MHT CET 2026 Sample Paper 2

Subjects : Physics, Chemistry & Mathematics

Question Booklet Version	MH-CET-2026 Roll No.	Question Booklet Sr. No.
2		
(Write this number on your Answer Sheet)	Answer Sheet No.	(Write this number on your Answer Sheet)

Day and Date :

Duration: 3.00 hours
Total Marks : 200

This is to certify that, the entries of MH-CET Roll No. and Answer Sheet No. have been correctly written and verified.

Candidate's Signature *Invigilator's Signature*

Instructions to Candidates

1. The test contains **150 Multiple Choice Questions (MCQs)** divided into three sections: **Physics (50)**, **Chemistry (50)**, and **Mathematics (50)**.
2. The total time allotted for the examination is **180 minutes**. The countdown timer on the top right of the screen will display the remaining time.
3. Candidates can toggle between sections (Physics, Chemistry, Mathematics) and questions at any time during the exam.
4. **Login Procedure:** Enter your Roll No. and Password as provided. Verify your name and photograph appearing on the screen. If there is a mismatch, report it to the invigilator immediately.
5. **Navigating Questions:** To select a question, click on the question number in the Question Palette on the right side of the screen.
6. **Answering:** To select your answer, click on the button of one of the options. To deselect, click on the chosen option again or click the **'Clear Response'** button.
7. **Saving:** You **MUST** click the **'Save & Next'** button to save your answer for any question. Clicking 'Mark for Review' will not save the answer for final evaluation unless it is specifically answered and saved.
8. **Marking Scheme:**
   - For **Physics** and **Chemistry**: Each correct response is awarded **one (1) mark**.
   - For **Mathematics**: Each correct response is awarded **two (2) marks**.
   - There is **no negative marking** for incorrect answers.
9. Status of questions will be shown by color codes: Green (Answered), Red (Not Answered), White (Not Visited), and Violet (Marked for Review).
10. Candidates are not allowed to open any other software or browser tabs. Doing so will result in the automated locking of the terminal.
11. **Rough Work:** All calculations must be done on the **Scribble Pad** provided. Candidates must write their Roll No. on the pad and return it to the invigilator before leaving the hall.
12. A digital Log Table/Calculator (if applicable) will be accessible via a button on the exam interface.
13. The test will automatically submit once the timer reaches zero. Candidates cannot submit the exam before the first 90 minutes.
14. Use of mobile phones, smartwatches, or any electronic gadgets is strictly prohibited.
15. No marks will be deducted for questions that are left unattempted.

1 Physics

1. A car accelerates uniformly from rest to a velocity of 25 m/s in 10 seconds. What is the acceleration of the car?
(A) 2.5 m/s^2
(B) 5 m/s^2
(C) 10 m/s^2
(D) 15 m/s^2

---

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?
(A) 10 N
(B) 15 N
(C) 20 N
(D) 25 N

---

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.
(A) 0.3 mm
(B) 0.6 mm
(C) 1.2 mm
(D) 1.5 mm

---

4. In an LC circuit, the inductance L is 2 H and the capacitance C is 4 μF. What is the frequency of oscillation of the circuit?
(A) 100 Hz
(B) 50 Hz
(C) 25 Hz
(D) 200 Hz

---

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

(B) $1.0\ \text{kg} \cdot \text{m}^2$
(C) $2.0\ \text{kg} \cdot \text{m}^2$
(D) $4.0\ \text{kg} \cdot \text{m}^2$

---

6. 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) $1.25\ \text{m/s}^2$
(B) $2.5\ \text{m/s}^2$
(C) $5\ \text{m/s}^2$
(D) $10\ \text{m/s}^2$

---

7. 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?
(A) 25 N
(B) 50 N
(C) 45 N
(D) 75 N

---

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 μC placed at that point?
(A) 0.5 mJ
(B) 1.0 mJ
(C) 2.0 mJ
(D) 5.0 mJ

---

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?
(A) 2×10^{-2} T
(B) 4×10^{-2} T
(C) 6×10^{-2} T
(D) 8×10^{-2} T

---

10. A photon has an energy of 3.2×10^{-19} J. What is the frequency of the photon?
(A) 5.0×10^{14} Hz
(B) 4.0×10^{14} Hz
(C) 3.0×10^{14} Hz
(D) 6.0×10^{14} Hz

---

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 $G = 6.67 \times 10^{-11}$ $\mathbf{N \cdot m^2/kg^2}$ and Earth's mass $M = 6 \times 10^{24}$ kg)
(A) 7.0 km/s
(B) 8.0 km/s
(C) 9.0 km/s
(D) 10.0 km/s

