Monthly Progessive Test

Class: XII

Subject: PCMB

Academic Excellence Programme TECHNO ACE

Test Booklet No.: MPT01 **Test Date:** 22042024

Time: 180 mins **Full Marks: 200**

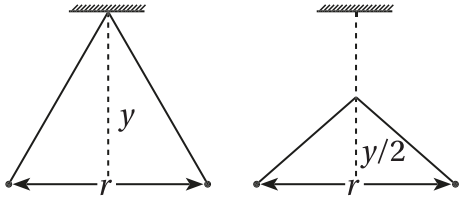
Important Instructions :

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 MPT0122042024.
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 both side discrete bars of Answer Sheet**.
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.

Space For Rough Works

Physics

1. Two pith balls carrying equal charges are suspended from a common point by strings of equal length, the equilibrium separation between them is r. Now the strings are rigidly clamped at half the height. The equilibrium separation between the balls now become



Ⓐ $\left(\frac{2r}{\sqrt{3}}\right)$ Ⓑ $\left(\frac{2r}{3}\right)$

Ⓒ $\left(\frac{r}{\sqrt{2}}\right)$ Ⓓ $\left(\frac{r}{\sqrt[3]{2}}\right)$

2. If two charges q_1 and q_2 are separated with distance 'd' and placed in a medium of dielectric constant K. What will be the equivalent distance between charges in air for the same electrostatic force?

Ⓐ $d\sqrt{K}$ Ⓑ $K\sqrt{d}$ Ⓒ $1.5d\sqrt{K}$ Ⓓ $2d\sqrt{K}$

3. Two point charges Q each are placed at a distance d apart. A third point charge q is placed at a distance x from mid-point on the perpendicular bisector. The value of x at which charge q will experience the maximum Coulomb's force is:

Ⓐ $x = d$ Ⓑ $x = \frac{d}{2}$ Ⓒ $x = \frac{d}{\sqrt{2}}$ Ⓓ $x = \frac{d}{2\sqrt{2}}$

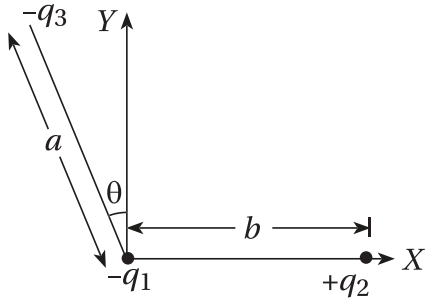
4. Charge is distributed within a sphere of radius R with a volume charge density $p(r) = \frac{A}{r^2}e^{-2r/a}$ where A and a are constants. If Q is the total charge of this charge distribution, the radius R is:

Ⓐ $a\log\left(1-\frac{Q}{2\pi aA}\right)$ Ⓑ $\frac{a}{2}\log\left(\frac{1}{1-\frac{Q}{2\pi aA}}\right)$ Ⓒ $a\log\left(\frac{1}{1-\frac{Q}{2\pi aA}}\right)$ Ⓓ $\frac{a}{2}\log\left(1-\frac{Q}{2\pi aA}\right)$

5. Two charges, each equal to q, are kept at $x = -a$ and $x = a$ on the x-axis. A particle of mass m and charge $q_0 = \frac{q}{2}$ is placed at the origin. If charge q_0 is given a small displacement ($y << a$) along the y-axis, the net force acting on the particle is proportional to

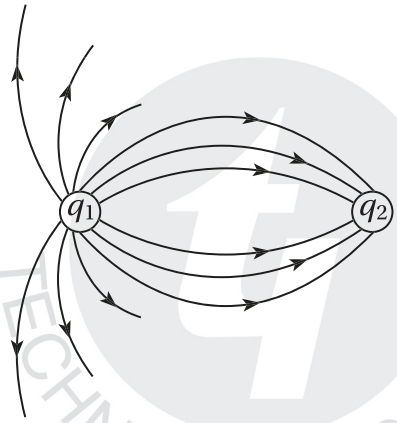
Ⓐ y Ⓑ $-y$ Ⓒ $\frac{1}{y}$ Ⓓ $-\frac{1}{y}$

6. Three charges $-q_1$, $+q_2$ and $-q_3$ are place as shown in the figure. The x-component of the force on $-q_1$ is proportional to



Ⓐ $\frac{q_2}{b^2}-\frac{q_3}{a^2}\cos\theta$ Ⓑ $\frac{q_2}{b^2}+\frac{q_3}{a^2}\sin\theta$ Ⓒ $\frac{q_2}{b^2}+\frac{q_3}{a^2}\cos\theta$ Ⓓ $\frac{q_2}{b^2}-\frac{q_3}{a^2}\sin\theta$

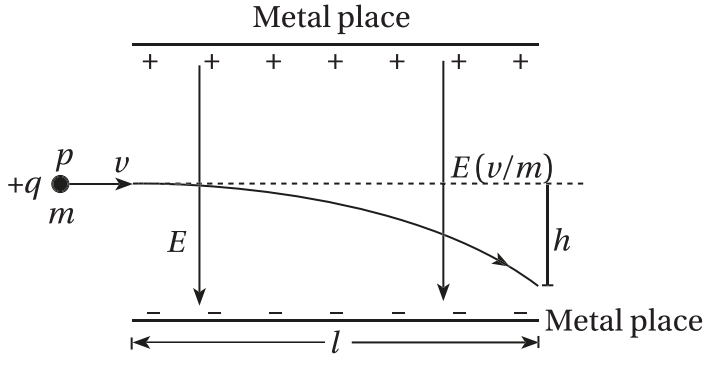
7.



