Sample Paper

ENGINEERING

Aakash
Medical | IIT-JEE | Foundations

Aakash
NATIONAL
TALENT HUNT EXAM
2025

KASHMIR

Class XII Studying Moving to XII Passed

Physics, Chemistry & Mathematics

INSTRUCTIONS FOR CANDIDATE

1. Duration of Test is 1 hr.
2. The Test Booklet consists of **40** questions. The maximum marks are **90**. There is **no negative marking** for wrong answer.
3. Pattern of the questions are as under:
   (i) The question paper consists of three parts *i.e.*, **Physics, Chemistry and Mathematics**. Each part has **two sections**.
   (ii) **Section-I:** This section contains **35** multiple choice questions, which have **only one** correct answer. Each question carries **+2 marks** for correct answer.
   (iii) **Section-II:** This section contains **5** multiple choice questions, in which **one or more than one** choice(s) is(are) correct. Each question carries **+4 marks** for correct answer.

Aakash National Talent Hunt Exam (Kashmir)-2025
Sample Paper

(*Class XII Studying Moving to XII Passed*)

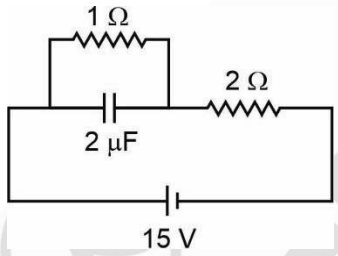
(The questions given in sample paper are indicative of the level and pattern of questions that will be asked in ANTHE-2025)

Time : 1 Hour **PHYSICS** **MM : 90**

SECTION-I : SINGLE CORRECT ANSWER TYPE

This section contains 11 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which **ONLY ONE** choice is correct.

1. The charge on capacitor at steady state is



(1) 8 μC (2) 6 μC

(3) 10 μC (4) 5 μC

2. Inside a hollow charged spherical conductor, the potential

(1) Is constant

(2) Varies directly as the distance from the centre

(3) Varies inversely as the distance from the centre

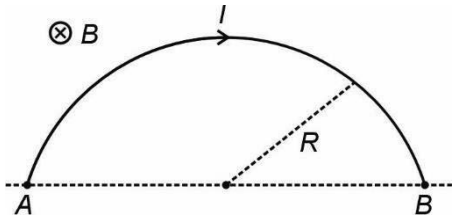
(4) Varies inversely as the square of the distance from the centre

3. An uncharged capacitor of capacitance 10 μF connected with a battery of emf 4 V. The heat dissipated in the circuit during the process of charging is

(1) 100 μJ (2) 120 μJ

(3) 80 μJ (4) 60 μJ

4. Find net magnetic force on a semicircular wire of radius *R* carrying current *I* which placed in uniform magnetic field *B* as shown.



(1) 4*IBR* (2) 3*IBR*

(3) *IBR* (4) 2*IBR*

5. The electric field in region is given by $E = (2\hat{i} + 3\hat{j})$ N/C . Find the net electric flux passing through a square of side length 2 m parallel to *Y*-*Z* plane.

(1) 4 N m^2/C (2) 8 N m^2/C

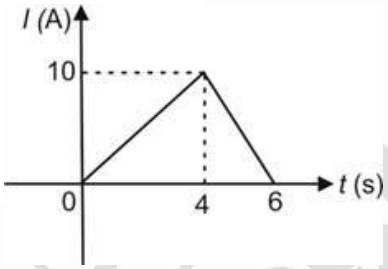
(3) 6 N m^2/C (4) 10 N m^2/C

6. A charged particle of mass 10 g and charge +2 mC moving with velocity $\vec{v} = (\hat{i} + 2\hat{j} - \hat{k})$ m/s in magnetic field $\vec{B} = (3\hat{j} - \hat{k})$ T . The acceleration of particle at this instant is

(1) $0.6(\hat{i} + \hat{j} + 3\hat{k})$ m/s^2 (2) $0.5(\hat{i} + \hat{j} + 2\hat{k})$ m/s^2

(3) $(\hat{i} + \hat{j} - 3\hat{k})$ m/s^2 (4) $0.2(\hat{i} + \hat{j} + 3\hat{k})$ m/s^2

