Monthly Progressive Test

Class: XII

Subject: PCMB

Test Booklet No.: MPT010

Test Date: | 1 | 0 | 0 | 2 | 2 | 0 | 2 | 5 |

Time: 120 mins

Full Marks: 200

Important Instructions :

1. The Test is of 120 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 MPT1010022025.

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.

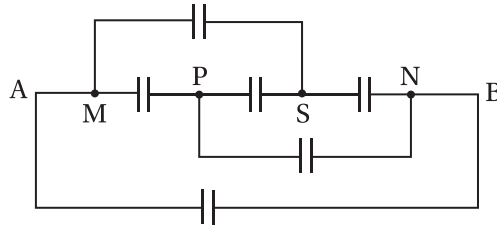13. There is no scope for altering response mark in Answer Sheet.

Physics

1. A Square sheet of side 'a' is lying parallel to xy plane at Z = a. The electric field in the region is $\vec{E} = CZ^2\hat{K}$. The electric flux through the sheet is
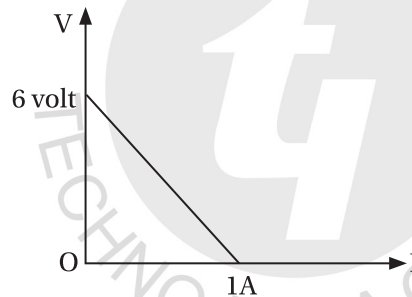
Ⓐ a^4C　　　　Ⓑ $\dfrac{1}{3}a^3C$　　　　Ⓒ $\dfrac{1}{3}a^4C$　　　　Ⓓ 0

**2.** The equivalent capacitance between points A and B, if capacitance of each capacitor is C.

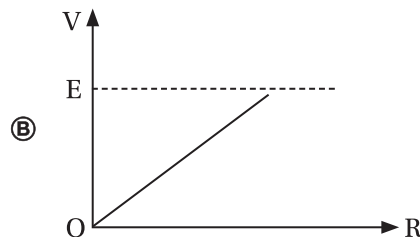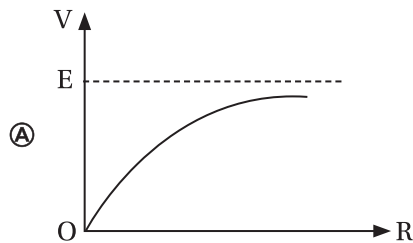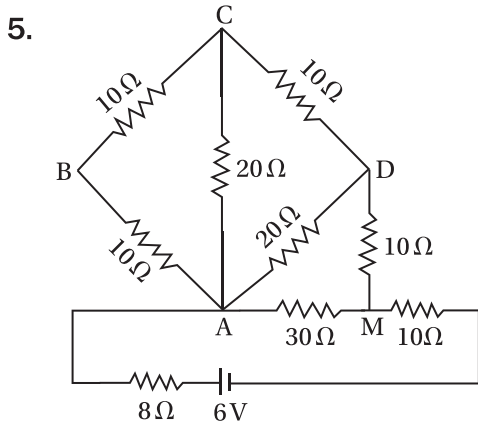
Ⓐ C　　　　Ⓑ $\dfrac{C}{2}$　　　　Ⓒ 3C　　　　Ⓓ 2C

3. The plot of variation of potential difference across a combination of three identical cells in series versus current is shown in the figure. The emf of each cell is

Ⓐ 1 volt　　　　Ⓑ 3 volt　　　　Ⓒ 2 volt　　　　Ⓓ 0.5 volt
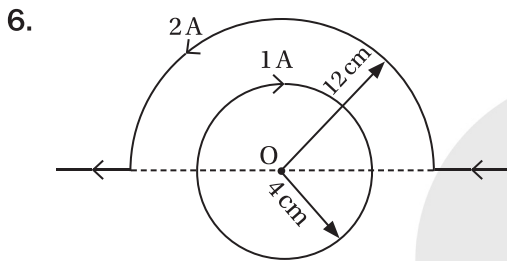
4. Select the correct graph of V (terminal potential difference) versus R. (Resistance)

5.
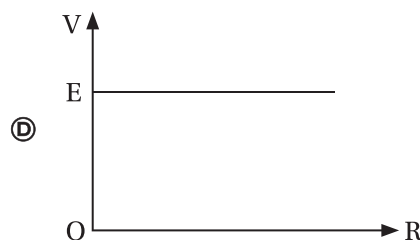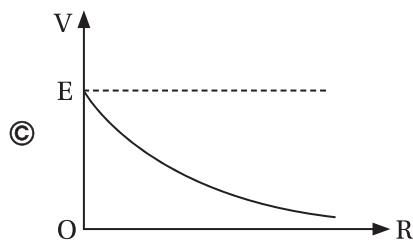
The power supplied by the battery 6 volt is

Ⓐ 2W

Ⓑ 1.2 W

Ⓒ 1 W

Ⓓ 2.4 W

6.