Ⓐ q_1 must be a positive charge Ⓑ q_2 must be a negative charge

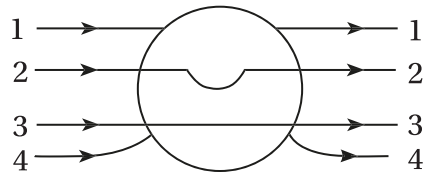
Ⓒ Magnitude of $q_1 = 2 \times$ magnitude of q_2 Ⓓ All of these are correct

8. If h is the vertical displacement of particle at the end, then charge to mass ratio of particle p, q/m =



Ⓐ $\frac{2v^2h}{El^2}$ Ⓑ $\frac{2vh}{El^2}$ Ⓒ $\frac{2v^2h}{El}$ Ⓓ $\frac{2vh^2}{El}$

9. 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

10. An infinite sheet carrying a uniform surface charge density σ lies on the xy-plane. The work done to carry a charge q from the point $\vec{A}=a\left(\hat{i}+2\hat{j}+3\hat{k}\right)$ to the point $\vec{B}=a\left(\hat{i}-2\hat{j}+6\hat{k}\right)$ (where a is a constant with the dimension of length and ε_0 is the permitivity of free space) is

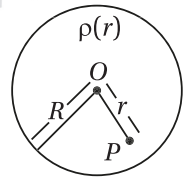
Ⓐ $\frac{3\sigma aq}{2\varepsilon_0}$ Ⓑ $\frac{2\sigma aq}{\varepsilon_0}$ Ⓒ $\frac{5\sigma aq}{2\varepsilon_0}$ Ⓓ $\frac{3\sigma aq}{\varepsilon_0}$

11. An early model for an atom considered it to have a positively charged point nucleus of charge Ze, surrounded by a uniform density of negative charge upto a radius R. The atom as a whole is neutral. The electric field at a distance r from the nucleus is ($r < R$)

Ⓐ $\frac{Ze}{4\pi\varepsilon_0}\left[\frac{1}{r^2}-\frac{r}{R^3}\right]$ Ⓑ $\frac{Ze}{4\pi\varepsilon_0}\left[\frac{1}{r^3}+\frac{r}{R^2}\right]$ Ⓒ $\frac{Ze}{4\pi\varepsilon_0}\left[\frac{r}{R^3}-\frac{1}{r^2}\right]$ Ⓓ $\frac{Ze}{4\pi\varepsilon_0}\left[\frac{r}{R^3}+\frac{1}{r^2}\right]$

12. A spherically symmetric charge distribution is considered with charge density varying as

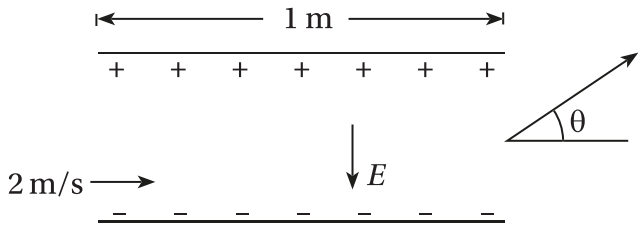
$$\rho(r)=\begin{cases}\rho_0\left(\frac{3}{4}-\frac{r}{R}\right) & \text{for } r\le R\\ \text{Zero} & \text{for } r>R\end{cases}$$



Where, $r(r<R)$ is the distance from the centre O (as shown in figure). The electric field at point P will be

Ⓐ $\frac{\rho_0 r}{4\varepsilon_0}\left(\frac{3}{4}-\frac{r}{R}\right)$ Ⓑ $\frac{\rho_0 r}{3\varepsilon_0}\left(\frac{3}{4}-\frac{r}{R}\right)$ Ⓒ $\frac{\rho_0 r}{4\varepsilon_0}\left(1-\frac{r}{R}\right)$ Ⓓ $\frac{\rho_0 r}{5\varepsilon_0}\left(1-\frac{r}{R}\right)$

13. A uniform electric field $E = (8m/e)$ V/m is created between two parallel plates of length 1 m as shown in figure, (where m = mass of electron and e = charge of electron). An electron enters the field symmetrically between the plates with a speed of 2 m/s. The angle of the deviation (θ) of the path of the electron as it comes out of the field will be _____.



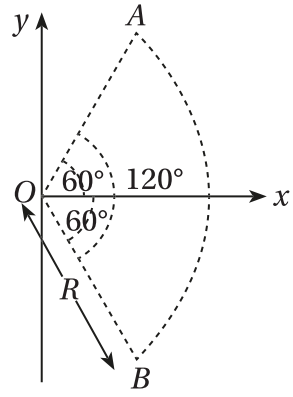
Ⓐ $\tan^{-1}(4)$ Ⓑ $\tan^{-1}(2)$ Ⓒ $\tan^{-1}\left(\frac{1}{3}\right)$ Ⓓ $\tan^{-1}(3)$

14. A uniformly charged disc of radius R having surface charge density σ is placed in the xy plane with its center at the origin. Find the electric field intensity along the z-axis at a distance Z from origin

