MHT CET 2025 Apr 16 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 200 questions. The maximum marks are 200.
3. There are three parts in the question paper consisting of Physics, Chemistry and Biology (Botany and Zoology) having 50 questions in each part of equal weightage.

1. A long straight current-carrying wire is placed in a uniform magnetic field of strength $B = 0.5$ T. If the current in the wire is $I = 2$ A and the wire makes an angle of 30° with the magnetic field, find the force per unit length on the wire.

(1) 1.0 N/m

(2) 2.0 N/m

(3) 0.5 N/m

(4) 3.0 N/m

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2. A ball is thrown vertically upward with an initial velocity of 20 m/s. Calculate the time taken for the ball to reach its maximum height.

(1) 2 s

(2) 4 s

(3) 1.5 s

(4) 3 s

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3. A 10 kg object is lifted to a height of 5 meters. Calculate the work done in lifting the object.

(1) 500 J

(2) $100\,\text{J}$

(3) $200\,\text{J}$

(4) $150\,\text{J}$

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4. A gas in a cylinder is compressed from an initial volume of $5\,\text{m}^3$ to a final volume of $2\,\text{m}^3$ while maintaining a constant pressure of $1 \times 10^5\,\text{Pa}$. Calculate the work done by the gas during the compression.

(1) $-3 \times 10^5\,\text{J}$

(2) $-1 \times 10^5\,\text{J}$

(3) $3 \times 10^5\,\text{J}$

(4) $1 \times 10^5\,\text{J}$

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5. A concave mirror has a focal length of $10\,\text{cm}$. An object is placed at a distance of $15\,\text{cm}$ from the mirror. Calculate the position of the image formed.

(1) $30\,\text{cm}$ (real and inverted)

(2) $5\,\text{cm}$ (virtual and erect)

(3) $10\,\text{cm}$ (real and inverted)

(4) $20\,\text{cm}$ (virtual and erect)

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6. A long straight wire carries a current of 10 A. A proton moves parallel to the wire at a distance of 0.05 m with a velocity of 2×10^5 m/s in the same direction as the current. Find the magnitude of the magnetic force acting on the proton. (Given: Charge of proton $q = 1.6 \times 10^{-19}$ C, permeability of free space $\mu_0 = 4\pi \times 10^{-7}$ Tm/A).

(1) $2.56 \times 10^{-19}\,\text{N}$

(2) $1.28 \times 10^{-19}\,\text{N}$

(3) $5.12 \times 10^{-19}\,\text{N}$

(4) $3.84 \times 10^{-19}\,\text{N}$

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7. In a circuit, a current of $2\,\text{A}$ flows through a resistor of resistance $5\,\Omega$. Calculate the power dissipated in the resistor.

(1) $10\,\text{W}$

(2) $5\,\mathrm{W}$

(3) $15\,\mathrm{W}$

(4) $20\,\mathrm{W}$

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8. A cylindrical pipe has a radius of $0.1\,\mathrm{m}$. If the speed of water flowing through the pipe is $2\,\mathrm{m/s}$, calculate the volume flow rate of water through the pipe.

(1) $0.0628\,\mathrm{m}^3/\mathrm{s}$

(2) $0.0314\,\mathrm{m}^3/\mathrm{s}$

(3) $0.1256\,\mathrm{m}^3/\mathrm{s}$

(4) $0.02\,\mathrm{m}^3/\mathrm{s}$

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9. In the reaction $2\,\mathrm{H_2} + \mathrm{O_2} \rightarrow 2\,\mathrm{H_2O}$, how many moles of water are produced when 4 moles of hydrogen react with excess oxygen?

(1) $2\,\mathrm{mol}$

(2) $4\,\mathrm{mol}$

(3) $6\,\mathrm{mol}$

(4) $8\,\mathrm{mol}$

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10. The wavelength of the light emitted by a hydrogen atom during a transition from $n = 3$ to $n = 2$ is $656.3\,\mathrm{nm}$. What is the energy of the photon emitted during this transition?

(1) $3.02 \times 10^{-19}\,\mathrm{J}$

(2) $4.56 \times 10^{-19}\,\mathrm{J}$

(3) $2.18 \times 10^{-19}\,\mathrm{J}$

(4) $5.00 \times 10^{-19}\,\mathrm{J}$

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11. For a reaction, the rate law is given by rate $= k[A]^2[B]$. If the concentration of A is doubled and the concentration of B is halved, how will the rate of the reaction change?

(1) The rate will be doubled.

(2) The rate will be halved.

(3) The rate will be quadrupled.

