SAMPLE PAPER Engineering

M-STAR

Momentum Scholarship Test for Admission & Rewards

10th Edition, 2025

Talent HUNT Exam

(Class XI Studying Moving to Class XII)
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:**

   The question paper consists of three subjects i.e., , **Physics, Chemistry** and **Mathematics .** There are two sections in this question paper.

(i) **Section-I:** This section contains **35 multiple choice questions**, which have **only one correct** answer. Each question carries **+2 marks** for correct answer.

(ii) **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.

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SECTION - I

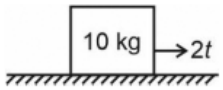
This section contains **35 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct. Each question carries **+2 Marks** for correct answer.

1. A car starting from rest accelerates uniformly to reach speed of 50 m/s in time t and then moves with uniform speed for time t. Find the average speed of car in the entire duration.

(1) 37.5 m/s (2) 30.5 m/s

(3) 25.0 m/s (4) 50.0 m/s

2. A block of mass 10 kg is placed on a rough horizontal surface as shown. The coefficient of friction between the block and the ground is 0.4. A time varying horizontal force $F = 2t$ starts acting on the block. The time at which the block will start moving is



(1) 30 s (2) 10 s

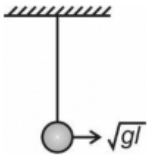
(3) 15 s (4) 20 s

3. A physical quantity P depends on x, y and z as $P = \frac{xy^2}{z}$, the percentage error in measurement of x, y and z are 1%, 2% and 1% respectively. The maximum percentage error in P is equal to

(1) 5% (2) 6%

(3) 4% (4) 3%

4. A bob attached to a string of length l is given a horizontal velocity of $\sqrt{gl}$ as shown. The maximum angular displacement of the bob is



(1) $\frac{\pi}{3}$ (2) $\frac{\pi}{6}$

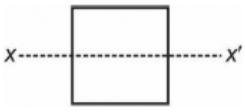
(3) $\frac{\pi}{2}$ (4) $\frac{2\pi}{3}$

5. Which of the following physical quantity has same dimensions as that of torque?

(1) Momentum (2) Energy

(3) Angular momentum (4) Acceleration

6. Four rods each of mass m and length l are joined to form a square structure as shown. The moment of inertia of the square about the axis xx' lying in the same plane of square is



(1) $\frac{5}{3}ml^2$ (2) $\frac{2}{3}ml^2$

(3) $4ml^2$ (4) $\frac{4}{3}ml^2$

7. The horizontal range of a projectile when projected at an angle of 30° is 75 m. If the projectile is projected with same velocity at an angle of 60°, the horizontal range will be

(1) 75 m

(2) $75\sqrt{3}$ m

(3) $\frac{75\sqrt{3}}{2}$ m

(4) 65 m

8. A man standing at rest observes the rain falling at 45° with the vertical. When he starts running with speed 5 m/s on the ground, he finds the rain hitting him vertically. The speed of the rain is

(1) 5 m/s

(2) $5\sqrt{2}$ m/s

(3) 10 m/s

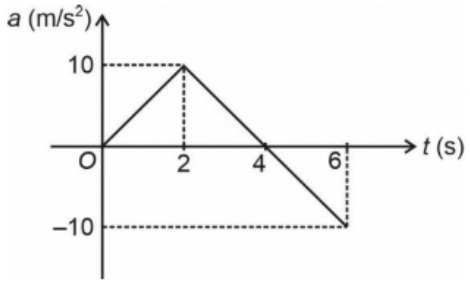
(4) $10\sqrt{2}$ m/s

9. A variable force given by $F = (2x^2 + 3x - 2)$ N acts on a body and displaces it from $x = 1$ to $x = 2$. The work done by this force is

(1) $\frac{53}{6}$ J (2) $\frac{43}{6}$ J

(3) 28 J (4) $\frac{41}{6}$ J

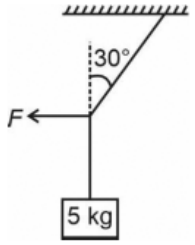
10. A particle is moving in a straight line along x-axis. The acceleration-time curve for the particle is shown. If initial velocity of the particle is 3 m/s, then velocity at $t = 6$ s is



(1) 10 m/s (2) 33 m/s

(3) 12 m/s (4) 13 m/s

11. A block of mass 5 kg is hanging from the ceiling through a rope. A force F is applied at mid-point of the rope so that at equilibrium the rope makes 30° with respect to the vertical axis as shown. The magnitude of F is



