MHT CET 2020 PCM Oct 20 Shift 2 Question Paper

Conducted by the State Common Entrance Test Cell, Maharashtra

Time Allowed: 180 Minutes **Total Questions: 150** **Maximum Marks: 200**

General Instructions

(i) This **PCM** paper is from **MHT CET 2020**, conducted by the **State Common Entrance Test Cell, Maharashtra**.

(ii) Answer all **150 multiple choice questions**: **50 Physics**, **50 Chemistry** and **50 Mathematics**.

(iii) Each question offers **four choices**, with **one correct answer**.

(iv) Allow **90 minutes for Physics and Chemistry together**, followed by **90 minutes for Mathematics**. The first group closes before the second opens.

(v) Correct answers earn **1 mark in Physics and Chemistry** and **2 marks in Mathematics**.

(vi) There is **no negative marking**. Unanswered questions score zero.

1. A mass $2\sqrt{3}$ kg is acted upon by two forces which are inclined to each other at 60° and each of magnitude 1 N. The acceleration of that mass in SI system is $[\sin 30^\circ = \cos 60^\circ = 0.5]$

(A) $0.7\ \mathrm{m/s^2}$ (B) $0.3\ \mathrm{m/s^2}$

(C) $0.9\ \mathrm{m/s^2}$ (D) $0.5\ \mathrm{m/s^2}$

2. A vector $\vec{A}$ having magnitude 6 units is added to vector $\vec{B}$, which is along x -axis. The resultant of $\vec{A}$ and $\vec{B}$ is along Y axis. If the magnitude of the resultant of $\vec{A}$ and $\vec{B}$ is three times that of $\vec{B}$ then magnitude of $\vec{B}$ is

(A) $\sqrt{1 \cdot 8}$ (B) $\sqrt{2 \cdot 4}$

(C) $\sqrt{3 \cdot 6}$ (D) $\sqrt{1 \cdot 2}$

3. Out of the following units, the WRONG unit of magnetic dipole moment is

(A) $\mathrm{Nm^3/Wb}$ (B) $\mathrm{Am^2}$

(C) J – T (D) Nm/T

4. In the expression $A = B + \frac{C}{D+E}$, the dimensions of physical quantities B and C are $\left[\mathrm{L^1M^0\ T^{-1}}\right]$ and $\left[\mathrm{L^1M^0\ T^0}\right]$ respectively. The dimensions of quantities A, D and E are

(A) $[\mathrm{A}] = \left[\mathrm{L^1M^0\ T^{-1}}\right], [\mathrm{D}] = \left[\mathrm{T^1}\right], [\mathrm{E}] = \left[\mathrm{T^1}\right]$

(B) $[\mathrm{A}] = \left[\mathrm{L^0M^0\ T^{-1}}\right], [\mathrm{D}] = \left[\mathrm{T^1}\right], [\mathrm{E}] = \left[\mathrm{L^1\ T^1}\right]$

(C) $[\mathrm{A}] = \left[\mathrm{L^1M^1\ T^0}\right], [\mathrm{D}] = \left[\mathrm{T^2}\right], [\mathrm{E}] = \left[\mathrm{L^1\ T^2}\right]$

(D) $[\mathrm{A}] = \left[\mathrm{L^1M^0\ T^{-1}}\right], [\mathrm{D}] = \left[\mathrm{M^1\ T^1}\right], [\mathrm{E}] = \left[\mathrm{M^1\ T^1}\right]$

5. A particle is revolving in anticlockwise sense along the circumference of a circle of radius 'r' with linear velocity 'v', then the angle between ' v′ and angular velocity 'ω′ will be

(A) 180° (B) 90°

(C) 45° (D) 0°

6. A body is moving along the horizontal surface with a velocity of 4 m/s. If the coefficient of kinetic friction is 0.2, the distance travelled by body before coming to rest is $\left(\mathrm{g} = 10\ \mathrm{m/s^2}\right)$

(A) 8 m (B) 16 m

(C) 4 m (D) 6 m

7. A simple pendulum has length 2 m and a bob of mass 100 gram. It is whirled in a horizontal plane. If the string breaks under a tension of 10 N , the angle made by the string with vertical is $\left(\mathrm{g} = 10\ \mathrm{m/s^2}\right)$

(A) $\cos^{-1}(0 \cdot 4)$ (B) $\cos^{-1}(0 \cdot 1)$

(C) $\cos^{-1}(0 \cdot 05)$ (D) $\cos^{-1}(0 \cdot 2)$

8. The kinetic energy of a light body and a heavy body is same. Which one of the following statements is CORRECT?

(A) The light body has greater momentum.

(B) A body having high velocity has greater momentum.

(C) Both bodies have same momentum.

(D) The heavy body has greater momentum.

9. A body of mass 'm' moving with speed 3 m/s collides with a body of mass '2m' at rest. The coalesced mass will start to move with a speed of

(A) 3 m/s (B) 6 m/s

(C) 9 m/s (D) 1 m/s

10. The moment of inertia of a uniform square plate about an axis perpendicular to its plane and passing through the centre is $\frac{\mathrm{Ma^2}}{6}$ where M is the mass and a′ ' is the side of square plate. Moment of inertia of this plate about an axis perpendicular to its plane and passing through one of its corner is

(A) $\frac{\mathrm{Ma^2}}{3}$ (B) $\frac{3}{\mathrm{Ma^2}}$

(C) $\frac{3\mathrm{Ma^2}}{2}$ (D) $\frac{2\mathrm{Ma^2}}{3}$

11. If the spherical planet of mass ' M′ and radius 'R' suddenly shrinks to half its size, its mass reduces to half. The new moment of inertia of the planet about its diameter is