The magnitude of magnetic field (Tesla) at O is

Ⓐ 1.047×10^{-5} (outwards)

Ⓑ 1.047×10^{-5} (inwards)

Ⓒ 2×10^{-5} (outwards)

Ⓓ 2×10^{-5} (inwards)

7. A long straight wire of radius a carries a steady current I. The current is uniformly distributed across its area of cross-section. The ratio of magnitude of magnetic field B_1 at $\left(\dfrac{a}{2}\right)$ and B_2 at distance 2a is

Ⓐ $\dfrac{1}{2}$

Ⓑ 1

Ⓒ 2

Ⓓ 4

8. If a charge (q) is accelerated through a potential difference (ΔV) with velocity V. Then $v =$

Ⓐ $\sqrt{\dfrac{q\Delta V}{m}}$

Ⓑ $\sqrt{\dfrac{q.\Delta V}{2m}}$

Ⓒ $\sqrt{\dfrac{2q\Delta V}{m}}$

Ⓓ None of these

9.
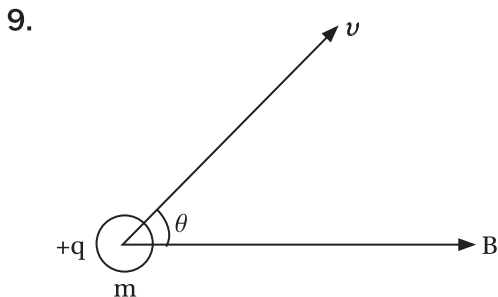
The pitch of helical path is

Ⓐ $\left(\dfrac{2\pi m v \cos\theta}{qB}\right)$

Ⓑ $\left[\dfrac{2\pi m v \sin\theta}{qB}\right]$

Ⓒ $\left(\dfrac{\pi m v \cos\theta}{qB}\right)$

Ⓓ $\left(\dfrac{\pi m v \sin\theta}{qB}\right)$

10. A galvanometer coil has a resistance of 15 ohm and it shows full scale deflection for a current of 4 mA. The value of the shunt resistance required to convert the galvanometer into an ammeter of range 0–6 A.

(A) 0.04 ohm   (B) 0.01 ohm   (C) 0.03 ohm   (D) 0.50 ohm

11. A galvanometer shows full scale deflection for a current i_g. If a shunt of resistance S_1 is connected to the galvanometer, it gets converted into an ammeter of range (0–i). When resistance of the shunt is made S_2, its range becomes (0–2i). Then $\dfrac{S_1}{S_2} =$

(A) $\dfrac{i+i_g}{i-i_g}$ (B) $\dfrac{i-i_g}{i+i_g}$ (C) $\dfrac{2i-i_g}{i-i_g}$ (D) $\dfrac{i-i_g}{2i-i_g}$

12. A (hypothetical) bar magnet (AB) is cut into two equal parts. One part is now kept over the other, so that the pole C_2 is above C_1. If M is the magnetic moment of the original magnet, what will be the magnetic moment of the combination so formed.

(A) 0   (B) $\dfrac{M}{2}$

(C) M   (D) 2M
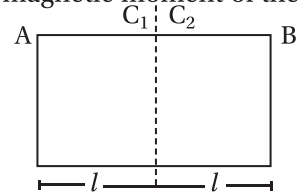
13. Select the correct statements

(A) For $-1 \leq \chi < 0$, material is diamagnetic   (B) For $0 < \chi < 1$ material is paramagnetic

(C) Both (A) and (B) are correct   (D) None of the above

14. A thick current carrying cable of radius 'R' carries current I uniformly distributed across its cross-section. The variation of magnetic field B(r) due to the cable with distance r from the axis of the cable is represented by

15.
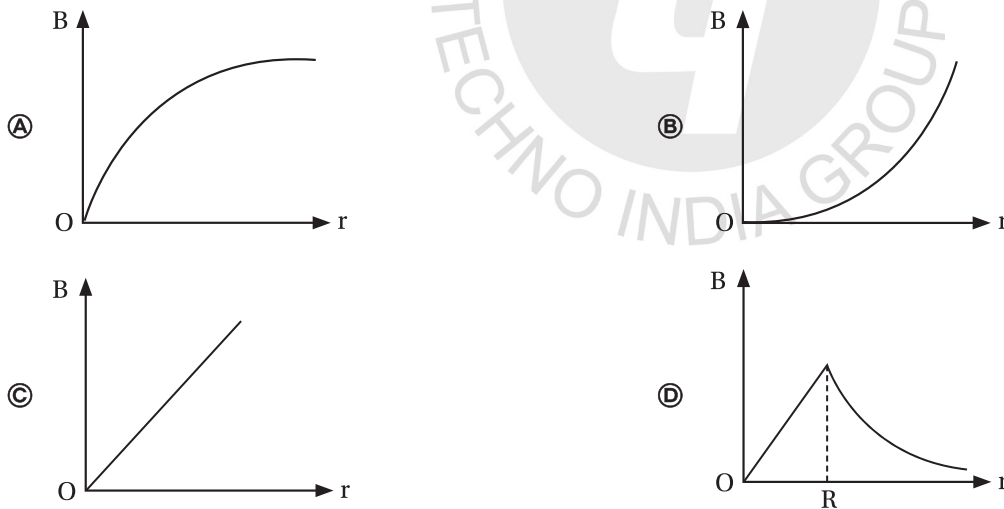
$F_1 - F_2 =$

(A) $\dfrac{\mu_0}{2\pi} \, I_r.I_2.l.\left(\dfrac{1}{r}+\dfrac{1}{r+b}\right)$ (B) $\dfrac{\mu_0}{2\pi} \, I_1.I_2 l\left(\dfrac{1}{r}-\dfrac{1}{r+b}\right)$

(C) $\dfrac{\mu_0}{4\pi} \, I_1.I_2.l.\left(\dfrac{r}{r+b}\right)$ (D) $\dfrac{\mu_0}{4\pi}.I_1.I_2.l\left(\dfrac{b}{r+b}\right)$
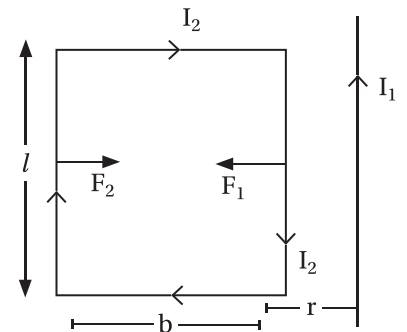
■ **Assertion Reason based Questions:**

**Directions:** Read the following questions and choose any one of the following four responses.

A: Assertion and Reason both are correct and Reason is the correct explanation of Assertion.