Ⓐ $E=\frac{\sigma}{2\varepsilon_0}\left(1-\frac{Z}{\left(Z^2+R^2\right)^{1/2}}\right)$ Ⓑ $E=\frac{\sigma}{2\varepsilon_0}\left(1+\frac{Z}{\left(Z^2+R^2\right)^{1/2}}\right)$

Ⓒ $E=\frac{2\varepsilon_0}{\sigma}\left(\frac{1}{\left(Z^2+R^2\right)^{1/2}}+Z\right)$ Ⓓ $E=\frac{\sigma}{2\varepsilon_0}\left(\frac{1}{\left(Z^2+R^2\right)}+\frac{1}{Z^2}\right)$

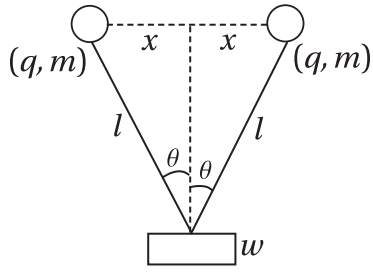
15. Figure shows a rod AB, which is bent in a 120° circular arc of radius R. A charge $(-Q)$ is uniformly distributed over rod AB. What is the electric field $\vec{E}$ at the centre of curvature O?



Ⓐ $\frac{3\sqrt{3}Q}{8\pi\varepsilon_0 R^2}(\vec{i})$ Ⓑ $\frac{3\sqrt{3}Q}{8\pi^2\varepsilon_0 R^2}(\vec{i})$

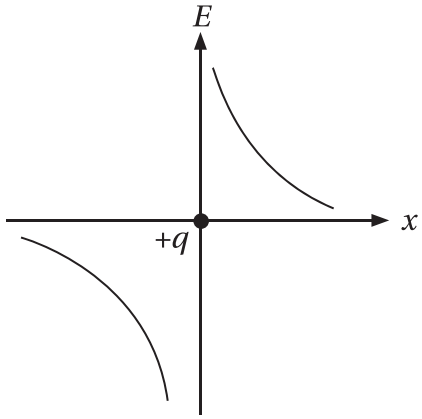
Ⓒ $\frac{3\sqrt{3}Q}{16\pi^2\varepsilon_0 R^2}(\vec{i})$ Ⓓ $\frac{3\sqrt{3}Q}{8\pi^2\varepsilon_0 R^2}(-\vec{i})$

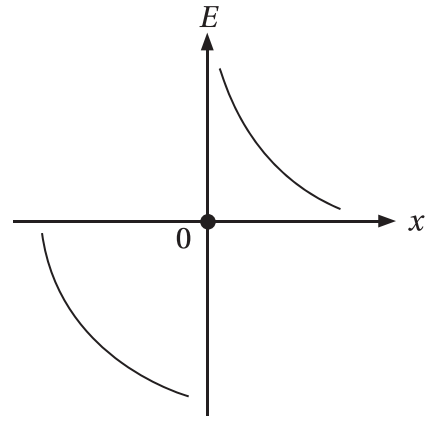
16. Two identical He filled spherical balloons each carrying a charge q are tied to a weight W with strings and float in equilibrium. Then the magnitude of charge q, assuming that the charge on each balloon acts as if it were concentrated at the center.

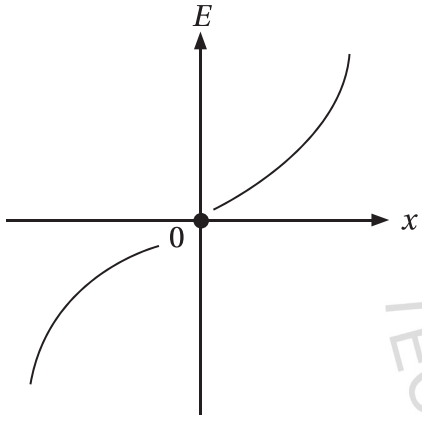


Ⓐ $\sqrt{8w\tan\theta\pi}\,x$ Ⓑ $\sqrt{4\pi w\tan\theta}\,x$ Ⓒ $\sqrt{2\pi w\tan\theta}\,x$ Ⓓ $\sqrt{8w\tan\theta}\,x$

17. Select the correct graphical variation of $\vec{E}$ on x-axis due to a point positive charge.

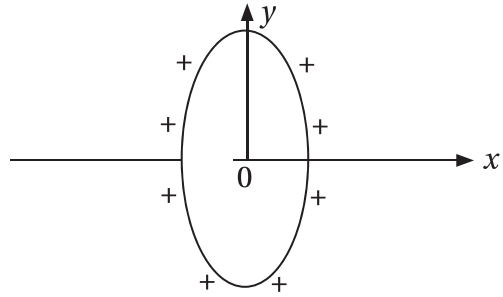
Ⓐ 

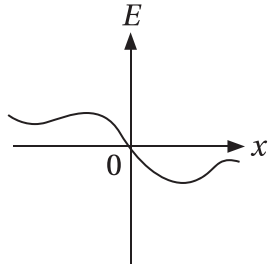
Ⓑ 

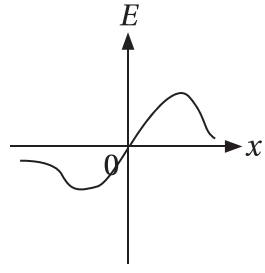
Ⓒ 

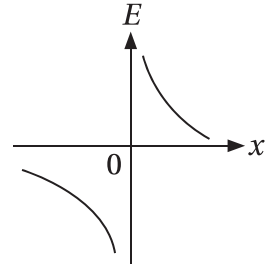
Ⓓ None of these

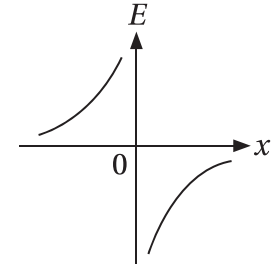
18. Select the correct graphical variation of $\vec{E}$ on x-axis due to a ring shaped conductor carries a total charge Q uniformly distributed in it.