(A) $\frac{\mathrm{MR^2}}{10}$ (B) $\frac{\mathrm{MR^2}}{20}$

(C) $\frac{2}{3}\mathrm{MR^2}$ (D) $\frac{2}{5}\mathrm{MR^2}$

12. Let a force $\vec{\mathrm{F}} = -\mathrm{Fk}$ acts on the origin of cartesian frame of reference. The moment of force about a point $(1, -1)$ will be

(A) $-\mathrm{F}(\hat{\imath} + \hat{\jmath})$ (B) $-\mathrm{F}(\hat{\imath} - \hat{\jmath})$

(C) $\mathrm{F}(\hat{\imath} - \hat{\jmath})$ (D) $\mathrm{F}(\hat{\imath} + \hat{\jmath})$

13. A body is projected vertically upwards from earth's surface. If velocity of projection is $\left(\frac{1}{3}\right)^{rd}$ of escape velocity, then the height upto which a body rises is (R = radius of earth)

(A) 2R (B) $\frac{R}{4}$

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

14. Two satellites of masses 'm' and '4m' are revolving in a same orbit around the earth. Which one of the following statements is correct?

(A) They have periods in the ratio 1 : 4. (B) They have same kinetic energy.

(C) They have same potential energy. (D) They have same period.

15. A wire of Young's modulus $1 \cdot 6 \times 10^{12}\ N/m^2$ is stretched by a force so as to produce a strain of 2×10^{-4}. The energy density of the wire is

(A) $3 \cdot 2 \times 10^4\ J/m^3$ (B) $3 \cdot 2 \times 10^8\ J/m^3$

(C) $1 \cdot 6 \times 10^3\ J/m^3$ (D) $6 \cdot 4 \times 10^3\ J/m^3$

16. A steel ring of radius 'r' is to be fitted over a wooden disc of radius 'R' (R > r). The force required to expand the ring so that it fits over the disc is [Y = Young's modulus of steel, A = area of cross section of wire]

(A) YA $\left(\frac{R-r}{r}\right)$ (B) YA $\left(\frac{r}{R-r}\right)$

(C) YA$\frac{r}{R}$ (D) $\left(\frac{YAR}{r}\right)$

17. Three liquids have same surface tension and densities ϱ_1, Q_2, and $\varrho_3 (\varrho_1 > \varrho_2 > \varrho_3)$. In three identical capillaries, rise of liquid is same. The corresponding angles of contact θ_1, θ_2 and θ_3 are related as

(A) $\theta_1 > \theta_2 > \theta_3$ (B) $\theta_1 < \theta_2 > \theta_3$

(C) $\theta_1 > \theta_2 < \theta_3$ (D) $\theta_1 < \theta_2 < \theta_3$

18. What would be the absolute pressure at depth 1 km below the ocean? [Given : density of water $= 10^3\ kg/m^3$, $g = 10\ m/s^2, 1$ atmospheric pressure $= 1 \cdot 01 \times 10^5\ N/m^2$]

(A) $10 \cdot 101 \times 10^7\ N/m^2$

(B) $10 \cdot 101 \times 10^7$ dyne $/cm^2$

(C) $10 \cdot 101 \times 10^6$ dyne $/cm^2$

(D) $10 \cdot 101 \times 10^6\ N/m^2$

19. A black body radiates maximum energy at wavelength 'λ' and its emissive power is 'E'. Now, due to change in temperature of that body, it radiates maximum energy at wavelength $\frac{2\lambda}{3}$. At that temperature, emissive power is

(A) $\frac{27E}{16}$ (B) $\frac{81E}{16}$

(C) $\frac{91E}{16}$ (D) $\frac{54E}{16}$

20. We have a sample of gas characterised by P, V and T and another sample of gas characterised by 2P, V/4, and 2 T. What is the ratio of the number of molecules in the first and second samples?

(A) 2 : 1 (B) 4 : 1

(C) 8 : 1 (D) 16 : 1

21. A body performs linear S.H.M. with amplitude 'a'. When it is at a distance $\frac{a}{3}$ from extreme position, the magnitude of velocity is $\frac{1}{3}$ times the magnitude of acceleration. The period of S.H.M. is

(A) $\frac{3\pi}{2\sqrt{5}}$ s (B) $\frac{5\pi}{3\sqrt{5}}$ s

(C) $\frac{2\pi}{3\sqrt{5}}$ s (D) $\frac{\pi}{3\sqrt{5}}$ s

22. A particle executes simple harmonic motion with amplitude 'A' and period 'T'. If it is half way between mean position and extreme position, then its speed at that point is

(A) $\frac{3\pi A}{T}$ (B) $\frac{\sqrt{3}\pi A}{2T}$

(C) $\frac{\pi A}{T}$ (D) $\frac{\sqrt{3}\pi A}{T}$

23. A particle starts from mean position and performs S.H.M. with period 6 second. At what time its kinetic energy is 50% of total energy? $\left(\cos 45^\circ = \frac{1}{\sqrt{2}}\right)$

(A) 0.75 second (B) 1 second

(C) 0.25 second (D) 0.50 second

24. The correct statement about stationary wave is that

(A) displacement at node is zero and at antinode is maximum. (B) displacement at node is maximum and at antinode is zero.

(C) displacement at node is maximum. (D) displacement at antinode is minimum.

25. An engine is moving on a circular path of radius 200 m with speed of 15 m/s. What will be the frequency heard by an observer who is at rest at the centre of the circular path, when engine blows the whistle with frequency 250 Hz?