---

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 $\mathbf{m^2}$. What is the magnetic moment of the coil?
(A) 0.5 $\mathrm{A \cdot m^2}$
(B) 1.0 $\mathrm{A \cdot m^2}$
(C) 2.0 $\mathrm{A \cdot m^2}$
(D) 5.0 $\mathrm{A \cdot m^2}$

---

13. A radioactive substance has a half-life of 5 years. What is the probability that a single atom of this substance will decay within 5 years?
(A) $\frac{1}{2}$
(B) $\frac{1}{4}$
(C) $\frac{3}{4}$
(D) $\frac{1}{8}$

---

14. In the case of a particle in a one-dimensional infinite potential well (box), what is the probability of finding the particle in the first half of the box for the ground state?
(A) $\frac{1}{2}$
(B) $\frac{1}{3}$
(C) $\frac{1}{4}$

(D) 1

---

15. For a system of particles in thermal equilibrium, what is the probability that a particle will have energy greater than E_0 according to the Boltzmann distribution?
(A) $e^{\frac{E_0}{kT}}$
(B) $1 - e^{-\frac{E_0}{kT}}$
(C) $e^{-\frac{E_0}{kT}}$
(D) $1 + e^{\frac{E_0}{kT}}$

---

16. 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 $g = 10$ m/s^2)
(A) 2 m/s
(B) 4.47 m/s
(C) 5 m/s
(D) 6.32 m/s

---

17. 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

---

18. 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 μC placed at that point?
(A) 0.5 mJ
(B) 1.0 mJ
(C) 2.0 mJ
(D) 5.0 mJ

---

19. 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?
(A) 25 N
(B) 50 N
(C) 45 N
(D) 75 N

---

20. 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?
(A) 2×10^{-2} T
(B) 4×10^{-2} T
(C) 6×10^{-2} T
(D) 8×10^{-2} T

---

21. 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

---

22. What is the moment of inertia of a solid sphere of mass M and radius R about its diameter?
(A) $\frac{1}{3}MR^2$
(B) $\frac{2}{5}MR^2$
(C) $\frac{3}{5}MR^2$
(D) $\frac{1}{2}MR^2$

---

23. A galvanometer has resistance $G = 100\Omega$ and shows full-scale deflection at $I_g = 1$ mA. To convert it into a voltmeter of range 5 V, what resistance should be connected in series?
(A) 400Ω
(B) 4900Ω
(C) 490Ω

(D) 5000Ω

---

24. 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

---

25. 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

---

26. Two point charges $+2$ μC and -3 μC 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

---

27. 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 $g = 10$ m/s^2)
(A) 50 J
(B) 500 J
(C) 100 J
(D) 250 J

---

28. A gas expands from a volume of 2 m^3 to 4 m^3 against a constant pressure of 5 atm. How much work is done by the gas during expansion? (1 atm $= 1.01 \times 10^5$ 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

---

29. A coil has 200 turns and an area of 0.01 $\mathbf{m}^2$. 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

---

30. 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

---

31. A water tank is open at the top and has a hole of area 10^{-4} $\mathbf{m}^2$ 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 $g = 10$ $\mathbf{m/s}^2$)
(A) 5 m/s
(B) 10 m/s
(C) 15 m/s
(D) 20 m/s

---

32. In an LC circuit, the inductance L is 2 H and the capacitance C is 4 μF. What is the frequency of oscillation of the circuit?
(A) 100 Hz
(B) 50 Hz
(C) 25 Hz
(D) 200 Hz

33. A wire of length L having Resistance R falls from a height h in Earth's horizontal magnetic field. What is the current through the wire?
(A) $\frac{hB}{R}$
(B) $\frac{hB^2}{R}$
(C) $\frac{BL\sqrt{2gh}}{2R}$
(D) $\frac{hB}{2R}$

---

34. Mass $= (28 \pm 0.01)$ g, Volume $= (5 \pm 0.1)$ cm^3. What is the percentage error in density?
(A) 2.25%
(B) 3.57%
(C) 1.25%
(D) 1.00%

---

35. The value of g at height h above Earth's surface is $\frac{g}{\sqrt{3}}$. Find h in terms of the radius of the Earth.
(A) R
(B) $2R$
(C) $R\sqrt{3}$
(D) $\frac{R}{\sqrt{3}}$

---

36. Given the voltage equation $V = 100\sqrt{2}\sin(\omega t)$ and capacitance $C = 2$ μF, calculate the RMS current.
(A) 10 A
(B) 20 A
(C) 50 A
(D) 100 A

---

37. The equation for the RMS velocity is given as $v_{\text{rms}} = \sqrt{\frac{3RT}{M_0}}$ where R is the gas constant, T is the temperature, and M_0 is the molecular mass. If the temperature is increased, find the new RMS velocity v'_{rms} when the temperature is doubled.
(A) $\sqrt{3}v_{\text{rms}}$

