MHT CET 2025 PCM (Re-exam) May 5 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 2025**, 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.

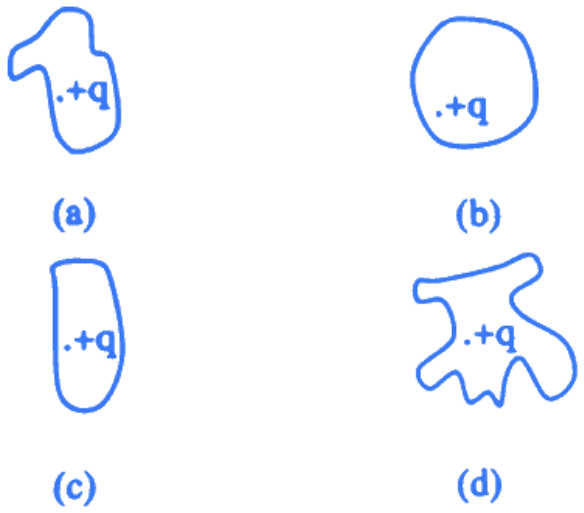
1. In an LC circuit, angular frequency at resonance is ω. The new angular frequency when inductance is made four times and capacitance is made eight times is

(A) $\frac{\omega}{2\sqrt{2}}$ (B) $\frac{\omega}{4\sqrt{2}}$

(C) $\frac{\omega}{4}$ (D) $\frac{\omega}{\sqrt{2}}$

2.

The electric flux through the surface



(A) in figure (c) is the largest

(B) in figure (b) is same as figure (c) but is smaller than figure (d)

(C) is the same for all the figures

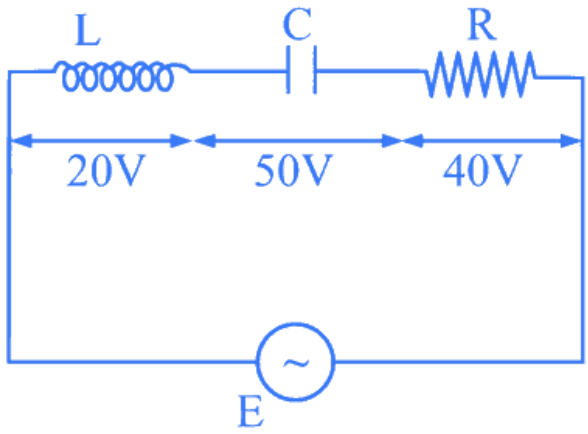
(D) in figure (d) is the least

3. A person observes two moving trains. First reaching the station and another leaves the station with equal speed of 30 m/s. If both trains emit sounds of frequency 300 Hz , difference of frequencies heard by the person will be (speed of sound in air 330 m/s)

(A) 80 Hz (B) 75 Hz

(C) 55 Hz (D) 45 Hz

4. The value of alternating e.m.f. (E) in the given circuit is



(A) 30 V (B) 60 V

(C) 50 V (D) 110 V

5. An open organ pipe and closed organ pipe of same length produce 2 beats per second, when they are set into vibrations together, in fundamental mode. The length of open pipe is made half and that of closed pipe is doubled.
The number of beats produced per second will be (neglect end correction)

(A) 4 (B) 6

(C) 7 (D) 8

6. A beam of light of intensity I_0 falls on a system of three polaroids which are arranged in succession such that the pass (transmission) axis is turned through 60° with respect to preceding one. The fraction of the incident light intensity that passes through the system is $\left(\cos 60^\circ = \frac{1}{2}\right)$

(A) $\frac{1}{8}$ (B) $\frac{1}{32}$

(C) $\frac{1}{16}$ (D) $\frac{1}{2}$

7. The angular momentum of a rotating body is ' L '. When the frequency of rotating body is tripled and its kinetic energy is made one-third, the new angular momentum becomes

(A) $\frac{1}{9}$ L (B) $\frac{1}{3}$ L

(C) 6 L (D) 9 L

8. An electric dipole of length 2 cm is placed with its axis making an angle of 60° to a uniform electric field of 10^{+5} N/C. If it experiences a torque of $9\sqrt{3}$Nm, the magnitude of the charge on the dipole is $\left(\sin 60^\circ = \frac{\sqrt{3}}{2}\right)$

(A) 7×10^{-3}C (B) 8×10^{-3}C

(C) 9×10^{-3}C (D) $\frac{9}{2} \times 10^{-3}$C

9. Two inductors of 80 mH each are joined in parallel. The current passing through the combination is 2.1 A . The energy stored in this combination of inductors is

(A) 4.84×10^{-2} J (B) 7.26×10^{-2} J

(C) 8.82×10^{-2} J (D) 10.85×10^{-2} J

10. The liquid (mercury) meniscus in capillary tube will be convex if the angle of contact is

(A) greater than 90° (B) less than 90°

(C) equal to 90° (D) equal to 0°

11. A 2.5 V battery is connected to a potentiometer wire. A cell of e.m.f. 1.08 V is balanced by the voltage drop across 2.16 m of wire. The length of the potentiometer wire is

(A) 2.5 m (B) 3 m

(C) 5 m (D) 6 m

12. A stone of mass ' m ' kg is tied to a string of length ' L ' m and moved in a vertical circle of radius 49 cm in a vertical plane. If it completes 30 revolutions per minute, the tension in the string when it is at the lowermost point is nearly [Take $\pi^2 = 10$ and acceleration due to gravity, $g = 10\ m/s^2$]

(A) $(90\ m)$N (B) $(60\ m)$N

(C) $(45m)$N (D) $(15m)$N

13. A photosensitive surface has work function ϕ . If photon of energy 3ϕ falls on this surface, the electron comes out with maximum velocity of 4×10^6 m/s When photon energy is increased to 7ϕ then maximum velocity of photoelectron will be

(A) $4\sqrt{3} \times 10^6$ m/s (B) $2\sqrt{3} \times 10^6$ m/s

(C) $4\sqrt{3} \times 10^3$ m/s (D) $2\sqrt{3} \times 10^3$ m/s

14. A vessel completely filled with water has two holes ' P ' and ' Q ' at depths ' 2 h ' and ' 8 h ' from the top respectively. Hole ' P ' is square of side ' a ' and hole ' Q ' is a circle of radius ' r '. The water flowing out per second from both the holes is same, then side ' a ' of hole ' P ' is

(A) $\sqrt{2\pi r}$ (B) $\mathrm{r}\sqrt{2\pi}$

(C) $2\sqrt{\pi r}$ (D) $2\pi r$

15. A wire of length ' L ' carries a current ' I '. If the wire is turned into a square coil of single turn, the maximum magnitude of the torque in a given magnetic field $(\vec{B})$ is