B: Assertion and Reason both are correct and Reason is not the correct explanation of Assertion.

C: Assertion is correct but Reason is wrong.

D: Assertion is wrong but Reason is correct.

16. **Assertion(A) :** Lenz's law is a consequence of the law of conservation of energy.

Reason(R) : There is no power loss in the inductor.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

17. A metallic rod PQ of length l is rotated with an angular velocity w about an axis passing through its mid-point (O) and perpendicular to the plane of the paper, in uniform magnetic field B. What is the potential difference developed between the two ends of the rod, P and Q?
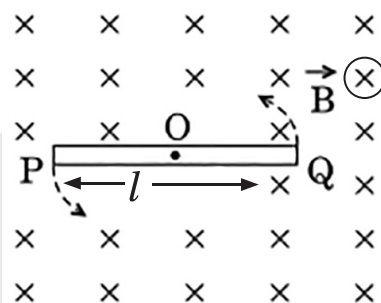
Ⓐ Bwl^2 Ⓑ $\frac{1}{2}Bwl^2$ Ⓒ $2Bwl^2$ Ⓓ zero

18. The current in the primary coil of a pair of coils changes from 7A to 3A in 0.04s. The mutual inductance between the two coils is 0.5H. The induced emf in the secondary coil is

Ⓐ 50 V   Ⓑ 75 V   Ⓒ 100 V   Ⓓ 220 V

19. The direction of induced current in the loop abc is
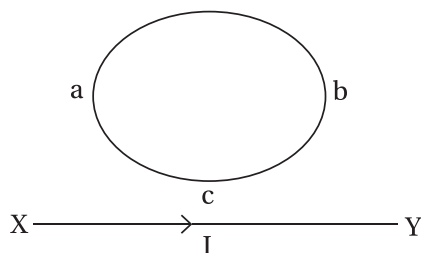
Ⓐ along abc if I decreases   Ⓑ along acb if I increases

Ⓒ along abc if I is constant   Ⓓ along abc if I increases

20. Select the correct graph showing variation of induced emf, with the rate of change of current flowing through a coil.

21. Given below are a few characteristics of solenoids P and Q.

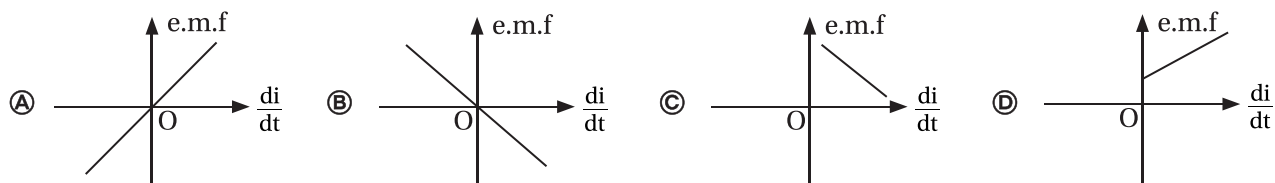|	Solenoid P	Solenoid Q
Length of solenoid	1 m	1 m
Number of turns (N)	200	50
Cross sectional area	A (m^2)	A (m^2)
Relative permeability of core material	1	500
Self inductance	2 (mH)	?

The self inductance of solenoid Q is

Ⓐ 62.5 mH   Ⓑ 50 mH   Ⓒ 45 mH   Ⓓ 80 mH

22. Compare the focal lengths (with sign) of the two lenses shown below if the radius of curvature of the curved surface is same in both lenses.

Ⓐ 1 : 2

Ⓑ 2 : 1

Ⓒ –1 : 1

Ⓓ –2 : 1

R   R

μ μ

Plano concave   Plano convex
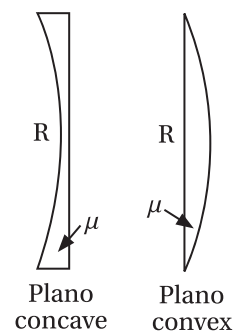
23. In youngs double slit experiment, find the ratio of intensities at two points on a screen when waves emanating from two slits reaching these points have path differences   (i) $\lambda/6$ (ii) $\lambda/12$

Ⓐ 2/3   Ⓑ $\left[\dfrac{\cos(\pi/6)}{\cos(\pi/12)} \right]^2$ Ⓒ 3/5   Ⓓ 2/5

24. Which of the following graph correctly represents the variation of a particle momentum with its associated de-Broglie wavelength?

Ⓐ

P / O / λ

Ⓑ

P / O / λ

Ⓒ

P / O / λ

Ⓓ

P / O / λ
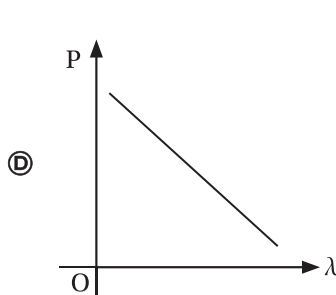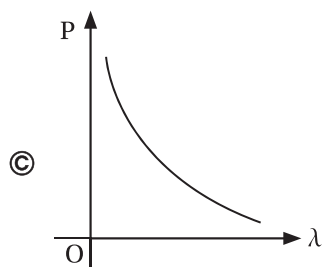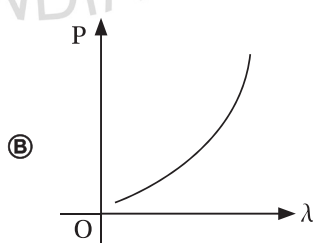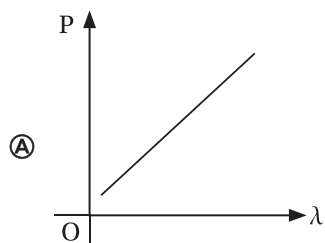
25. Angular momentum of electron of H-atom (n = 1): angular momentum of electron of Li^{++} ion (n = 1) is

