MHT CET 2025 Apr 19 Shift 2 Question Paper with Solutions

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. The value of the definite integral $\int_0^{\pi} \sin^2 x \, dx$ is:

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

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

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

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

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2. The distance between the points $A(3, 4)$ and $B(-1, -2)$ is:

(1) 5

(2) 6

(3) 7

(4) 8

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3. A bag contains 5 red balls and 3 green balls. If two balls are drawn at random without replacement, what is the probability that both balls drawn are red?

(1) $\frac{5}{28}$

(2) $\frac{5}{21}$

(3) $\frac{3}{14}$

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

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4. If $\tan\theta = 2$, then the value of $\sec^2\theta$ is:

(1) 5

(2) 4

(3) 3

(4) 2

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5. If the roots of the quadratic equation $x^2 - 7x + 12 = 0$ are α and β, then the value of $\alpha + \beta$ is:

(1) 7

(2) 12

(3) 5

(4) 6

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6. The general solution of the differential equation $\frac{dy}{dx} = 3x^2$ is:

(1) $y = x^3 + C$

(2) $y = 3x^3 + C$

(3) $y = \frac{3}{2}x^3 + C$

(4) $y = x^3 + 3C$

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7. If $A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$, then the determinant of matrix A is:

(1) 4

(2) 5

(3) 7

(4) 10

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8. The limit of $\lim_{x\to 0} \frac{\sin x}{x}$ is:

(1) 1

(2) 0

(3) ∞

(4) Does not exist

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9. If $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = 4\hat{i} - \hat{j}$, then the dot product $\vec{A} \cdot \vec{B}$ is:

(1) 5

(2) 6

(3) 7

(4) 8

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10. The maximum value of the function $f(x) = -2x^2 + 4x + 1$ occurs at:

(1) $x = 1$

(2) $x = -1$

(3) $x = 0$

(4) $x = 2$

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11. The value of the integral $\int_0^1 x^2 \, dx$ is:

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

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

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

(4) 1

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12. If $z = 3 + 4i$, then the modulus of z is:

(1) 5

(2) 7

(3) 9

(4) 10

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13. A die is rolled. What is the probability of getting a number less than or equal to 4?

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

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

(3) $\frac{3}{6}$

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

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14. In how many ways can 5 people be arranged in a row?

(1) 120

(2) 60

(3) 24

(4) 10

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15. The feasible region of the linear programming problem is determined by the system of inequalities:

$$x + y \leq 6, \quad x \geq 0, \quad y \geq 0.$$

What is the maximum value of $x + y$ in the feasible region?

(1) 6

(2) 5

(3) 4

(4) 3

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16. A car accelerates uniformly from rest and attains a velocity of 20 m/s in 10 seconds. What is the acceleration of the car?

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

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

(3) $4\,\text{m/s}^2$

(4) $5\,\text{m/s}^2$

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17. A force of 10 N acts on a body and moves it through a displacement of 5 m in the direction of the force. What is the work done by the force?

(1) 50 J

(2) 25 J

(3) 10 J

(4) 5 J

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18. Two charges of $+2\,\mu$C and $-2\,\mu$C are placed 1 meter apart. What is the force between them?

(1) 9×10^9 N

(2) 18×10^9 N

(3) 4×10^9 N

(4) 0 N

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19. A gas expands from an initial volume of $V_1 = 1$ m^3 to a final volume of $V_2 = 3$ m^3 under constant pressure of $P = 2$ atm. What is the work done by the gas during this expansion?

(1) 6×10^5 J

(2) 4×10^5 J

(3) 2×10^5 J

(4) 1×10^5 J

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20. A convex lens has a focal length of 20 cm. An object is placed at a distance of 30 cm from the lens. What is the position of the image formed?

(1) 60 cm

(2) 15 cm

(3) 10 cm

(4) 25 cm

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21. A body moves in a circle of radius $r = 5$ m with a constant speed of $v = 10$ m/s. What is the centripetal acceleration of the body?

(1) 2 m/s^2

(2) 5 m/s^2

(3) 10 m/s^2

(4) 20 m/s^2

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22. A fluid flows through a pipe with a varying cross-sectional area. If the velocity of the fluid is $v_1 = 4$ m/s at a point where the cross-sectional area is $A_1 = 2$ m^2, and the velocity at another point where the cross-sectional area is $A_2 = 1$ m^2 is v_2, what is the velocity v_2?

(1) 8 m/s

(2) 4 m/s

(3) 2 m/s

(4) 1 m/s

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23. A mass of 0.5 kg is attached to a spring with a spring constant $k = 200$ N/m. The mass is displaced by 0.1 m from its equilibrium position. What is the potential energy stored in the spring?

(1) 1 J

(2) 0.5 J

(3) 2 J

(4) 0.25 J

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24. Two bodies of masses $m_1 = 5$ kg and $m_2 = 10$ kg are placed 2 meters apart. What is the gravitational force between them?

(1) 1.67×10^{-7} N

(2) 6.67×10^{-11} N

(3) 3.34×10^{-7} N

(4) 2.00×10^{-10} N

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25. A charge of $2\,\mu$C is placed in an electric field of intensity 4×10^3 N/C. What is the force experienced by the charge?

(1) 8×10^{-3} N

(2) 8×10^{-6} N

(3) 4×10^{-3} N

(4) 4×10^{-6} N

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26. In the reaction $2\,H_2 + O_2 \rightarrow 2\,H_2O$, if 4 moles of hydrogen react completely with oxygen, how many moles of water will be produced?

(1) 2 mol

(2) 4 mol

(3) 8 mol

(4) 1 mol

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27. What is the pH of a 0.01 M hydrochloric acid (HCl) solution?

(1) 1

(2) 2

(3) 3

(4) 4

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28. What is the molarity of a solution prepared by dissolving 10 grams of NaOH in 250 mL of water? (Molar mass of NaOH = 40 g/mol)

(1) 0.1 M

(2) 0.5 M

(3) 1.0 M

(4) 2.0 M

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29. What is the pH of a 0.1 M NaOH solution?

(1) 12

(2) 13

(3) 14

(4) 11

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30. Which of the following gases is produced when zinc reacts with dilute hydrochloric acid?

(1) Oxygen

(2) Hydrogen

(3) Nitrogen

(4) Carbon dioxide

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31. Which of the following is an example of a redox reaction?

(1) NaCl dissolving in water

(2) $2H_2O_2$ (aq) $\rightarrow$ $2H_2O$ (l) + O_2 (g)

(3) NaOH dissolving in water

(4) $CaCO_3$ (s) $\rightarrow$ CaO (s) + CO_2 (g)

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32. Which of the following elements does not have a completely filled outermost shell in its ground state?

(1) Neon

(2) Helium

(3) Oxygen

(4) Argon

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33. Which of the following compounds is an example of an ionic bond?

(1) H_2O

(2) CO_2

(3) NaCl

(4) Cl_2

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34. Which of the following is the correct electron configuration for the ion Fe^{3+}?

(1) [Ar] $3d^6$

(2) [Ar] $3d^5$

(3) [Ar] $4s^2$ $3d^3$

(4) [Ar] $3d^8$

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35. Which of the following gases is most soluble in water?

(1) Oxygen

(2) Nitrogen

(3) Carbon dioxide

(4) Hydrogen