(A) $\frac{IBL}{16}$ (B) $\frac{IBL}{8}$

(C) $\frac{IBL^2}{8}$ (D) $\frac{IBL^2}{16}$

16. A black body has maximum wavelength ' λ_m ' at temperature 2000 K . Its maximum wavelength at 3000 K will be

(A) $\frac{3}{2}\lambda_m$ (B) $\frac{16}{81}\lambda_m$

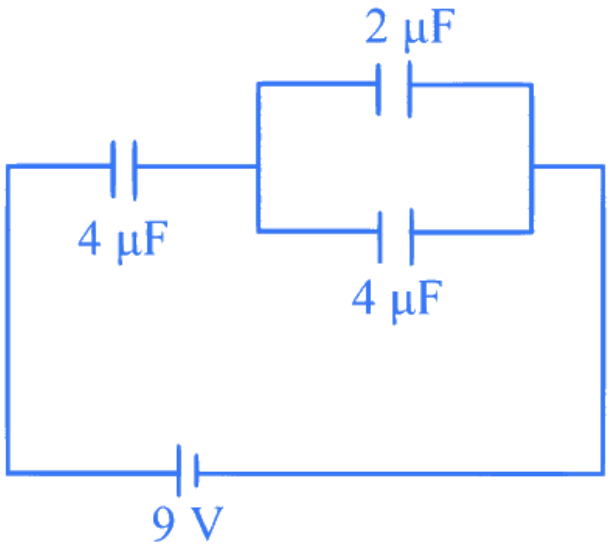
(C) $\frac{81}{16}\lambda_m$ (D) $\frac{2}{3}\lambda_m$

17. The moment of inertia of a thin uniform rod of mass ' M ' and length ' L ', about an axis perpendicular to length of the rod and at a distance ' $L/4$ ' from one end is

(A) $\frac{ML^2}{6}$ (B) $\frac{ML^2}{12}$

(C) $\frac{7ML^2}{24}$ (D) $\frac{7ML^2}{48}$

18. The potential difference across the 4μF capacitor in the following circuit is



(A) 3.4 V (B) 4.6 V

(C) 5.4 V (D) 6.2 V

19. The relation between efficiency (η) of Carnot engine and coefficient of performance (η_1) of refrigerator is

(A) $\eta = \frac{1}{1+\eta_1}$ (B) $\eta = \frac{1}{1-\eta_1}$

(C) $\eta = \frac{\eta_1}{1-\eta_1}$ (D) $\eta = \frac{1+\eta_1}{\eta_1}$

20. A radioactive element having half-life 30 min . is undergoing beta decay. The fraction of radioactive element remains undecayed after 90 min . will be

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) $\frac{1}{8}$ (D) $\frac{1}{16}$

21. 500 gram of a diatomic gas is enclosed at a pressure of $10^5 \mathrm{Nm}^{-2}$. The density of the gas is $5 \mathrm{kgm}^{-3}$. The energy of one mole of the gas due to its thermal motion is [consider the gas molecule as a rigid rotator]

(A) 1.5×10^4 J (B) 2.5×10^4 J

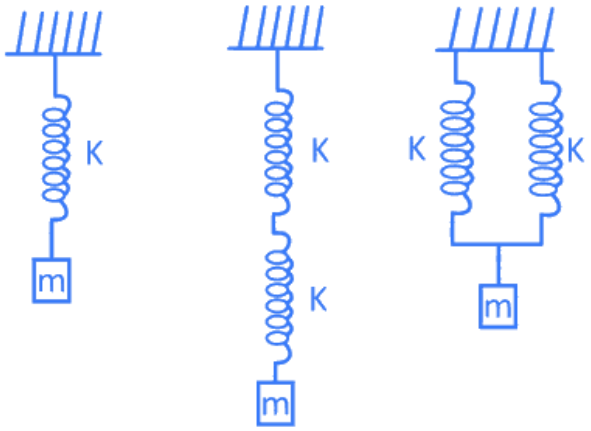
(C) 1.5×10^7 J (D) 2.5×10^7 J

22. In metre-bridge experiment the balance point is obtained if the gaps are closed by 2Ω and 3Ω. A shunt of $x\Omega$ is added to 3Ω resistor to shift the balance point by 22.5 cm . The value of x is

(A) 3 (B) 2

(C) 1 (D) 4

23. All the springs in fig. (a), (b) and (c) are identical, each having force constant K each. Mass m is attached to each system. If T_a, T_b and T_c are the time periods of oscillations of the three systems in fig. (a), (b) and (c) respectively, then



(A) $\mathrm{T_a} = \sqrt{2}\,\mathrm{T_b}$ (B) $\mathrm{T_a} = \frac{\mathrm{T_c}}{\sqrt{2}}$

(C) $\mathrm{T_b} = 2\,\mathrm{T_a}$ (D) $\mathrm{T_b} = 2\,\mathrm{T_c}$

24. A physical quantity ' X ' is related to four measurable quantities ' a ', ' b ', ' c ' and ' d ' as $\mathrm{X} = \mathrm{a}^2\,\mathrm{b}^3\mathrm{c}^{5/2}\,\mathrm{d}^{-2}$. The percentage error in the measurement of 'a', 'b', 'c' and 'd' are 1%, 2%, 2% and 4% respectively. The percentage error in measurement of quantity ' X ' is

(A) 15% (B) 17%

(C) 21% (D) 23%

25. A coil of effective area 3 m^2 is placed at right angles to a magnetic field of induction $0.05\ \mathrm{Wb/m}^2$ If the field is decreased to 20% of its original value in 10 second, the e.m.f. induced in the coil will be

(A) 10 mV (B) 12 mV

(C) 15 mV (D) 20 mV

26. Two vectors $a\hat{i} + b\hat{j} + \hat{k}$ and $2\hat{i} - 3\hat{j} + 4\hat{k}$ are perpendicular to each other. When $3\mathrm{a} + 2\,\mathrm{b} = 7$, the ratio of a to b is $\frac{x}{2}$. The value of x is

(A) zero (B) 2

(C) 1 (D) 4

27. Three immiscible transparent liquids with refractive indices $3/2, 4/3$ and $6/5$ are arranged one above the other in a container. The depths of the liquids are $3\ \mathrm{cm}, 4\ \mathrm{cm}$ and $6\ \mathrm{cm}$ respectively. The apparent depth of the vessel is

(A) 4 cm (B) 6 cm

(C) 8 cm (D) 10 cm

28. A spherical liquid drop splits in to 729 identical spherical drops. If E is the surface energy of the original drop and U is the total surface energy of resulting drops, then $\frac{E}{U} = \frac{1}{x}$. The value of x is

(A) 9 (B) 7

(C) 6 (D) 13

29. A circular coil carrying current has radius ' R '. The distance from the centre of the coil on the axis where the magnetic induction will be $\frac{1}{27}$ th of its value at the centre of the coil is

(A) $3\sqrt{2}\mathrm{R}$ (B) $3R$

(C) $2\sqrt{2}\mathrm{R}$ (D) $2R$

30. A point particle of mass 200 gram is executing S.H.M. of amplitude 0.2 m . When the particle passes through the mean position, its kinetic energy is 16×10^{-3} J. The equation of motion of this particle is (Initial phase of oscillation $= 0^{\circ}$)

(A) $Y = 0.2\sin(4t)$ (B) $Y = 0.2\sin(\frac{t}{4})$

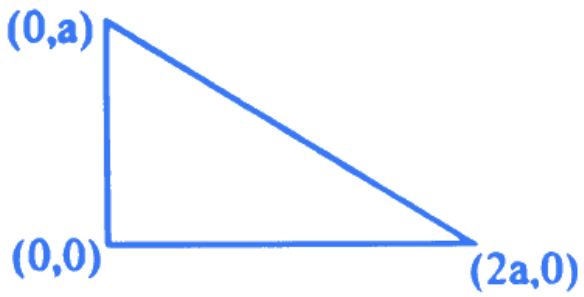
(C) $Y = 0.2\sin(\frac{t}{2})$ (D) $Y = 0.2\sin(2t)$

31. An inductor of $(\frac{100}{\pi})$ mH, capacitor of capacitance $(\frac{10^{-3}}{2\pi})$ F and resistance of 10Ω are connected in series with an AC voltage source of 110 V, 50 Hz supply. The tangent of the phase angle ' ϕ ' between voltage and current is

(A) 4 (B) 3

(C) 2 (D) 1

32. Three rods of same mass are placed as shown in figure. The co-ordinates of centre of mass of the system are



(A) $(\frac{a}{3}, \frac{a}{3})$ (B) $(a, \frac{a}{2})$

(C) $(2a, \frac{a}{2})$ (D) $(\frac{2a}{3}, \frac{a}{3})$

33. A charge is uniformly distributed on the surface of a spherical rubber balloon. As it is blown up, the total electric flux coming out of the surface

(A) decreases. (B) increases.