Ⓐ 1 : 1   Ⓑ 1 : 3   Ⓒ 3 : 1   Ⓓ 1 : 2

Chemistry

26. In the following reaction :

[benzene ring with three CHO groups] + NaOH $\xrightarrow{\Delta}$ the main product is:

Ⓐ [benzene ring with CH_2OH, CHO, N_aOOC groups]

Ⓑ [benzene ring with CH_2OH, CH_2OH, N_aOOC groups]

Ⓒ [benzene ring with CH_2OH, $COON_a$, HOH_2C groups]

Ⓓ [benzene ring with $COONa$, CH_2OH, OHC groups]
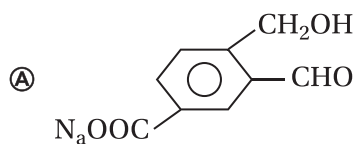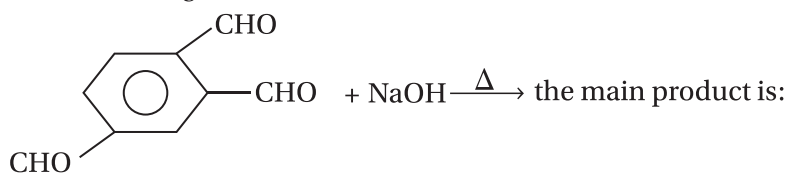
27. Arrange Ce^{3+}, La^{3+}, Pm^{3+} and Yb^{3+} in increasing order of their ionic radii:

Ⓐ $Yb^{3+} < Pm^{3+} < Ce^{3+} < La^{3+}$
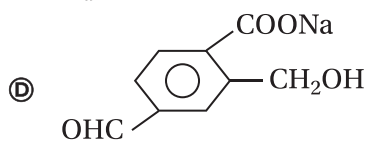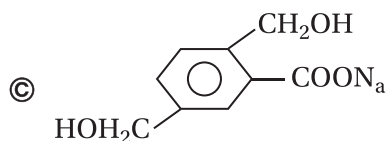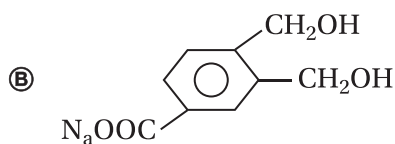
Ⓑ $Ce^{3+} < Yb^{3+} < Pm^{3+} < La^{3+}$

Ⓒ $Yb^{3+} < Pm^{3+} < La^{3+} < Ce^{3+}$

Ⓓ $Pm^{3+} < La^{3+} < Ce^{3+} < Yb^{3+}$
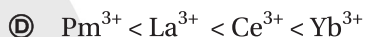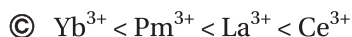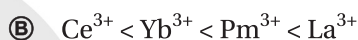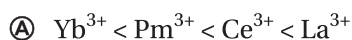
28. Which of the following biomolecules doesn't contain $C_1 - C_4$ glycosidic linkage ?

Ⓐ Amylopectin   Ⓑ Matose   Ⓒ Lactose   Ⓓ Sucrose

29. Major product of the following reaction is :

$$CH_2 - \overset{\overset{\displaystyle O}{18}}{CH} - CH_2 + CH_3O^{\ominus} \ Na^+ \longrightarrow$$
with Cl on one CH_2

Ⓐ $CH_2 - CH - CH_2 - OCH_3$ (with $\overset{18}{O}$ epoxide)

Ⓑ $CH_2 - CH - CH_2 - \overset{18}{OH}$ (with OCH_3 and Cl)

Ⓒ $CH_2 - CH - CH_2$ (with $\overset{18}{O}$ epoxide and OCH_3)

Ⓓ $CH_2 - CH - CH_2 - OH$ (with $\overset{18}{O}$ epoxide)
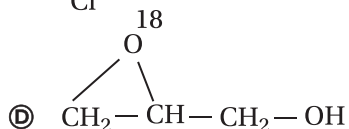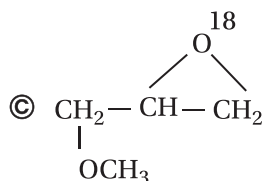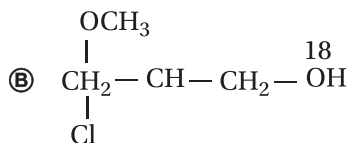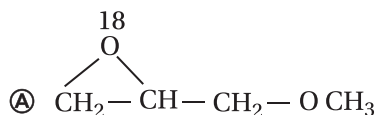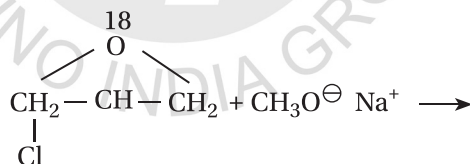
30. Which of the following is the weakest Bronsted base ?

Ⓐ [benzene ring with NH_2]

Ⓑ [piperidine ring with N–H]

Ⓒ [pyrrolidine ring with N–H]

Ⓓ $C_2H_5NH_2$
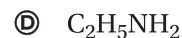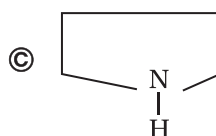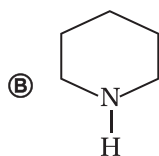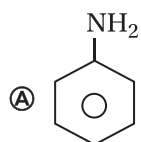
31. Oxidatiion of anilime with Conc. sulphuric acid followed by heating produces :

   Ⓐ phenylhydroxyl amine   Ⓑ nitrobenzene

   Ⓒ sulphanilic acid   Ⓓ phenol.