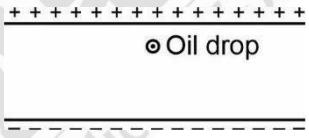
7. The variation of current through a wire is as shown in *I*–*t* graph. The amount of charge flown through any cross-section of wire in 6 second is



(1) 30 C (2) 20 C

(3) 60 C (4) 15 C

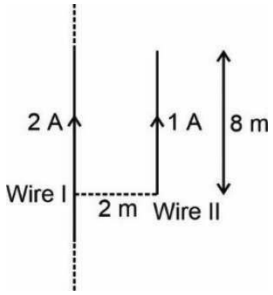
8. An oil drop of specific charge 2 × 10^{-5} C/kg is in equilibrium between two charged plates separated at distance 40 mm. The potential difference between plates is



(1) 2 × 10^5 volt (2) 4 × 10^3 volt

(3) 6 × 10^4 volt (4) 2 × 10^4 volt

9. Find the force on wire II due to wire I.



(1) $\frac{4\mu_0}{\pi}$ (2) $\frac{2\mu_0}{\pi}$

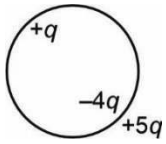
(3) $\frac{\mu_0 \ln(2)}{\pi}$ (4) $\frac{6\mu_0}{\pi}$

10. The resistance of metallic wire is R. It is stretched to increase its length to four times. Its resistance will be

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

(3) $\frac{R}{16}$ (4) $16R$

11. The figure shown below is a distribution of charges. The flux of electric field due to these charges through the surface is



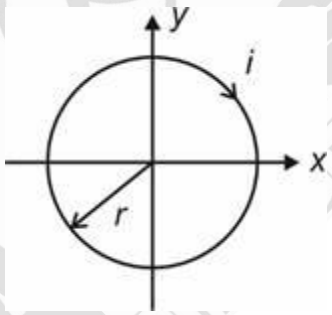
(1) Zero (2) $\frac{\varepsilon q}{\varepsilon_0}$

(3) $\frac{3q}{\varepsilon_0}$ (4) $\frac{-3q}{\varepsilon_0}$

SECTION-II : ONE OR MORE THAN ONE CORRECT ANSWER TYPE

This section contains 2 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which **ONE OR MORE THAN ONE** choice(s) is(are) correct.

12. A circular current carrying loop of radius r is placed in xy plane in a uniform magnetic field $\vec{B} = (\hat{i} - \hat{k})$ T as shown in figure, then



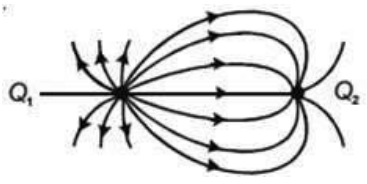
(1) Torque acting on the loop along negative y-axis

(2) Magnetic dipole moment is in the direction of negative z-axis

(3) Force experienced by the current carrying loop is zero

(4) Potential energy of the system is negative

13. A few electric field lines for a system of two charges Q_1 and Q_2 fixed at two different points on the x-axis are shown in the figure. These lines suggest that



(1) $|Q_1| > |Q_2|$

(2) $|Q_1| < |Q_2|$

(3) At a finite distance to the left of Q_1 the electric field is zero

(4) At a finite distance to the right of Q_2 the electric field is zero

CHEMISTRY

SECTION-I : SINGLE CORRECT ANSWER TYPE

This section contains 11 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which **ONLY ONE** choice is correct.

14. During the electrolysis of an **aqueous** salt solution, the pH in the space near one of the electrode is **increased** and near other one, the value of pH is **decreased**. The salt solution contains

(1) $Cu(NO_3)_2$ (2) $ZnCl_2$

(3) NaCl (Conc.) (4) NaCl (very dilute)

15. The vapour pressure of a pure liquid solvent A is 0.80 atm at a temperature T K. When a non-volatile substance B is added to the solvent at same temperature T K, its vapour pressure becomes 0.60 atm. The mole fraction of solute B in the solution is