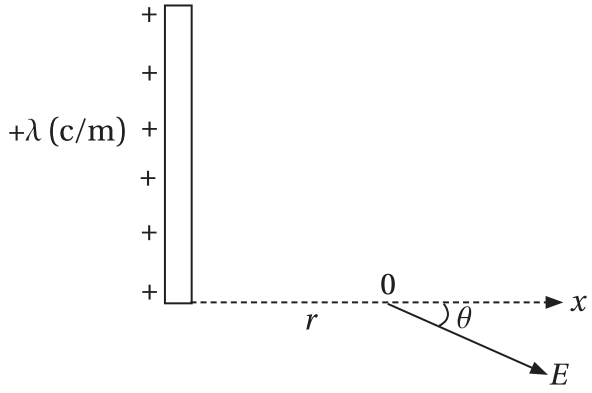
Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

19. The magnitude of angle (θ) that E (N/C) makes with x-axis, at the end of positively charged (line charge λ c/m) long wire as shown in figure is



Ⓐ 30° Ⓑ 60° Ⓒ 45° Ⓓ 90°

20. The electric field caused by a disc of radius R with a uniform positive surface charge density σ at a point on the axis of disc at a distance x from its center. Suppose we keep increasing the radius R of the disc, simultaneously adding charge so that the surface charge density σ is constant. Then E_x =

Ⓐ $\frac{\sigma}{\epsilon_0}$ Ⓑ $\frac{2\sigma}{\epsilon_0}$ Ⓒ $\frac{\sigma}{2\epsilon_0}$ Ⓓ 0

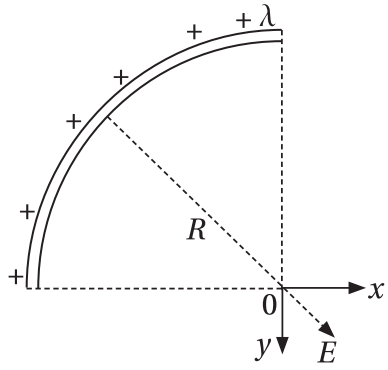
21. For a quarterly circular ring having linear charge density λ (c/m)

Ⓐ $|\vec{E}_x| = |\vec{E}_y|$

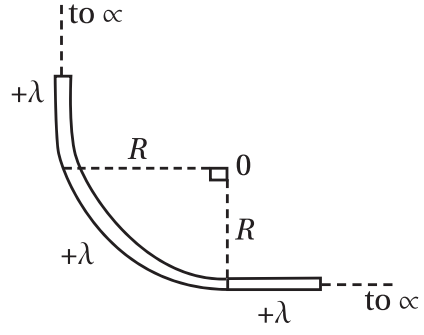
Ⓑ $|\vec{E}_x| > |\vec{E}_y|$

Ⓒ $|\vec{E}_x| < |\vec{E}_y|$

Ⓓ None of these



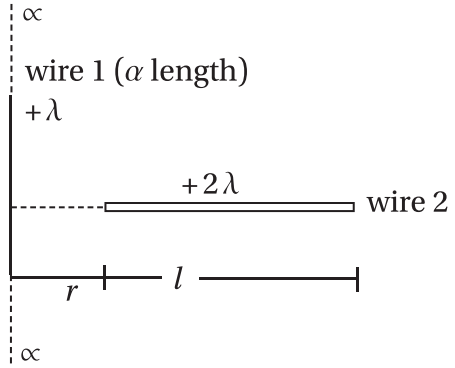
22. A long wire with uniform charge density λ is bent in configuration as shown in the figure given below. The net electric field at 0 is



Ⓐ $\frac{\lambda}{4\pi\epsilon_0 R}$ Ⓑ $\frac{\lambda\sqrt{2}}{4\pi\epsilon_0 R}$

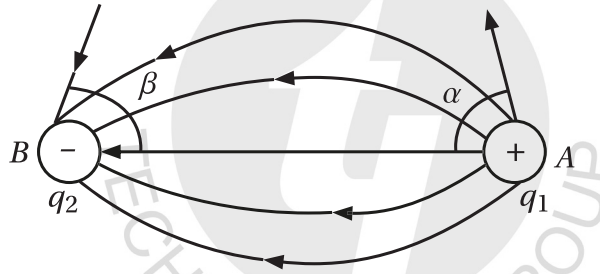
Ⓒ $\frac{\lambda}{8\pi\epsilon_0 R}$ Ⓓ None of these

23. The force of interaction interaction between the two wires



Ⓐ $\frac{\lambda^2}{2\pi\epsilon_0}\ln\left[1+\frac{r}{\ell}\right]$ Ⓑ $\frac{\lambda^2}{2\pi\epsilon_0}\ln\left[1+\frac{\ell}{r}\right]$ Ⓒ $\frac{2\lambda^2}{\pi\epsilon_0}\ln\left[1+\frac{\ell}{r}\right]$ Ⓓ $\frac{\lambda^2}{\pi\epsilon_0}\ln\left[1+\frac{\ell}{r}\right]$