(C) remains unchanged. (D) becomes zero.

34. Resolving power of a telescope can be increased by increasing

(A) the diameter of eyepiece. (B) the wavelength of light.

(C) the focal length of eye-piece. (D) the diameter of the objective.

35. The ratio of the total energy of the 2^{nd} orbit electron for the hydrogen atom (^{1}H) to that of a helium ion (He^+) is :

(A) 4 (B) 2

(C) $\frac{1}{2}$ (D) $\frac{1}{4}$

36. An organ pipe closed at one end has fundamental frequency of 1500 Hz . The maximum number of overtones generated by this pipe which a normal person can hear is (Normal man can hear the frequency up to 19.5 kHz , Neglect end correction)

(A) 6 (B) 3

(C) 13 (D) 11

37. The outer surface of star in the form of a sphere radiates heat as a black body at temperature ' T '. The total radiant energy per unit area, normal to the direction of incidence, received at a distance ' R ' from the centre of a star of radius ' r ' is $(R > r)(\sigma =$ Stefan's constant)

(A) $\frac{\sigma r^2 \mathrm{T}^4}{\mathrm{R}^2}$ (B) $\frac{\sigma r^2 T^4}{4\pi R^2}$

(C) $\frac{\sigma r^2 \mathrm{T}^4}{\mathrm{R}^4}$ (D) $\frac{4\pi\sigma r^2 T^4}{R^2}$

38. The magnetic field (B) inside a long solenoid having ' n ' turns per unit length and carrying current ' i ' when iron core is kept in it, is ($\mu_0 =$ permeability of vacuum, $\chi =$ magnetic susceptibility)

(A) $\mu_0 \mathrm{ni}(1+\chi)$ (B) $\mu_0 \mathrm{ni}^2(1+\chi)$

(C) $\mu_0 ni\chi$ (D) $\mu_0 \mathrm{ni}(1-\chi)$

39. A gas having $\gamma = \frac{5}{2}$ and volume 360 c.c. is suddenly compressed to 90 c.c. If the initial pressure of the gas is P , then the final pressure will be

(A) $\frac{\mathrm{P}}{4}$ (B) 8 P

(C) 16 P (D) 32 P

40. In Young's double slit experiment, the intensity on screen at a point, where path difference is $\frac{\lambda}{4}$ is $\frac{K}{4}$. The intensity at a point when path difference is ' λ ' will be $\left[\cos\frac{\pi}{2} = 0, \cos 2\pi = 1\right]$

(A) 4 K (B) 2 K

(C) K (D) $\frac{\mathrm{K}}{2}$

41. When LED is manufactured by using aluminium gallium arsenide (AlGaAs), it emits

(A) ultra-violet light (B) infra red radiation

(C) green light (D) blue light

42. A simple pendulum starts oscillating simple harmonically from its mean position (x = 0) with amplitude ' a ' and periodic time ' T '. The magnitude of velocity of pendulum at $x = \frac{a}{2}$ is

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

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

43. A coil having ' N ' turns and resistance ' R ' Ω is connected to a galvanometer of resistance ' 6 R ' Ω. The magnetic flux linked with this coil changes from ϕ_1 weber to ϕ_2 weber in time ' t ' second. The induced current in the circuit is

(A) $\frac{N(\varrho_2-\varrho_1)}{t}$ (B) $\frac{N(\varrho_2-\varrho_1)}{7Rt}$

(C) $\frac{N(\varrho_2-\varrho_1)}{Rt}$ (D) $\frac{N(\varrho_2-\varrho_1)}{6Rt}$

44. Energy of the incident photons on the metal surface is initially 4 W and then 6 W where W is the work function of that metal. The ratio of velocities of emitted photoelectrons is

(A) $\sqrt{3}:\sqrt{5}$ (B) $1:2$

(C) $2:3$ (D) $\sqrt{2}:\sqrt{3}$

45. The distance between two consecutive points with phase difference of 45° in a wave of frequency 300 Hz is 4.0 m . The velocity of the travelling wave is (in km/s)

(A) 1.6 (B) 3.6

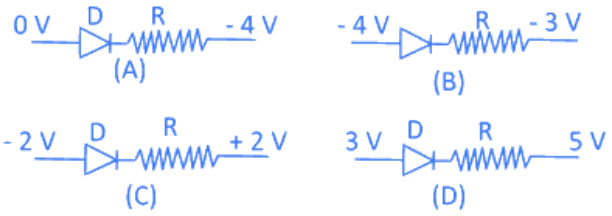
(C) 4.8 (D) 9.6

46. A ball is dropped on the floor from a height of 20 m . It rebounds to a height of 5 m . Ball remains in contact with floor for 1 s . The average acceleration during contact is (acceleration due to gravity $= 10\ \mathrm{m/s^2}$)

(A) $30\ \mathrm{m/s^2}$ (B) $20\ \mathrm{m/s^2}$

(C) $40\ \mathrm{m/s^2}$ (D) $35\ \mathrm{m/s^2}$

47. Which of the following figure represents forward bias diode?



(A) A (B) C

(C) D (D) B

48. The length of steel rod is 5 cm longer than the copper rod at all temperatures. The length of the steel and copper rod is respectively (Coefficient of linear expansion for steel and copper is respectively $1.1\times10^{-5}/^\circ\mathrm{C}$ and $1.7\times10^{-5}/^\circ\mathrm{C}$)

(A) nearly 15 cm and 10 cm (B) nearly 14 cm and 9 cm

(C) nearly 12 cm and 7 cm (D) nearly 13 cm and 8 cm

49. An AND gate is followed by a NOT gate in series. With two inputs ' A ' and ' B ', the Boolean expression for the output ' Y ' will be

(A) $\overline{\mathrm{A}+\mathrm{B}}$ (B) $\overline{\mathrm{A}\cdot\mathrm{B}}$

(C) $\mathrm{A}\cdot\mathrm{B}$ (D) $\mathrm{A}+\mathrm{B}$

50. A uniform sphere has radius ' R ' and mass ' M '. The magnitude of gravitational field at distances ' r_1 ' and ' r_2 ' from the centre of the sphere are ' E_1 ' and ' E_2 ' respectively. The ratio $E_1:E_2$ is ($r_1>R$ and $r_2<R$)

(A) $\frac{R^2}{r_1^2r_2}$ (B) $\frac{R^3}{r_1r_2}$

(C) $\frac{R^3}{r_1^2r_2}$ (D) $\frac{R^3}{r_1r_2^2}$

51. Which of the following statements is NOT correct regarding order of reaction?

(A) It is determined experimentally.
(B) It is not influenced by stoichiometric coefficient of reactants.
(C) It is sum of power to the concentration terms of reactants in rate law equation.
(D) It is always whole number.

