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MHT CET 2025 Apr 25 Shift 1 Question Paper

Time Allowed :3 Hour	Maximum Marks :200	Total Questions :200

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 150 questions. The maximum marks are 200.
3. There are three parts in the question paper consisting of Physics, Chemistry and Mathematics having 50 questions in each part of equal weightage.

1. A body of mass 0.2 kg is attached to a light string of length 1 m and revolved in a vertical circle. What is the minimum speed at the lowest point so that the body can complete the circular motion? (Take $g = 10\,\text{m/s}^2$)

(a) 2 m/s

(b) 4.47 m/s

(c) 5 m/s

(d) 6.32 m/s

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2. A coil of 100 turns, carrying a current of 5A, is placed in a magnetic field of 2T. The area of each turn is 0.01 m^2. What is the magnetic moment of the coil?

(a) 0.5 Am^2

(b) 1 Am^2

(c) 2 Am^2

(d) 5 Am^2

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3. The electric field at a point in space is 2×10^3 N/C and the potential at the same point is 100 V. What is the potential energy of a charge of 5 C placed at that point?

(a) 0.5 mJ

(b) 1.0 mJ

(c) 2.0 mJ

(d) 5.0 mJ

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4. In an LC circuit, the inductance L is 2 H and the capacitance C is 4 F. What is the frequency of oscillation of the circuit?

(a) 100 Hz

(b) 50 Hz

(c) 25 Hz

(d) 200 Hz

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5. A body of mass 5 kg is placed on a frictionless inclined plane of angle 30°. What is the component of the weight of the body along the plane?

(1) 25 N

(2) 50 N

(3) 45 N

(4) 75 N

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6. A 0.5 m long solenoid has 100 turns and carries a current of 3A. What is the magnetic field at the center of the solenoid?

(1) 2×10^{-2} T

(2) 4×10^{-2} T

(3) 6×10^{-2} T

(4) 8×10^{-2} T

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7. A particle is moving with a constant velocity of 5 m/s in a circular path of radius 2 m. What is the centripetal acceleration of the particle?

(a) 1.25 m/s^2

(b) 2.5 m/s^2

(c) 5 m/s^2

(d) 10 m/s^2

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8. What is the moment of inertia of a solid sphere of mass M and radius R about its

diameter?

(a) $\frac{2}{5}MR^2$

(b) $\frac{1}{2}MR^2$

(c) $\frac{3}{5}MR^2$

(d) MR^2

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9. A galvanometer has resistance $G = 100\,\Omega$ and shows full-scale deflection at $I_q = 1\,\text{mA}$. To convert it into a voltmeter of range 5 V, what resistance should be connected in series?

(a) 400 Ω

(b) 4900 Ω

(c) 490 Ω

(d) 5000 Ω

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10. A body of mass 2 kg is moving in a circular path of radius 3 m with a constant speed of 6 m/s. What is the centripetal force acting on the body?

(a) 4 N

(b) 8 N

(c) 24 N

(d) 12 N

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11. A force of 20 N is applied to a body at an angle of 30° to the horizontal, moving the body a distance of 5 m. What is the work done by the force?

(a) 100 J

(b) 50 J

(c) 200 J

(d) 150 J

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12. Two point charges $+2\,\mu$C and $-3\,\mu$C are placed 10 cm apart in vacuum. What is the electrostatic force between them?

(a) 4.5 N

(b) 9 N

(c) 18 N

(d) 2.25 N

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13. A body of mass 10 kg is at a height of 5 m above the surface of the Earth. What is the gravitational potential energy of the body? (Take $g = 10\,\text{m/s}^2$)

(a) 50 J

(b) 500 J

(c) 100 J

(d) 250 J

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14. A gas expands from a volume of 2 m³ to 4 m³ against a constant pressure of 5 atm. How much work is done by the gas during expansion? (1 atm = 1.01×10^5 Pa)

(a) 2.02×10^5 J

(b) 1.01×10^5 J

(c) 5.02×10^5 J

(d) 1.02×10^5 J

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15. A coil has 200 turns and an area of $0.01\,\text{m}^2$. If the magnetic field changes from 0 to 0.5 T in 0.1 seconds, what is the induced emf in the coil?

(a) 1 V

(b) 0.5 V

(c) 2 V

(d) 5 V

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16. A concave mirror has a focal length of 15 cm. An object is placed 30 cm from the mirror. What is the image distance?