32. The intermediate compound 'X' in the following chemical reaction is :
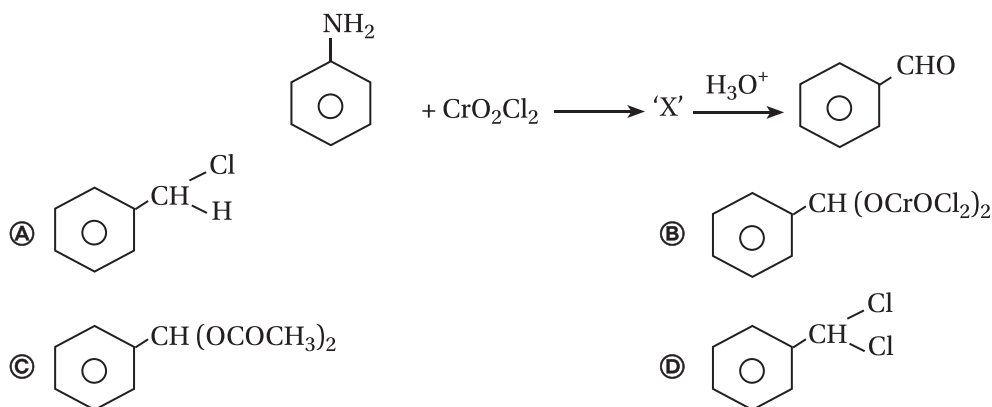
33. A white crystalline solid 'P' gives the following chemical tests :

(i) it liberates CO_2 with sodium bicarbonate.

(ii) it forms a coloured dye on diazotisation followed by coupling with β-naphthol.

(iii) it forms a white precipitate of 2, 4, 6 tribromo aniline on reaction with Br_2 water :

    The structure of 'P' is :

34. The term anomers of glucose refers to :

   Ⓐ isomers of glucose that differ in configurations at carbons one and four (C –1 and C – 4)

   Ⓑ a mixture of D-glucose and L-glucose.

   Ⓒ enantiomers of glucose.

   Ⓓ isomers of glucose that differ in configuration at carbon one (C – 1) .

35. The order of reactivity of phenyl magnesium bromide (ph Mg Br) with the following compounds :
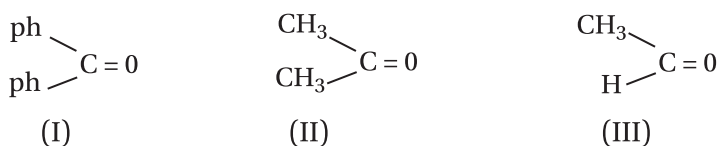
   (I)   (II)   (III)

   Ⓐ III > II > I   Ⓑ II > I > III   Ⓒ I > III > II   Ⓓ I> II > III

36. Consider the reaction, $2N_2O_5 \longrightarrow 4NO_2 + O_2$. In the reaction, NO_2 is being formed at the rate of $0.0125 \, mol(L)^{-1}$. What is the rate of reaction at this time ?

   Ⓐ $0.0018 \, mol(L)^{-1}(S)^{-1}$ Ⓑ $0.0031 \, mol(L)^{-1}(S)^{-1}$

   Ⓒ $0.0041 \, mol(L)^{-1}(S)^{-1}$ Ⓓ $0.050 \, mol(L)^{-1}(S)^{-1}$

Assertion-Reason type Questions (37–40):

Direction : A statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

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.

37. **Assertion (A):** Kohlrausch's law helps to find the molar conductivity of weak electrolyte at infinite dilution.

Reason (R): Molar conductivity of a weak electrolyte at infinite dilution can not be determined experimentally.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

38. Assertion (A) : Fructose is a reducing sugar.
Reason (R) : Fehling's solution on treatment with fructose gives brick red ppt.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

39. Assertion (A) : Half-life of a reaction following first order kinetics is independent of concentration.

Reason (R) : The time required to complete any definite fraction of the first order reaction is independent of the initial concentration.

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

40. Assertion (A) : Enzymes are very specific for a particular reaction and for a particular substrate.

Reason (R) : Enzymes are biocatalysts

Ⓐ A   Ⓑ B   Ⓒ C   Ⓓ D

Case Based Questions (Q41–Q43)

Monosaccharides can be either aldoses or ketoses. Whereas glucose and galactose are aldoses, fructose is a ketose. All monosaccharides are reducing i.e., they reduce Tollen's reagent and Fehling's solution, undergo mutarotation and form Osazones. However, glucose does not give some of the characteristics reaction of aldehydes. Based on the above paragraph and relations question are given :

41. Glucose and Fructose can be distinguish by the following :

Ⓐ Fehlings solutions   Ⓑ Alkaline $KMnO_4$ Ⓒ Br_2/H_2O Ⓓ Tollen's reagent

42. Glucose does not react when with :

Ⓐ hydroxyl amine   Ⓑ acetic anhydride   Ⓒ sodium bisulphite   Ⓓ Br_2/H_2O

43. Fructose reduces Tollen's reagent due to :

Ⓐ assymetric carbon

Ⓑ primary alcoholic group

Ⓒ secondary alcoholic group

Ⓓ enolisation of fructose followed by conversion to aldehyde by base

44. 0.004 (M) Na_2SO_4 is isotonic with 0.010 (M). $C_6H_{12}O_6$ solution at 298 K. What is the apparent degree of dissociation of Na_2SO_4?