(A) Less than 250 Hz (B) Greater than 250 Hz
(C) 250 Hz (D) Zero

26. The fundamental frequency of open pipe is 'n'. If it is closed from one end then frequency of the 2^{nd} harmonic of closed pipe is higher by 200 Hz than $'n'$. The value of 'n' is

(A) 800 Hz (B) 200 Hz
(C) 100 Hz (D) 400 Hz

27. Choose the correct relation between polarisation 'P' and electric susceptibility ${}^4\chi_e'$ of dielectric material. (E = electric field)

(A) $P = \frac{\chi_e}{E^2}$ (B) $P = \frac{\chi_e}{E}$
(C) $P = \chi_e E$ (D) $P = \chi_e^2 E$

28. The earth is assumed to be a charged conducting sphere having volume ' V' and surface area 'A'. The capacitance of the earth in free space is (E_0 = permittivity of free space)

(A) $12\pi \in_0 \frac{V}{A}$ (B) $4\pi \in_0 \frac{V}{A}$
(C) $2\pi \in_0 \frac{V}{A}$ (D) $8\pi \in_0 \frac{V}{A}$

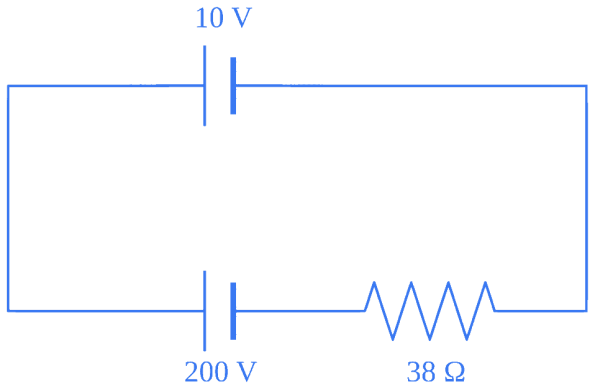
29. What will be the resistance of the shunt when 5% of the main current is passed through a galvanometer of resistance G?

(A) $\frac{G}{20}$ (B) $\frac{G}{21}$
(C) $\frac{G}{5}$ (D) $\frac{G}{19}$

30. In an atom, electron of charge (-e) performs U.C.M. around a stationary positively charged nucleus, with period of revolution 'T'. If 'r' is the radius of the orbit of the electron and ' v' is the orbital velocity, then the circulating current (I) is proportional to

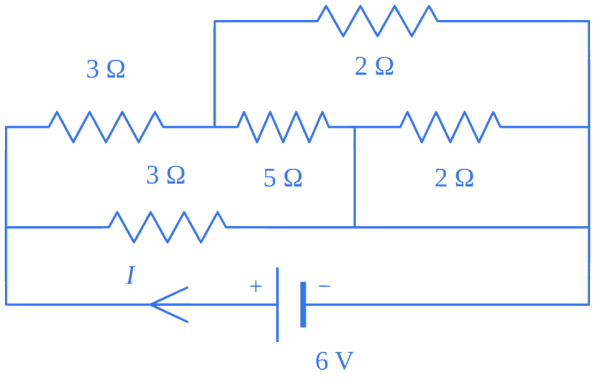
(A) $e^1 r^{-1} v^{-1}$ (B) $e^1 r^1 V^{-1}$
(C) $e^1 V^1 r^{-1}$ (D) $v^1 r^1 e^{-1}$

31. In the given circuit, current flowing through it is



(A) 5 A (B) 4 A
(C) 2 A (D) 3 A

32. The current drawn from the battery in the given network is (Internal resistance of battery is neglected)



(A) 2 · 4 A (B) 0.6 A
(C) 3.6 A (D) 1 · 2 A

33. A straight horizontal conducting rod of length ' L ' and mass 'M' is suspended by two vertical wires at its ends. If 'I' is the current passing through the rod, then in order that tension in the wire is zero, the magnetic field set up normal to the conductor is (Neglect the mass of wire, g = acceleration due to gravity)

(A) $\frac{IL}{Mg}$ (B) $\frac{Mg}{IL^2}$
(C) $\frac{Mg}{I^2 L}$ (D) $\frac{Mg}{IL}$

34. An alternating electric field of frequency ' v' is applied across the dees of a cyclotron which is used to accelerate protons of mass 'm'. The radius of the dees is 'R'. The operating magnetic field used in cyclotron is 'B'. The kinetic energy of the proton beam is given by

(A) $2m\pi^2v^2R^2$ (B) $2m\pi v^2R^2$

(C) $m\pi^2v^2R^2$ (D) $m\pi v^2R^2$

35. The susceptibility of a magnetic material is positive and small. The material is

(A) diamagnetic and ferromagnetic. (B) paramagnetic.

(C) ferromagnetic. (D) diamagnetic.

36. The area of a coil is 'A'. The coil is placed in a magnetic field which changes from $'B_{0'}$ to $^{\circ}4\ B_0'$ in time 't'. The magnitude of induced e.m.f. in the coil will be

(A) $\frac{3AB_0}{t}$ (B) $\frac{4AB_0}{t}$

(C) $\frac{3\ B_0}{At}$ (D) $\frac{4\ B_0}{At}$

37. When a capacitor is connected in series LR circuit, the alternating current flowing in the circuit

(A) increases. (B) decreases.

(C) remains constant. (D) is zero.

38. To obtain a magnified image at distance of distinct vision (DDV) using a simple microscope, the object should be placed

(A) between the principal focus and optical centre of the lens. (B) at the principal focus.

(C) slightly beyond the principal focus. (D) at the distance of distinct vision.

39. For a ray of light, the critical angle is minimum when it travels from

(A) air to glass. (B) glass to water.

(C) water to glass. (D) glass to air.

40. In Young's double slit experiment, the ratio of intensities at two points on a screen when waves from the two slits have a path difference of zero and $\frac{\lambda}{4}$ is $[\cos 0^{\circ} = \sin 90^{\circ} = 1,\ \sin 0^{\circ} = \cos 90^{\circ} = 0]$

(A) 2 : 1 (B) 3 : 1

(C) 2 : 3 (D) 3 : 2

41. If two light waves reaching at a point produce destructive interference, then condition of phase difference is

(A) $0, 2\pi, 4\pi, 6\pi \ldots\ldots$ (B) $\frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4} \ldots\ldots$

(C) $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2} \ldots\ldots$ (D) $\pi, 3\pi, 5\pi \ldots\ldots$

42. Choose the CORRECT statement from the following. (b)ewster's angle for a transparent medium is

(A) different for lights of different colours. (B) different for lights of same colour.

