MHT CET 2024 PCM May 3 Shift 1 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 2024**, 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 ball ' A ' is projected vertically upwards with certain initial speed. Another ball 'B' of same mass is projected at an angle of 30° with vertical with the same initial speed. At the highest point, the ratio of potential energy of ball A to that of ball B will be

$$\left(\sin 90^\circ = 1, \sin 60^\circ = \cos 30^\circ = \frac{\sqrt{3}}{2}, \sin 30^\circ = \cos 60^\circ = \frac{1}{2}\right)$$

(A) 4 : 3
(B) 3 : 4
(C) 4 : 1
(D) 3 : 2

2. A small sphere oscillates simple harmonically in a watch glass whose radius of curvature is 1.6 m . The period of oscillation of the sphere in second is (acceleration due to gravity, $g = 10\ m/s^2$)

(A) 0.8π
(B) 0.6π
(C) 0.4π
(D) $0 \cdot 2\pi$

3. The path difference between two waves $Y_1 = a_1 \sin\left(\omega t - \frac{2\pi x}{\lambda}\right)$ and $Y_2 = a_2 \cos\left(\omega t - \frac{2\pi x}{\lambda} + \phi\right)$ is

(A) $\frac{\lambda\varrho}{2\pi}$
(B) $\frac{\lambda}{2\pi}(\varrho + \frac{\pi}{2})$
(C) $\frac{2\pi}{\lambda}(\varrho - \frac{\pi}{2})$
(D) $\frac{2\pi}{\lambda}\varrho$

4. Two equal point charges ' q ' each exert a force ' F ' on each other, when they are placed distance ' x ' apart in air. When the same charges are placed distance ' y ' apart in a medium of dielectric constant ' k ', they exert the same force. The ratio of distance ' y ' to ' x ' is equal to

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

5. An alternating voltage $v = 200\sqrt{2}\sin(100t)$ is connected to a $1\mu F$ capacitor through an a. c. ammeter. The reading of the ammeter shall be

(A) 10 mA
(B) 20 mA
(C) 40 mA
(D) 80 mA

6. Three charges $2q, -q$ and $-q$ are located at the vertices of an equilateral triangle. At the centre of the triangle

(A) the field is zero but potential is non-zero.
(B) the field is non-zero but potential is zero.
(C) both field and potential are zero.
(D) both field and potential are non-zero.

7. A gardening pipe having an internal radius ' R ' is connected to a water sprinkler having ' n ' holes each of radius ' r '. The water in the pipe has a speed ' v '. The speed of water leaving the sprinkler is

(A) $(\frac{R^2}{r^2})nV$
(B) $\frac{R^2 v}{nr^2}$
(C) $(\frac{nr^2}{R^2})V$
(D) $(\frac{nR^2}{r^2})V$

8. A magnetic needle of magnetic moment $6 \times 10^{-2} Am^2$ and moment of inertia $9.6 \times 10^{-5}\ kg\ m^2$ performs simple harmonic motion in a magnetic field of 0.01 T . Time taken to complete 10 oscillations is [Take $\pi = 3 \cdot 14$]

(A) 0.2512 s
(B) 2.512 s
(C) 25.12 s
(D) 251.2 s

9. In case of rotational dynamics, which one of the following statements is correct?
[$\vec{\omega}$ = angular velocity, $\vec{v}$ = linear velocity
$\vec{r}$ = radius vector, $\vec{\alpha}$ = angular acceleration
$\vec{a}$ = linear acceleration, $\vec{L}$ = angular momentum
$\vec{p}$ = linear momentum, $\bar{\tau}$ = torque,
$\vec{f}$ = centripetal force]

(A) $\vec{v} = \vec{r} \times \vec{\omega}, \vec{\alpha} = \vec{r} \times \vec{a}, \vec{L} = \vec{r} \times \vec{p}, \vec{\tau} = \vec{f} \times \vec{r}$
(B) $\vec{v} = \vec{\omega} \times \vec{r}, \vec{\alpha} = \vec{a} \times \vec{r}, \vec{L} = \vec{p} \times \vec{r}, \vec{\tau} = \vec{r} \times \vec{f}$
(C) $\vec{v} = \vec{\omega} \times \vec{r}, \vec{\alpha} = \vec{a} \times \vec{r}, \vec{L} = \vec{r} \times \vec{p}, \vec{\tau} = \vec{r} \times \vec{f}$
(D) $\vec{v} = \vec{\omega} \times \vec{r}, \vec{\alpha} = \vec{a} \times \vec{r}, \vec{L} = \vec{p} \cdot \vec{r}, \vec{\tau} = \vec{r} \times \vec{f}$

10. A convex lens of focal length ' f ' m forms a real, inverted image twice in size of the object. The object distance from the lens in metre is

(A) 0.5 f
(B) 0.66 f
(C) f
(D) 1.5 f

11. The ratio of the wavelength of a photon of energy ' E ' to that of the electron of same energy is (m = mass of an electron, c = speed of light, h = Planck's constant)

(A) $\sqrt{\frac{\mathrm{m}}{\mathrm{cE}}}$ (B) $\sqrt{\frac{2\,\mathrm{m}}{\mathrm{cE}}}$

(C) $c\sqrt{\frac{\mathrm{m}}{\mathrm{E}}}$ (D) $c\sqrt{\frac{2m}{E}}$

12. The r.m.s. velocity of hydrogen at S.T.P. is ' u ' m/s. If the gas is heated at constant pressure till its volume becomes three times, then the final temperature of the gas and the r.m.s. speed are respectively

(A) 819 K, $(\sqrt{3})$um/s (B) 1092 K, 3um/s

(C) 819 K, $\frac{\mathrm{u}}{\sqrt{3}}$ m/s (D) 1092 K, $\frac{\mathrm{u}}{3}$ m/s

13. The distance of the two planets A and B from the sun are r_A and r_B respectively. Also r_B is equal to $100r_A$. If the orbital speed of the planet A is ' v ' then the orbital speed of the planet B is

(A) $\frac{\mathrm{v}}{10}$ (B) $\frac{v}{2}$

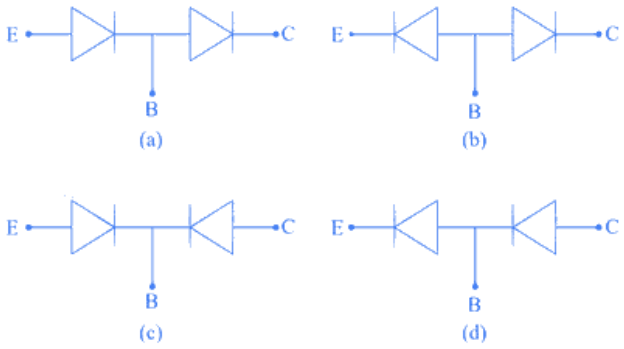
(C) $\sqrt{2}v$ (D) 10 v

14. A tube of uniform bore of cross-sectional area ' A ' has been set up vertically with open end facing up. Now ' M ' gram of a liquid of density ' d ' is poured into it. The column of liquid in this tube will oscillate with a period ' T ', which is equal to [g = acceleration due to gravity]

(A) $2\pi\sqrt{\frac{\mathrm{MA}}{\mathrm{gd}}}$ (B) $2\pi\sqrt{\frac{\mathrm{M}}{\mathrm{2Adg}}}$

(C) $2\pi\sqrt{\frac{M}{g}}$ (D) $2\pi\sqrt{\frac{M}{gdA}}$

15. An n-p-n transistor can be considered to be equivalent to two diodes connected. The correct figure out of the following is



(A) a (B) b

(C) c (D) d

16. The fundamental frequency of an air column in a pipe open at both ends is ' f_1 '. Now 80% of its length is immersed in water, the fundamental frequency of the air column becomes f_2. The ratio of $f_1 : f_2$ is