Ⓐ 90%   Ⓑ 80%   Ⓒ 75%   Ⓓ 85%

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

Ⓐ Swarts reaction   Ⓑ Sandmeyer's reaction   Ⓒ Hunsdiecker reaction   Ⓓ Finkelstein reaction

46. Which of the following is formed in DNA?

Ⓐ Adenine with thymine   Ⓑ Guanine with adenine

Ⓒ Thymine with guanine   Ⓓ Uracil with adenine

47. The spin only magnetic moment value of $Cr(CO)_6$ is (in BM) :

Ⓐ 0   Ⓑ 2.84   Ⓒ 4.90   Ⓓ 5.92

48. Which is correct in the case of $[NiCl_4]^{2-}$ complex?

Ⓐ It involves sp^3 hybridisation   Ⓑ It is paramagnetic and tetrahedral

Ⓒ It has two unpaired electron   Ⓓ All of these

49. $KMnO_4$ is deep pink colour due to :

Ⓐ d–d transition   Ⓑ polarisation   Ⓒ charge transfer   Ⓓ All of these

50. Given, $E^0_{Cr^{3+}/Cr} = -0.72$ V , $E^0_{Fe^{2+}/Fe} = -0.42$ V

The potential for the cell :

Cr/Cr^{3+} (0.1 M) $||$ Fe^{2+} (0.01 M)/Fe is

Ⓐ –0.339 V   Ⓑ +0.26 V   Ⓒ –0.26 V   Ⓓ +0.33 V

Mathematics

51. If $\int \dfrac{\sin^8 x - \cos^8 x}{1 - 2\sin^2 x \cdot \cos^2 x} dx = a\sin 2x + c$, then $a =$

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

52. $\int \dfrac{1}{x(x^7 + 1)} dx$ is equal to

Ⓐ $\log\left(\dfrac{x^7}{x^7 + 1}\right) + c$ Ⓑ $\dfrac{1}{7}\log\left(\dfrac{x^7}{x^7 + 1}\right)$ Ⓒ $\log\left(\dfrac{x^7 + 1}{x^7}\right) + c$ Ⓓ $\dfrac{1}{7}\log\left(\dfrac{x^7 + 1}{x^7}\right) + c$

53. If $u = \int e^{ax} \sin bx$ and $v = \int e^{ax} \cos bx\, dx$, then $\tan^{-1}\left(\dfrac{u}{v}\right) + \tan^{-1}\left(\dfrac{b}{a}\right)$ equals

Ⓐ bx Ⓑ $2bx$ Ⓒ $b^2 x^2$ Ⓓ $\sqrt{bx}$

54. $\lim\limits_{n\to\infty} \dfrac{(n!)^{1/n}}{n^n}$ equals

Ⓐ e Ⓑ e^{-1} Ⓒ 1   Ⓓ none of these

55. The value of $\displaystyle\int_{0}^{\pi/2} \dfrac{dx}{a^2\cos^2 x + b^2\sin^2 x}(a, b > 0)$ is

Ⓐ $\dfrac{\pi}{ab}$ Ⓑ $\dfrac{\pi}{2ab}$ Ⓒ $\dfrac{\pi}{a^2 + b^2}$ Ⓓ $\dfrac{\pi}{2}$

56. The value of the integral $\int\limits_{0}^{1} e^{x^2} \, dx$ lies in the interval.

  Ⓐ (0,1)   Ⓑ (−1,0)   Ⓒ (1,*e*)   Ⓓ none of these

57. The area bounded by the curve $x^2 = ky$ $(k>0)$ and the line $y=3$ is 12 sq. units, then *k* is

  Ⓐ 3   Ⓑ $3\sqrt{3}$ Ⓒ 4   Ⓓ none of these

58. The area bounded by the curves $y=-\sqrt{-x}$ and $x=-\sqrt{-y}$ where $x,y \le 0$

  Ⓐ $\dfrac{1}{3}$ sq. unit   Ⓑ $\dfrac{2}{3}$ sq. unit   Ⓒ $\dfrac{5}{3}$ sq. unit   Ⓓ can not be determined

59. The differential equation of all 'Simple Harmonic Motion' of given period $\dfrac{2\pi}{n}$, is

  Ⓐ $\dfrac{d^2 x}{dt^2} + nx = 0$ Ⓑ $\dfrac{d^2 x}{dt^2} + n^2 x = 0$ Ⓒ $\dfrac{d^2 x}{dt^2} - n^2 x = 0$ Ⓓ none of these

60. Find the orthogonal trajectory of $y^2 = 4ax$, (*a* being the parameter)

  Ⓐ $2x^2 + y^2 = 2c$ Ⓑ $x^2 + 2y^2 = c$ Ⓒ $x^2 - y^2 = 2c$ Ⓓ $x^2 - 2y^2 = 2c$

61. If $\vec{a} = 3\hat{i} - 2\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{k}$ are adjacent sides of a parallelogram, then the angle between its diagonals is

  Ⓐ $\dfrac{\pi}{6}$ Ⓑ $\dfrac{\pi}{4}$ Ⓒ $\dfrac{\pi}{3}$ Ⓓ $\dfrac{\pi}{2}$

62. Find the coordinates of the point which is three fifth of the way from (3,4,5) to (−2,−1,0)

  Ⓐ (4,0,2)   Ⓑ (0,1,2)   Ⓒ (3,1,2)   Ⓓ (1,2,−1)

63. The foot of the perpendicular from (a,b,c) on the line $x=y=z$ is the point (r,r,r) then find the value of *r* is

  Ⓐ $\dfrac{a+b+c}{-3}$ Ⓑ $\dfrac{a+b+c}{3}$ Ⓒ $\dfrac{a-b+c}{3}$ Ⓓ $\dfrac{a+b-c}{3}$