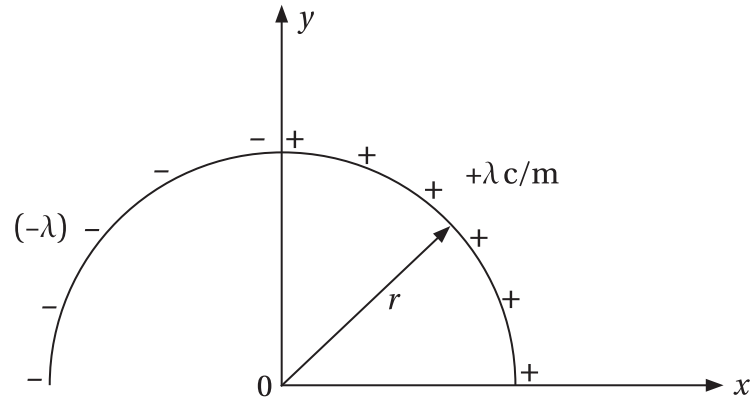
24. A line of force emanates from q_1 at an angle α with the line AB, then the angle B, with which it will terminate at $-q_2$. Select the correct relation.



Ⓐ $\sin\frac{\beta}{2}=\left(\sin\frac{\alpha}{2}\right)\sqrt{\frac{q_1}{q_2}}$ Ⓑ $\sin\beta=\sin\alpha\sqrt{\frac{q_1}{q_2}}$

Ⓒ $\beta=\alpha\sqrt{\frac{q_1}{q_2}}$ Ⓓ None of these

25. A non-conducting semicircular wire is shown above. The dipole moment is



Ⓐ $2\lambda r^2$ Ⓑ $\frac{\lambda r^2}{2}$ Ⓒ $4\lambda r^2$ Ⓓ λr

Chemistry

26. 200 ml 0.1 N NaOH solution is added to 50 ml 0.01 N KOH solution. What is the final concentration in normality of the mixture solution ?

Ⓐ 0.062 N Ⓑ 0.072 N Ⓒ 0.082 N Ⓓ 0.092 N

27. Which of the following is not a good solvent for the ionic compounds ?

Ⓐ Liquid NH_3 Ⓑ Liquid H_2S Ⓒ Liquid SO_2 Ⓓ CCl_4

28. What is the concentration when 3.6 gm $C_6H_{12}O_6$ [MW = 180] is dissolved in 200 gm water ?

Ⓐ 0.1 m Ⓑ 0.01 m Ⓒ 0.2 m Ⓓ 0.02 m

29. At 300 K temperature, a solution is formed by acetone in chloroform and Henry's law constant is 150 torr and mole fraction of acetone is 0.12. What is the vapour pressure of acetone ?

Ⓐ 1.8 torr Ⓑ 0.18 torr Ⓒ 18 torr Ⓓ 9 torr

30. At high altitude, anoxia occurs due to

Ⓐ decrease of partial pressure of oxygen in human blood
Ⓑ decrease of partial pressure of carbon dioxide in human blood
Ⓒ increase of rate of decomposition of haemoglobin in human blood
Ⓓ increase of partial pressure of nitrogen in human lungs

31. If a strong intermolecular force of attraction is there between liquid molecules then vapour pressure

Ⓐ Decreases Ⓑ Increases
Ⓒ At first increases then decreases Ⓓ At first decreases then increases

32. 2 mole volatile solute is added to 18 mole volatile solvent. What will be the final vapour pressure (in mm of Hg) of the system when $p^0_{solute} = 200$ mm of Hg and $p^0_{solvent} = 600$ mm of Hg?

Ⓐ 540 Ⓑ 550
Ⓒ 570 Ⓓ No option is correct

33. A solution containing 12 gm of a non-volatile solute in 52 gm of water gave the boiling point value of 373.40 K. What is the molar mass of the solute ? $(K_b)_{H_2O} = 0.52\ K.Kg.mol^{-1}$

Ⓐ 250 Ⓑ 300 Ⓒ 225 Ⓓ 275

34. What will be the freezing point of the solution, formed by mixing 20 gm urea (MW = 60) in 250 gm water $(K_f)_{H_2O} = 1.86\ K.Kg.mol^{-1}$?

Ⓐ 270.52 K Ⓑ 271.48 K Ⓒ 271.52 K Ⓓ 270.48 K

35. An aqueous solution of methanol in water has the vapour pressure

Ⓐ Less than water
Ⓑ More than water
Ⓒ Equal to water
Ⓓ Less than methanol

36. 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

QUESTION NUMBER 37 TO 40 ARE ASSERTION–REASON TYPE. SELECT THE CORRECT ANSWER AMONG THE GIVEN OPTIONS

OPTION A : Assertion and reason both are correct and reason is the correct explanation of assertion

OPTION B : Assertion and reason both are correct and reason is not the correct explanation of assertion

OPTION C : Assertion is correct but reason is wrong

OPTION D : Assertion is wrong but reason is correct

37. **Assertion :** Higher the value of temperature, osmotic pressure value is lower

Reason : Osmotic pressure value depends on the number of solute particles

38. **Assertion :** Positive deviation from Raoult's law is observed when H_2SO_4 is added to water