(A) 5 : 2 (B) 4 : 5

(C) 5 : 4 (D) 2 : 5

17. Earth has mass ' M_1 ' radius ' R_1 ' and for moon mass ' M_2 ' and radius ' R_2 '. Distance between their centres is ' r '. A body of mass ' M ' is placed on the line joining them at a distance $\frac{\mathrm{r}}{3}$ from the centre of the earth. To project a mass ' M ' to escape to infinity, the minimum speed required is

(A) $[\frac{2G}{r}(M_2 + \frac{M_1}{2})]^{1/2}$ (B) $[\frac{4\mathrm{G}}{\mathrm{r}}(\mathrm{M}_1 + \frac{\mathrm{M}_2}{2})]^{1/2}$

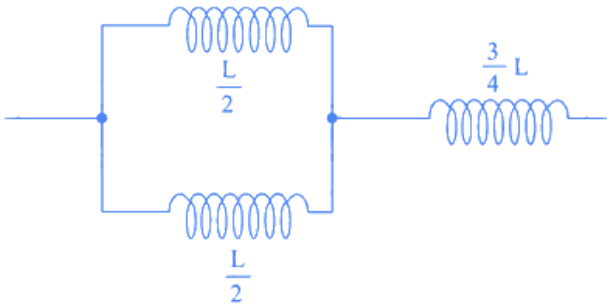
(C) $[\frac{3G}{r}(M_1 + M_2)]^{1/2}$ (D) $[\frac{6G}{r}(M_1 + \frac{M_2}{2})]^{1/2}$

18. In an interference experiment, the n^{th} bright fringe for light of wavelength $\lambda_1(\mathrm{n} = 0, 1, 2, 3\ldots)$ coincides with the m^{th} dark fringe for light of wavelength $\lambda_2(\mathrm{m} = 1, 2, 3\ldots)$. The ratio $\frac{\lambda_1}{\lambda_2}$ is

(A) $\frac{\mathrm{m}-1}{\mathrm{n}}$ (B) $\frac{2\,\mathrm{m}-1}{\mathrm{n}}$

(C) $\frac{2m-1}{2n}$ (D) $\frac{2\,\mathrm{m}+1}{2\mathrm{n}}$

19. Three inductances are connected as shown in figure. The equivalent inductance is



(A) $\frac{\mathrm{L}}{4}$ (B) $\frac{5}{4}$ L

(C) $\frac{7}{4}$ L (D) L

20. There are two samples A and B of a certain gas, which are initially at the same temperature and pressure. Both are compressed from volume v to $\frac{\mathrm{v}}{2}$. Sample A is compressed isothermally while sample B is compressed adiabatically. The final pressure of A is

(A) twice that of B. (B) equal to that of B.

(C) more than that of B. (D) less than that of B .

21. A single slit diffraction pattern is formed with light of wavelength 6195 $\overset{o}{A}$. The second secondary maximum for this wavelength coincides with the third secondary maximum in the pattern for light of wavelength ' λ_0 '. The value of ' λ_0 ' is

(A) 4180 $\overset{o}{A}$ (B) 4425 $\overset{o}{A}$

(C) 5330 $\overset{o}{A}$ (D) 6235 $\overset{o}{A}$

22. Two rods, one of aluminium and the other of steel, having initial lengths ' L_1 ' and ' L_2 ' are connected together to form a single rod of length $(L_1 + L_2)$. The coefficients of linear expansion of aluminium and steel are ' α_1 ' and ' α_2 ' respectively. If the length of each rod increases by the same amount, when their temperatures are raised by $t^{L}C$, then the ratio $\frac{L_1}{L_1+L_2}$ will be

(A) $\frac{\alpha_2}{\alpha_1}$ (B) $\frac{\alpha_1}{\alpha_2}$

(C) $\frac{\alpha_2}{\alpha_1+\alpha_2}$ (D) $\frac{\alpha_1}{\alpha_1-\alpha_2}$

23. In an a. c. generator, when the plane of the coil is perpendicular to the magnetic field

(A) magnetic flux is zero and induced e.m.f. is maximum.

(B) magnetic flux is maximum and induced e.m.f. is zero.

(C) both magnetic flux and induced e.m.f. are maximum.

(D) both magnetic flux and induced e.m.f. are zero.

24. Two circular metal plates each of radius ' r ' are kept parallel to each other distance ' d ' apart. The capacitance of the capacitor formed is ' C_1 '. If the radius of each of the plates is increased to $\sqrt{2}$ times the earlier radius and their distance of separation decreased to half the initial value, the capacitance now becomes ' C_2 '. The ratio of the capacitances $C_1 : C_2$ is

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

(C) 1 : 4 (D) 4 : 1

25. Ratio of radius of gyration of a circular disc to that of circular ring each of same mass and radius around their respective axes is

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

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

26. In an AC circuit $E = 200\sin(50t)$ volt and $I = 100\sin\left(50t + \frac{\pi}{3}\right)$ mA. The power dissipated in the circuit is

$$\begin{pmatrix} \sin 30^\circ = \cos 60^\circ = 0.5 \\ \sin 60^\circ = \cos 30^\circ = \sqrt{3}/2 \end{pmatrix}$$

(A) 20 watt (B) 15 watt

(C) 10 watt (D) 5 watt

27. In the following circuit, a power of 50 watt is absorbed in the section AB of the circuit. The value of resistance ' x ' is



(A) 10Ω (B) 8Ω

(C) 6Ω (D) 4Ω

28. A ray of light is incident at 60° on one face of a prism of angle 30° and the emergent ray makes 30° with the incident ray. The refractive index of the prism is $(\sin 30^\circ = 0 \cdot 5, \sin 60^\circ = \sqrt{3}/2)$

(A) 1.732 (B) 1.414

(C) 1.5 (D) 1.33

29. Given that ' x ' joule of heat is incident on a body. Out of that, total heat reflected and transmitted is ' y ' joule. The absorption coefficient of body is

(A) $\frac{x}{y}$ (B) $\frac{y}{x}$

(C) $\frac{x-y}{x}$ (D) $\frac{y-x}{x}$

30. In the uranium radioactive series, the initial nucleus is $^{238}_{92}$U and that the final nucleus is $^{206}_{82}$ Pb . When uranium nucleus decays into lead, the number of α-particles and β-particles emitted are

(A) $4\alpha, 5\beta$ (B) $5\alpha, 3\beta$

(C) $6\alpha, 7\beta$ (D) $8\alpha, 6\beta$

31. When photons of energy hv fall on a photosensitive surface of work function E_0, photoelectrons of maximum energy k are emitted. If the frequency of radiation is doubled the maximum kinetic energy will be equal to (h = Planck's constant)

(A) k (B) 2 k

(C) $k + E_0$ (D) $k + h\nu$

32. The pressure inside two soap bubbles, (A) is 1.01 and that of (B) is 1.02 atmosphere respectively. The ratio of their respective radii (A to B) is (outside pressure $= 1$ atm.)