(B) $2v_{\text{rms}}$
(C) $\sqrt{2}v_{\text{rms}}$
(D) $\frac{v_{\text{rms}}}{\sqrt{2}}$

---

38. Two spherical black bodies radiate the same amount of heat per second. If their temperatures are T_1 and T_2, and their radii are R_1 and R_2, respectively, find the relation between their temperatures and radii.
(A) $T_1 = \sqrt{2}T_2$
(B) $T_1 = 2T_2$
(C) $T_1 = \frac{T_2}{\sqrt{2}}$
(D) $T_1 = \sqrt{3}T_2$

---

39. Energy stored in a capacitor is given by the equation $E = \frac{1}{2}CV^2$ where: C is the capacitance, V is the voltage, E is the energy stored. Given the values of C, V, and E, determine the energy stored.
(A) $E = \frac{1}{2}CV^2$
(B) $E = CV$
(C) $E = CV^3$
(D) $E = \frac{1}{4}CV$

---

40. What is the ratio of the wavelength of the Lyman series limit to the Paschen series limit?
(A) 1 : 4
(B) 1 : 3
(C) 2 : 3
(D) 1 : 2

---

41. What is the ratio of the wavelength of a photon?
(A) $\lambda = \frac{h}{mv}$
(B) $\lambda = \frac{c}{f}$
(C) $\lambda = \frac{h}{E}$
(D) $\lambda = \frac{E}{h}$

42. A wire of length L and resistance R is falling vertically through Earth's horizontal magnetic field B. What is the current induced in the wire when it has fallen a height L? (Take acceleration due to gravity as g)

(A) $\frac{BL\sqrt{2gL}}{R}$

(B) $\frac{B\sqrt{2gL}}{R}$

(C) $\frac{BL^2\sqrt{2g}}{R}$

(D) $\frac{BLg}{R}$

---

43. The mass of an object is measured as (28 ± 0.01) g and its volume as (5 ± 0.1) cm^3. What is the percentage error in density?

(A) 1.20%

(B) 2.04%

(C) 0.35%

(D) 0.71%

---

44. At a height h above the Earth's surface, the acceleration due to gravity becomes $\frac{g}{\sqrt{3}}$. What is the value of h in terms of the Earth's radius R?

(A) R

(B) $\sqrt{2}R$

(C) $2R$

(D) $\frac{R}{2}$

---

45. A block slides down a smooth inclined plane, and its acceleration is found to be $\frac{g}{8}$. If g is the acceleration due to gravity, what is the angle of inclination θ of the plane?

(A) $\tan^{-1}\left(\frac{1}{3}\right)$

(B) $\tan^{-1}\left(\frac{1}{4}\right)$

(C) $\tan^{-1}\left(\frac{1}{8}\right)$

(D) $\tan^{-1}\left(\frac{1}{16}\right)$

---

46. An AC voltage $V = 50\sqrt{2}\sin(100t)$ is applied across a capacitor of capacitance $C = 1\mu$F. What is the rms value of the current through the capacitor?

(A) 0.0025 A
(B) 0.01 A
(C) 0.005 A
(D) 0.007 A

---

47. Two black bodies emit the same amount of radiation per second. The radius of the first is $R_1 = 2$m and its temperature is $T_1 = 400$ K. If the second body has a radius $R_2 = 4$m, what is its temperature T_2 in Kelvin?
(A) 200 K
(B) 300 K
(C) 250 K
(D) 400 K

---

48. What is the ratio of the wavelength of the Lyman series limit to that of the Paschen series limit in the hydrogen spectrum?
(A) $\frac{1}{4}$
(B) $\frac{1}{3}$
(C) $\frac{2}{3}$
(D) $\frac{3}{2}$

---

49. A photon and an electron have the same energy E. If λ_p is the wavelength of the photon and λ_e is the de Broglie wavelength of the electron, then the ratio $\frac{\lambda_p}{\lambda_e}$ is:
(A) $\frac{E^2}{mc^2}$
(B) $\frac{\sqrt{2mE}}{c^2}$
(C) $\frac{\sqrt{2mE}}{c}$
(D) $\frac{\sqrt{2mE}}{R}$

---

50. What is the ratio of the wavelength of the Lyman series limit to that of the Paschen series limit in the hydrogen spectrum?
(A) $\frac{1}{4}$
(B) $\frac{1}{3}$
(C) $\frac{2}{3}$
(D) $\frac{3}{2}$

2 Chemistry

1. The pH of a solution is 3. What is the concentration of H^+ ions in the solution?
(A) 1×10^{-3} mol/L
(B) 3×10^{-3} mol/L
(C) 1×10^{-6} mol/L
(D) 3×10^{-6} mol/L