52. Identify cross linked polymer from following.

(A) High density polythene
(B) Low density polythene
(C) Melamine
(D) PVC

53. Which of the following forces is involved in dinitrogen?

(A) Dipole - dipole interaction
(B) Dipole - induced dipole interaction
(C) London dispersion force
(D) Hydrogen bonding

54. Which among the following is dicarboxylic acid?

(A) Valeric acid
(B) Caproic acid
(C) Glutaric acid
(D) Butyric acid

55. Calculate the edge length of unit cell if metal having atomic radius 170 pm forms simple cubic unit cell.

(A) 1.17×10^{-8} cm
(B) 3.40×10^{-8} cm
(C) 5.12×10^{-8} cm
(D) 6.81×10^{-8} cm

56. Calculate the frequency in Hz of orange colour light having wavelength 600 nm .

$$\left[C = 3 \times 10^{8}\ ms^{-1}\right]$$

(A) 5.4×10^{14} Hz
(B) 5.0×10^{14} Hz
(C) 5.8×10^{14} Hz
(D) 6.2×10^{14} Hz

57. Which from following statements is NOT correct regarding tannins?

(A) These avoid browning of freshly cut potato.
(B) These are formed from polyphenols.
(C) These are obtained by polymerisation of quinones.
(D) These are generated after cutting fruits or vegetables.

58. Calculate the solubility of gas in solvent at 25°C and 0.8 atm if Henry's law constant for solvent is 6.8×10^{-4} $moldm^{-3}$ atm^{-1}.

(A) 5.88×10^{-4}M
(B) 6.12×10^{-4}M
(C) 5.44×10^{-4}M
(D) 6.48×10^{-4}M

59. Identify the correct order of acidity of hydrides of 16^{th} group elements from the following.

(A) $H_2O > H_2S > H_2Se > H_2Te$
(B) $H_2Te > H_2O > H_2S > H_2Se$
(C) $H_2Te > H_2Se > H_2S > H_2O$
(D) $H_2Te > H_2Se > H_2O > H_2S$

60. Which from following elements belongs to inner transition elements?

(A) Cm
(B) W
(C) Mo
(D) Ru

61. Which of the following is NOT a characteristic of chemisorption?

(A) It is specific.
(B) Heat released is in the range of $40 - 200$ kJ/mol
(C) Formation of multimolecular layer of adsorbate.
(D) It is irreversible.

62. Identify a side chain (R) group present in Leucine, an amino acid.

(A) H–
(B) $-CH_3$
(C) Me_2CH-
(D) $Me_2CH - CH_2-$

63. What is half life of a first order reaction if time required to decrease concentration of reactant from 0.4 M to 0.1 M is x hour?

(A) x hour
(B) $2x$ hour
(C) $\frac{x}{2}$ hour
(D) $\frac{3x}{2}$ hour

64. Identify ' A ' in the following reaction.

$$\text{A} + \text{Acetyl chloride} \xrightarrow[\text{AlCl}_3]{\text{anhydrous}} \text{2-Chloroacetophenone} + \text{4-Chloroacetophenone}$$

(A) Benzene (B) Chlorobenzene
(C) Toluene (D) Phenol

65. Calculate osmotic pressure of 0.1 M aqueous solution of an electrolyte at 300 K if van't Hoff factor is 1.125. $[\text{R} = 0.0821\ \text{atmdm}^3\ \text{K}^{-1}\ \text{mol}^{-1}]$

(A) 2.15 atm (B) 2.41 atm
(C) 2.77 atm (D) 3.25 atm

66. Which from following gases causes the depletion of ozone layer in upper atmosphere?

(A) NO (B) NO_2
(C) N_2O (D) N_2O_5

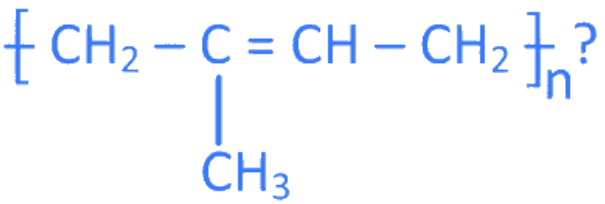
67. Which from following complexes contains anionic ligand?

(A) Tetraamminecopper (II) ion
(B) Pentaammineaquacobalt (III) iodide
(C) Tetracyanonickelate (II) ion
(D) Pentacarbonyliron(0)

68. Find principle of green chemistry to show protection of selective group is not advantageous.

(A) Use of renewable feed stock (B) Reduce number of derivatives
(C) Use of catalysis (D) Design for degradation

69. What is the name of monomer used in the formation of a polymer



(A) Isoprene (B) Tetrafluoroethylene
(C) Acrylonitrile (D) Caprolactum

70. Which of the following is obtained as major product when excess of methane is treated with limited chlorine in presence of UV light?

(A) Chloromethane (B) Dichloromethane
(C) Trichloromethane (D) Tetrachloromethane

71. What type of alcohol is the crotonyl alcohol?

(A) Allylic alcohol (B) Benzylic alcohol
(C) Vinylic alcohol (D) Polyhydric alcohol

72. What type of solution is the H_2 in palladium?

(A) Gas as solute and solid as solvent (B) Gas as solute and liquid as solvent
(C) Gas as solvent and solid as solute (D) Liquid as solute and gas as solvent

73. Identify conjugate acid and conjugate base for HCO_3^- ion respectively

(A) CO_3^{2-} and H_2CO_3 (B) H_2CO_3 and CO_2
(C) CO_2 and H_2CO_3 (D) H_2CO_3 and CO_3^{2-}

74. Which from following complexes does NOT obey EAN rule?

(A) $[Co(NH_3)_6]^{3+}$ (B) $Cr(CO)_6$
(C) $[Zn(NH_3)_4]^{2+}$ (D) $[Cu(NH_3)_4]^{2+}$

75. Identify catalyst used in following reaction.

$$CO_{(g)} + H_2O_{(g)} \xrightarrow{623\ K} CO_{2(g)} + H_{2(g)}$$

(A) Iron chromate (B) Vanadium pentoxide
(C) Ni metal (D) Traces of acid or alkali

76. Which of the following reagents is used in the preparation of nitroalkane from haloalkane?

(A) Potassium cyanide (B) Sodium nitrite
(C) Potassium nitrite (D) Silver nitrite

77. What is percent dissociation of NH_4OH if molar conductance at zero concentration for NH_4Cl, NaCl and NaOH are 130, 109 and 213 S cm^2 mol^{-1} respectively and molar conductivity of 0.01 M NH_4OH is 9.0 S cm^2 mol^{-1} ?

(A) $\frac{100}{40}$ (B) $\frac{100}{35}$
(C) $\frac{100}{32}$ (D) $\frac{100}{26}$

78. Identify the reagent used for Rosenmund reduction.

(A) H_2/Ni (B) $H_2/Pd, BaSO_4$
(C) $Na - Hg/H_2O$ (D) $SnCl_2 - H_2O$

79. Calculate the work done in the oxidation of one mole $HCl_{(g)}$ at 27°C, according to reaction.

$$4HCl_{(g)} + O_{2(g)} \longrightarrow 2Cl_{2(g)} + 2H_2O_{(g)}$$

$$\left(R = 8.314\ J\ K^{-1}\ mol^{-1}\right)$$

(A) 2494.2 J (B) 623.6 J
(C) 1247.1 J (D) 1870.7 J

80. Find the concentration of sodium acetate when added to 0.1 M solution of acetic acid to form a buffer solution of pH = 5.5 ?
(pK_a of $CH_3COOH = 4.5$)

(A) 0.1 M (B) 0.01M
(C) 1.0 M (D) 10.0 M

81. Which actinoid from following in its +3 state has largest size?

(A) U (B) Bk
(C) Es (D) Md

82. Which of the following halogens does always show oxidation state -1 ?

(A) Cl (B) F
(C) Br (D) I

83. Which from following carbohydrates produces glucose, galactose and fructose on hydrolysis?

(A) Maltose (B) Stachyose
(C) Raffinose (D) Lactose

84. What is degree of dissociation of CH_3COOH if, $\wedge^\circ\left(CH_3COO^-\right) = 50\ S\ cm^2\ mol^{-1}$, $\wedge^\circ\left(H^+\right) = 350\ S\ cm^2\ mol^{-1}$ and molar conductivity of $5 \times 10^{-2}M CH_3COOH$ is $20\ S\ cm^2\ mol^{-1}$?