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

(C) $6:1$ (D) $8:1$

33. The pitch of a whistle of an engine appears to drop by 30% of original value when it passes a stationary observer. If the speed of sound in air is 350 ms^{-1}, then the speed of engine in ms^{-1} is

(A) 840 (B) 700

(C) 175 (D) 150

34. A transformer having efficiency 90% is working on 200 V and 3 kw power supply. If the current in the secondary coil is 6 A , the voltage across the secondary coil and the current in the primary coil are respectively

(A) 300 V, 15 A (B) 450 V, 15 A

(C) 450 V, $13 \cdot 5$ A (D) 600 V, 15 A

35. A diatomic ideal gas is used in Carnot engine as a working substance. If during the adiabatic expansion part of the cycle, the volume of the gas increases from V to 32 V , the efficiency of the engine is

(A) 0.25 (B) 0.50

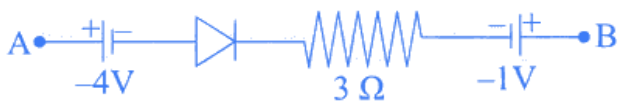
(C) 0.75 (D) 0.90

36. The range of voltmeter of resistance ' G ' Ω is ' V ' volt. The resistance required to be connected in series with it in order to convert it into a voltmeter of range ' nV ' volt, will be

(A) $(\mathrm{n}-1)\mathrm{G}$ (B) $\mathrm{G/n}$

(C) nG (D) $\frac{\mathrm{G}}{\mathrm{n}}-1$

37. Find the magnitude of current in the given circuit.



(A) zero ampere (B) 1 ampere

(C) 0.1 ampere (D) 0.2 ampere

38. An inductance coil has a resistance of 80Ω. When on AC signal of frequency 480 Hz is applied to the coil, the voltage leads the current by 45°. The inductance of the coil in henry is $\left[\sin 45^{\circ}=\cos 45^{\circ}=1/\sqrt{2}\right]$

(A) $\frac{1}{24\pi}$ (B) $\frac{\pi}{20}$

(C) $\frac{\pi}{40}$ (D) $\frac{1}{12\pi}$

39. The displacement of a wave is given by $y=0.002\sin(100t+x)$ where ' x 'and ' y ' are in metre and ' t ' is in second. This represents a wave

(A) of wavelength one metre

(B) travelling with a velocity of 100 $\mathrm{m/s}$ in the negative x-direction

(C) of frequency $(\frac{100}{\pi})\mathrm{Hz}$

(D) travelling with a velocity of $(\frac{50}{\pi})\mathrm{m/s}$ in the positive x -direction

40. A current of 5 A flows through a toroid having a core of mean radius 20 cm . If 4000 turns of the conducting wire are wound on the core, then the magnetic field inside the core of the toroid is [permeability of free space $=4\pi\times10^{-7}$ SI units]

(A) $8\times10^{-2}\ \mathrm{Wb/m^2}$ (B) $6\times10^{-2}\ \mathrm{Wb/m^2}$

(C) $5\times10^{-2}\ \mathrm{Wb/m^2}$ (D) $2\times10^{-2}\ \mathrm{Wb/m^2}$

41. A metal ball of radius 9×10^{-4} m and density $10^4\ \mathrm{kg/m^3}$ falls freely under gravity through a distance ' h ' and enters a tank of water. Considering that the metal ball has constant velocity, the value of h is [coefficient of viscosity of water $=8.1\times10^{-4}\mathrm{pa-s}, \mathrm{g}=10\ \mathrm{m/s^2}$ density of water $=10^3\ \mathrm{kg/m^3}$]

(A) 20 m (B) 18 m

(C) 15 m (D) 12 m

42. When wavefronts pass from denser medium to rarer medium, the width of the wavefront

(A) increases. (B) may increase or decrease.

(C) decreases. (D) remains unchanged.

43. The relation between total magnetic field (B), magnetic intensity (H), permeability of free space (μ_0) and susceptibility (χ) is

(A) $\frac{\mathrm{H}}{\mathrm{B}}=\mu_0(1+\chi)$ (B) $\frac{B}{H}=\mu_0(1+\chi)$

(C) $\frac{\mathrm{H}}{\mathrm{B}}=\mu_0(\chi-1)$ (D) $\frac{B}{H}=\mu_0(1-x)$

44. In common emitter transistor amplifier, load resistance is 6.5kΩ and an input resistance is 1.3kΩ. If the current gain is 78 , the voltage gain is

(A) 780 (B) 390
(C) 260 (D) 50

45. A particle having a charge 50 e is revolving in a circular path of radius 0.4 m with 1r.p.s. The magnetic field produced at the centre of the circle is $(\mu_0 = 4\pi \times 10^{-7}$ SI units and $e = 1.6 \times 10^{-19}$c)

(A) $10^{-7}\mu_0$ (B) $10^{-10}\mu_0$
(C) $10^{-14}\mu_0$ (D) $10^{-17}\mu_0$

46. Two blocks of masses 6 kg and 4 kg are placed in contact with each other on a smooth surface as shown. If a force of 5 N is applied on a heavier block, the force on the lighter block is



(A) 5N (B) 4N
(C) 2N (D) 1N

47. Two circular loops P and Q of radii ' r ' and ' nr ' are made respectively from a uniform wire. Moment of inertia of loop Q about its axis is four times that of loop P about its axis. The value of ' n ' is

(A) $(2)^{1/3}$ (B) $(2)^{2/3}$
(C) $(2)^{3/4}$ (D) $(2)^{1/4}$

48. Two spherical black bodies of radii ' R_1 ' and ' R_2 ' and with surface temperature ' T_1 ' and ' T_2 ' respectively radiate the same power. The ratio of ' R_1 ' to ' R_2 ' will be

(A) $(\frac{T_2}{T_1})^4$ (B) $(\frac{T_2}{T_1})^2$
(C) $(\frac{T_1}{T_2})^4$ (D) $(\frac{T_1}{T_2})^2$

49. If ' λ_1 ' and ' λ_2 ' are the wavelengths of the first line of the Lyman and Paschen series respectively, then $\lambda_2 : \lambda_1$ is

(A) 3 : 1 (B) 30 : 1
(C) 50 : 7 (D) 108 : 7

50. An electric dipole of moment $\vec{p}$ is lying along a uniform electric field $\vec{E}$. The work done in rotating the dipole through $\frac{\pi^c}{3}$ is

$[\sin 30° = \cos 60° = 0 \cdot 5, \cos 30° = \sin 60° = \sqrt{3}/2]$

(A) 3 pE (B) $\sqrt{2}$pE
(C) pE (D) $\frac{pE}{2}$

51. A solution of non volatile solute has boiling point elevation 1.75 K . Calculate molality of solution $\left[K_b = 3.5 \text{ K kg mol}^{-1}\right]$

(A) 0.77 mol kg^{-1} (B) 0.69 mol kg^{-1}
(C) 0.50 mol kg^{-1} (D) 0.35 mol kg^{-1}

52. Which from following metal ions in their respective oxidation states forms coloured compound?

(A) Zn^{2+} (B) Fe^{2+}
(C) Cu^{+} (D) Sc^{3+}

53. Calculate the density of an element having molar mass 63 g mol^{-1} that forms fcc structure $\left[a^3 \times N_A = 28 \text{ cm}^3 \text{ mol}^{-1}\right]$

(A) 6.0 g cm^{-3} (B) 9.0 g cm^{-3}
(C) 5.0 g cm^{-3} (D) 7.0 g cm^{-3}

54. Which from following groups is selected as principal functional group for nomenclature of a polyfunctional compound according to IUPAC system?

(A) $-CONH_2$ (B) $-CN$
(C) $-OH$ (D) $-C \equiv C-$

55. Identify the structure of XeF_4 molecule from following.

(A) Trigonal pyramidal (B) Square pyramidal
(C) Square planar (D) Distorted octahedral

56. Calculate $[H_3O^+]$in 0.02 M solution of monobasic acid if dissociation constant is 1.8×10^{-5}.

(A) 3.0×10^{-4}M (B) 6.0×10^{-4}M
(C) 2.0×10^{-4}M (D) 4.0×10^{-4}M

57. Which from following statements is NOT true according to principles of green chemistry?

(A) It is good to use the technique of protection and deprotection of functional group in organic synthesis.
(B) Use of chemicals derived from plant resource is better than crude oil.
(C) Use of biodegradable pesticides is advantageous.
(D) Use of critical CO_2 as solvent is better than organic solvents.