(C) same for lights of different colours. (D) independent of refractive index of the medium.

43. Two incident radiations having energies two times and ten times of the work function of a metal surface, produce photoelectric effect. The ratio of maximum velocities of emitted photo electrons respectively is

(A) 3 : 2 (B) 1 : 3

(C) 2 : 3 (D) 1 : 2

44. Photoelectrons are emitted from a photosensitive surface for the light of wavelengths $\lambda_1 = 360$ nm and $\lambda_2 = 600$ nm. What is the ratio of work functions for lights of wavelength $'\lambda_1'$ to λ_2'?

(A) 6 : 1 (B) 1 : 6

(C) 5 : 3 (D) 3 : 5

45. The radii of the first four Bohr orbits of hydrogen atom are related as

(A) 1 : 2 : 3 : 4 (B) 1 : 4 : 9 : 16

(C) $1 : \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ (D) $1 : \frac{1}{4} : \frac{1}{9} : \frac{1}{16}$

46. When the electron orbiting in hydrogen atom in its ground state moves to third excited state, the de-Broglie wavelength associated with it

(A) will decrease. (B) remain same.

(C) will increase. (D) will be zero.

47. In a study of transistor as an amplifier, the ratio of collector current to emitter current is 0.98. The collector current is 3 mA, then base current will be approximately

(A) 6 mA (B) 60 mA

(C) 6μA (D) 60μA

48. When p – n junction diode is reverse biased, then the width of the barrier potential will

(A) increase and it will offer more resistance.
(B) decrease and it will offer zero resistance.
(C) remain constant and it will not offer resistance.
(D) decrease and it will offer more resistance.

49. Identify the 'INCORRECT' statement from the following.

(A) Modulation index μ is kept greater than one to avoid distortion.
(B) The receiving antenna is followed by amplifier, intermediate frequency (IF) stage and detector.
(C) AM detection is carried out using a rectifier and an envelop detector.
(D) Modulated signal is to be followed by power amplifier and then fed to an antenna.

50. In a resonance tube experiment, a tuning fork resonates with air column of length 12 cm and again resonates when air column is 38 cm long. The end correction will (b)

(A) 0.25 cm
(B) 0.5 cm
(C) 1 cm
(D) 0.75 cm

51. The symbol used for hydrogen in Dalton's atomic theory is

(A) $\oplus$

(B) O

(C) $\odot$



(D)

52. How many gram of dihydrogen is required to react with dinitrogen to produce 34 g of ammonia?

(A) 6 g (B) 2 g

(C) 12 g (D) 3 g

53. What is the molarity of solution containing $0 \cdot 8$ g of NaOH (Molar mass $40\ \text{g mol}^{-1}$) in $150\ \text{cm}^3$ of water?

(A) $0 \cdot 02\ \text{moldm}^{-3}$ (B) $0 \cdot 12\ \text{moldm}^{-3}$

(C) $5 \cdot 33\ \text{moldm}^{-3}$ (D) $0 \cdot 1333\ \text{moldm}^{-3}$

54. 34.2 g sugar dissolved in $1 \cdot 8 \times 10^2$ g water to from sugar syrup, calculate mole fraction of sugar? (Molar mass sugar $= 342$, water $= 18$)

(A) $0 \cdot 0099$ (B) $0 \cdot 001$

(C) $0 \cdot 1$ (D) $0 \cdot 9$

55. Which among the following elements possesses one electron in 4 s orbital in observed electronic configaration?

(A) V(Z = 23) (B) Ni(Z = 28)

(C) Mn(Z = 25) (D) Cu(Z = 29)

56. Identify the type of intermolecular force present between benzene and ammonia

(A) Hydrogen bonding (B) Dipole - dipole interaction

(C) Dipole - induced dipole interaction (D) Ion- dipole interaction

57. What is the bond order of Be_2 molecule?

(A) 2 (B) 3

(C) 0 (D) 1

58. Which of the following molecules contain 25% S character of carbon atom in hybrid state?

(A) Ethylene (B) Acetylene

(C) Methane (D) Benzene

59. When will be the reaction becomes spontaneous at all temperatures?

(A) $\Delta H = -\text{ve}, \Delta S = -\text{ve}, \Delta G = -\text{ve}$

(B) $\Delta H = -\text{ve}, \Delta S = +\text{ve}, \Delta G = -\text{ve}$

(C) $\Delta H = +\text{ve}, \Delta S = +\text{ve}, \Delta G = -\text{ve}$

(D) $\Delta H = +\text{ve}, \Delta S = -\text{ve}, \Delta G = +\text{ve}$

60. An ideal gas expands isothermally and reversibly from $10\ \text{m}^3$ to $20\ \text{m}^3$ at 300 K performing $5 \cdot 187$ kJ of work on surrrounding. Calculate number of moles of gas undergoing expansion? ($R = 8 \cdot 314 \text{JK}^{-1}\ \text{mol}^{-1}$)

(A) 1.5 (B) 2

(C) 3 (D) 1

61. $2 \cdot 5$ kJ of work is done on the system and it releases 1500 J of heat. What is the change in internal energy?