Reason : On mixing water and H_2SO_4 forms strong hydrogen bonding with each other

39. **Assertion :** Ammonia is more soluble in water than C_2H_6 at a constant temperature

Reason : Molar mass of ammonia is lower than C_2H_6

40. **Assertion :** Osmotic pressure increases with increasing concentration but decreases with inceasing temperature

Reason : Osmotic pressure is an intensive property at a particular temperature

41. 5 gm solute is dissioved in 500 gm water in each case at same temperature. The correct order of vapour pressure is

Ⓐ $C_{12}H_{22}O_{11} > C_6H_{12}O_6 > CO(NH_2)_2$
Ⓑ $CO(NH_2)_2 > C_6H_{12}O_6 > C_{12}H_{22}O_{11}$
Ⓒ $C_{12}H_{22}O_{11} > CO(NH_2)_2 > C_6H_{12}O_6$
Ⓓ $CO(NH_2)_2 > C_{12}H_{22}O_{11} > C_6H_{12}O_6$

42. 3.42 gm $C_{12}H_{22}O_{11}$ (MW = 342) is added to180 gm water. Mole fraction of sugar is 9.99×10^{-x}. What is the value of 'x' ?

Ⓐ 4 Ⓑ 3 Ⓒ 2 Ⓓ 5

43. What mass of glucose (MW = 180) in gm that would be dissolved in 50 gm of water in order to produce the same lowering of vapour pressure as is produced by dissolving 1 gm of urea (MW = 60) in the same quantity of water ?

Ⓐ 4 Ⓑ 3 Ⓒ 2 Ⓓ m

44. What is the osmotic pressure of a solution in atm at 300 K which is formed by adding 0.444 gm 75 % dissociated $CaCl_2$ (MW = 111) in 500 gm water if R = 0.08 lit-atm.K^{-1}.mol^{-1} ?

Ⓐ 1.72 Ⓑ 1.82 Ⓒ 1.62 Ⓓ 1.92

45. If molality of the dilute solution is doubled then the value of molal elevation constant will

Ⓐ become half Ⓑ become double
Ⓒ become 4 times Ⓓ remain unchanged

46. Y gm of a non-volatile organic substance of molar mass M is dissolved in 250 gm benzene.Molal elevation constant of benzene is K_b then elevation in its boiling point is given by

Ⓐ $\left[\frac{M}{Y.K_b}\right]$ Ⓑ $\left[\frac{4.K_b.Y}{M}\right]$ Ⓒ $\left[\frac{K_b.Y}{4.M}\right]$ Ⓓ $\left[\frac{K_b.Y}{M}\right]$

47. A solution weighing 'a' gm has molality 'b'. What will be the molar mass of solute if the mass of solute is 'c' ?

Ⓐ $\frac{c}{b}\times\frac{1000}{(a-c)}$ Ⓑ $\frac{b}{a}\times\frac{1000}{(a-b)}$ Ⓒ $\frac{b}{c}\times\frac{1000}{(a-c)}$ Ⓓ $\frac{c}{a}\times\frac{1000}{(b-a)}$

48. Mole fraction of a given sample of I_2 in C_6H_6 (MW = 78) is 0.2. The molality of I_2 in C_6H_6 will be

Ⓐ 0.16 Ⓑ 0.32 Ⓒ 1.6 Ⓓ 3.2

49. 100 ml aqueous solution of glucose with osmotic pressure 1.2 atm at 25°C is mixed with 300 ml aqueous solution of urea at 2.4 atm at the same temperature. What is the osmotic pressure of the final mixture ?

Ⓐ 2.54 atm Ⓑ 1.96 atm Ⓒ 1.68 atm Ⓓ 2.24 atm

50. 0.004 M Na_2SO_4 solution 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%