64. The angle between any two diagonals of a cube is

  Ⓐ $\cos^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$ Ⓑ $\cos^{-1}\left(\dfrac{2}{3}\right)$ Ⓒ $\cos^{-1}\left(\dfrac{1}{3}\right)$ Ⓓ $\cos^{-1}\left(\dfrac{3}{4}\right)$

65. Minimum value of $z = 3x + 3y$ subject to the constraints $x - y \le 1$, $x + y \ge 3$, $x, y \ge 0$ is

  Ⓐ 3   Ⓑ 6   Ⓒ 9   Ⓓ 15

66. If $P(A) = \dfrac{1}{4}$, $P(B) = \dfrac{1}{5}$ and $P(A \cap B) = \dfrac{1}{8}$, then $P\left(\dfrac{A^c}{B^c}\right) = ?$

  Ⓐ $\dfrac{21}{32}$ Ⓑ $\dfrac{25}{32}$ Ⓒ $\dfrac{27}{32}$ Ⓓ $\dfrac{29}{32}$

67. A bag contains 4 balls of unknown colours. A ball is drawn at random from it and is found to be white. The probability that all the balls in the bag are white is

  Ⓐ $\dfrac{4}{5}$ Ⓑ $\dfrac{1}{5}$ Ⓒ $\dfrac{3}{5}$ Ⓓ $\dfrac{2}{5}$

68. Let x denote the number of hours you study on a Sunday. Also it is known that

$$P(X = x) = \begin{cases} 0.1 & \text{if } x = 0 \\ kx & \text{if } x = 1 \text{ or } 2 \\ k(5-x) & \text{if } x = 3 \text{ or } 4 \\ 0 & , \text{ otherwise} \end{cases}$$

where k is a constant.

What is the probability that you study atleast two hours?

(A) 0.55   (B) 0.15   (C) 0.75   (D) 0.3

69. If $f(x) = \log_e x$ and $g(x) = \dfrac{x^4 - 2x^3 + 3x^2 - 2x + 2}{2x^2 - 2x + 1}$. Then find the domain of $f(g(x))$.

(A) R^- (B) R^+ (C) $R - \{1\}$ (D) none of these

70. If $|A| = -2$ where A is a matrix of order 3×3. Given that $\det(\text{adj}(\text{adj}(-3A))) = 2^a \cdot 3^b$ then the value of $4b + 2a$ is

(A) 40   (B) 46   (C) 50   (D) 56

Assertion and Reason Type Questions :

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.

71. **Assertion :** The number of 3×3 matrices with entries -1 or $+1$ is 2^9

Reason : Permutation of n distinct objects taken r at a time is $^nC_r = \dfrac{n!}{r!(n-r)!}$

(A) A   (B) B   (C) C   (D) D

72. **Assertion :** The number of points where $f(x) = |\cos x|$ is not differentiable where $x \in \left[\dfrac{-3\pi}{2}, \dfrac{3\pi}{2}\right]$ is 2.

Reason : Every continuous function is differentiable.
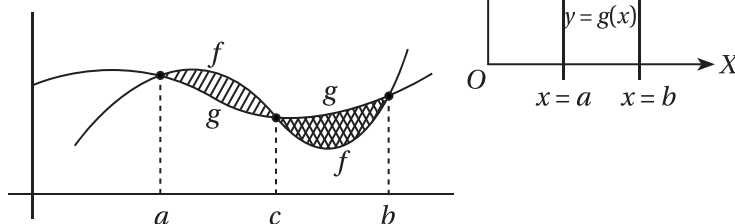
(A) A   (B) B   (C) C   (D) D

Case Study based Questions:

Area between two curves can be calculated as

$$\text{Area} = \int_a^b [f(x) - g(x)]\,dx, \ f(x) \geq g(x) \text{ in } [a,b]$$

For the curves $\rightarrow$

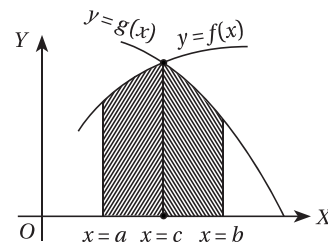$$\text{Area} = \int_a^c [f(x) - g(x)]\,dx + \int_c^b (g(x) - f(x))\,dx$$

where $f(x) \geq g(x)$ in $[a,c]$ and $f(x) \leq g(x)$ in $[c,b]$

Again for this curves :

$$\text{Area} = \int_a^c f(x)dx + \int_c^b g(x)dx$$

On the based on the above information answer the following questions.

73. The area of the region bounded by $y^2 = x$ and $x^2 = y$ is

Ⓐ $\dfrac{16}{3}$ Ⓑ $\dfrac{8}{3}$ Ⓒ $\dfrac{4}{3}$ Ⓓ none of these

74. The area of the region bounded by $y^2 = 4ax$ and $y = mx$ is

Ⓐ $\dfrac{8a^2}{3m}$ Ⓑ $\dfrac{8a^2}{3m^2}$ Ⓒ $\dfrac{8a^2}{3m^3}$ Ⓓ none of these

75. Area of the region of an ellipse $\dfrac{x^2}{5^2} + \dfrac{y^2}{4^2} = 1$ is

Ⓐ 10π Ⓑ 20π Ⓒ 30π Ⓓ none of these

Biology

76. A type of asexual reproduction that mimics sexual reproduction to form seeds, without fertilisation, is

Ⓐ Parthenocarpy   Ⓑ Apomixis   Ⓒ Dioecy   Ⓓ Autogamy

77. Which hormone of pituitary gland regulates Sertoli cells?

Ⓐ LH   Ⓑ FSH   Ⓒ GH   Ⓓ Prolactin

78. After the first meiotic division, the primary oocyte turns into—

Ⓐ Two secondary oocytes   Ⓑ One secondary oocyte and first polar body

Ⓒ One secondary oocyte and two polar bodies   Ⓓ The primary oocyte undergoes mitosis