(a) 30 cm

(b) 45 cm

(c) 60 cm

(d) 20 cm

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17. A water tank is open at the top and has a hole of area $10^{-4}\,\text{m}^2$ at the bottom. The height of the water column is 5 m. What is the speed of the water flowing out of the hole? (Take

$g = 10\,\text{m/s}^2$)

(a) 5 m/s

(b) 10 m/s

(c) 15 m/s

(d) 20 m/s

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18. If $\mathbf{a} = \frac{1}{\sqrt{10}}(4\hat{i} - 3\hat{j} + \hat{k})$ and $\mathbf{b} = \frac{1}{5}(\hat{i} + 2\hat{j} + 2\hat{k})$, then the value of

$$(2\mathbf{a} - \mathbf{b}) \cdot [(\mathbf{a} \times \mathbf{b}) \times (\mathbf{a} + 2\mathbf{b})]$$

(1) 5

(2) -3

(3) -5

(4) 3

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19. Evaluate the integral:

$$\int \sqrt{x^2 + 3x}\, dx$$

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20. If $P(A \cap B) = \frac{2}{25}$ and $P(A \cup B) = \frac{8}{25}$, then find the value of $P(A)$.

(1) $\frac{4}{15}$

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

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

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

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21. Find the smallest angle of the triangle whose sides are $6 + \sqrt{12}, \sqrt{48}, \sqrt{24}$.

(a) $\frac{\pi}{4}$

(b) $\frac{\pi}{2}$

(c) $\frac{\pi}{6}$

(d) $\frac{\pi}{3}$

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22. Evaluate the integral:

$$\int \frac{x^2 + 2x}{\sqrt{x^2 + 1}}\, dx$$

(1) $\frac{1}{3}\left(x^2+1\right)^{3/2}$

(2) $\frac{1}{2}\left(x^2+1\right)^{3/2}$

(3) $\frac{1}{2}\left(x^2+1\right)^{5/2}$

(4) $\frac{1}{3}\left(x^2+1\right)^{5/2}$

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23. Find the value of the following expression:

$$\sin^2(30^\circ) + \cos^2(60^\circ)$$

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

(2) 1

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

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

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24. If two dice are rolled, what is the probability of getting a sum of 7?

(1) $\frac{1}{6}$

(2) $\frac{1}{36}$

(3) $\frac{5}{36}$

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

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25. If $\mathbf{a} = 3\hat{i} + 4\hat{j}$ and $\mathbf{b} = 2\hat{i} - \hat{j}$, find $\mathbf{a} \cdot \mathbf{b}$ (the dot product).

(1) 6

(2) 4

(3) 10

(4) 12

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26. Find the roots of the quadratic equation $x^2 - 5x + 6 = 0$.

(1) 2 and 3

(2) 3 and -2

(3) -2 and -3

(4) 1 and 6

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27. A bag contains 5 red balls, 7 green balls, and 8 blue balls. One ball is drawn at random.

What is the probability that the ball is either red or green?

(1) $\frac{5}{20}$

(2) $\frac{7}{20}$

(3) $\frac{12}{20}$

(4) $\frac{5}{10}$

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28. In the reaction $2H_2 + O_2 \rightarrow 2H_2O$, if 4 moles of hydrogen react with excess oxygen, how many moles of water are produced?

(1) 2 moles

(2) 4 moles

(3) 8 moles

(4) 1 mole

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29. What is the pH of a solution with a hydrogen ion concentration of 1×10^{-5} mol/L?

(1) 5

(2) 10

(3) 7

(4) 4

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30. Which of the following elements has the highest electronegativity?

(1) Fluorine (F)

(2) Oxygen (O)

(3) Nitrogen (N)

(4) Chlorine (Cl)

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31. The enthalpy change for the reaction $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ is $-92.4\,\text{kJ/mol}$. What is the enthalpy change when 4 moles of nitrogen react?

(1) $-92.4\,\text{kJ}$

(2) $-184.8\,\text{kJ}$

(3) $-46.2\,\text{kJ}$

(4) $-368.4\,\text{kJ}$

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32. What is the volume occupied by 2 moles of an ideal gas at standard temperature and pressure (STP)?

(1) 22.4 L

(2) 44.8 L

(3) 11.2 L

(4) 48.8 L

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33. In the reaction $Zn + 2Ag^{+} \rightarrow Zn^{2+} + 2Ag$, what is the oxidation state of zinc in Zn and Zn^{2+}?

(1) 0 in Zn, $+2$ in Zn^{2+}

(2) $+2$ in Zn, 0 in Zn^{2+}

(3) $+2$ in Zn, $+1$ in Zn^{2+}

(4) 0 in Zn, 0 in Zn^{2+}

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