58. The molar conductivity of 0.02 M KCl solution is $410\Omega^{-1}$ cm^2 mol^{-1} at 25°C. Calculate its conductivity?

(A) $8.2 \times 10^{-3}\Omega^{-1}$ cm^{-1}
(B) $2.8 \times 10^{-3}\Omega^{-1}$ cm^{-1}
(C) $4.1 \times 10^{-3}\Omega^{-1}$ cm^{-1}
(D) $5.4 \times 10^{-3}\Omega^{-1}$ cm^{-1}

59. What is the coordination number of a particle in hcp structure?

(A) 2 (B) 4
(C) 6 (D) 12

60. Identify essential amino acid from following.

(A) Glutamic acid (B) Proline
(C) Cysteine (D) Histidine

61. Identify the formula of pentaaquaisothiocyanatoiron(III) ion from following.

(A) $Fe[(H_2O)_5(SCN)]^{3+}$
(B) $[Fe(H_2O)_5(NCS)]^{2+}$
(C) $Fe[(H_2O)_3(NCS)_2]^{3+}$
(D) $[Fe[(H_2O)_2(SCN)_3]^{5+}$

62. If bond formation energy of H – H bond is -433 kJ mol^{-1} find the bond dissociation energy for 0.5 mole $H_{2(g)}$.

(A) 108.0 kJ (B) 216.5 kJ
(C) 433.0 kJ (D) 324.5 kJ

63. Identify homopolymer from following.

(A) Polycarbonate (B) Buna-N
(C) Glyptal (D) Thermocol

64. Which from following molecules has two lone pair of electrons in valence shell of its central atom?

(A) SO_2 (B) NH_3

(C) H_2O (D) SF_4

65. Identify the product ' B ' in the following sequence of reactions. Propanone $\xrightarrow{Ba(OH)_2} A \xrightarrow[-H_2O]{\Delta} B$

(A) 4-Hydroxy-4-methylpentan-2-one (B) 2-methylpentan-3-one

(C) 2-methylpent-2-en-4-one (D) 4-methylpent-3-en-2-one

66. What time is required for 100 g of reactant to reduce to 25 g in a first order reaction having half life 5760 year?

(A) 4760 year (B) 8640.26 year

(C) 2880.15 year (D) 11526.48 year

67. What is the value of standard enthalpy of formation of dihydrogen?

(A) 436.4 kJ (B) 0 kJ

(C) 100.3 kJ (D) 200.5 kJ

68. What is the amount of energy associated with first orbit of monopositive helium ion? $\left[R_H = 2.18 \times 10^{-18}\ J\right]$

(A) -1.9×10^{-18} J (B) -4.36×10^{-18} J

(C) -6.54×10^{-18} J (D) -8.72×10^{-18} J

69. Which of the following statements is correct about zero order reaction?

(A) Rate of reaction depends on rate constant. (B) Rate of reaction is independent of concentration of reactant.

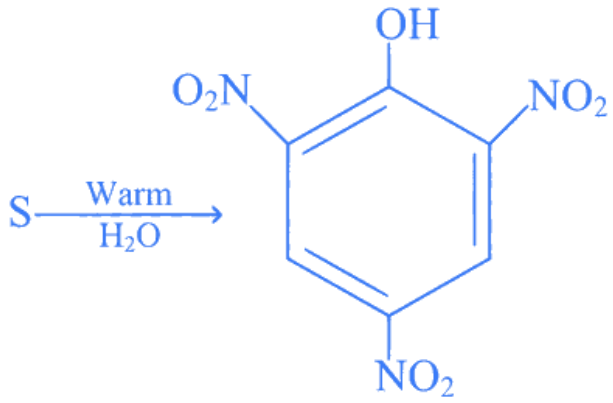
(C) Half life of reaction does not depend on initial concentration. (D) Unit of rate constant is time $^{-1}$.

70. Calculate Gibbs energy change for a reaction having $\Delta H = 31400\ J, \Delta S = 32\ J\ K^{-1}$ at $1000^\circ C$?

(A) -4668 J (B) -9336 J

(C) -4073 J (D) -2334 J

71. Identify the substrate 'S' in the following reaction.



(A) p-Nitrochlorobenzene

(B) o-Nitrochlorobenzene

(C) 2,4,6-trichloronitrobenzene

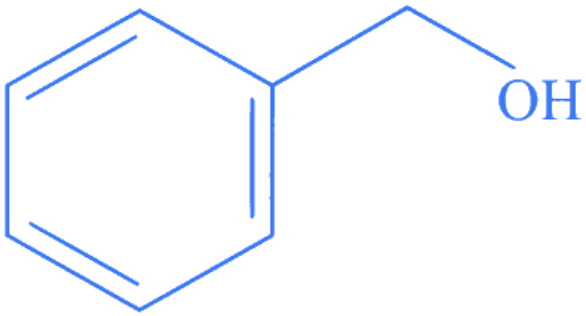
(D) 2,4,6-trinitrochlorobenzene

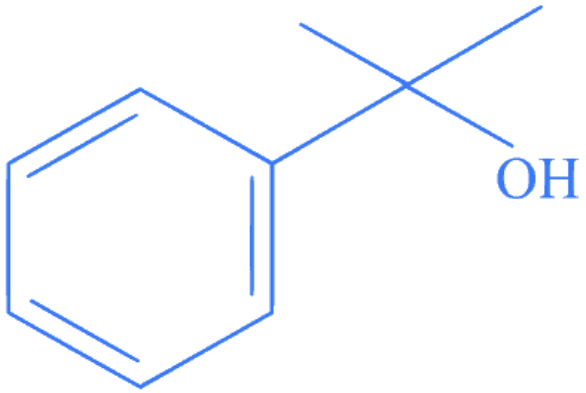
72. Which from following is an example of multimolecular colloids?

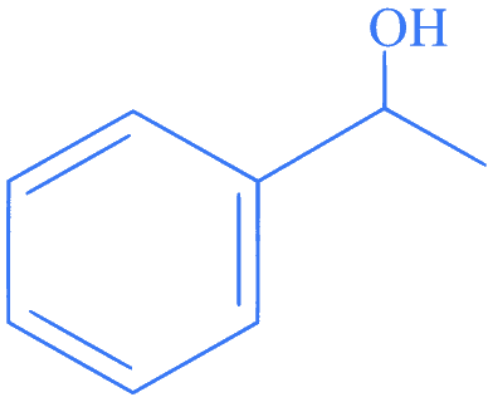
(A) Soap (B) Polythene

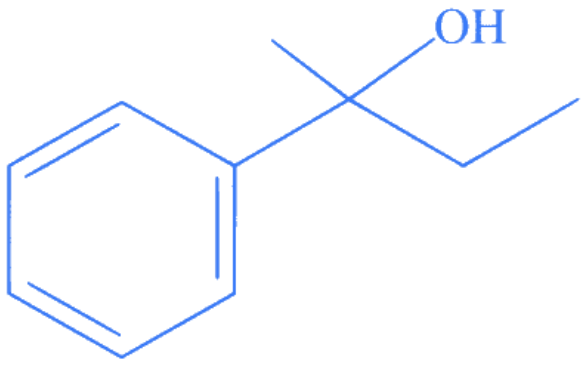
(C) Sulfur molecule (S_8) (D) Nylon

73. Which of the following is secondary benzylic alcohol?

(A) 

(B) 

(C) 

(D) 

74. Identify the reagent ' R ' used in the following reaction. Benzoyl chloride $\rightarrow$ Benzaldehyde

(A) CO, HCl (B) $H_2, Pd - BaSO_4$

(C) DIBAL $-$ H (D) H_2O

75. What is the representation of an element having mass number of 40 and 21 neutrons in it?

(A) $^{40}_{18}X$ (B) $^{40}_{19}X$

(C) $^{40}_{12}X$ (D) $^{40}_{20}X$

76. How many moles of dioxygen are present in $8.314 \times 10^{-3}\ m^3$ of it at 318 K having pressure $3.18 \times 10^5 Nm^{-2}$? $\left(R = 8.314\ J\ K^{-1}\ mol^{-1}\right)$

