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MHT CET 2025 Apr 23 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 car accelerates uniformly from rest to a velocity of 25 m/s in 10 seconds. What is the acceleration of the car?

(1) $2.5\ \text{m/s}^2$

(2) $5\ \text{m/s}^2$

(3) $10\ \text{m/s}^2$

(4) $15\ \text{m/s}^2$

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2. A block of mass 5 kg is placed on a horizontal surface. The coefficient of friction between the block and the surface is 0.4. What is the force of friction acting on the block?

(1) 10 N

(2) 15 N

(3) 20 N

(4) 25 N

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3. In a Young's double-slit experiment, the distance between the slits is 0.2 mm and the distance between the screen and the slits is 2 m. If the wavelength of the light used is 600 nm, calculate the distance between the two adjacent bright fringes.

(1) 0.3 mm

(2) $0.6\,\text{mm}$

(3) $1.2\,\text{mm}$

(4) $1.5\,\text{mm}$

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4. In an LC circuit, the inductance L is $2\,\text{H}$ and the capacitance C is $4\,\mu\text{F}$. What is the frequency of oscillation of the circuit?

(1) $100\,\text{Hz}$

(2) $50\,\text{Hz}$

(3) $25\,\text{Hz}$

(4) $200\,\text{Hz}$

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5. A thin spherical shell of radius $0.5\,\text{m}$ and mass $2\,\text{kg}$ is rotating about its axis of symmetry with an angular velocity of $10\,\text{rad/s}$. What is its moment of inertia?

(1) $0.5\,\text{kg}\cdot\text{m}^2$

(2) $1.0\,\text{kg}\cdot\text{m}^2$

(3) $2.0\,\text{kg}\cdot\text{m}^2$

(4) $4.0\,\text{kg}\cdot\text{m}^2$

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6. A particle is moving with a constant velocity of $5\,\text{m/s}$ in a circular path of radius $2\,\text{m}$. What is the centripetal acceleration of the particle?

(1) $1.25\,\text{m/s}^2$

(2) $2.5\,\text{m/s}^2$

(3) $5\,\text{m/s}^2$

(4) $10\,\text{m/s}^2$

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7. A body of mass $5\,\text{kg}$ is placed on a frictionless inclined plane of angle 30°. What is the component of the weight of the body along the plane?

(1) $25\,\text{N}$

(2) $50\,\text{N}$

(3) $45\,\text{N}$

(4) $75\,\text{N}$

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8. 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 $5\,\mu$C placed at that point?

(1) 0.5 mJ

(2) 1.0 mJ

(3) 2.0 mJ

(4) 5.0 mJ

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9. A 0.5 m long solenoid has 400 turns and carries a current of 3 A. 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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10. A photon has an energy of 3.2×10^{-19} J. What is the frequency of the photon?

(1) 5.0×10^{14} Hz

(2) 4.0×10^{14} Hz

(3) 3.0×10^{14} Hz

(4) 6.0×10^{14} Hz

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11. A satellite is orbiting the Earth at a height of 10^4 km above the Earth's surface. If the radius of the Earth is 6.4×10^6 m, calculate the orbital speed of the satellite. (Gravitational constant $G = 6.67 \times 10^{-11}$ N $\cdot$ m^2/kg^2 and Earth's mass $M = 6 \times 10^{24}$ kg)

(1) 7.0 km/s

(2) 8.0 km/s

(3) 9.0 km/s

(4) 10.0 km/s

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

(1) 0.5 A $\cdot$ m^2

(2) $1.0\,\text{A} \cdot \text{m}^2$

(3) $2.0\,\text{A} \cdot \text{m}^2$

(4) $5.0\,\text{A} \cdot \text{m}^2$

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13. The pH of a solution is 3. What is the concentration of H^+ ions in the solution?

(1) 1×10^{-3} mol/L

(2) 3×10^{-3} mol/L

(3) 1×10^{-6} mol/L

(4) 3×10^{-6} mol/L

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14. What is the oxidation state of chromium in $K_2Cr_2O_7$?

(1) +2

(2) +3

(3) +6

(4) +7

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15. What is the molecular geometry of SO_3?

(1) Linear

(2) Trigonal planar

(3) Tetrahedral

(4) Octahedral

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16. What is the mass of sodium chloride (NaCl) formed when 0.5 moles of sodium (Na) reacts with excess chlorine (Cl_2)?

