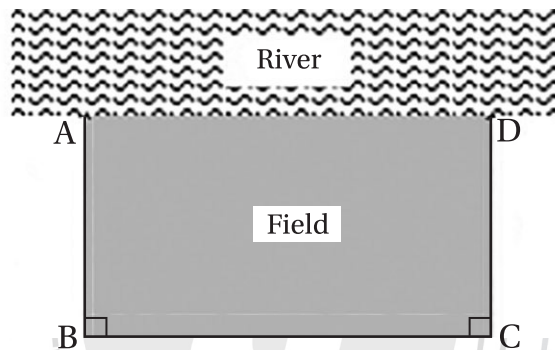


**71.** Determine the length that will maximise the area of the field.

    Ⓐ 100m      Ⓑ 150m      Ⓒ 200m      Ⓓ 175m

**72.** Determine the maximum area of the field.

    Ⓐ 11250 m$^2$      Ⓑ 11500 m$^2$      Ⓒ 10250 m$^2$      Ⓓ 10500 m$^2$

**73.** If the cost of fencing is ₹20 per 10m find the total cost of fencing

    Ⓐ ₹400      Ⓑ ₹500      Ⓒ ₹600      Ⓓ ₹800

## Assertion Reason based Questions (74 – 75):

**Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

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

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

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

74. **Assertion (A) :** The function $f(x) = x^3 - 3x + 1$ is increasing for all $x$.

   **Reason (R) :** A function $f(x)$ is increasing if its first derivative $f'(x)$ is positive.

   Ⓐ a      Ⓑ b      Ⓒ c      Ⓓ d

75. **Assertion (A) :** The rate of change of the area $A$ of a circle with respect to radius $(r)$ is $2\pi r$

   **Reason (R) :** The area of a circle is given by $A = \pi r^2$

   Ⓐ a      Ⓑ b      Ⓒ c      Ⓓ d

## Biology

76. A graphical representation to calculate the probability of all possible genotypes of offsprings in a genetic cross is called _____

   Ⓐ Punnett square      Ⓑ Polygenic inheritance
   Ⓒ Check board      Ⓓ Genome sequencing

77. In Mendel's cross, when a tall pea plant was self pollinated _____ of the progeny was dwarf.

   Ⓐ Two-third    Ⓑ One -third    Ⓒ One -fourth    Ⓓ Two - fifth

78. Experimental proof for replication of DNA was given by

   Ⓐ Watson and Crick      Ⓑ Taylor *et al*
   Ⓒ Meselson and Stahl      Ⓓ Mendel

79. Which is the main enzyme which uses a DNA template to catalyse the polymerisation of deoxynucleotides?

   Ⓐ DNA Dependent DNA Polymerase      Ⓑ DNA Dependent RNA Polymerase
   Ⓒ Helicase      Ⓓ DNA Ligase

80. A segment of DNA that codes for a polypeptide is _____

   Ⓐ Cistron    Ⓑ Exon    Ⓒ Intron    Ⓓ Gene

81. Analogous structures are a result of

   Ⓐ Divergent evolution      Ⓑ Convergent evolution
   Ⓒ Shared Ancestry      Ⓓ Stabilising selection

82. The scientific name of Java man is

   Ⓐ *Homo habilis*      Ⓑ *Homo sapiens neandarthalensis*
   Ⓒ *Homo erectus erectus*      Ⓓ *Australopithecus afarensis*

■ **Assertion-Reason type Questions**

**Directions:** Each of the following questions (83–85) consists of two statements, namely Assertion (A) and Reason (R).

For selecting the correct answer, use the following code:

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

**B.** Both A and R are true, but R is not the correct explanation of A.

**C.** A is true, R is false.

**D.** A is false, R is true.

83. **Assertion:** Haemophilia is a sex linked disease.
**Reason:** It is due to the presence of a recessive gene on X chromosome.

84. **Assertion:** Genetic code is universal.
**Reason:** Genetic code is same for all organisms.

85. **Assertion:** ABO blood groups in human beings is controlled by the gene I.
**Reason:** The gene I has three alleles, $I^A$, $I^B$ and i.