(A) 0.1 mole (B) 1.0 mole

(C) 1.5 mole (D) 2.0 mole

77. Which of the following compounds has difficulty in breaking the C $-$ Cl bond?

(A) o-Nitrochlorobenzene

(B) m-Nitrochlorobenzene

(C) p-Nitrochlorobenzene

(D) 2,4,6-trinitrochlorobenzene

78. Identify the alkene obtained as major product in the following Hofmann elimination reaction.

$$\left(C_3H_7\right)N^{\ominus}\left(C_2H_5\right)_3I^{\ominus} \xrightarrow[\Delta]{\text{mois } A_2O} A \xrightarrow[\text{Alkene}+H]{-H_2O}$$

Alkene + Amine

(A) Propene (B) Ethene

(C) But-1-ene (D) But-2-ene

79. Calculate the amount of electricity required to convert 1.1 mol of $Cr_2O_7^{2-}$ to Cr^{+3} in acidic medium.

(A) $6.369 \times 10^5 C$ (B) $1.462 \times 10^5 C$

(C) $4.839 \times 10^5 C$ (D) $3.419 \times 10^5 C$

80. Which of the following on reaction with Grignard reagent followed by hydrolysis forms secondary alcohol?

(A) HCHO

(B) CH_3CHO

(C) $CH_3 - CO - CH_3$

(D) $CH_3 - CH_2 - CO - CH_3$

81. Which of the following compounds does not undergo haloform reaction?

(A) Ethanal (B) Propanal

(C) Propanone (D) Butanone

82. Which from following properties is NOT identical for Enantiomers?

(A) Melting point
(B) Density
(C) Refractive index
(D) Sign of optical rotation

83. Which from following combinations represents water gas?

(A) $CO_{(g)} + H_{2(g)}$
(B) $CO_{(g)} + 3H_{2(g)}$
(C) $CO_{2(g)} + 3H_{2(g)}$
(D) $CO_{2(g)} + 2H_{2(g)}$

84. Which from the following statements is correct for aqueous solution of $6\ g\ L^{-1}$ urea and $17 \cdot 12\ g\ L^{-1}$ of sucrose?
[Molar mass of urea $= 60\ g\ mol^{-1}$
Molar mass of sucrose $= 342\ g\ mol^{-1}$]

(A) Osmotic pressure exhibited by urea solution is lower than that of sucrose solution.
(B) Urea solution is hypertonic to sucrose solution.
(C) These solutions are isotonic.
(D) On doubling the concentration of sucrose solution it becomes hypertonic to urea solution.

85. Identify the element with lowest electronegativity.

(A) O
(B) S
(C) F
(D) Cl

86. Calculate the volume occupied by all atoms in bcc unit cell if the volume of unit cell is $1.5 \times 10^{-22}\ cm^3$.

(A) $2.40 \times 10^{-22}\ cm^3$
(B) $3.51 \times 10^{-22}\ cm^3$
(C) $1.56 \times 10^{-22}\ cm^3$
(D) $1.02 \times 10^{-22}\ cm^3$

87. What is the number of electrons present in 3d orbital of Ti in +2 state?

(A) Zero
(B) One
(C) Two
(D) Three

88. Identify molecular formula of laevulose

(A) $C_6H_{12}O_6$
(B) $C_5H_{10}O_5$
(C) $C_4H_8O_4$
(D) $C_3H_6O_3$

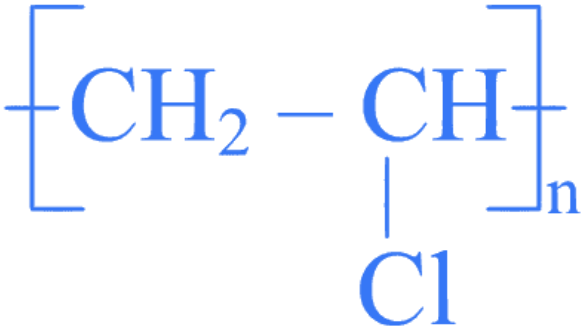
89. Which of the following pair of compounds does not demonstrate the law of multiple proportion?

(A) CuO, Cu_2O
(B) $NaNO_3, CaCO_3$
(C) CO, CO_2
(D) $N_2O_4,\ N_2O_5$

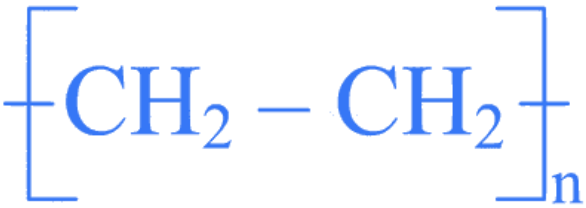
90. What is the coordination number of central metal ion in $[Fe\,(C_2O_4)_3]^{3-}$?

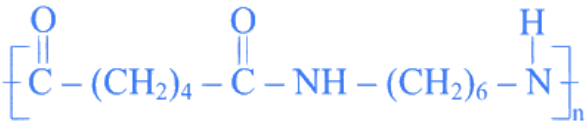
(A) 2
(B) 4
(C) 6
(D) 12

91. Which from following polymers is obtained by ring opening polymerization method?

(A) 

(B) 

(C) 

(D) 

92. What is IUPAC name of propylene glycerol?

(A) Propane-1,2-diol
(B) Propane-1,3-diol
(C) Propene-1,2,3-triol
(D) Propane-1,2,3-triol

93. Which of the following equations represents the relation between solubility and solubility product for salt BA_3?

(A) $S = (\frac{K_{sp}}{27})^{1/4}$
(B) $S = (27 \times K_{sp})^{1/4}$
(C) $S = (\frac{K_{sp}}{4})^{1/4}$
(D) $S = (4 \times K_{sp})^{1/4}$

94. Which of the following catalysts is used to convert



to form cis-alkene?

(A) $ZnCl_2/HCl$ (B) $Pd - C$ quinoline

(C) Na / liquid NH_3 (D) Na/Hg in H_2O

95. For a reaction,

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

N_2O_5 disappears at a rate of $0.06\ mol\ dm^{-3}\ s^{-1}$ What is rate of $NO_{2(g)}$ formation?

(A) $0.06\ mol\ dm^{-3}\ s^{-1}$ (B) $0.12\ mol\ dm^{-3}\ s^{-1}$

(C) $0.18\ mol\ dm^{-3}\ s^{-1}$ (D) $0.24\ mol\ dm^{-3}\ s^{-1}$

96. Calculate the molar mass of nonvolatile solute when 1.5 g of it is dissolved in 90 g solvent decreases its freezing point by 0.25 K.

$$\left[K_f = 1.2\ K\ kg\ mol^{-1}\right]$$

(A) $72\ g\ mol^{-1}$ (B) $80\ g\ mol^{-1}$

(C) $88\ g\ mol^{-1}$ (D) $96\ g\ mol^{-1}$

97. Which of the following does not have intermolecular hydrogen bonding?

(A) Cyclohexylamine (B) Allylamine

(C) Trimethylamine (D) Diphenylamine

98. Which of the following statements is NOT correct for $H_2 - O_2$ fuel cell?

(A) $H_{2(g)}$ serves as fuel (B) $O_{2(g)}$ is an oxidising agent

(C) Platinum wires are used as anode and cathode (D) Hot aqueous KOH solution acts as an electrolyte

99. Identify the element reduced in following reaction.

$$Cr_2O_7^{2-} + 14H^+ + 6I^- \longrightarrow 2Cr^{3+} + 3H_2O + 3I_2$$

(A) Cr (B) H

(C) O (D) I

100. Calculate the pH of buffer solution containing 0.027 M weak acid and 0.054 M of its salt with strong base if pK_a is 4.2.