79. Amniocentesis is a process to

Ⓐ grow cells on a culture medium   Ⓑ determine any hereditary disease of the embryo

Ⓒ know about the diseases of the brain   Ⓓ determine any disease of the heart of the embryo

80. In a certain taxon of insects, some have 17 chromosomes and the others have 18 chromosomes. The 17 and 18 chromosomes bearing organisms are

Ⓐ males and females, respectively   Ⓑ females and males, respectively

Ⓒ all males   Ⓓ all females

81. The human chromosome with the highest and least number of genes in them are, respectively,

Ⓐ Chromosome 2 and X   Ⓑ Chromosome 1 and Y

Ⓒ Chromosome 21 and Y   Ⓓ Chromosome 20 and X

82. Which of the following is the ancestor of modern day horse?

Ⓐ *Dryopithecus*   Ⓑ *Procamelus*   Ⓒ *Pliohippus*   Ⓓ *Equus*

83. Heroin is a

Ⓐ Opioid   Ⓑ Cannabinoid   Ⓒ Cocaine   Ⓓ Alkaloid

84. *Nostoc, Anabaena* and *Oscillatoria* are:

Ⓐ Bacteria used as biofertilizers   Ⓑ Fungi used as biofertilizers

Ⓒ Cyanobacteria used as biofertilizers   Ⓓ Algae used as biofertilizers

85. An enzyme catalysing the removal of nucleotides from the ends of DNA is

Ⓐ Endonuclease   Ⓑ Exonuclease   Ⓒ Ligase   Ⓓ DNA polymerase

86. Crystals of Bt toxin, produced by some bacteria, do not kill the bacteria themselves because—

Ⓐ bacteria are resistant to the toxin   Ⓑ toxin is a protein

Ⓒ toxin is inactive   Ⓓ bacteria encloses the toxin in a special sac

87. How do desert plants adapt to the dry and warm environment?

Ⓐ Leaf surface has a thick cuticle   Ⓑ Stomata are situated in deep pits

Ⓒ Stem is flattened and performs photosynthesis   Ⓓ All

88. Out of the total incident solar radiation, only _____ of it is photosynthetically active radiation.

Ⓐ 50%   Ⓑ 40%   Ⓒ 60%   Ⓓ 10%

89. A collection of plants and seeds, having diverse alleles of all the genes of a crop, is called

Ⓐ Germplasm   Ⓑ Herbarium   Ⓒ Genome   Ⓓ Gene library

■ **Case Based Questions (90-92):**

Read the given passage and answer the following questions:

Interspecific interactions are interactions of populations of two different species. The interactions may be beneficial for both the species, harmful for one and beneficial for the other, beneficial for one and neutral for the other, etc.

90. Which type of interaction is harmful for both the species?

Ⓐ Predation   Ⓑ Competition   Ⓒ Amensalism   Ⓓ Commensalism

91. An orchid growing on an epiphyte is an example of _____

Ⓐ Predation   Ⓑ Mutualism   Ⓒ Amensalism   Ⓓ Commensalism
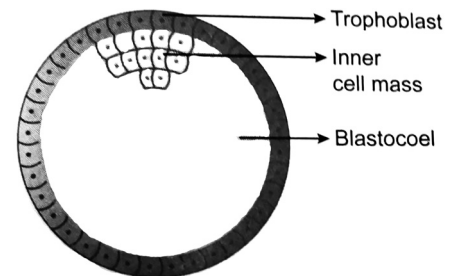
92. Mycorrhizae display

Ⓐ Parasitism   Ⓑ Mutualism   Ⓒ Predation   Ⓓ None

■ **Case Based Questions (93-95):**

93. The diagram shows—

Ⓐ Human placenta

Ⓑ 12 celled embryo

Ⓒ Corpus luteum

Ⓓ Blastocyst

94. What is the fate of trophoblast?

Ⓐ It gives rise to the umbilical cord   Ⓑ It forms the allantois

Ⓒ It produces hPL   Ⓓ It gets attached to the endometrium of the uterus

95. When do chorionic villi appear in humans?

Ⓐ Before implantation   Ⓑ During implantation

Ⓒ Before the division of zygote   Ⓓ After implantation

■ **Assertion – Reason Based Questions: (96-100):**

A: Assertion and Reason both are correct and Reason is the correct explanation of Assertion.

B: Assertion and Reason both are correct but Reason is not the correct explanation of Assertion.

C: Assertion is correct but Reason is wrong.

D: Assertion is wrong but Reason is correct.

96.   **Assertion:** Scutellum represents the single cotyledon of cereal grains.
      Reason: Scutellum stores food for the embryo.

97.   **Assertion:** Alleles I^A and I^B exhibit codominance in human blood group.
      Reason: Both being dominant, express their own types of sugars or traits.

98.   **Assertion:** The two strands of DNA show complementary base pairing.
      Reason: DNA fingerprinting is used to settle paternity disputes.

99.   **Assertion:** Wolf is a placental mammal, whereas Tasmanian wolf is a marsupial mammal.
      Reason: Tasmanian wolf evolved by the process of adaptive radiation.

100. **Assertion:** For organ transplantation, Cyclosporin A needs to be injected to the patient.
      Reason: Cyclosporin A inhibits activation of T-cells and interferons.