(A) 1.25×10^{-4} (B) 5×10^{-2}
(C) 1.25×10^{-2} (D) 5×10^{-4}

85. Identify the reaction so that carbonyl group of aldehydes and ketones is reduced to methylene group on treatment with Zinc-amalgam and concentrated hydrochloric acid.

(A) Wolf-Kishner reduction. (B) Stephan reaction.
(C) Clemmensen reduction. (D) Etard reaction.

86. Which of the following dopant is added in silicon to obtain n-type semiconductor?

(A) As (B) B
(C) Ga (D) In

87. Which from following is an example of an intensive property of the system?

(A) Volume (B) Enthalpy
(C) Entropy (D) Molar volume

88. What is the number of hydrogen atoms present in 5.4 g of urea?

(A) 9.011×10^{23} (B) 6.022×10^{23}
(C) 2.168×10^{23} (D) 3.011×10^{23}

89. What is the order of reactivity of alkyl halides with ammonia?

(A) R − Cl > R − Br > R − I
(B) R − Br > R − I > R − Cl
(C) R − I > R − Br > R − Cl
(D) R − Cl > R − I > R − Br

90. For the reaction,

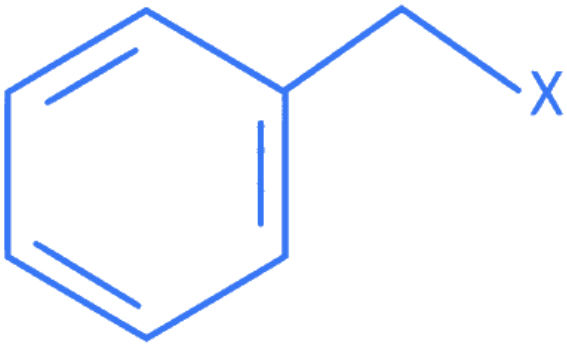
$$2\ N_2O_{5(g)} \longrightarrow 4NO_{2(g)} + O_{2(g)}$$

N_2O_5 disappears at a rate of $x\ moldm^{-3}\ s^{-1}$
Find the rate of formation of O_2 ?

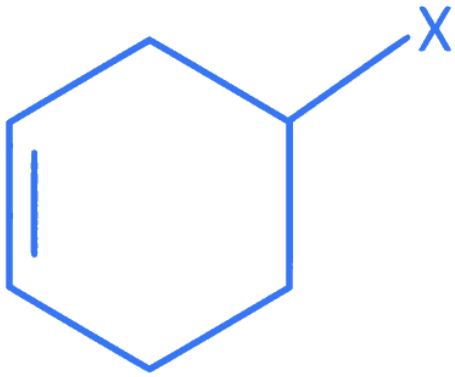
(A) $x\ moldm^{-3}\ s^{-1}$ (B) $2x\ moldm^{-3}\ s^{-1}$
(C) $\frac{x}{2}\ moldm^{-3}\ s^{-1}$ (D) $\frac{3x}{2}\ moldm^{-3}\ s^{-1}$

91. Which among the following is haloarene?

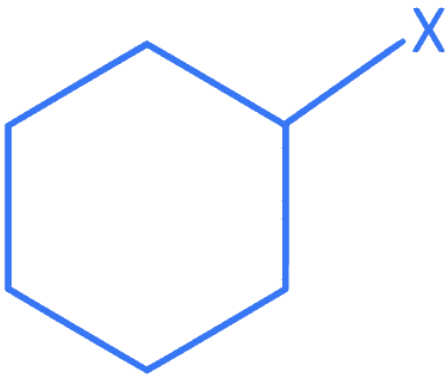
(A)



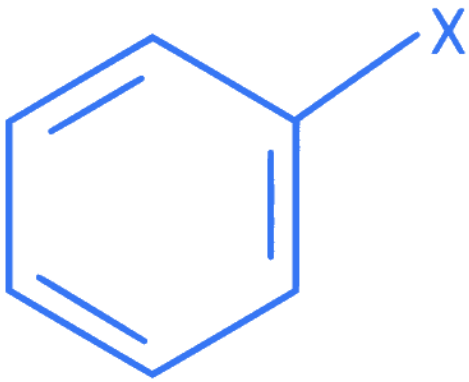
(B)



(C)



(D)



92. Which of the following molecules does not obey octet rule?

(A) CO_2 (B) $CHCl_3$

(C) ClF_3 (D) NH_3

93. Which of the following on reaction with Grignards reagent followed by hydrolysis forms tertiary alcohol?

(A) Methanal (B) Ethanal

(C) Propanal (D) Propanone

94. In an ionic solid anions are arranged in hcp array and cations occupy $\frac{2}{3}$ of octahedral voids. What is the formula of ionic compound? [consider A = cation; B = anion]

(A) AB (B) A_2B_3

(C) A_3B_2 (D) AB_3

95. For a certain reaction $\Delta H = -225$ kJ and $\Delta S = -150 JK^{-1}$. Find the temperature so that ΔG is zero.

(A) 1500 K (B) 1450 K

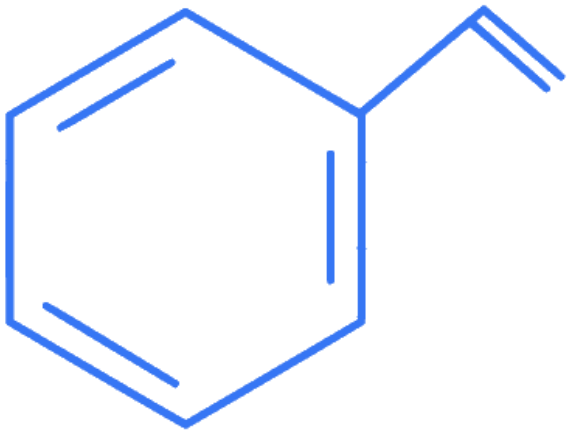
(C) 1340 K (D) 1300 K

96. Calculate the ionisation constant of 0.08 $moldm^{-3}$ of a monobasic acid having pH = 2.

(A) 3.531×10^{-7} (B) 2.081×10^{-6}

(C) 3.456×10^{-8} (D) 1.25×10^{-3}

97. What is the number of moles of ' C ' and ' H ' atoms respectively present in n mole molecule represented by following structure?