(A) 4.5 (B) 3.2

(C) 5.6 (D) 6.4

101. If $\int \frac{dx}{\cos^3 x\sqrt{2\sin 2x}} = (\tan x)^A + C(\tan x)^B + K$, where K is a constant of integration, then the value of $5(A+B+C)$ is equal to

(A) 25 (B) 14

(C) 16 (D) 20

102.

$$\int \frac{2x^2-1}{(x^2+4)(x^2-3)}dx =$$

(A) $\frac{9}{14}\tan^{-1}(\frac{x}{2}) + \frac{5}{14\sqrt{3}}\log(\frac{x-\sqrt{3}}{x+\sqrt{3}}) + c$, (where c is constant of integration)

(B) $\frac{9}{7}\tan^{-1}(\frac{x}{2}) + \frac{5}{7\sqrt{3}}\log(\frac{x-\sqrt{3}}{x+\sqrt{3}}) + c$, (where c is constant of integration)

(C) $\frac{9}{7}\tan^{-1}(\frac{x}{2}) - \frac{5}{7\sqrt{3}}\log(\frac{x-\sqrt{3}}{x+\sqrt{3}}) + c$, (where c is constant of integration)

(D) $\frac{9}{14}\tan^{-1}(\frac{x}{2}) + \frac{5}{7}\log(\frac{x-\sqrt{3}}{x+\sqrt{3}}) + c$, (where c is constant of integration)

103. Let $f(x) = \frac{1-\tan x}{4x-\pi}, x \neq \frac{\pi}{4}, x \in [0, \frac{1}{2}]$, $f(x)$ is continuous in $[0, \frac{\pi}{2}]$, then $f(\frac{\pi}{4})$ is

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

(C) 1 (D) -1

104. The number of possible distinct straight lines passing through $(2,3)$ and forming a triangle with co-ordinate axes whose area is 12 sq . units are,

(A) one (B) two

(C) three (D) four

105. The differential equation $\left[\frac{1+(\frac{dy}{dx})^2}{(\frac{d^2y}{dx^2})}\right]^{\frac{3}{2}} = kx$ is of

(A) order $= 2$, degree $= 3$ (B) order $= 3$, degree $= 2$

(C) order $= 2$, degree $= 2$ (D) order $= 3$, degree $= 3$

106. A triangular park is enclosed on two sides by a fence and on the third side a straight river bank. The two sides having fence are of same length x. The maximum area (in sq. units) enclosed by the park is

(A) $\frac{3}{2}x^2$ (B) $\sqrt{\frac{x^3}{8}}$

(C) $\frac{1}{2}x^2$ (D) πx^2

107. If p and q are statements, then _____ is a contingency.

(A) $p \wedge \sim p$ (B) $p \vee \sim p$

(C) $p \vee q$ (D) $(p \wedge (p \to q)) \to q$

108. If $\int_0^{\frac{\pi}{3}} \frac{\tan\theta}{\sqrt{2k\sec\theta}}d\theta = 1 - \frac{1}{\sqrt{2}}, (k > 0)$, then the value of k is

(A) 2 (B) 1

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

109. A random variable x has the following probability distribution. Then value of k is _____ and $P(3 < x \leq 6)$ has the value

X = x	0	1	2	3	4	5	6	7	8
P(x)	k	2k	3k	4k	4k	3k	2k	k	k

(A) $\frac{1}{20}, \frac{3}{7}$ (B) $\frac{5}{21}, \frac{3}{7}$

(C) $\frac{1}{21}, \frac{3}{7}$ (D) $\frac{1}{20}, \frac{4}{7}$

110. If $y = \log\left[e^{5x}\left(\frac{3x-4}{x+5}\right)^{\frac{4}{3}}\right]$, then $\frac{dy}{dx}$ is equal to

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

(C) $5x + \frac{4}{3x-4} - \frac{4}{3(x+5)}$ (D) $5 + \frac{12}{3x-4} - \frac{4}{(x+5)}$

111. Let f be a twice differentiable function such that $f''(x) = -f(x), f'(x) = g(x)$ and $h(x) = [f(x)]^2 + [g(x)]^2$. If $h(5) = 1$, then $h(10)$ is _____.

(A) 2 (B) 4

(C) -1 (D) 1

112. The area (in sq. units) of the parallelogram whose diagonals are along the vectors $8\hat{i} - 6\hat{j}$ and $3\hat{i} + 4\hat{j} - 12\hat{k}$, is

(A) 52 (B) 26

(C) 65 (D) 20

113. The line L given by $\frac{x}{5} + \frac{y}{b} = 1$ passes through the point $(13, 32)$. The line K is parallel to L and has the equation $\frac{x}{c} + \frac{y}{3} = 1$. Then the distance between L and K is

(A) $\frac{23}{\sqrt{15}}$ (B) $\sqrt{17}$

(C) $\frac{17}{\sqrt{15}}$ (D) $\frac{23}{\sqrt{17}}$

114. If $|\bar{a}| = \sqrt{27}, |\bar{b}| = 7$ and $|\bar{a} \times \bar{b}| = 35$, then $\bar{a} \cdot \bar{b}$ is equal to

(A) $\sqrt{\frac{35}{2}}$ (B) $\frac{\sqrt{35}}{2}$

(C) $7\sqrt{2}$ (D) $\sqrt{35}$

115. The number of real solutions of $\tan^{-1}\sqrt{x(x+1)} + \sin^{-1}\sqrt{x^2+x+1} = \frac{\pi}{2}$ is

(A) one (B) zero

(C) two (D) infinite

116. Let $S = \left\{x \in (-\pi, \pi) \mid x \neq 0, \pm\frac{\pi}{2}\right\}$. The sum of all distinct solutions of the equation $\sqrt{3}\sec x + \operatorname{cosec} x + 2(\tan x - \cot x) = 0$ in the set S is equal to

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

(C) 0 (D) $\frac{5\pi}{9}$

117. The number of four letter words that can be formed using letters of the word BARRACK

(A) 120 (B) 264

(C) 270 (D) 144

118. A stone is dropped into a quiet lake and waves move in circles at speed of 8 cm/sec. At the instant when the radius of the circular wave is 12 cm . how fast is the enclosed area increasing?

(A) 180π cm^2/sec (B) 196π cm^2/sec

(C) 192π cm^2/sec (D) 200π cm^2/sec

119. The area (in sq. units) of the region bounded by the curve $x^2 = 4y$ and the straight line $x = 4y - 2$ is

(A) $\frac{9}{8}$ (B) $\frac{7}{8}$

(C) $\frac{5}{4}$ (D) $\frac{3}{4}$

120. If the half life of substance is 5 years, then the total amount of the substance left after 15 years, when initial amount is 64 gms is

(A) 6 gm (B) 8 gm

(C) 10 gm (D) 12 gm

121. Equation of the plane containing the straight line $\frac{x}{3} = \frac{y}{2} = \frac{z}{4}$ and perpendicular to the plane containing the straight lines $\frac{x}{4} = \frac{y}{3} = \frac{z}{2}$ and $\frac{x}{2} = \frac{y}{-4} = \frac{z}{3}$ is

(A) $6x - 67y - 29z = 0$ (B) $6x + 67y - 29z = 0$

(C) $6x - 67y + 29z = 0$ (D) $6x + 67y + 29z = 0$

122. The number of roots of the equation, $(81)^{\sin^2 x} + (81)^{\cos^2 x} = 30$ in the interval $[0, \pi]$, is equal to