(A) 1000 J (B) 4000 J

(C) 2500 J (D) 1500 J

62. What is the oxidation number of Carbon in $K_2C_2O_4$?

(A) $+3$ (B) -2

(C) 0 (D) $+4$

63. Which of the following compound is used as fire extinguisher?

(A) $NaHCO_3$ (B) Na_2CO_3

(C) NaOH (D) Na_2SO_4

64. How many primary, secondary and tertiary carbon atoms repsectively are present in isobutane?

(A) 0,1 and 3 (B) 3,1 and 0

(C) 3,0 and 1 (D) 1,0 and 3

65. Which inert gas is used in chromatography?

(A) Ar (B) Ne

(C) Kr (D) He

66. Mixture of sodium chloride and ammonium chloride is separated by

(A) sublimation (B) distillation

(C) chromatography (D) differential extraction

67. Which of the following is NOT an example of freons?

(A) Dichloro difluoromethane (B) Diphenyl

(C) Trichloro fluoromethane (D) Chloro difluoromethane

68. If radius ratio for an ionic solid is 0.5248 and radius of cation is 0.95 A°. What is the radius of anion?

(A) $1 \cdot 45$ A° (B) $1 \cdot 81$ A°

(C) $1 \cdot 20$ A° (D) $1 \cdot 60$ A°

69. Which of the following is ferromagnetic in nature?

(A) Oxygen (B) Gadolinium

(C) Benzene (D) Water

70. If radius of anion is double that of cation, coordination number of cation and type of hole occupied respectively are

(A) 3, trigonal (B) 4, tetrahedral

(C) 8, cubic (D) 6, octahedral

71. Molal elevation constant is the elevation in boiling point produced by

(A) 1 mole of solute in one litre of solvent (B) 1 g of solute in 100 g of solvent

(C) 100 g of solute in 1000 g of solvent (D) 1 mole of solute in one Kg of solvent

72. E° cell is $1 \cdot 049$ V and involves transfer of 2 electrons, calculate equilibrium constant of cell?

(A) 2.75×10^{35} (B) 2.75×10^{10}

(C) $0 \cdot 524 \times 10^{35}$ (D) $2 \cdot 098 \times 10^{10}$

73. Conductivity of a conductor is

(A) equal to resistivity (B) inverse of resistance

(C) inverse of conductance (D) inverse of resistivity

74. Consider the reaction $2\ A + 2\ B \rightarrow C + 2D$. If the concentration of A is doubled at constant B, the rate increases by a factor 4 . If the concentration of B is doubled at constant A, rate is doubled. What is the rate law?

(A) $r = k[A]^2[B]^2$ (B) $r = k[A]^4[B]^2$

(C) $r = k[A][B]^2$ (D) $r = k[A]^2[B]$

75. For the reaction $2NOBr_{(g)} \rightarrow 2NO_{(g)} + Br_{2_{(g)}}$, rate law is $r = K[NOBr]^2$ If rate constant is $1 \cdot 62 M^{-1}\ s^{-1}$ and concentration of NOBr is $2 \cdot 00 \times 10^{-3}$M, What is the rate of reaction?

(A) $6 \cdot 48 \times 10^{-6} Ms^{-1}$ (B) $4 \cdot 05 \times 10^{-5} Ms^{-1}$

(C) $2 \cdot 46 \times 10^{-6} Ms^{-1}$ (D) $5 \cdot 24 \times 10^{-6} Ms^{-1}$

76. Identify the product formed when bauxite ore is treated with sodium hydroxide?

(A) Sodium hydrogen carbonate (B) Aluminium hydroxide

(C) Sodium meta aluminate (D) Aluminium chloride

77. Which of the following magnetic impurity is present in Cassiterite ore?

(A) Fe_2O_3 (B) $FeWO_4$

(C) FeO (D) Fe_3O_4

78. Which among the following is a mineral of copper?

(A) Carnotite (B) Azurite

(C) Pyrolusite (D) Chromite

79. Which of the following pairs of inert gases is used in flash bulb?

(A) Xe and He (B) Xe and Kr

(C) Xe and Rn (D) Xe and Ar

80. Identify the inert gas used for filling balloons?

(A) Krypton (B) Neon

(C) Helium (D) Argon

81. Which of the following compounds is formed when tungsten adsorbs oxygen gas?

(A) Tungsten dioxide (B) Tungsten oxide

(C) Tungsten tetraoxide (D) Tungsten trioxide

82. What is EAN of Cobalt in $[Co(NH_3)_6]Cl_3$ (At. No. of Co = 27)

(A) 30 (B) 28

(C) 27 (D) 36

83. How many donor groups are present in diethylene triamine?

(A) 4 (B) 2

(C) 6 (D) 3

84. Which of the following haloalkane is used as paint remover?

(A) Carbon tetra chloride (B) Dichloromethane

(C) Chloroethane (D) Trichloromethane

85. How many chlorine atoms are present in a molecule of D.D.T.?

(A) 3 (B) 5

(C) 2 (D) 4

86. Identify the correct decreasing order of reactivity of alkyl halide with ammonia?

(A) $R-I > R-Br > R-Cl$

(B) $R-Br > R-Cl > R-I$

(C) $R-I > R-Cl > R-Br$

(D) $R-Cl > R-Br > R-I$

87. Which of the following is NOT a dihydric phenol?

(A) Quinol (B) Resorcinol

(C) Catechol (D) Hydroxyquinol

88. Identify the alcohol that react immediately with Lucas reagent?

(A) Ethanol (B) Butan-2-ol

(C) 2-Methyl Propan-2-ol (D) Propan-2-ol

89. Which products are obtained when methoxy ethane is heated with HI?

(A) CH_3I and C_2H_5I (B) CH_3I and C_2H_5OH

(C) CH_3OH and C_2H_5OH (D) C_2H_5I and CH_3OH

90. What is the final product obtained when benzonitrile react with phenyl megnesium bromide in equimolar proportion?

(A) Diphenyl magnesium bromide (B) Benzene

(C) Dicyclohexane (D) Benzophenone

91. Which of the following catalyst is used in Rosenmund reaction?

(A) Cu_2Cl_2 (B) CS_2

(C) $Pd-BaSO_4$ (D) V_2O_5

92. The reaction in which methyl group on benzene ring is converted to aldehydic group is called

(A) Etard reaction (B) Fridel - Craft reaction

(C) Rosenmund reaction (D) Gatterman - Koch reaction

93. Identify ' A' in the following reaction Salicylic acid $\xrightarrow{\text{Acetic anthydride}}$ A

(A) Aspirin (B) Methyl salicylate

(C) BHT (D) Steric acid

94. Which of the following type of amines is obtained by alkylation of phthalimide?

(A) $Ar-NH_2$ (B) $R-NH_2$

(C) $(R)_3\ N$ (D) $R-NH-R$

95. Which of the following amines forms a clear solution when treated with benzene sulphonyl chloride and excess of potassium hydroxide?