---

2. What is the oxidation state of chromium in $K_2Cr_2O_7$?
(A) +2
(B) +3
(C) +6
(D) +7

---

3. What is the molecular geometry of SO_3?
(A) Linear
(B) Trigonal planar
(C) Tetrahedral
(D) Octahedral

---

4. What is the mass of sodium chloride (NaCl) formed when 0.5 moles of sodium (Na) reacts with excess chlorine (Cl_2)?
(A) 29 g
(B) 35.5 g
(C) 58 g
(D) 70 g

---

5. Calculate the oxidation number of sulfur in H_2SO_4.
(A) +4
(B) +6
(C) +2
(D) 0

6. 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?
(A) 5 L
(B) 10 L
(C) 20 L
(D) 40 L

---

7. What is the total number of orbitals in the third energy level ($n = 3$)?
(A) 9
(B) 16
(C) 4
(D) 3

---

8. What is the value of the ionization energy of hydrogen in joules? (Given that the ionization energy of hydrogen is 13.6 eV)
(A) 2.18×10^{-18} J
(B) 1.6×10^{-18} J
(C) 3.2×10^{-19} J
(D) 1.0×10^{-19} J

---

9. What is the empirical formula of a compound containing 40% sulfur and 60% oxygen by mass?
(A) SO_2
(B) SO_3
(C) S_2O_3
(D) SO

---

10. What is the standard electrode potential for the half-reaction $Cu^{2+} + 2e^- \rightarrow Cu$?
(A) +0.34 V
(B) −0.34 V
(C) +1.10 V
(D) 0 V

11. What is the percentage composition of nitrogen in ammonium nitrate (NH_4NO_3)?
(A) 18.5
(B) 28.0
(C) 35.0
(D) 42.5

---

12. 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)?
(A) 0.4 mol
(B) 0.6 mol
(C) 1.0 mol
(D) 2.0 mol

---

13. A solution contains 10 g of NaOH dissolved in 500 mL of water. What is the molarity of the NaOH solution?
(A) 0.25 M
(B) 0.5 M
(C) 1.0 M
(D) 2.0 M

---

14. 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?
(A) -393.5 kJ
(B) -787 kJ
(C) -196.75 kJ
(D) 0 kJ

---

15. For the reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, the equilibrium constant K_c at a certain temperature is 1.5. If the concentration of N_2 is 0.5 M, H_2 is 1.0 M, and NH_3 is 0.2 M, what is the reaction quotient Q_c?
(A) 1.0
(B) 1.5
(C) 0.5

(D) 2.0

---

16. In the reaction $2\mathbf{Al(s)} + 3\mathbf{Cl_2(g)} \rightarrow 2\mathbf{AlCl_3(s)}$, if 4.0 g of aluminum reacts with 6.0 g of chlorine gas, what is the limiting reactant?
(A) Al
(B) Cl_2
(C) $AlCl_3$
(D) None

---

17. The enthalpy of formation for $\mathbf{H_2(g)}$, $\mathbf{O_2(g)}$, and $\mathbf{H_2O(l)}$ are 0, 0, and -285.8 kJ/mol, respectively. What is the enthalpy change for the following reaction: $2\mathbf{H_2(g)} + \mathbf{O_2(g)} \rightarrow 2\mathbf{H_2O(l)}$
(A) -571.6 kJ/mol
(B) -285.8 kJ/mol
(C) 0 kJ/mol
(D) 571.6 kJ/mol

---

18. What is the pH of a 0.01 M solution of hydrochloric acid (HCl)?
(A) 1
(B) 2
(C) 3
(D) 4

---

19. A gas occupies a volume of 10.0 L at a pressure of 2.0 atm and a temperature of 300 K. What will the volume be if the pressure is increased to 4.0 atm and the temperature is increased to 600 K? (Assume the amount of gas remains constant.)
(A) 5.0 L
(B) 10.0 L
(C) 20.0 L
(D) 2.5 L

---

20. A medicine compound having an amide linkage was asked. Which of the following compounds contains an amide linkage?
(A) Acetanilide
(B) Aspirin
(C) Benzene
(D) Acetic acid

---

21. Which is the weakest ligand?
(A) F^-
(B) EDTA
(C) en
(D) CO

---

22. What is the product obtained on the reaction of chlorobenzene with concentrated HNO_3?
(A) Para nitro chloro benzene
(B) Ortho nitro chloro benzene
(C) Mixture of ortho and para nitro benzene
(D) Not provided

---

23. Find the radius of a BCC molecule having an edge length of 2.0×10^{-11} m.
(A) 1.0×10^{-11} m
(B) 1.5×10^{-11} m
(C) 2.0×10^{-11} m
(D) 3.0×10^{-11} m