Study the given diagram and answer the following questions (Questions 86 to 90)
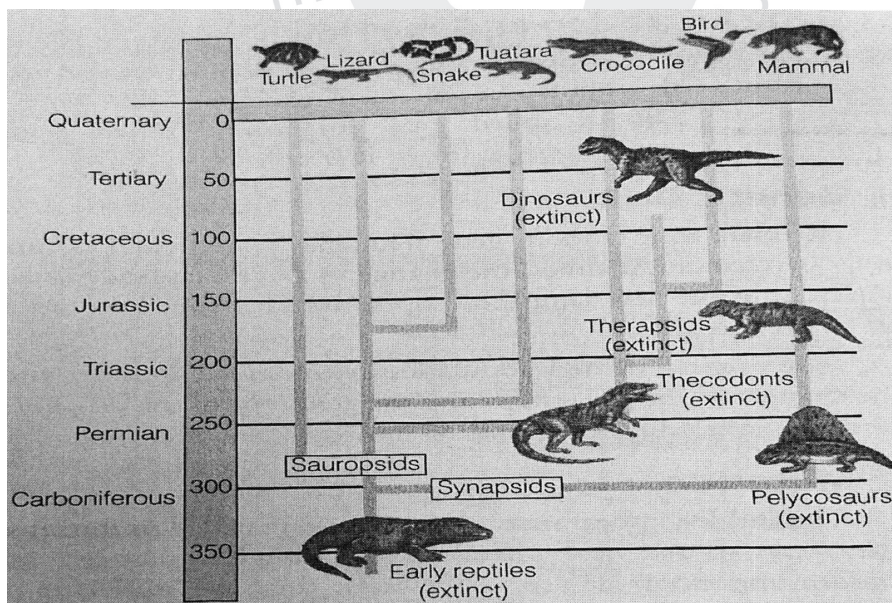


**Representative evolutionary history of vertebrates through geological period**

86. Lobefins (*Coelocanth*) were the ancestors of modern day _____

Ⓐ Fish　　Ⓑ Frogs　　Ⓒ Reptiles　　Ⓓ Birds

**87.** In Jurassic period, the first mammals that evolved were _____

Ⓐ Shrews    Ⓑ Rats    Ⓒ Whales    Ⓓ Horses

**88.** The biggest dinosaur was _____

Ⓐ Spinosaurus    Ⓑ Triceratops

Ⓒ Brachiosaurus    Ⓓ Tyrannosaurus

**89.** Evolutionary changes that occurred in humans are—

Ⓐ Development of prominent chin    Ⓑ Development of community life

Ⓒ Slow assumption of erect posture    Ⓓ All of these

**90.** The hominids were ancestors of _____

Ⓐ Apes    Ⓑ Man

Ⓒ Both apes and man    Ⓓ Neither apes nor man

**91.** A plant that produces both chasmogamous and cleistogamous flower is

Ⓐ Papaya    Ⓑ Viola    Ⓒ Water lily    Ⓓ Maize

**92.** The remnant persistent nucellus present in the seeds of black pepper and beet is called _____

Ⓐ Pericarp    Ⓑ Perisperm    Ⓒ Epicarp    Ⓓ Suspensor

**93.** Which one of the following is not an STD?

Ⓐ Gonorrhoea    Ⓑ Syphilis    Ⓒ Hepatitis A    Ⓓ Hepatitis B

**94.** Streptokinase, produced from the bacterium Streptococcus, is used as a _____ for patients of myocardial infection.

Ⓐ coagulant    Ⓑ clot buster    Ⓒ pain killer    Ⓓ antibiotic

**95.** Baculovirus is associated with—

Ⓐ Sewage treatment    Ⓑ *Rhizobium*

Ⓒ Integrated Pest Management    Ⓓ Enhancement of soil fertility

**96.** Mutations lead to—

Ⓐ Extinction of organisms    Ⓑ Variations in populations

Ⓒ Increase in population    Ⓓ Maintaining genetic continuity

**97.** XXY person suffers from:

Ⓐ Down's syndrome    Ⓑ Klinefelter's syndrome

Ⓒ AIDS    Ⓓ Turner's syndrome

**98.** DNA replication is _____

Ⓐ Conservative and discontinuous

Ⓑ Semi conservative and semi discontinuous

Ⓒ Conservative and continuous

Ⓓ Conservative

**99.** With 4 bases, the number of possible triplet codons is _____

Ⓐ 24        Ⓑ 32        Ⓒ 48        Ⓓ 64

**100.** The classical example of adaptive radiation during formation of new species is—

Ⓐ Marsupials of Australia        Ⓑ Darwin's finches

Ⓒ Giant tortoise        Ⓓ All

# Space For Rough Works