(A) $6n$ and $6n$ (B) $6n$ and $8n$

(C) $8n$ and $8n$ (D) $7n$ and $9n$

98. Identify the product obtained when nitro ethane is treated with $Sn - HCl$ under ideal conditions.

(A) Ethanamine (B) Acetamide

(C) Formamide (D) Methanamine

99. What is the SI unit of resistivity?

(A) Ωm (B) Ωm^{-1}

(C) $\Omega^{-1}\ m^{-1}$ (D) Ωm^{-2}

100. Which of the following is trihydric phenol?

(A) Catechol (B) Pyrogallol

(C) Resorcinol (D) Quinol

101. The negation of statement pattern $(p \wedge \sim q) \rightarrow (p \vee \sim q)$ is

(A) a tautology (B) a contingency
(C) a contradiction (D) equivalent to $p \vee q$

102. If the line $3x + 4y - 24 = 0$ intersects X and Y axes in points A and B respectively then incentre of the triangle OAB where O is origin is

(A) $(4, 4)$ (B) $(2, 2)$
(C) $(3, 4)$ (D) $(4, 3)$

103. The area of the triangle formed by the co-ordinate axes and a tangent to the curve $xy = a^2$ at the point (x_1, y_1) is _____ sq. units (where a, x_1 and y_1 are non-zero)

(A) $\frac{a^2 x_1}{y_1}$ (B) $\frac{a^2 y_1}{x_1}$
(C) $2a^2$ (D) $4a^2$

104. The co-ordinates of the point in which line joining $(1, 1, 1)$ and $(2, 2, 2)$ intersects the plane $x + y + z = 9$ are

(A) $(3, 4, 2)$ (B) $(2, 3, 4)$
(C) $(3, 2, 4)$ (D) $(3, 3, 3)$

105. The minimum value of the slope of the tangent to curve $y = x^3 - 3x^2 + 2x + 93$ is

(A) 1 (B) -1
(C) 2 (D) -2

106. If $f(x) = \begin{cases} \frac{9^x - 2 \cdot 3^x + 1}{\log(1+3x) \cdot \tan 2x} & , \text{if } x \neq 0 \\ a(\log b)^c & , \text{if } x = 0 \end{cases}$ is continuous at $x = 0$, then $a + b + c =$

(A) $\frac{31}{6}$ (B) $\frac{1}{6}$
(C) $\frac{5}{6}$ (D) $\frac{3}{20}$

107. If $x = \tan^{-1}\left\{\frac{\sqrt{1+t^2}-1}{t}\right\}, y = \cos^{-1}\left\{\frac{1-t^2}{1+t^2}\right\}$, then $\frac{dy}{dx}$ is equal to

(A) 2 (B) $\frac{1}{2}$
(C) 4 (D) $\frac{1}{4}$

108. Define $f(x) = \begin{cases} b - ax & , \text{if } x < 2 \\ 3 & , \text{if } x = 2 \\ a + 2bx & , \text{if } x > 2 \end{cases}$ and if $\lim_{x \to 2} f(x)$ exists, then $\frac{a}{b} =$

(A) 1 (B) -1
(C) $\frac{2}{3}$ (D) $\frac{3}{2}$

109. The function $f(x) = \sec\left[\log\left(x + \sqrt{1 + x^2}\right)\right]$ is_____function

(A) even (B) odd
(C) neither even nor odd (D) square

110. The value of ${}^{47}C_4 + \sum_{j=1}^{5} {}^{(52-j)}C_3$ is

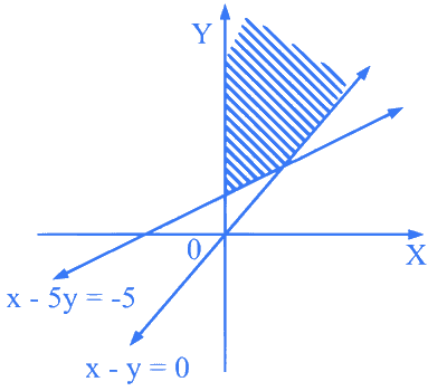
(A) ${}^{52}C_4$ (B) ${}^{52}C_2$
(C) ${}^{48}C_4$ (D) ${}^{48}C_2$

111. Derivative of $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \ldots \ldots \ldots \ldots \ldots \ldots \infty}}}$ is

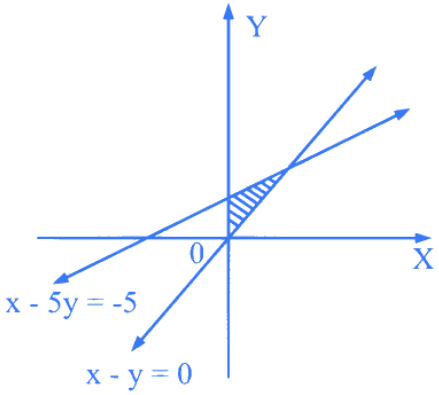
(A) $\frac{\sin x}{1-2y}$ (B) $\frac{\cos x}{1-2y}$
(C) $\frac{\sin x}{1+2y}$ (D) $\frac{\cos x}{2y-1}$

112. The feasible region for the constraints $x - y \geq 0, x - 5y \leq -5, x \geq 0, y \geq 0$ is shown by the figure:

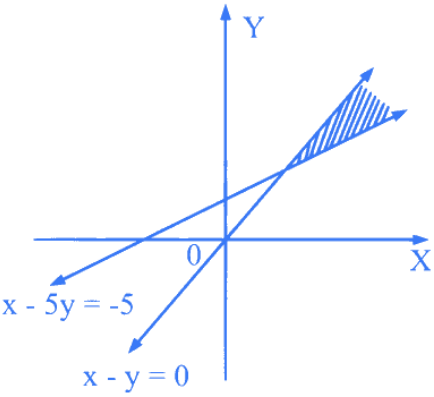
(A)



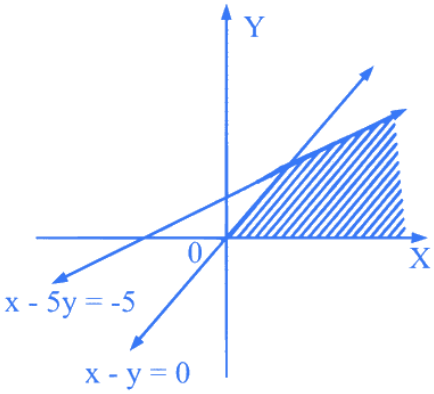
(B)



(C)



(D)



113. The area of the triangle whose vertices are i, ω and ω^2 is (Where ω is a complex cube root of unity other than $1, i$ is an imaginary number)_____ sq.units

(A) $\frac{3\sqrt{3}}{4}$ (B) $\frac{\sqrt{3}}{2}$

(C) $\frac{3\sqrt{3}}{2}$ (D) $\frac{\sqrt{3}}{4}$

114. Three numbers are chosen at random from numbers 1 to 20 . The probability that they are consecutive is

(A) $\frac{1}{190}$ (B) $\frac{1}{120}$

(C) $\frac{3}{190}$ (D) $\frac{5}{190}$

115. The approximate value of $\frac{1}{(2.002)^2}$ is

(A) 0.2495 (B) 0.2595

(C) 0.2095 (D) 0.2392

116. The equation of plane passing through $(1, 0, 0)$ and $(0, 1, 0)$ and making an angle 45° with the plane $x + y - 3 = 0$ is

(A) $x + y \pm \sqrt{2}\ z - 1 = 0$

(B) $3x + y \pm \sqrt{3}z - 3 = 0$

(C) $x + y \pm \sqrt{3}z - 1 = 0$

(D) $2x + 2y \pm \sqrt{3}z - 2 = 0$

117. The distance of the point $(5, 3, -1)$ from the plane passing through points $(2, 1, 0), (3, -2, 4)$ and $(1, -3, 3)$ is