---

24. Which of the following elements shows a $+4$ oxidation state with the given configuration?
(A) Ce
(B) Tb
(C) Eu
(D) Lu

---

25. Given the formula for depression of freezing point: $\Delta T_f = K_f \cdot m$ where ΔT_f is the depression of freezing point, K_f is the freezing point depression constant, and m is the molality, calculate the value of m.
(A) $m = \frac{\Delta T_f}{K_f}$
(B) $m = \frac{K_f}{\Delta T_f}$
(C) $m = K_f \cdot \Delta T_f$
(D) $m = \frac{\Delta T_f}{K}$

---

26. What is the number of unpaired electrons in Lutetium (Lu) in the $+3$ oxidation state?
(A) 0
(B) 1
(C) 2
(D) 3

---

27. Total pressure of the solution is 500, the partial pressure of component A is 400, and the partial pressure of component B is 575. What is the mole fraction of component B?
(A) 0.5
(B) 0.6
(C) 0.8
(D) 0.9

---

28. A medicine compound having an amide linkage was asked. Which of the following compounds contains an amide linkage?
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(C) Benzene
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30. What is the product obtained on the reaction of chlorobenzene with concentrated HNO_3?

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31. Find the radius of a BCC molecule having an edge length of 2.0×10^{-11} m.
(A) 1.0×10^{-11} m
(B) 1.5×10^{-11} m
(C) 2.0×10^{-11} m
(D) 3.0×10^{-11} m

---

32. Which of the following elements shows a $+4$ oxidation state with the given configuration?
(A) Ce
(B) Tb
(C) Eu
(D) Lu

---

33. Given the formula for depression of freezing point: $\Delta T_f = K_f \cdot m$ where ΔT_f is the depression of freezing point, K_f is the freezing point depression constant, and m is the molality, calculate the value of m.
(A) $m = \frac{\Delta T_f}{K_f}$
(B) $m = \frac{K_f}{\Delta T_f}$
(C) $m = K_f \cdot \Delta T_f$
(D) $m = \frac{\Delta T_f}{K}$

---

34. What is the number of unpaired electrons in Lutetium (Lu) in the $+3$ oxidation state?
(A) 0
(B) 1
(C) 2

(D) 3

---

34. Total pressure of the solution is 500, the partial pressure of component A is 400, and the partial pressure of component B is 575. What is the mole fraction of component B?
(A) 0.5
(B) 0.6
(C) 0.8
(D) 0.9

---

35. Which of the following elements has the most electronegativity: Li, Na, K, or Rb?
(A) Li
(B) Na
(C) K
(D) Rb

---

36. Which of the following has the lowest boiling point?
(A) Butanol
(B) Propanol
(C) Ethanol
(D) Methanol

---

37. A medicine compound having an amide linkage was asked. Which of the following compounds contains an amide linkage?
(A) Acetanilide
(B) Aspirin
(C) Benzene
(D) Acetic acid

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(A) Para nitro chloro benzene
(B) Ortho nitro chloro benzene
(C) Mixture of ortho and para nitro benzene
(D) Not provided

---

40. Find the radius of a BCC molecule having an edge length of 2.0×10^{-11} m.
(A) 1.0×10^{-11} m
(B) 1.5×10^{-11} m
(C) 2.0×10^{-11} m
(D) 3.0×10^{-11} m

---

41. Which of the following elements shows a $+4$ oxidation state with the given configuration?
(A) Ce
(B) Tb
(C) Eu
(D) Lu

---

42. Given the formula for depression of freezing point: $\Delta T_f = K_f \cdot m$ where ΔT_f is the depression of freezing point, K_f is the freezing point depression constant, and m is the molality, calculate the value of m.
(A) $m = \frac{\Delta T_f}{K_f}$
(B) $m = \frac{K_f}{\Delta T_f}$
(C) $m = K_f \cdot \Delta T_f$
(D) $m = \frac{\Delta T_f}{K}$

---

43. What is the number of unpaired electrons in Lutetium (Lu) in the $+3$ oxidation state?
(A) 0
(B) 1
(C) 2
(D) 3

---

44. Total pressure of the solution is 500, the partial pressure of component A is 400, and the partial pressure of component B is 575. What is the mole fraction of component B?
(A) 0.5
(B) 0.6
(C) 0.8
(D) 0.9

---

45. Which of the following elements has the most electronegativity: Li, Na, K, or Rb?
(A) Li
(B) Na
(C) K
(D) Rb

---

46. Which of the following has the lowest boiling point?
(A) Butanol
(B) Propanol
(C) Ethanol
(D) Methanol

---

47. Which of the following reagents is used in Rosenmund reduction?
(A) $H_2/Pd - BaSO_4$ (poisoned)
(B) Zn/HCl
(C) $LiAlH_4$
(D) $NaBH_4$