(1) 29 g

(2) 35.5 g

(3) 58 g

(4) 70 g

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17. Calculate the oxidation number of sulfur in H_2SO_4.

(1) +4

(2) +6

(3) +2

(4) 0

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18. A sample of an ideal gas occupies 10 liters at a pressure of 2 atm and a temperature of 300 K. What is the volume of the gas at 1 atm pressure and 300 K temperature?

(1) 5 L

(2) 10 L

(3) 20 L

(4) 40 L

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19. What is the total number of orbitals in the third energy level (n = 3)?

(1) 9

(2) 16

(3) 4

(4) 3

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20. What is the value of the ionization energy of hydrogen in joules? (Given that the ionization energy of hydrogen is 13.6 eV)

(1) 2.18×10^{-18} J

(2) 1.6×10^{-18} J

(3) 3.2×10^{-19} J

(4) 1.0×10^{-19} J

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21. What is the empirical formula of a compound containing 40% sulfur and 60% oxygen by mass?

(1) SO_2

(2) SO_3

(3) S_2O_3

(4) SO

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22. What is the standard electrode potential for the half-reaction $Cu^{2+} + 2e^- \rightarrow$ Cu?

(1) +0.34 V

(2) -0.34 V

(3) +1.10 V

(4) 0 V

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23. What is the percentage composition of nitrogen in ammonium nitrate (NH_4NO_3)?

(1) 18.5(2) 28.0(3) 35.0(4) 42.5

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24. What is the total number of moles of gas in a 5 L container at 300 K and 2 atm pressure (Use the ideal gas law)?

(1) 0.4 mol

(2) 0.6 mol

(3) 1.0 mol

(4) 2.0 mol

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25. A solution contains 10 g of NaOH dissolved in 500 mL of water. What is the molarity of the NaOH solution?

(1) 0.25 M

(2) 0.5 M

(3) 1.0 M

(4) 2.0 M

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26. The enthalpy change for the reaction $C + O_2 \rightarrow CO_2$ is -393.5 kJ/mol. What is the heat released when 2 moles of carbon react with excess oxygen?

(1) -393.5 kJ

(2) -787 kJ

(3) -196.75 kJ

(4) 0 kJ

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27. Find the roots of the quadratic equation $2x^2 - 4x - 6 = 0$.

(1) $x = 1$ or $x = -3$

(2) $x = -1$ or $x = 3$

(3) $x = 2$ or $x = -1$

(4) $x = 3$ or $x = -2$

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28. Find the area of a triangle with vertices $A(2, 3)$, $B(5, 11)$, and $C(8, 7)$.

(1) 15

(2) 18

(3) 20

(4) 25

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29. Solve for x: $\log_2(x - 1) = 3$.

(1) $x = 9$

(2) $x = 7$

(3) $x = 8$

(4) $x = 6$

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30. Find the derivative of the function $f(x) = 3x^2 - 5x + 7$.

(1) $6x - 5$

(2) $6x + 5$

(3) $3x^2 + 5$

(4) $3x^2 - 5$

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31. Find the value of the determinant $\begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix}$.

(1) 2

(2) 1

(3) 0

(4) -1

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32. Solve the system of equations:

$$x + y = 5$$

$$2x - y = 4$$

(1) $x = 3, y = 2$

(2) $x = 2, y = 3$

(3) $x = 4, y = 1$

(4) $x = 1, y = 4$

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33. If $\log_2 x = 5$, what is the value of x?

(1) $x = 32$

(2) $x = 25$

(3) $x = 20$

(4) $x = 16$

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34. Find the length of the diagonal of a rectangle with length 6 cm and breadth 8 cm.

(1) 10 cm

(2) 12 cm

(3) 14 cm

(4) 8 cm

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35. Solve the system of equations:

$$x + y = 10$$

$$3x - y = 5$$

(1) $x = 5, y = 5$

(2) $x = 4, y = 6$

(3) $x = 3, y = 7$

(4) $x = 6, y = 4$

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36. Find the sum of the first 20 terms of the arithmetic progression: $2, 5, 8, 11, \ldots$.

(1) 400

(2) 420

(3) 440

(4) 460

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37. Find the value of x if $\sin(2x) = 1$.

(1) $x = \frac{\pi}{4}$

(2) $x = \frac{\pi}{2}$

(3) $x = \frac{\pi}{6}$

(4) $x = \frac{3\pi}{4}$

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38. Find the value of $\log_3 81$**.**

(1) 3

(2) 4

(3) 2

(4) 1

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