(4) The rate will remain unchanged.

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12. A gas absorbs $100\,\text{J}$ of heat while performing $40\,\text{J}$ of work on its surroundings. Calculate the change in internal energy of the gas.

(1) $60\,\text{J}$

(2) $140\,\text{J}$

(3) $40\,\text{J}$

(4) $100\,\text{J}$

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13. Which of the following is the correct IUPAC name for the compound with the molecular formula C_5H_{12} that contains a branched chain with a methyl group attached to the second carbon of a butane chain?

(1) 2-Methylbutane

(2) 3-Methylbutane

(3) 2-Ethylpropane

(4) Pentane

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14. For the reaction $\text{N}_2(g) + 3\,\text{H}_2(g) \rightleftharpoons 2\,\text{NH}_3(g)$, the equilibrium constant K_c at a certain temperature is 0.5. If the initial concentrations of N_2, H_2, and NH_3 are $1.0\,\text{mol/L}$, $1.0\,\text{mol/L}$, and $0\,\text{mol/L}$ respectively, calculate the equilibrium concentrations of all species.

(1) $[\text{N}_2] = 0.5\,\text{mol/L}$, $[\text{H}_2] = 0.5\,\text{mol/L}$, $[\text{NH}_3] = 1.0\,\text{mol/L}$

(2) $[\text{N}_2] = 0.75\,\text{mol/L}$, $[\text{H}_2] = 0.75\,\text{mol/L}$, $[\text{NH}_3] = 0.5\,\text{mol/L}$

(3) $[\text{N}_2] = 0.25\,\text{mol/L}$, $[\text{H}_2] = 0.25\,\text{mol/L}$, $[\text{NH}_3] = 1.25\,\text{mol/L}$

(4) $[\text{N}_2] = 0.33\,\text{mol/L}$, $[\text{H}_2] = 0.33\,\text{mol/L}$, $[\text{NH}_3] = 1.33\,\text{mol/L}$

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15. In the reaction $\text{Zn(s)} + \text{Cu}^{2+}(aq) \rightarrow \text{Zn}^{2+}(aq) + \text{Cu(s)}$, what is the oxidation state of zinc in the products?

(1) $+2$

(2) $+1$

(3) 0

(4) -2

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16. In humans, the condition of color blindness is caused by a recessive allele located on the X chromosome. A color-blind woman marries a man with normal vision. What is the probability that their son will be color-blind?

(1) 0%

(2) 25%

(3) 50%

(4) 100%

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16. Which of the following processes in humans is primarily responsible for the exchange of gases between the blood and the tissues?

(1) Diffusion

(2) Osmosis

(3) Active Transport

(4) Filtration

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17. A man with blood group AB marries a woman with blood group O. What is the probability that their child will have blood group A? (1) 0%

(2) 25%

(3) 50%

(4) 75%

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18. Which of the following enzymes is responsible for breaking down starch into maltose during digestion in humans?

(1) Trypsin

(2) Amylase

(3) Lipase

(4) Pepsin

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19. In a flowering plant, a cross is made between a homozygous dominant tall plant (TT) and a homozygous recessive dwarf plant (tt). What is the phenotypic ratio of the

F1 generation?

(1) 1 Tall : 1 Dwarf

(2) 3 Tall : 1 Dwarf

(3) All Tall

(4) All Dwarf

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20. Which of the following is the primary site of gaseous exchange in the human respiratory system?

(1) Trachea

(2) Bronchi

(3) Alveoli

(4) Bronchioles

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21. In a dihybrid cross between two heterozygous pea plants (RrYy × RrYy), what is the phenotypic ratio of the offspring for seed shape and seed color? (R = round, r = wrinkled; Y = yellow, y = green)

(1) 1:1:1:1

(2) 9:3:3:1

(3) 3:1

(4) 1:2:1

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22. Which of the following hormones is secreted by the anterior pituitary gland and stimulates the thyroid gland to release thyroxine?

(1) Adrenocorticotropic hormone (ACTH)

(2) Thyroid-stimulating hormone (TSH)

(3) Follicle-stimulating hormone (FSH)

(4) Luteinizing hormone (LH)

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23. In DNA replication, which enzyme is responsible for unwinding the double helix and separating the DNA strands?

(1) DNA polymerase

(2) Helicase

(3) Ligase

(4) Primase

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24. In a population of plants, the allele for red flowers (R) is dominant over the allele for white flowers (r). If 36% of the population has white flowers, what is the frequency of the recessive allele (r) in the population?

(1) 0.6

(2) 0.4

(3) 0.36

(4) 0.64