48. Which reagent will best convert alcohol to aldehyde selectively?
(A) $KMnO_4$
(B) PCC
(C) $K_2Cr_2O_7$
(D) HNO_3

---

49. How many isomers are possible for $C_4H_8Cl_2$ (including chain and positional)?
(A) 6
(B) 7
(C) 8
(D) 9

---

50. Which of the following shows resonance but not hyperconjugation?
(A) Propene
(B) Aniline
(C) Toluene
(D) Ethylbenzene

---

3 Mathematics

1. Find the roots of the quadratic equation $2x^2 - 4x - 6 = 0$.
(A) $x = 1$ or $x = -3$
(B) $x = -1$ or $x = 3$
(C) $x = 2$ or $x = -1$
(D) $x = 3$ or $x = -2$

---

2. Find the area of a triangle with vertices $A(2, 3)$, $B(5, 11)$, and $C(8, 7)$.
(A) 15
(B) 18
(C) 20
(D) 25

3. Solve for x: $\log_2(x-1) = 3$.
(A) $x = 9$
(B) $x = 7$
(C) $x = 8$
(D) $x = 6$

---

4. Find the derivative of the function $f(x) = 3x^2 - 5x + 7$.
(A) $6x - 5$
(B) $6x + 5$
(C) $3x^2 + 5$
(D) $3x^2 - 5$

---

5. Find the value of the determinant $\begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix}$.
(A) 2
(B) 1
(C) 0
(D) -1

---

6. Solve the system of equations: $x + y = 5$ and $2x - y = 4$.
(A) $x = 3, y = 2$
(B) $x = 2, y = 3$
(C) $x = 4, y = 1$
(D) $x = 1, y = 4$

---

7. If $\log_2 x = 5$, what is the value of x?
(A) $x = 32$
(B) $x = 25$
(C) $x = 20$
(D) $x = 16$

---

8. Find the length of the diagonal of a rectangle with length 6 cm and breadth 8 cm.
(A) 10 cm
(B) 12 cm
(C) 14 cm
(D) 8 cm

---

9. Solve the system of equations: $x + y = 10$ and $3x - y = 5$.
(A) $x = 5, y = 5$
(B) $x = 4, y = 6$
(C) $x = 3, y = 7$
(D) $x = 6, y = 4$

---

10. Find the sum of the first 20 terms of the arithmetic progression: $2, 5, 8, 11, \ldots$.
(A) 400
(B) 420
(C) 440
(D) 460

---

11. Find the value of x if $\sin(2x) = 1$.
(A) $x = \frac{\pi}{4}$
(B) $x = \frac{\pi}{2}$
(C) $x = \frac{\pi}{6}$
(D) $x = \frac{3\pi}{4}$

---

12. Find the value of $\log_3 81$.
(A) 3
(B) 4
(C) 2
(D) 1

---

13. Given that: $x = a\sin(2t)(1+\cos(2t))$, $y = a\cos(2t)(1-\cos(2t))$. **Find** $\frac{dy}{dx}$.
(A) $\frac{a\tan(t)}{b}$
(B) $\frac{b}{a\tan(t)}$
(C) $b\tan(t)$
(D) $\frac{b}{a\tan(t)}$

---

14. Find the value of the following expression: $\tan^2(\sec^{-1}4) + \cot(\csc^{-1}3)$.
(A) 1
(B) 2
(C) 3
(D) 4

---

15. In the word "UNIVERSITY", find the probability that the two "I"s do not come together.
(A) $\frac{7}{11}$
(B) $\frac{8}{11}$
(C) $\frac{9}{11}$
(D) $\frac{10}{11}$

---

16. A die is rolled once. What is the probability of rolling a number greater than 4?
(A) $\frac{1}{6}$
(B) $\frac{1}{3}$
(C) $\frac{1}{2}$
(D) $\frac{2}{3}$

---

17. If a and b are two non-zero vectors such that the angle between them is $60°$**, what is the probability that the dot product** $\mathbf{a}\cdot\mathbf{b}$ **is positive?**
(A) $\frac{1}{2}$
(B) $\frac{2}{3}$
(C) $\frac{3}{4}$
(D) 1

---

18. In a dataset of 50 values, the mean is 40 and the variance is 25. What is the probability that a randomly selected value from this dataset is between 35 and 45?
(A) 0.68
(B) 0.95
(C) 0.34
(D) 0.99