(1) 0.75 (2) 0.50

(3) 0.20 (4) 0.25

16. Two liquids A and B are mixed at temperature T K in a certain ratio to form an ideal solution. It is found that the partial pressure of A *i.e.*, p_A is equal to partial pressure of B *i.e.*, $p_B (p_A = p_B)$. What is the total pressure of the liquid mixture in terms of p_A^o and p_B^o ?

p_A^o = Vapour pressure of pure liquid A

p_B^o = Vapour pressure of pure liquid B

(1) $\frac{p_A^o p_B^o}{p_A^o + p_B^o}$ (2) $\frac{2p_A^o p_B^o}{p_A^o + p_B^o}$

(3) $\frac{2p_A^o}{p_A^o + p_B^o}$ (4) $\frac{2p_B^o}{p_A^o + p_B^o}$

17. We are given with following data at some temperature T K

λ_m^o (HCl) = x S cm^2 mole^{-1}

λ_m^o (NaCl) = y S cm^2 mole^{-1}

λ_m^o (CH_3COONa) = z S cm^2 mole^{-1}

Find out λ_m^o (CH_3COOH) at same temperature T K (in S cm^2 mole^{-1}).

(1) (x + y – z) (2) (x + z – y)

(3) (y + z – x) (4) (z + y + x)

18. The magnetic moment of the following complexes follows the order

I. $[Zn(NH_3)_4]^{2+}$

II. $[CoF_6]^{3-}$

III. $[Cr(NH_3)_6]^{3+}$

(1) I > II > III (2) II > I > III

(3) III > II > I (4) II > III > I

19. We are given with Arrhenius equation,

$k = Ae^{-\frac{E_a}{RT}}$

k = Rate constant of the reaction

A = Pre-exponential factor

E_a = Activation energy of reaction

Find out the value of k when T approaches infinity ($T \to \infty$).

(1) 0 (2) ∞

(3) A (4) $-\infty$

20. Rate constant of a reaction is 0.693 min^{-1}. Find out half-life of the reaction.

(1) 1 min (2) 10 min

(3) 100 min (4) 0.1 min

21. Number of stereoisomers possible for the complex $[Co(en)_2Cl_2]^+$ is equal to

(1) 1 (2) 2

(3) 3 (4) 4

22. Which of the following is paramagnetic?

(1) $[Ni(CO)_4]$ (2) $[Ni(CN)_4]^{2-}$

(3) $[NiCl_4]^{2-}$ (4) $[Fe(CN)_6]^{4-}$

23. Which of the following element **does not** show variable oxidation states?

(1) Sc (2) Mn

(3) Fe (4) Cr

24. Which of the following transition metal ion is colourless in aqueous solution?

(1) V^{2+} (2) Fe^{3+}

(3) Zn^{2+} (4) Cu^{2+}

SECTION-II : ONE OR MORE THAN ONE CORRECT ANSWER TYPE

This section contains 2 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which **ONE OR MORE THAN ONE** choice(s) is(are) correct.

25. Which of the following option(s) is/are correct for given **first order** reaction?

$A \longrightarrow$ Products

(1) $C_t = C_0e^{-kt}$

(2) $\alpha = (1 - e^{-kt})$

(α : degree of dissociation of A)

(3) $t_{99.9} \simeq 10t_{1/2}$

($t_{99.9}$ = Time required for 99.9% completion of reaction)

($t_{1/2}$ = Half-life of reaction)

(4) $x = C_0(1 - e^{-kt})$

(x : Concentration of A consumed at any time t)

26. The values of E^o for some reactions are given :

$I_2 + 2e^- \longrightarrow 2I^-$ $E^o = 0.54$ V

$Sn^{4+} + 2e^- \longrightarrow Sn^{2+}$ $E^o = 0.152$ V

$Cl_2 + 2e^- \longrightarrow 2Cl^-$ $E^o = 1.36$ V

$Fe^{3+} + e^- \longrightarrow Fe^{2+}$ $E^o = 0.76$ V

$Ce^{4+} + e^- \longrightarrow Ce^{3+}$ $E^o = 1.60$ V

Which of the following statement(s) is/are correct based on above data?