(A) $\frac{2}{\sqrt{3}}$ units (B) $\frac{4}{\sqrt{3}}$ units

(C) $\sqrt{3}$ units (D) $\frac{1}{\sqrt{3}}$ units

118.

$$\int \frac{dx}{\cos x(1 + \cos x)} =$$

(A) $\log(\sec x + \tan x) + 2\tan(\frac{x}{2}) + c$, where c is the constant of integration

(B) $\log(\sec x + \tan x) - 2\tan(\frac{x}{2}) + c$, where c is the constant of integration

(C) $\log(\sec x + \tan x) + \tan(\frac{x}{2}) + c$, where c is the constant of integration

(D) $\log(\sec x + \tan x) - \tan(\frac{x}{2}) + c$, where c is the constant of integration

119. Two cards are drawn successively with replacement from fair playing 52 cards. let X denote number of kings obtained when two cards are drawn, then $\mathrm{E}\left(\mathrm{X}^2\right) =$

(A) $\frac{24}{169}$ (B) $\frac{26}{169}$
(C) $\frac{27}{169}$ (D) $\frac{28}{169}$

120. The eccentric angle of the point $\mathrm{P}(-6, 2)$ of the ellipse $\frac{x^2}{48} + \frac{y^2}{16} = 1$ is

(A) $30°$ (B) $135°$
(C) $150°$ (D) $120°$

121. If one of the diameters of the circle, given by the equation $x^2 + y^2 - 4x + 6y - 12 = 0$, is a chord of a circle, ' S ', whose centre is at $(-3, 2)$, then the length of radius of ' S ' is _____ units.

(A) 5 (B) $5\sqrt{2}$
(C) $5\sqrt{3}$ (D) 10

122. The area of the region bounded by the parabola $y^2 = 27x$ and the line $x = 1$ is _____ sq.units.

(A) $2\sqrt{3}$ (B) $3\sqrt{3}$
(C) $4\sqrt{3}$ (D) $7\sqrt{3}$

123. If $\sin(\alpha + \beta) = 1, \sin(\alpha - \beta) = \frac{1}{2}, \alpha, \beta \in \left[0, \frac{\pi}{2}\right]$, then $\tan(\alpha + 2\beta) \cdot \tan(2\alpha + \beta) =$

(A) 1 (B) -1
(C) 0 (D) 4

124. The value of $\int_0^{\pi} \left|\sin^3 x\right| \mathrm{d}x$ is

(A) 0 (B) $\frac{3}{8}$
(C) $\frac{4}{3}$ (D) π

125. The population p of the city at time t is given by $\frac{\mathrm{dp}}{\mathrm{dt}} = \frac{\mathrm{p}}{2} - 100$. If initial population is 100 then $\mathrm{p} =$

(A) $200 + 100\mathrm{e}^{\frac{t}{2}}$ (B) $200 - 100\mathrm{e}^{\frac{t}{2}}$
(C) $300 - 100\mathrm{e}^{\frac{t}{2}}$ (D) $300 + 100\mathrm{e}^{\frac{t}{2}}$

126.

$$\int_0^1 \log(x+1)dx =$$

(A) $\log 2 - 1$ (B) $\log 2 + 1$
(C) $2\log 2 + 1$ (D) $2\log 2 - 1$

127. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ where $a = 7^x, b = 7^{7^x}, c = 7^{7^{7^x}}$ then $\int |A| dx$, (Where $|A|$ is the determinant of the matrix A) is equal to

(A) $\frac{7^{7^x}}{(\log 7)^3} + \mathrm{k}$, where k is constant of integration
(B) $\frac{7^{7^{7^x}}}{\log 7} + \mathrm{k}$, where k is constant of integration
(C) $\frac{7^{7^{7^x}}}{(\log 7)^3} + \mathrm{k}$, where k is constant of integration
(D) $7^{7^{7^x}} (\log 7)^3 + \mathrm{k}$, where k is constant of integration

128. $\int \frac{\sin 7x}{\cos 9x \cos 2x} \mathrm{d}x$ is equal to

(A) $\log\sec(9x) - \log\sec(2x) + \mathrm{c}$, where c is the constant of integration
(B) $\log\sec(9x) + \log\sec(2x) + \mathrm{c}$, where c is the constant of integration
(C) $\frac{1}{9}\log\sec(9x) - \frac{1}{2}\log\sec(2x) + \mathrm{c}$, where c is the constant of integration
(D) $\frac{1}{9}\log\sec(9x) + \frac{1}{2}\log\sec(2x) + \mathrm{c}$, where c is the constant of integration

129. The solution of the equation $\frac{\mathrm{dy}}{\mathrm{dx}} = \frac{1}{x+y+1}$ is

(A) $x = \log(x + y + 2) + \mathrm{c}$, where c is the constant of integration
(B) $x = \log(x + y - 2) + \mathrm{c}$, where c is the constant of integration
(C) $y = \log(x + y + 2) + c$, where c is the constant of integration
(D) $y = \log(x + y - 2) + \mathrm{c}$, where c is the constant of integration

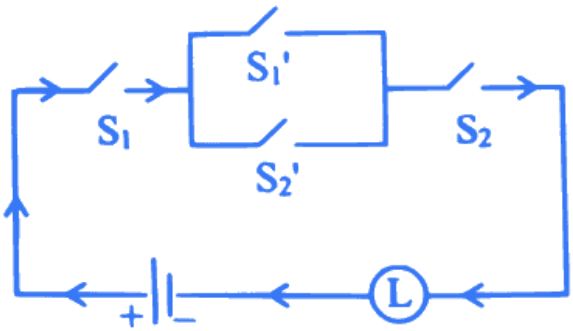
130. A spherical balloon is filled with 4500π cubic meters of helium gas. If a leak in the balloon causes the gas to escape at the rate of 72π cubic meters per minute, then the rate (in meters per minute) at which the radius of the balloon decreases 49 minutes after the leakage has begun, is

(A) $\frac{9}{7}$ (B) $-\frac{2}{9}$
(C) $\frac{9}{2}$ (D) $\frac{2}{9}$

131. If $x \cdot \log_e(\log_e x) - x^2 + y^2 = 4 (y > 0)$, then $\frac{dy}{dx}$ at $x = \mathrm{e}$ is

(A) $\frac{\mathrm{e}}{\sqrt{4+\mathrm{e}^2}}$ (B) $\frac{2\mathrm{e}-1}{2\sqrt{4+\mathrm{e}^2}}$
(C) $\frac{1+2e}{\sqrt{4+e^2}}$ (D) $\frac{1+2\mathrm{e}}{2\sqrt{4+\mathrm{e}^2}}$

132. If p : switch S_1 is closed, q : switch S_2 is closed then correct interpretation from the following circuit is



(A) The lamp is always on
(B) The lamp is always off
(C) Symbolic form is $p \vee (\sim p \wedge \sim q) \vee q$
(D) is equivalent to $p \vee q$

133. The solution of $\log\left(\frac{dy}{dx}\right) = 2x - 5y, y(0) = 0$ is

(A) $2e^{2x} + 5e^{5y} = 6$
(B) $5e^{2x} - 2e^{5y} = 3$
(C) $2e^{2x} - 5e^{5y} = 6$
(D) $5e^{2x} + 2e^{5y} = 3$

134. The integrating factor of the differential equation $x\frac{dy}{dx} + y\log x = x \cdot e^x x^{-\frac{1}{2}} \log x (x > 0)$ is