---

19. If $\mathbf{a} = \frac{1}{\sqrt{10}}(4\mathbf{i} - 3\mathbf{j} + \mathbf{k})$ and $\mathbf{b} = \frac{1}{\sqrt{6}}(\mathbf{i} + 2\mathbf{j} + 2\mathbf{k})$, then the value of $(2\mathbf{a} - \mathbf{b}) \cdot [(\mathbf{a} \times \mathbf{b}) \times (\mathbf{a} + 2\mathbf{b})]$
(A) 5
(B) -3
(C) -5
(D) 3

---

20. Evaluate the integral: $\int \sqrt{x^2 + 3x}\ dx$

---

21. If $P(A \cap B) = \frac{2}{25}$ and $P(A \cup B) = \frac{8}{25}$, then find the value of $P(A)$.
(A) $\frac{1}{5}$
(B) $\frac{4}{15}$
(C) $\frac{3}{5}$
(D) $\frac{2}{5}$

---

22. Find the smallest angle of the triangle whose sides are $6 + \sqrt{12}$, $\sqrt{48}$, $\sqrt{24}$.
(A) $\frac{\pi}{3}$
(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{6}$
(D) $\frac{2\pi}{3}$

---

23. Evaluate the integral: $\int \frac{x^2+2x}{\sqrt{x^2+1}}\ dx$
(A) $\frac{1}{3}(x^2 + 1)^{3/2}$

(B) $\frac{1}{2}(x^2+1)^{3/2}$
(C) $\frac{1}{3}(x^2+1)^{5/2}$
(D) $\frac{1}{2}(x^2+1)^{5/2}$

---

24. Find the value of the following expression: $\sin^2(30°) + \cos^2(60°)$
(A) $\frac{1}{2}$
(B) 1
(C) $\frac{3}{4}$
(D) $\frac{1}{4}$

---

25. Principal Solution
(A) $(5 + 3\sin\theta)$
(B) $(2\cos\theta + 1)$
(C) Not provided
(D) Not provided

---

26. Curves Represented: $x = 3(\cos t + \sin t)$ **and** $y = (\cos t - \sin t)$

---

27. Principal Solution: $(5\sin\theta)(2\cos\theta + 1) = 0$

---

28. Find the solution: $\frac{d^2y}{dm^2} - k^3\frac{dy}{dm} = y\cos m, \quad y(0) = 1$

---

29. Series Expansion: $n^6 + \frac{1}{2}n^4 + \frac{1}{3}n^2 + \cdots + \frac{1}{n}C_n + 1 \quad n \to \infty$

---

30. Binomial Expansion Series: $\left(\frac{1+x}{n+1}\right)' = n_0 x + n_1 \frac{x^2}{2} + n_2 \frac{x^3}{3} + \cdots + n_n \frac{x^n}{n+1}$

---

31. If $y = \frac{b}{a}$, then $\frac{dy}{dx}$ is:
(A) $-\frac{b^4}{a}$
(B) $\frac{b^2}{a}$
(C) $-\frac{b^3}{a^2 y^3}$
(D) $\frac{b^4}{a^2}$

---

32. The eccentricity of the curve represented by $x = 3(\cos t + \sin t), y = 4(\cos t - \sin t)$ is:
(A) $\frac{\sqrt{7}}{4}$
(B) $\frac{1}{16}$
(C) $\frac{\sqrt{2}}{3}$
(D) $\frac{\sqrt{8}}{4}$

---

33. The integral $\int e^x \frac{x+5}{(x+6)^2}\, dx$ is:
(A) $\frac{e^x}{x+6}$
(B) $-\frac{e^x}{x+6}$
(C) $\frac{e^x}{(x+6)^2}$
(D) $-\frac{e^x}{(x+6)^2}$

---

34. The integral $\int_0^1 \frac{1}{2+\sqrt{2x}}\, dx$ is:
(A) $\frac{1}{\sqrt{2}} \ln(2 + \sqrt{2e})$
(B) $\frac{1}{\sqrt{2}}$
(C) $\frac{1}{2\sqrt{2}} \ln(2 + \sqrt{2e})$
(D) $\frac{1}{2\sqrt{2}}$

---

35. The integral $\int e^x \frac{x+5}{(x+6)^2}\ dx$ is:

(A) $\frac{e^x}{x+6}$
(B) $-\frac{e^x}{x+6}$
(C) $\frac{e^x}{(x+6)^2}$
(D) $-\frac{e^x}{(x+6)^2}$

---

36. If a and b are non-coplanar unit vectors such that $\mathbf{a}\times(\mathbf{b}\times\mathbf{c}) = \frac{\mathbf{b}}{2}$ then the angle between a and b is:

(A) $\frac{\pi}{4}$
(B) $\frac{\pi}{3}$
(C) $\frac{5\pi}{6}$
(D) $\frac{\pi}{6}$

---

37. If a random variable X has the following probability distribution values

X	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
$P(X)$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

Then $P(X \geq 6)$ has the value

(A) $\frac{16}{100}$
(B) $\frac{81}{100}$
(C) $\frac{91}{100}$
(D) $\frac{100}{100}$

---

38. In ΔABC, with usual notations, $\sin\left(\frac{A}{2}\right)\sin\left(\frac{C}{2}\right) = \sin\left(\frac{B}{2}\right)$ and $2s$ is the perimeter of the triangle. Find the value of s.