(1) Fe^{3+} can oxidise Ce^{3+} to Ce^{4+}

(2) Ce^{4+} can oxidise Fe^{2+} to Fe^{3+}

(3) Sn^{2+} will reduce Fe^{3+} to Fe^{2+}

(4) Cl_2 will be liberated when I_2 is passed through a solution of KCl

MATHEMATICS

SECTION-I : SINGLE CORRECT ANSWER TYPE

This section contains 13 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which **ONLY ONE** choice is correct.

27. The value of $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)+\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$ is equal to

(1) 0 (2) $\frac{\pi}{2}$

(3) $\frac{3\pi}{4}$ (4) π

28. If $A=\begin{bmatrix} x & y \\ 1 & 2 \end{bmatrix}$ and $A^2=\begin{bmatrix} 5 & 4 \\ 4 & 5 \end{bmatrix}$, then

(1) $x + y = 4$ (2) $x + y = 3$

(3) $y - x = 1$ (4) $xy = 3$

29. The value of $\begin{vmatrix} 1 & \alpha\beta & \gamma \\ 1 & \beta\gamma & \alpha \\ 1 & \alpha\gamma & \beta \end{vmatrix}$ is equal to

(1) $(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$ (2) $-(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$

(3) $(\alpha+\beta)(\beta+\gamma)(\gamma+\alpha)$ (4) 0

30. Consider the function $f(x)=\begin{cases} \sin^{-1}x+\frac{1}{2} & , \quad -1\le x\le 0 \\ \cos^{-1}x+a & , \quad 0<x\le 1 \end{cases}$

If $f(x)$ is continuous at each point in its domain, then a =

(1) $\frac{\pi}{2}-\frac{1}{2}$ (2) $\frac{\pi}{2}+\frac{1}{2}$

(3) $\frac{1}{2}-\frac{\pi}{2}$ (4) $-\frac{1}{2}-\frac{\pi}{2}$

31. The sum of all x where $f(x) = |x-1| + |x-2| + ... + |x-99|$ is non-differentiable is equal to

(1) 5050 (2) 4950

(3) 5100 (4) 4800

32. The derivative of $y = \frac{1}{\sqrt{x-1}}$ at $x = 2$ is equal to

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

(3) 1 (4) 0

33. $\int \frac{\sin 2x}{\sin x} dx =$

(1) $\frac{\cos 2x}{\cos x} + c$ (2) $\sin x + c$

(3) $2 \sin x + c$ (4) $2 \cos x + c$

34. The area of the region bounded by the parabola $y^2 = 16x$ and the line $x = 4$ is equal to

(1) $\frac{128}{3}$ sq. units (2) $\frac{64}{3}$ sq. units

(3) $\frac{16}{3}$ sq. units (4) $\frac{32}{3}$ sq. units

35. $\int_{-\pi/2}^{\pi/2} \cos^2 x . \sin x \, dx =$

(1) $\frac{3}{2}$ (2) $\frac{1}{8}$

(3) Zero (4) $\frac{3}{8}$

36. The exhaustive values of x where $f(x) = e^x$ is increasing, is equal to

(1) $(-\infty, 0)$ (2) $(0, \infty)$

(3) $(-\infty, \infty)$ (4) $[-1, 1]$

37. The maximum value of $f(x) = \frac{1}{2}\cos x$ is equal to

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

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

38. The value of x if $\cos^{-1}(x) = \frac{\pi}{6}$ is equal to

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

(3) 1 (4) 0

39. The value of $-\frac{dx}{dy}$ at (1, 1) for $y^2 = x$ is

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

(3) –2 (4) $-\frac{1}{2}$

SECTION-II : ONE OR MORE THAN ONE CORRECT ANSWER TYPE

This section contains 1 multiple choice question, which has 4 choices (1), (2), (3) and (4) out of which **ONE OR MORE THAN ONE** choice(s) is(are) correct.

40. If $A^2 = A$, where A is a square matrix, then det(A) can be

(1) 1 (2) –1

(3) 0 (4) 2

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Olympiads Results

899 Classroom Students Aakashians Qualified in IOQM 2024	**161** Classroom Students Aakashians Qualified in RMO 2024-25	**420** Classroom Students Aakashians Qualified in NSEs 2024-25	**25** Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2024-25	**4902** Classroom Students Aakashians Qualified in NSO (Level-I) 2024-25

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