(A) 4 (B) 3

(C) 8 (D) 2

123. If

$$\int (2x+4)\sqrt{x-1}\, dx = a(x-1)^{5/2} + b(x-1)^{3/2} + c$$

where c is a constant of integration, then the value of $(2a+b)$ is

(A) $\frac{20}{5}$ (B) $\frac{28}{5}$

(C) $\frac{48}{5}$ (D) $\frac{16}{5}$

124. Let $X \sim B\left(6, \frac{1}{2}\right)$, then $P[|x-4| \leqslant 2]$ is

(A) $\frac{115}{128}$ (B) $\frac{63}{64}$

(C) $\frac{57}{64}$ (D) $\frac{7}{64}$

125. The mean of n observations is $\bar{x}$. If three observations $n+1, n-1, 2n-1$ are added such that mean remains same, then value of n is

(A) $\frac{2\bar{x}+1}{3}$ (B) $\frac{3\bar{x}-1}{4}$

(C) $\frac{3\bar{x}+1}{4}$ (D) $\frac{\bar{x}+1}{4}$

126. If $y = \sec\left(\tan^{-1} x\right)$, then $\frac{dy}{dx}$ at $x = 1$ is equal to

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

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

127. The equation of the concentric circle, with the circle C_1 having equation $x^2 + y^2 - 6x - 4y - 12 = 0$ and having double area compared to the area of C_1, is

(A) $x^2 + y^2 - 6x - 4y = 27$

(B) $x^2 + y^2 - 6x - 4y = 13$

(C) $x^2 + y^2 - 6x - 4y = 50$

(D) $x^2 + y^2 - 6x - 4y = 37$

128. Let $\alpha(a)$ and $\beta(a)$ be the roots of the equation

$$(\sqrt[3]{1+a} - 1)x^2 + (\sqrt{1+a} - 1)x + (\sqrt[6]{1+a} - 1) = 0$$

where $a > -1$ then $\lim\limits_{a \to 0^+} \alpha(a)$ and $\lim\limits_{a \to 0^+} \beta(a)$ respectively are

(A) 1 and $-\frac{5}{2}$ (B) -1 and $-\frac{1}{2}$

(C) 2 and $-\frac{7}{2}$ (D) 3 and $-\frac{9}{2}$

129. Let $2\sin^2 x + 3\sin x - 2 > 0$ and $x^2 - x - 2 < 0$. (x is measured in radians). The x lies in the interval

(A) $(\frac{\pi}{6}, \frac{5\pi}{6})$ (B) $(-1, \frac{5\pi}{6})$

(C) $(-1, 2)$ (D) $(\frac{\pi}{6}, 2)$

130. If $A \equiv (1,-1,0), B \equiv (0,1,-1)$ and $C \equiv (-1,0,1)$, then the unit vector $\overline{d}$ such that $\overline{a}$ and $\overline{d}$ are perpendiculars and $\overline{b}, \overline{c}, \overline{d}$ are coplanar is

(A) $+\frac{1}{\sqrt{3}}(1,1,1)$ (B) $+\frac{1}{\sqrt{3}}(-1,-1,1)$

(C) $+\frac{1}{\sqrt{6}}(1,1,-2)$ (D) $+\frac{1}{\sqrt{2}}(1,1,0)$

131. A bullet is shot horizontally and its distance S cm at time t second is given by $S = 1200t - 15t^2$, then the distance covered by the bullet when it comes to the rest, is

(A) 12000 cm (B) 24000 cm

(C) 1200 cm (D) 2400 cm

132. If $|z| = 1$ and $w = \frac{z-1}{z+1}$ (where $z \neq -1$), then $\mathrm{Re}(w)$ is

(A) 0 (B) $-\frac{1}{|z+1|^2}$

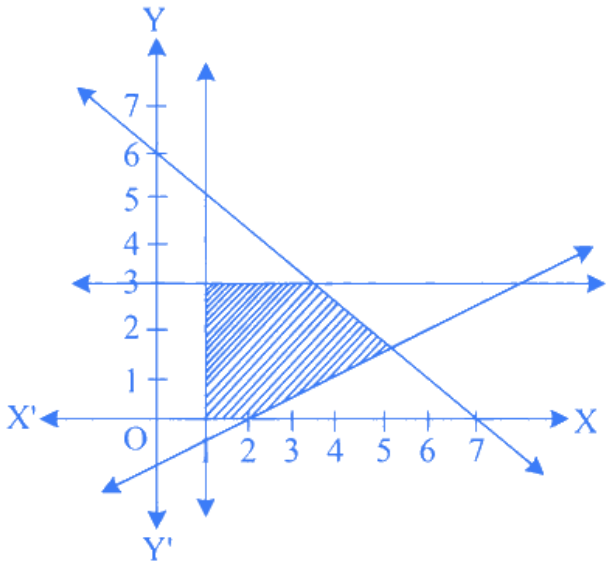
(C) $|\frac{z}{z+1}| \cdot \frac{1}{|z+1|^2}$ (D) $\frac{\sqrt{2}}{|z+1|^2}$

133. If $g(x) = x^2 + x - 1$ and (gof) $(x) = 4x^2 - 10x + 5$, then f(2) is equal to

(A) 1 (B) -1

(C) 2 (D) -2

134. The shaded area in the figure below is the solution set for a certain linear programming problem, then the linear constraints are given by



(A) $x \geq 1, y \leq 3, x - 2y \geq 2, 6x + 7y \leq 42, x \geq 0, y \geq 0$

(B) $x \geq 1, y \leq 3, x - 2y \geq 2, 6x + 7y \geq 42, x \geq 0, y \geq 0$

(C) $x \leq 1, y \geq 3, x - 2y \leq 2, 6x + 7y \leq 42, x \geq 0, y \geq 0$

(D) $x \geq 1, y \leq 3, x - 2y \leq 2, 6x + 7y \leq 42, x \geq 0, y \geq 0$

135. The equation of the normal to the curve $x = \theta + \sin\theta, y = 1 + \cos\theta$ at $\theta = \frac{\pi}{2}$ is

(A) $2x + 2y + \pi = 0$ (B) $2x - 2y - \pi = 0$

(C) $x + y + \pi = 0$ (D) $x + y - 2\pi = 0$

136. If $\tan x = \frac{3}{4}$ and $\pi < x < \frac{3\pi}{2}$, then $\cos\frac{x}{2} =$ _____

(A) $\frac{-2}{5}$ (B) $\frac{2}{5}$

(C) $\frac{1}{\sqrt{10}}$ (D) $\frac{-1}{\sqrt{10}}$

137. The value of m, such that $\frac{x-4}{1} = \frac{y-2}{1} = \frac{2z-m}{3}$ lies in the plane $2x - 5y + 2z = 7$, is

(A) 8 (B) 10

(C) 9 (D) 7

138. The image of the line $\frac{x-1}{3} = \frac{y-3}{1} = \frac{z-4}{-5}$ in the plane $2x - y + z + 3 = 0$ is the line

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

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

139. Let the vectors $\overline{a}, \overline{b}, \overline{c}$ be such that $|\overline{a}| = 2, |\overline{b}| = 4$ and $|\overline{c}| = 4$. If the projection of $\overline{b}$ on $\overline{a}$ is equal to the projection of $\overline{c}$ on $\overline{a}$ and $\overline{b}$ is perpendicular to $\overline{c}$, then the value of $|\overline{a} + \overline{b} - \overline{c}|$ is equal to

(A) $2\sqrt{5}$ (B) 6

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

140. A person throws an unbiased die. If the number shown is even, he gains an amount equal to the number shown. If the number is odd, he loses an amount equal to the number shown. Then his expectation is ₹.