Mathematics

51. If $\cos^{-1}x+\sin^{-1}y=\frac{2\pi}{3}$ then find the value of $\sin^{-1}y-\sin^{-1}x$

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

52. If $\sin^{-1}\frac{x}{5}+\text{cosec}^{-1}\frac{5}{4}=\frac{\pi}{2}$, then one value of x is

Ⓐ 1 Ⓑ 4 Ⓒ 3 Ⓓ 5

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

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

54. The principal value of $\cos^{-1}\left(-\sin\frac{7\pi}{6}\right)$

Ⓐ $\frac{5\pi}{3}$ Ⓑ $\frac{7\pi}{6}$ Ⓒ $\frac{\pi}{3}$ Ⓓ None of these

55. The value of $\cot^{-1}3+\text{cosec}^{-1}\sqrt{5}$ is

Ⓐ $\frac{\pi}{3}$ Ⓑ $\frac{\pi}{2}$ Ⓒ $\frac{\pi}{4}$ Ⓓ None of these

56. Which of these is not a type of relation?

Ⓐ Reflexive Ⓑ Surjective Ⓒ Symmetric Ⓓ Transitive

57. If $f(x_1)=f(x_2)\Rightarrow x_1=x_2\ \forall\ x_1, x_2\in A$ then the function $f: A\to B$ is

Ⓐ One-one Ⓑ One-one onto Ⓒ Onto Ⓓ Many one

58. What type of a relation is $R=\{(1, 3), (4, 2), (2, 4), (2, 3), (3, 1)\}$ on the set $A=\{1, 2, 3, 4\}$

Ⓐ Reflexive Ⓑ Transitive Ⓒ Symmetric Ⓓ None of these

59. The range of function $f(x)=\sqrt{(x-1)(3-x)}$ is

Ⓐ [1, 3] Ⓑ [0, 1] Ⓒ [–2, 2] Ⓓ None of these

60. The function $f(x)=\log(x^2+\sqrt{x^2+1})$ is

Ⓐ Even function Ⓑ Odd function Ⓒ Both (Ⓐ) and (Ⓑ) Ⓓ None of these

61. Let $E=\{1, 2, 3, 4\}$ and $F=\{1, 2\}$ Then, the number of onto functions from E to F is

Ⓐ 14 Ⓑ 16 Ⓒ 12 Ⓓ 8

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

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

63. If $A = \{1, 2, 3\}$, $B = \{6, 7, 8\}$ and $f: A \to B$ is a function such that $f(x) = x + 5$ then what type of a function is f?

Ⓐ Many-one onto Ⓑ Constant function Ⓒ One-one onto Ⓓ Into

64. Let the function 'f' be defined by $f(x) = 5x^2 + 2 \; \forall \; x \in R$, then '$f$' is

Ⓐ Onto function
Ⓑ One-one onto function
Ⓒ One-one into function
Ⓓ Many-one into function

65. If $f(x) + 2f(1 - x) = x^2 + 2 \; \forall \; x \in R$, then $f(x) =$

Ⓐ $x^2 - 2$ Ⓑ 1 Ⓒ $\frac{1}{3}(x-2)^2$ Ⓓ None of these

66. The domain of $\sin^{-1}(\log_3(x/3))$ is

Ⓐ $[1, 9]$ Ⓑ $[-1, 9]$ Ⓒ $[-9, 1]$ Ⓓ $[-9, -1]$

67. What type of relation is 'less than' in the set of real numbers?

Ⓐ Only symmetric Ⓑ Only transitive Ⓒ Only reflexive Ⓓ Equivalence

68. Let T be the set of all triangles in the Euclidean plane, and let a relation R on T be defined as a R b if a congruent to $b \; \forall \; a, b \in T$. Then R is

Ⓐ Reflexive but-not transitive
Ⓑ Transitive but not symmetric
Ⓒ Equivalence
Ⓓ None of these

69. The maximum number of equivalence relations on the set $A = \{1, 2, 3\}$ are

Ⓐ 1 Ⓑ 2 Ⓒ 3 Ⓓ 5

70. Let $A = \{1, 2, 3\}$ and consider the relation $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)\}$. Then R is

Ⓐ Reflexive but not symmetric
Ⓑ Reflexive-but not transitive
Ⓒ Symmetric and transitive
Ⓓ Neither symmetric, nor transitive

71. If the set A contains 5 elements and the set B contains 6 elements, then the number of one-one and onto mappings from A to B is

Ⓐ 720 Ⓑ 120 Ⓒ 0 Ⓓ None of these

72. If $f(x) = \frac{4^x}{4^x + 2}$, the value of $f\left(\frac{1}{2025}\right) + f\left(\frac{2}{2025}\right) + f\left(\frac{3}{2025}\right) + \ldots\ldots + f\left(\frac{2023}{2025}\right) + f\left(\frac{2024}{2025}\right)$

Ⓐ 1000 Ⓑ 1011 Ⓒ 1012 Ⓓ 2024

73. The value of $\cos\left\{\tan^{-1}\left(\tan\frac{15\pi}{4}\right)\right\}$ is

Ⓐ $\frac{1}{\sqrt{2}}$ Ⓑ $-\frac{1}{\sqrt{2}}$ Ⓒ 1 Ⓓ None of these

74. The value of $\tan\left\{2\tan^{-1}\frac{1}{5}-\frac{\pi}{4}\right\}$

Ⓐ 0 Ⓑ 1 Ⓒ $\frac{7}{17}$ Ⓓ None of these

75. The principal value of $\sin^{-1}\left[\cos\left(\sin^{-1}\frac{\sqrt{3}}{2}\right)\right]$ is

Ⓐ $\frac{\pi}{6}$ Ⓑ $\frac{\pi}{3}$ Ⓒ $-\frac{\pi}{3}$ Ⓓ None of these

Biology

76. Which of the following process is not a part of the pollen-pistil interaction?

Ⓐ Recognition of compatible pollen Ⓑ Growth of a pollen tube
Ⓒ Entry of pollen tube into the ovule Ⓓ Triple fusion

77. Pollination by snails is called ____

Ⓐ Anemophily Ⓑ Hydrophily Ⓒ Malacophily Ⓓ Entomophily

78. The coconut water we drink is the ____

Ⓐ Endosperm Ⓑ Endocarp Ⓒ Mesocarp Ⓓ Perisperm

79. Outbreeding devices in plants are mechanisms which ____

Ⓐ Promote cross pollination Ⓑ Prevent cross pollination
Ⓒ Promote self pollination Ⓓ Promote both types of pollination

80. A typical anther is ____

Ⓐ Dithecous with four microsporangia Ⓑ Dithecous with six microsporangia
Ⓒ Tetrathecous with four microsporangia Ⓓ Trithecous with three microsporangia