(1) $25\sqrt{3}$ N (2) 50 N

(3) $\frac{50}{\sqrt{3}}$ N (4) $50\sqrt{3}$ N

12. Find out mole fraction of solute in its 2 molal aqueous solution.

(1) 0.035 (2) 0.35

(3) 0.017 (4) 0.17

13. Which of the following has the smallest value of de-Broglie wavelength (All have equal value of kinetic energy)?

(1) CO_2 molecule (2) NH_3 molecule

(3) Electron (4) Proton

14. Which of the following pair of elements shows diagonal relationship?

(1) Be and Mg (2) Li and Mg

(3) C and Al (4) C and Si

15. Which of the following is paramagnetic?

(1) C_2 (2) N_2

(3) F_2 (4) O_2

16. Heat of atomization of NH_3 and N_2H_4 are x kcal mole^{-1} and y kcal mole^{-1} respectively. Calculate the average bond energy of N–N bond (in kcal mole^{-1}).

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

(3) $\frac{4y-3x}{4}$ (4) $\frac{3y-4x}{3}$

17. Find out mass (in g) of zinc metal required to displace all the silver from 10 mL of 1 molar $AgNO_3$ solution.

(Atomic mass of zinc = 65.3 amu)

(1) 0.03265 g

(2) 0.3265 g

(3) 3.265 g

(4) 32.65 g

18. An electron in an atom jumps in such a way that its kinetic energy changes from $\left(\frac{x}{4}\right)$ eV to $\left(\frac{x}{16}\right)$ eV.

Find out change in potential energy of the electron. ($\Delta PE = (PE)_{Final} - (PE)_{Initial}$)

(1) $\frac{3x}{8}$ eV (2) $\frac{-3x}{8}$ eV

(3) $\frac{3x}{16}$ eV (4) $\frac{-3x}{16}$ eV

19. A hypothetical element has successive ionization enthalpies as 940 (first), 2080, 12570, 14522, kJ mole^{-1} respectively. Find out number of valence electrons present in the atom.

(1) 1 (2) 2

(3) 3 (4) 4

20. Which of the following molecule is polar in nature?

(1) PCl_5 (2) XeO_4

(3) SF_4 (4) CH_4

21. The correct relationship between standard free energy change (ΔG°) of a reaction and the corresponding equilibrium constant (K_c) is

(1) $\Delta G^\circ = -RT \ln K_c$ (2) $\Delta G^\circ = +RT \ln K_c$

(3) $\Delta G^\circ = -R \ln K_c$ (4) $\Delta G^\circ = +R \ln K_c$

22. Spin only magnetic moment of Fe^{3+} in BM is given by

(1) 4.89 (2) 5.92

(3) 6.93 (4) 3.87

23. Let $A = \{a, b, c\}$ and $B = \{c, d, e\}$, then $A - B$ is

(1) $\{d, e\}$ (2) $\{a, b, c\}$

(3) $\{a, b\}$ (4) $\{a\}$

24. In a ΔLMN, right-angled at M, if $\cos L = \frac{5}{13}$, then the value of cosec$N$ is

(1) $\frac{13}{5}$ (2) $\frac{5}{12}$

(3) $\frac{5}{13}$ (4) $\frac{12}{5}$

25. The value of $i + i^2 + i^3 + \ldots + i^{100}$ is (where $i = \sqrt{-1}$)

(1) 0 (2) 1

(3) i (4) $-i$

26. The number of integral value of x satisfying $x^2 + 2x + 1 \leq 0$ is

(1) 0 (2) 1

(3) 2 (4) 3

27. The number of ways in which 3 pandas can be placed into 4 different cages, where each cage can have atmost 1 panda, is

(1) 120 (2) 6

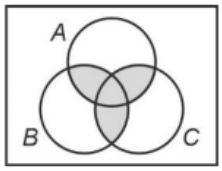
(3) ${}^4C_3$ (4) 24

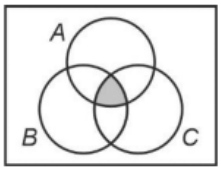
28. In a sequence a, b, c and d, if a, b, c are in arithmetic progression and b, c, d are in geometric progression, then

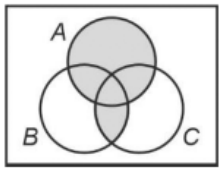
(1) $2c^2 - cd = ad$ (2) $2c^2 + cd = ad$

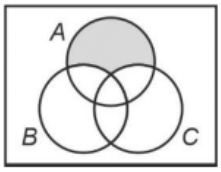
(3) $c^2 - cd = ad$ (4) $c^2 + cd = ad$

29. Which one of the following best represents $A \cup (B \cap C)$?

(1) 