(A) $(CH_3)_3\ N$ (B) $(CH_3)_2NC_2H_5$

(C) $(CH_3)_2NH$ (D) CH_3NH_2

96. On hydrolysis sucrose gives

(A) 2 moles of glucose (B) 2 moles of galactose

(C) equimolar mixture of glucose and fructose (D) 2 moles of fructose

97. Which among the following is basic amino acid?

(A) Lysine (B) Glycine

(C) Cystine (D) Cysteine

98. Which among the following is used as a monomer for the preparation of neoprene?

(A) Isoprene (B) Glycine

(C) Chloroprene (D) Styrene

99. Which among the following is biodegradable polymer?

(A) PHBV (B) Buna - N

(C) PTFE (D) PVC

100. Which among the following drugs is not a tranquilizer?

(A) Equanil
(B) Novestrol
(C) Valium
(D) Veronal

101. If $\sin x + \operatorname{cosec} x = 3$, then value of $\sin^4 x + \operatorname{cosec}^4 x$ is

(A) 74 (B) 47

(C) 07 (D) 49

102. The value of $\sin^2\left(\frac{\pi}{8}\right) =$

(A) $\frac{\sqrt{2}+1}{2\sqrt{2}}$ (B) $\frac{\sqrt{5}+1}{2\sqrt{2}}$

(C) $\frac{\sqrt{5}-1}{2\sqrt{2}}$ (D) $\frac{\sqrt{2}-1}{2\sqrt{2}}$

103. $\frac{\sin A+\sin 7A+\sin 13A}{\cos A+\cos 7A+\cos 13A} =$

(A) $\cot 7A$ (B) $\tan 6A$

(C) $\tan 7A$ (D) $\cot 6A$

104. If $f(x) = ax^2 + bx + 2$ and $f(1) = 4, f(3) = 38$, then $a - b =$

(A) 15 (B) -2

(C) 2 (D) 8

105. The co-efficient of x^6 in the series of e^{2x} is

(A) $\frac{2}{45}$ (B) $\frac{7}{45}$

(C) $\frac{4}{45}$ (D) $\frac{1}{45}$

106. If p_1 and p_2 are the lengths of perendiculars from the origin to the lines $x \sin\theta + y \cos\theta = 5 \cos 2\theta$ and $x \operatorname{cosec}\theta + y \sec\theta - 5 = 0$ respectively, then $p_1^2 + 4p_2^2 =$

(A) $\frac{1}{25}$ (B) $\frac{1}{5}$

(C) 25 (D) 5

107. The angle between the lines $y^2 \sin^2\theta - xy \sin^2\theta + x^2\left(\cos^2\theta - 1\right) = 0$ is

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{3}$

(C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

108. The joint equation of pair of lines through the origin and making equilateral triangle with the line $y = 4$ is

(A) $3x^2 + y^2 = 0$ (B) $3x^2 - y^2 = 0$

(C) $x^2 - y^2 = 0$ (D) $x^2 - 3y^2 = 0$

109. The cartesian equation of the curve $x = 3 + 5\cos\theta, y = 2 + 5\sin\theta$ is $(0 \le \theta \le 2\pi)$

(A) $x^2 + y^2 - 6x + 4y - 12 = 0$

(B) $x^2 + y^2 + 6x + 4y + 12 = 0$

(C) $x^2 + y^2 + 6x - 4y + 12 = 0$

(D) $x^2 + y^2 - 6x - 4y - 12 = 0$

110. If e_1 is the eccentricity of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, a > b$ and e_2 is the eccentricity of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then $e_1^2 + e_2^2 =$

(A) 2 (B) 4

(C) 1 (D) 3

111. If $A = \{2, 3, 4, 5, 6\}$, then which of the following statement has truth value 'false"

(A) $\exists x \in A$, such that $(x - 2) \in N$

(B) $\forall x \in A, x + 6$ is divisible by 2

(C) $\exists x \in A$, such that $x + 2$ is a prime number.

(D) $\exists x \in A$, such that $x^2 + 1$ is an even number.

112. The logical expression $[\mathrm{p} \wedge (\mathrm{q} \vee \mathrm{r})] \vee [(\sim \mathrm{p} \wedge \mathrm{q}) \vee (\sim \mathrm{p} \wedge \mathrm{r})]$ is equivalent to

(A) p (B) q

(C) $\mathrm{p} \wedge \mathrm{r}$ (D) $\mathrm{q} \vee \mathrm{r}$

113.