(A) $(\log x)^x$
(B) $x^{\log x}$
(C) $(\sqrt{x})^{\log x}$
(D) $e^{\sqrt{x}\log x}$

135. ABCD is a quadrilateral with $\overline{AB} = \overline{a}, \overline{AD} = \overline{b}$ and $\overline{AC} = 2\overline{a} + 3\overline{b}$. If its area is α times the area of the parallelogram with AB, AD as adjacent sides, then the value of α is

(A) $\frac{1}{2}$
(B) $\frac{5}{2}$
(C) $\frac{3}{2}$
(D) 2

136. The equation of a line passing through the point $(-1, 2, 3)$ and perpendicular to the lines $\frac{x}{2} = \frac{y-1}{-3} = \frac{z+2}{-2}$ and $\frac{x+3}{-1} = \frac{y+3}{2} = \frac{z-1}{3}$ is

(A) $\frac{x+1}{5} = \frac{y-2}{-4} = \frac{z+3}{1}$
(B) $\frac{x+1}{5} = \frac{y+2}{4} = \frac{z+3}{1}$
(C) $\frac{x+1}{5} = \frac{y-2}{4} = \frac{z-3}{-1}$
(D) $\frac{x+1}{1} = \frac{y-2}{4} = \frac{z-3}{3}$

137. If $A = \begin{bmatrix} 1 & -2 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$ then $A(I + \text{adj } A) =$

(A) $\begin{bmatrix} 9 & -2 & 2 \\ 0 & 10 & -3 \\ 3 & -2 & 11 \end{bmatrix}$
(B) $\begin{bmatrix} 8 & -2 & 2 \\ 0 & 9 & -3 \\ 3 & -2 & 10 \end{bmatrix}$
(C) $\begin{bmatrix} 9 & -2 & 2 \\ 0 & 10 & -3 \\ 3 & -2 & 12 \end{bmatrix}$
(D) $\begin{bmatrix} 3 & 2 & -2 \\ 0 & 10 & 3 \\ -3 & 2 & 12 \end{bmatrix}$

138. A line L is passing through points A(1, 3, 2) and B(2, 2, 1). If mirror image of point P(1, 1, −1) in the line L is (x, y, z) then $x + y + z =$

(A) $\frac{10}{3}$
(B) $\frac{13}{3}$
(C) $\frac{14}{3}$
(D) $\frac{23}{3}$

139. If $\overline{c} = 5\overline{a} + 6\overline{b}$ and $3\overline{c} = \overline{a} - 4\overline{b}$ then

(A) $\overline{a}, \overline{b}, \overline{c}$ are non-collinear
(B) $\bar{a}, \bar{b}, \bar{c}$ are in the same direction
(C) $\bar{a}, \bar{c}$ are in the same direction but $\bar{a}, \bar{b}$ are in the opposite direction
(D) $\bar{c}, \bar{b}$ are in the opposite direction and $\bar{a}, \bar{b}$ are in the same direction

140. The equation $x^2 - 3xy + 2y^2 + 3x - 5y + 2 = 0$ represents a pair of straight lines. If θ is the angle between them, then the value of $\cos\theta$ is equal to

(A) $\frac{1}{3\sqrt{2}}$
(B) $\frac{3}{\sqrt{10}}$
(C) $\frac{2}{\sqrt{10}}$
(D) $\frac{1}{5\sqrt{2}}$

141.

$\cot^{-1}\left(2 \cdot 1^2\right) + \cot^{-1}\left(2 \cdot 2^2\right) + \cot^{-1}\left(2 \cdot 3^2\right) + \ldots \ldots \ldots \infty =$

(A) $\frac{\pi}{2}$
(B) $\frac{\pi}{3}$
(C) $\frac{\pi}{4}$
(D) $\frac{\pi}{8}$

142. With usual notation, in a triangle ABC $\frac{b+c}{11} = \frac{c+a}{12} = \frac{a+b}{13}$, then the value of $\cos B$ is equal to

(A) $\frac{17}{35}$
(B) $\frac{17}{70}$
(C) $\frac{19}{35}$
(D) $\frac{19}{70}$

143. If $\overline{a} = \frac{1}{\sqrt{10}}(3\hat{i} + \hat{k}), \overline{b} = \frac{1}{7}(2\hat{i} + 3\hat{j} - 6\hat{k})$, then the value of $(\overline{a} - 2\overline{b}) \cdot \{(\overline{a} \times \overline{b}) \times (2\overline{a} + \overline{b})\}$ is

(A) 5
(B) -5
(C) 3
(D) -3

144. The vectors $\bar{p} = \hat{i} + a\hat{j} + a^2\hat{k}, \bar{q} = \hat{i} + b\hat{j} + b^2\hat{k}$ and $\bar{r} = \hat{i} + c\hat{j} + c^2\hat{k}$ are non-coplanar and $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$ then the value of (abc) is

(A) 0 (B) -1

(C) 1 (D) 2

145. Two adjacent sides of a parallelogram $ABCD$ are given by $\overline{AB} = 2\hat{i} + 10\hat{j} + 11\hat{k}$ and $\overline{AD} = -\hat{i} + 2\hat{j} + 2\hat{k}$. The side AD is rotated by an acute angle α in the plane of parallelogram so that AD becomes AD′. If AD′ makes a right angle with the side AB , then $\cos\alpha =$

(A) $\frac{\sqrt{17}}{8}$ (B) $\frac{\sqrt{17}}{9}$

(C) $\frac{\sqrt{17}}{13}$ (D) $\frac{\sqrt{17}}{16}$

146. The general solutions of the equation $\tan^2\theta + \sec 2\theta = 1$ are

(A) $n\pi, n\pi \pm \frac{\pi}{3}, n \in \mathbb{Z}$ (B) $n\pi, n\pi \pm \frac{\pi}{4}, n \in \mathbb{Z}$

(C) $\frac{n\pi}{4}, \frac{n\pi}{4} \pm \frac{\pi}{3}, n \in \mathbb{Z}$ (D) $n\pi, n\pi \pm \frac{\pi}{6}, n \in \mathbb{Z}$

147. In a triangle ABC, with usual notations, the sides a, b, c are such that they are roots of the equation $x^3 - 11x^2 + 38x - 40 = 0$ then $\frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c} =$

(A) $\frac{9}{16}$ (B) $\frac{3}{4}$

(C) 1 (D) $\frac{5}{16}$

148. The value of $\tan\left[2\tan^{-1}\frac{1}{5} - \frac{\pi}{4}\right]$ is

(A) $\frac{5}{4}$ (B) $\frac{5}{16}$

(C) $\frac{-7}{17}$ (D) $\frac{7}{17}$

149. If $X \sim B(35, p)$ such that $7P(X = 0) = P(X = 1)$ then the value of $\frac{P(X=15)}{P(X=20)}$ is equal to

(A) $\frac{3125}{7776}$ (B) 3125

(C) 7776 (D) $\frac{625}{1296}$

150. A student studies for X number of hours during a randomly selected school day. The probability that X can take the values, has the following form, where k is some constant.

$$P(X = x) = \begin{cases} 0.2, & \text{if } x = 0 \\ kx, & \text{if } x = 1 \text{ or } 2 \\ k(6 - x), & \text{if } x = 3 \text{ or } 4 \\ 0, & \text{otherwise} \end{cases}$$

The probability that the student studies for at most two hours is

(A) 0.1 (B) 0.5

(C) 0.3 (D) 0.7

- End of Question Paper -