81. Entry of pollen tube through the micropyle is called ____

Ⓐ Chalazogamy Ⓑ Porogamy Ⓒ Chasmogamy Ⓓ None of the above

82. Female gametophyte of angiosperms is represented by ____

Ⓐ Ovule Ⓑ Megaspore mother cell
Ⓒ Embryo sac Ⓓ Nuclellus

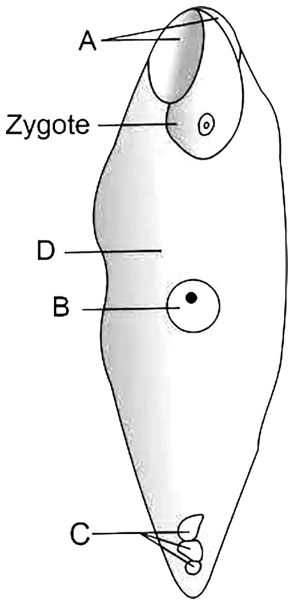
83. Select the mismatched pair____

Ⓐ Microsporangium — pollen sac
Ⓑ Megasporangium — nucellus
Ⓒ Pollen grain — male gametophyte
Ⓓ Pollen grain — male gamete

84. A plant that can produce both chasmogamous and cleistogamous flower is___

Ⓐ Papaya Ⓑ Viola Ⓒ Water lily Ⓓ Maize

85. Choose the correct sequence of A, B, C and D from the diagram given below____



Ⓐ A—Primary endosperm cell (PEC)
B—Degenerating antipodals
C—Primary endosperm nucleus (PEN)
D—Degenerating synergids

Ⓑ A—Degenerating antipodals
B—PEC
C—Degenerating synergids
D—PEN

Ⓒ A—Degenerating synergids
B—PEN
C—Degenerating antipodals
D—PEC

Ⓓ A—PEN
B—PEC
C—Degenerating synergids
D—Degenerating antipodals

86. What happens to the integuments around the ovule after fertilisation?

Ⓐ They turn to the fruit stalk
Ⓑ They turn to the pericarp
Ⓒ They dry and fall off
Ⓓ They turn to seed coats

87. Scutellum represents the ____

Ⓐ Endosperm of monocot seeds
Ⓑ Cotyledons of dicot seeds
Ⓒ Cotyledon of monocot seeds
Ⓓ Embryo of dicot seeds

88. Choose the correct equation___

Ⓐ Male gamete (n) + Female gamate (n) → Embryo ($2n$)

Ⓑ Male gamete (n) + Female gamate (n) → Zygote ($2n$)

Ⓒ Secondary nucleus (n) + Male gamate (n) → Endosperm $(2n)$

Ⓓ Secondary nucleus $(2n)$ + Male gamate $(2n)$ → Endosperm $(4n)$

89. Select the correct statement about plants with closed flowers

Ⓐ The flowers are called chasmogamous and show self pollination

Ⓑ The flowers are called cleistogamous and show cross pollination

Ⓒ The flowers are called cleistogamous and show self pollination

Ⓓ None of the above

90. Choose the aquatic plant which does not use water for pollination

Ⓐ Water hyacinth Ⓑ *Vallisneria* Ⓒ *Hydrilla* Ⓓ Sea grass

91. The nature of intine is ____

Ⓐ Sporopollenin containing Ⓑ Pectocellular

Ⓒ Starchy Ⓓ Cellulosic

92. The remnant, persistent nucellus, present in seeds of black pepper and beet is called ____

Ⓐ Pericarp Ⓑ Perisperm Ⓒ Epicarp Ⓓ Suspensor

93. _____ is a plant considered a contaminant and causes pollen allergy

Ⓐ *Polygonum* Ⓑ *Hydrilla* Ⓒ *Amorphophallus* Ⓓ *Parthenium*

94. The microscopic pollen grains of the past are preserved as fossils. Which compound makes this possible?

Ⓐ Sporopollenin Ⓑ Pectocellulose Ⓒ Cellulose Ⓓ Lignin

95. A typical angiosperm embryo sac at maturity, is _____

Ⓐ 8–nucleate and 7–celled Ⓑ 8–nucleate and 8–celled

Ⓒ 9–nucleate and 9–celled Ⓓ 9–nucleate and 8–celled

96. In most angiosperms, pollen grains are shed at the ____

Ⓐ 4–celled stage Ⓑ 2–celled stage Ⓒ 6–celled stage Ⓓ 5-celled stage

97. Emasculation is done to_____

Ⓐ Prevent cross pollination Ⓑ Prevent fertilisation

Ⓒ Prevent self pollination Ⓓ Prevent bagging of flowers

98. Choose the correct statement___

Ⓐ Occurence of an embryo in a seed is called polyembryony

Ⓑ The oldest and viable seeds are those of *Striga*

Ⓒ Apomixis is a kind of asexual reproduction which mimics sexual reproduction

Ⓓ Certain varieties of mango show apomixis

99. Banana shows____

Ⓐ Polyembryony
Ⓑ Production of seeds without fertilisation
Ⓒ Fruit formation from thalamus
Ⓓ Parthenocarpy

100. Choose the correct developmental sequence____

Ⓐ Pollen mother cell → Sporogenous tissue → Microspore tetrad → Male gametes → Pollen grain
Ⓑ Pollen grain → Sporogenous tissue → Pollen mother cell → Microspore tetrad → Male gametes
Ⓒ Sporogenous tissue → Pollen mother cell → Microspore tetrad → Pollen grain → Male gametes
Ⓓ Pollen mother cell → Sporogenous tissue → Male gametes → Pollen grain

Space For Rough Works

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