If A and B are subsets of universal set X such that n(X) = 200, n(A) = 90, n(B) = 80 ,

$$n(A' \cap B') = 40, \text{ then } n(A \cap B') =$$

(A) 70 (B) 80

(C) 20 (D) 10

114. The value of $\cos^{-1}\left(\cos\frac{8\pi}{3}\right)$ is

(A) $\frac{8\pi}{3}$ (B) $\frac{\pi}{3}$

(C) $\frac{2\pi}{3}$ (D) $\frac{3\pi}{2}$

115. The value of $\tan\left[\cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{2}{3}\right)\right]$ is

(A) $\frac{17}{6}$ (B) $\frac{16}{7}$

(C) $\frac{6}{17}$ (D) $\frac{7}{16}$

116. If $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \frac{\pi}{2}, x, y, z > 0, xy < 1$, then the value of $xy + yz + zx =$

(A) xyz (B) 0

(C) 1 (D) $-xyz$

117. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and X is a 2×2 matrix such that $AX = 1$, then $X =$

(A) $\begin{bmatrix} -2 & 1 \\ \frac{3}{2} & \frac{1}{2} \end{bmatrix}$ (B) $\begin{bmatrix} 2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$

(C) $\begin{bmatrix} -2 & 1 \\ -\frac{3}{2} & -\frac{1}{2} \end{bmatrix}$ (D) $\begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$

118. If $A = \begin{bmatrix} 2 & -3 \\ 5 & -7 \end{bmatrix}$, then $2A - 3A^{-1} =$

(A) $\begin{bmatrix} 25 & 15 \\ 25 & 20 \end{bmatrix}$ (B) $\begin{bmatrix} 25 & 25 \\ -15 & -20 \end{bmatrix}$

(C) $\begin{bmatrix} 25 & -15 \\ 25 & -20 \end{bmatrix}$ (D) $\begin{bmatrix} 25 & -25 \\ -15 & -20 \end{bmatrix}$

119. If $f(x) = \frac{(e^{3x}-1)\sin x^\circ}{x^2}$ if $x \neq 0$ $= \frac{\pi}{60}$ if $x = 0$, then

(A) f is continuous at $x = 0$ (B) $\lim_{x\to 0} f(x) = 3$

(C) f has irremovable discontinuity at $x = 0$ (D) f has removable discontinuity at $x = 0$

120. If $y = 2^{ax}$ and $\left(\frac{dy}{dx}\right)_{x=1} = \log 256$, then $a =$

(A) 4 (B) 2

(C) 8 (D) 3

121. If $y = x^{xe^x}$, $\frac{dy}{dx} = y \cdot g(x)$, then $g(x) =$

(A) $[e^x + e^x(x+1)\log x]$

(B) $[e^x - e^x \cdot x \cdot (1 + \log x)]$

(C) $[e^x + e^x \cdot x \cdot (1 + \log x)]$

(D) $[e^x(x+1)\log x]$

122. If $y = \log\left[a^{3x}\left(\frac{5-x}{x+4}\right)^{\frac{3}{4}}\right]$, then $\frac{dy}{dx} =$

(A) $3 + \frac{3}{4(5-x)} - \frac{3}{4(x+4)}$

(B) $\frac{3}{a} + \frac{3}{4(5-x)} - \frac{3}{4(x+4)}$

(C) $\frac{3}{\log a} - \frac{3}{4(5-x)} - \frac{3}{4(x+4)}$

(D) $3\log a - \frac{3}{4(5-x)} - \frac{3}{4(x+4)}$

123. The function $f(x) = 3x^4 + 16x^3 - 30x^2 + 10$ is increasing for

(A) every real value of x

(B) $x = 0, x = 1$ only

(C) $x \in (-5,0) \cup (1, \infty)$

(D) $x \in [0, 1]$

124. The approximate value of $(66)^{\frac{1}{3}}$ is

(A) 4.0416 (B) 4.0447

(C) 4.0433 (D) 4.0481

125. If P is a point on the segment AB of length 12 cm, then the position of P for $AP^2 + BP^2$ to be minimum is such that

(A) P divides AB in the ratio 2 : 3 internally (B) P divides AB in the ratio 4 : 3 internally

(C) P is the midpoint of segment AB (D) P divides BA in the ratio 2 : 1 internally

126. $\int e^x \cdot \sec x(1 + \tan x)dx =$

(A) $e^x \operatorname{cosec} x + c$ (B) $e^x \sec x + c$

(C) $e^x \cot x + c$ (D) $e^x \tan x + c$

127. $\int \frac{\sin x \cdot \cos x}{\sin^4 x + \cos^4 x}dx =$

(A) $\tan^{-1}\left(\sin^2 x\right) + c$ (B) $2\tan^{-1}\left(\tan^2 x\right) + c$

(C) $\frac{1}{2}\tan^{-1}\left(\tan^2 x\right) + c$ (D) $\tan^{-1}\left(\cos^2 x\right) + c$

128. $\int \frac{\left(\sin^{-1}x\right)^{\frac{3}{2}}}{\sqrt{1-x^2}}dx =$

(A) $\frac{2}{5}\left(\sin^{-1}x\right)^{\frac{5}{2}} + c$ (B) $\frac{2}{5}\left(\cos^{-1}x\right)^{\frac{5}{2}} + c$

(C) $\frac{5}{2}\left(\cos^{-1}x\right)^{\frac{5}{2}} + c$ (D) $\frac{5}{2}\left(\sin^{-1}x\right)^{\frac{5}{2}} + c$

129. If $\int_o^a \frac{dx}{1+4x^2} = \frac{\pi}{8}$, then $a =$

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

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

130. $\int_{-8}^{8} \frac{x^5+x^3}{4-x^2}dx =$

(A) 16 (B) 0

(C) 8 (D) -8

131. $\int_0^4 |x-2|dx =$

(A) 0 (B) 4

(C) 8 (D) 2

132. The area bonded by the curve $y = \sin^2 x, x$ -axis and the lines $x = 0$ and $x = \frac{\pi}{2}$ is

(A) 1 sq. units (B) $\frac{\pi}{8}$ sq. units

(C) $\frac{\pi}{4}$ sq. units (D) $\frac{\pi}{2}$ sq. units

133. The order and the degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^3\right]^{\frac{7}{3}} = 7\left(\frac{d^2y}{dx^2}\right)$ are respectively

(A) 2,3 (B) 3,3

(C) 2,2 (D) 3,2

134. The solution of the differential equation $x \cdot \sin\left(\frac{y}{x}\right) dy = \left[y \cdot \sin\left(\frac{y}{x}\right) - x\right] dx$ is

(A) $\cos\left(\frac{x}{y}\right) = \log|x| + c$

(B) $\cos\left(\frac{y}{x}\right) = \log|y| + c$

(C) $\cos\left(\frac{y}{x}\right) = \log|x| + c$

(D) $\cos\left(\frac{x}{y}\right) = \log|y| + c$

135. Bismath has half life of 5 days. If sample originally has a mass of 800mg. then the mass remaining after 30 days will be

(A) 10mg. (B) 10.5mg.