(A) 1 (B) 1.5

(C) 2 (D) 0.5

141. Let $\overline{a} = 2\hat{i} + \hat{j} - 2\hat{k}$ and $\overline{b} = \hat{i} + \hat{j}$. If $\overline{c}$ is a vector such that $\overline{a} \cdot \overline{c} = |\overline{c}|, |\overline{c} - \overline{a}| = 2\sqrt{2}$ and the angle between $(\overline{a} \times \overline{b})$ and $\overline{c}$ is 30°, then the value of $|(\overline{a} \times \overline{b}) \times \overline{c}|$ is equal to

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

(C) $\frac{1}{\sqrt{2}}$ (D) $\frac{\sqrt{3}}{4}$

142. If θ and α are not odd multiples of $\frac{\pi}{2}$ then $\tan\theta = \tan\alpha$ implies principal solution is

(A) $\theta = \alpha + \frac{n\pi}{2}, n \in \mathbb{Z}$ (B) $\theta = \alpha + \frac{3n\pi}{2}, n \in \mathbb{Z}$

(C) $\theta = n\pi + \alpha, n \in \mathbb{Z}$ (D) $\theta = \frac{n\pi}{4} + \alpha, n \in \mathbb{Z}$

143. The approximate value of $\cos(30^\circ, 30')$ is given that $1^\circ = 0.0175^\circ$ and $\cos 30^\circ = 0.8660$

(A) 0.8778 (B) 0.7666

(C) 0.7916 (D) 0.8616

144. Two cards are drawn successively with replacement from a well shuffled pack of 52 cards. Let X denote the random variable of number of jacks obtained in the two drawn cards. Then $P(X = 1) + P(X = 2)$ equals

(A) $\frac{24}{169}$ (B) $\frac{52}{169}$

(C) $\frac{25}{169}$ (D) $\frac{49}{169}$

145. The value of $\int \frac{(x-1)e^x}{(x+1)^3}\,dx$ is equal to

(A) $\frac{e^x}{(x+1)} + c$, (where c is constant of integration) (B) $\frac{e^x}{(x+1)^2} + c$, (where c is constant of integration)

(C) $\frac{-e^x}{(x+1)} + c$, (where c is constant of integration) (D) $\frac{-e^x}{(x+1)^2} + c$, (where c is constant of integration)

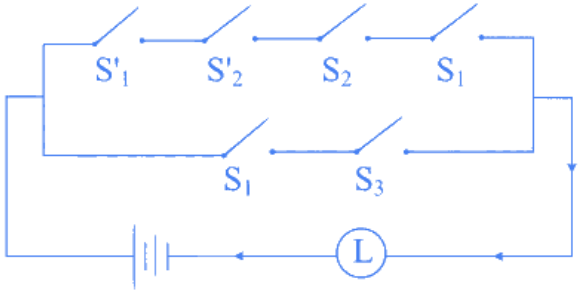
146. Let $P(2, 3, 6)$ be a point in space and Q be a point on the line $\bar{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(-3\hat{i} + \hat{j} + 5\hat{k})$. Then the value of μ for which vector $\overline{PQ}$ is parallel to the plane $x - 4y + 4z = 1$ is

(A) $\frac{13}{6}$ (B) $-\frac{6}{13}$

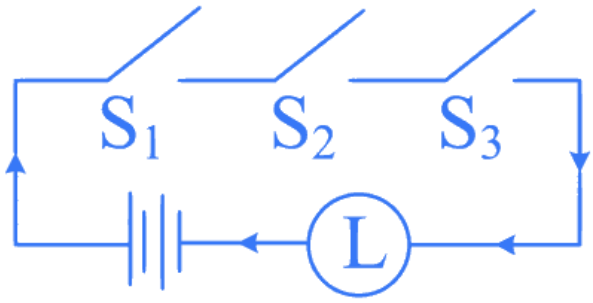
(C) $\frac{6}{13}$ (D) $-\frac{13}{6}$

147. Consider the following statements
p : the switch S_1 is closed.
q : the switch S_2 is closed.
r : the switch S_3 is closed.
Then the switching circuit represented by the statement $(p \wedge q) \vee (\sim p \wedge (\sim q \vee p \vee r))$ is

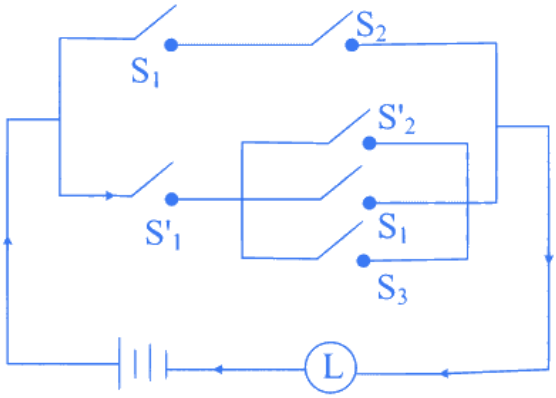
(A)



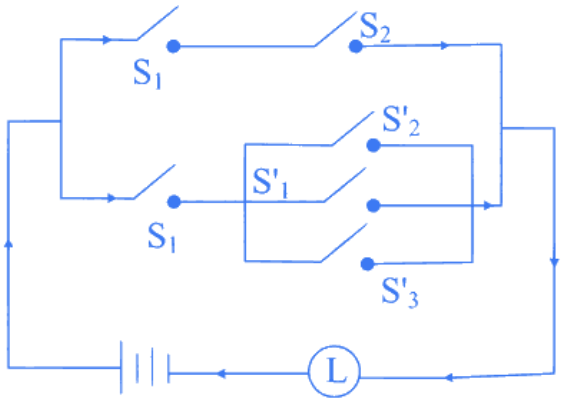
(B)



(C)



(D)



148. Let $\bar{a}, \bar{b}, \bar{c}$ be three non-coplanar vectors and $\overline{\mathrm{p}}, \overline{\mathrm{q}}, \overline{\mathrm{r}}$ defined by the relations

$$\mathrm{p} = \frac{\mathrm{b} \times \mathrm{c}}{[\mathrm{a}\ \mathrm{bc}]}, \mathrm{q} = \frac{\mathrm{c} \times \mathrm{a}}{[\mathrm{a}\ \mathrm{bc}]}, \mathrm{r} = \frac{\mathrm{a} \times \mathrm{b}}{[\mathrm{a}\ \mathrm{bc}]}$$

then the value of the expression $(\overline{\mathrm{a}} + \overline{\mathrm{b}}) \cdot \overline{\mathrm{p}} + (\overline{\mathrm{b}} + \overline{\mathrm{c}}) \cdot \overline{\mathrm{q}} + (\overline{\mathrm{c}} + \overline{\mathrm{a}}) \cdot \overline{\mathrm{r}}$ is equal to

(A) 0 (B) 1
(C) 2 (D) 3

149. If $A = \begin{bmatrix} 2 & -2 \\ 4 & 3 \end{bmatrix}$, then $A^{-1} =$

(A) $-\frac{1}{2}\begin{bmatrix} 3 & 2 \\ -4 & 2 \end{bmatrix}$ (B) $\frac{1}{14}\begin{bmatrix} 3 & 2 \\ -4 & 2 \end{bmatrix}$
(C) $\frac{1}{14}\begin{bmatrix} -3 & -2 \\ 4 & -2 \end{bmatrix}$ (D) $-\frac{1}{14}\begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$

150. The differential equation of family of circles, whose centres are on the X -axis and also touch the Y -axis is

(A) $4(x + y\frac{dy}{dx})^2 x^2 = (x^2 + y^2)^2$
(B) $(x + y\frac{dy}{dx})^2 x^2 = (x^2 + y^2)^2$
(C) $2(x + y\frac{dy}{dx})^2 x^2 = (x^2 + y^2)^2$
(D) $(x + y\frac{dy}{dx})^2 x^2 = 4(x^2 + y^2)^2$

- End of Question Paper -