(A) $2b$
(B) $6b$
(C) $3b$
(D) $4b$

---

39. Evaluate the limit: $\lim_{n\to\infty} \frac{6^n - 9x - 7^n + 1}{\sqrt{2} - \sqrt{11 + \cos n}}$

---

40. Evaluate the integral: $\int \frac{\sqrt{\tan x}}{\sin x \cos x}\ dx$
(A) $\frac{2}{\cos^2 x}$
(B) $\frac{2}{\sin^2 x}$
(C) $\frac{2}{\cos x}$
(D) $\frac{2}{\sin x}$

---

41. Population of Town A and B was $20,000$ in 1985. In 1989, the population of Town A was $25,000$, and Town B had $28,000$. What will be the difference in population between the two towns in 1993?
(A) 5950
(B) 6950
(C) 4500
(D) 0

---

42. A die was thrown n times until the lowest number on the die appeared. If the mean is $\frac{n}{g}$, then what is the value of n?
(A) 2
(B) 3
(C) 4
(D) 5

---

43. There are 6 boys and 4 girls. Arrange their seating arrangement on a round table such that 2 boys and 1 girl can't sit together.
(A) $6! \times 4!$
(B) $6! \times 3! \times 4!$
(C) $5! \times 4!$
(D) $5! \times 3! \times 4!$

---

44. Choose a randomly selected leap year, in which 52 Saturdays and 53 Sundays are to be there. Given the following probability distribution:

x	**1**	**2**	**3**	**4**
$p(x)$	0.1	0.2	0.3	0.4

Find the mean and standard deviation.
(A) Mean = 2.7, Standard Deviation = 1.5
(B) Mean = 2.5, Standard Deviation = 1.2
(C) Mean = 2.4, Standard Deviation = 1.4
(D) Mean = 3.0, Standard Deviation = 1.6

---

45. If $\tan^{-1}(\sqrt{\cos\alpha}) - \cot^{-1}(\cos\alpha) = x$**, then what is** $\sin\alpha$**?**
(A) $\tan\left(\frac{x}{2}\right)$
(B) $\cot\left(\frac{x}{2}\right)$
(C) $\cot^2\left(\frac{x}{2}\right)$
(D) $\tan^2\left(\frac{x}{2}\right)$

---

46. If $\tan(\pi\cos x) = \cot(\pi\sin x)$**, then what is** $\sin\left(\frac{\pi}{4} + x\right)$**?**
(A) $\frac{1}{2}$
(B) $\frac{1}{\sqrt{2}}$
(C) $-\frac{1}{2}$
(D) $-\frac{1}{\sqrt{2}}$

---

47. Evaluate the integral: $\int \frac{1}{\sin^2 2x \cdot \cos^2 2x}\, dx$
(A) $\frac{1}{2}\tan 2x$
(B) $\frac{1}{2}\cot 2x$
(C) $\frac{1}{4}\cot 2x$
(D) $\frac{1}{4}\tan 2x$

---

48. Given the equation: $81^{\sin^2 x} + 81^{\cos^2 x} = 30$**. Find the value of** x**.**
(A) $x = \frac{\pi}{4}$
(B) $x = \frac{\pi}{6}$
(C) $x = \frac{\pi}{3}$
(D) $x = \frac{\pi}{2}$

---

49. The angle between the lines whose direction cosines satisfy the equations: $l + m + n = 0$ and $m^2 + n^2 - l^2 = 0$. Find the angle between the two lines.
(A) $30°$
(B) $45°$
(C) $60°$
(D) $90°$

---

50. Let $\mathbf{a}, \mathbf{b}$, and $\mathbf{c}$ be vectors of magnitude $2, 3$, and 4 respectively. If: $\mathbf{a}$ is perpendicular to $(\mathbf{b} + \mathbf{c})$, $\mathbf{b}$ is perpendicular to $(\mathbf{c} + \mathbf{a})$, $\mathbf{c}$ is perpendicular to $(\mathbf{a} + \mathbf{b})$, then the magnitude of $\mathbf{a} + \mathbf{b} + \mathbf{c}$ is equal to:
(A) 29
(B) $\sqrt{29}$
(C) 26
(D) $\sqrt{26}$