(C) 12mg. (D) 12.5mg.

136. The population of a village increases at a rate proportional to the population at that time. In a period of 10 years the population grew from 20,000 to 40,000 , then the population after another 20 years is

(A) $1,20,000$ (B) $1,60,000$

(C) $1,00,000$ (D) 80,000

137. The integrating factor of the differential equation $\frac{dy}{dx}(x \log x) + y = 4 \log x$ is

(A) $\log(\log x)$ (B) x

(C) e^x (D) $\log x$

138. If $\bar{a}, \bar{b}, \bar{c}$ are the position vectors of the points $A(1,3,0)$, $B(2,5,0)$, $C(4,2,0)$ respectively and $\bar{c} = t_1\bar{a} + t_2\bar{b}$, then value of $t_1t_2 =$

(A) -16 (B) 16

(C) 160 (D) -160

139. If $\bar{a} = \hat{i} + \hat{j} + \hat{k}, \bar{b} = 2\hat{i} - 2\hat{j} + 2\hat{k}, \bar{c} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ are any three co-planar vectors such that $l\bar{a} + m\bar{b} + n\bar{c} = \bar{0}$, then values of l, m, n are respectively

(A) 10, 1, 4 (B) $10, -4, 1$

(C) $10, -1, -4$ (D) $10, 1, -4$

140. The unit vector perpendicular to the plane $4x - 3y + 12z = 15$ is

(A) $\frac{4\hat{i}+3\hat{j}+12\hat{k}}{13}$ (B) $\frac{4\hat{i}-3\hat{j}+12\hat{k}}{13}$

(C) $\frac{-4\hat{i}+3\hat{j}+12\hat{k}}{13}$ (D) $\frac{-4\hat{i}-3\hat{j}+12\hat{k}}{13}$

141. If the line $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ and $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$ are perpendicular to each other, then k is

(A) $\frac{7}{10}$ (B) $\frac{10}{7}$

(C) $\frac{-7}{10}$ (D) $\frac{-10}{7}$

142. A line makes an angle of 45° with x -axis and congruent angles with y and z -axes, then the direction cosines of the line are

(A) $\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$ and $-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}$

(B) $\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$ and $-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}$

(C) $\frac{1}{\sqrt{2}}, \frac{1}{2}, \frac{1}{2}$ and $-\frac{1}{\sqrt{2}}, -\frac{1}{2}, -\frac{1}{2}$

(D) $\frac{1}{\sqrt{2}}, \frac{1}{2}, \frac{1}{2}$ and $\frac{1}{\sqrt{2}}, -\frac{1}{2}, -\frac{1}{2}$

143. The position vector of the point of intersection of the line $\bar{r} = (2\hat{i} + \hat{j} - 4\hat{k}) + \lambda(\hat{i} - 2\hat{j} + 2\hat{k})$ and XOY-Plane is

(A) $4\hat{i} + 3\hat{k}$ (B) $4\hat{i} + 3\hat{j}$

(C) $4\hat{i} - 3\hat{k}$ (D) $4\hat{i} - 3\hat{j}$

144. The equation of a plane containing the line $x - 2 = \frac{y-4}{4} = \frac{z-6}{7}$ and parallel to the line $\bar{r} = (\hat{i} + 3\hat{j} + 5\hat{k}) + \lambda(3\hat{i} + 5\hat{j} + 7\hat{k})$ is

(A) $x - 2y + z = 10$ (B) $3x - 2y + z = 4$

(C) $x - 2y + z = 9$ (D) $x - 2y + z = 0$

145. If the origin and the points $(1,2,3), (2,3,4)$ and (x,y,z) are coplanar, then

(A) $x - 2y + z = 0$ (B) $x + y + z = 6$

(C) $x - 2y + z + 1 = 0$ (D) $z - 2x + y = 0$

146. If L. P. P. has optimum solutions at two consecutive corner points of feasible region, then L. P. P. has

(A) infinite solutions (B) no solution

(C) two solutions (D) unique solution

147. If $X \sim B\left(8, \frac{1}{2}\right)$, then $P(|x-4| \leq 2) =$

(A) $\frac{119}{128}$ (B) $\frac{29}{128}$

(C) $\frac{238}{728}$ (D) $\frac{119}{228}$

148. If A and B are two independent events and $P(A) = \frac{3}{5}$, $P(B) = \frac{2}{3}$, then $P(A' \cap B') =$

(A) $\frac{7}{15}$ (B) $\frac{2}{15}$

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

149. It is known that a box of 8 batteries contains 3 defective pieces and a person randomly selects two batteries from the box. If X is the number of defective batteries selected, then $P(X \leq 1) =$

(A) $\frac{25}{28}$ (B) $\frac{14}{28}$

(C) $\frac{10}{28}$ (D) $\frac{13}{28}$

150. The probability distribution of a random variable X is given by

$X = x$	0	1	2
$P(X = x)$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{2}{5}$

then the variance of X is

(A) $\frac{14}{25}$ (B) $\frac{9}{25}$

(C) $\frac{6}{25}$ (D) $\frac{1}{25}$

- End of Question Paper -

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