(2) 

(3) 

(4) 

30. The value of $\frac{2\tan 15^\circ}{1-\tan^2 15^\circ}$ is

(1) 1

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

(3) $\sqrt{3}$

(4) 0

31. The solution set of the inequation $3 + 2x \geq 7 - 3x$ is

(1) $\left(\frac{5}{4}, \infty\right)$

(2) $\left[\frac{4}{5}, \infty\right)$

(3) $\left[\frac{5}{4}, \infty\right)$

(4) $\left(\frac{4}{5}, \infty\right)$

32. The multiplicative inverse of $4 + 3i$ is $(i = \sqrt{-1})$

(1) $4 - 3i$

(2) $\frac{4-3i}{5}$

(3) $\frac{4-3i}{25}$

(4) $\frac{4+3i}{5}$

33. The sum of the terms of sequence formed with the common terms of the sequence 1, 3, 5, 7, ..., 33 and 5, 10, 15, ..., 35 is

(1) 30

(2) 135

(3) 45

(4) 80

34. If $z_1 = 2 + i$ and $z_2 = 1 + i$, then $\left|\frac{z_1 + z_2 + 1}{z_1 + z_2 - 1}\right|$ is $(i = \sqrt{-1})$

(1) $\sqrt{\frac{5}{2}}$

(2) $\sqrt{\frac{5}{4}}$

(3) $\frac{\sqrt{5}}{4}$

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

35. The number of ways in which 3 boys and 3 girls can sit alternate on 6 chairs in a row is

(1) 81

(2) $2 \times 3! \times 3!$

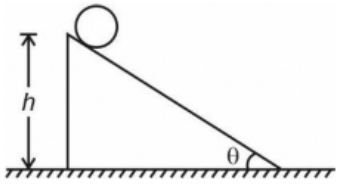
(3) 27

(4) $3! \times 3!$

SECTION - II

This section contains **5 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE OR MORE THAN ONE** choice(s) is/are correct. Each question carries **+4 makrs** for correct answer.

36. A uniform solid sphere of radius R is released from the top of an inclined plane of height h and inclination θ. The friction is sufficient for the sphere to have pure rolling. Then



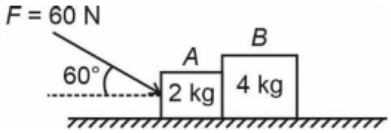
(1) The acceleration of the sphere is $\frac{2}{5}g\sin\theta$

(2) The acceleration of the sphere is $\frac{5}{7}g\sin\theta$

(3) The time taken by sphere to reach bottom of the plane is $\sqrt{\frac{14h}{5g\sin^2\theta}}$

(4) The time taken by sphere to reach bottom of the plane is $\sqrt{\frac{7h}{5g\sin\theta}}$

37. Two blocks *A* and *B* of mass 2 kg and 4 kg are kept in contact as shown. A force of 60 N at an angle 60° with the horizontal is acting on block *A* as shown. Then (consider the surface to be smooth)



(1) The acceleration of the blocks is 5 m/s^2

(2) The acceleration of the blocks is 10 m/s^2

(3) The contact force between the two blocks is 30 N

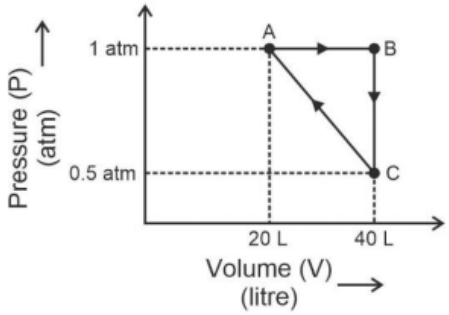
(4) The contact force between the two blocks is 20 N

38. Which of the following pairs of molecule(s) has(have) same shape?

(1) XeF_2; CO_2 (2) H_2O; OF_2

(3) H_3O^+; NH_3 (4) CH_4; NH_4^+

39. On the basis of following graph, choose the correct statement(s).



(1) $W_{ABCA} = 0$ (2) $W_{AB} = 0$

(3) $W_{BC} = 0$ (4) $q_{ABCA} = +5$ atm L

40. If $A = \sin20°\sin80°\sin40°$ and $B = \cos20°\cos80°\cos40°$, then

(1) $A + B = \frac{\sqrt{3}+1}{8}$

(2) $A - B = \frac{\sqrt{3}-1}{8}$

(3) $\frac{A}{B} = \sqrt{3}$

(4) $A \times B = \frac{\sqrt{3}}{64}$

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