MODEL TEST PAPER
AIEEE–2010
BOOKLET CODE(A)

Note: (i) The test is of 3 **hours** duration.
(ii) The test consists of **90** questions. The maximum marks are **432.**
(iii) There are ***three*** parts in the question paper. The distribution of marks subjectwise in each part is as under for each correct response.
Part A – Physics (144 marks) – Question No. 1 to 2 and 9 to 30 consists FOUR (4) marks each and Question No. 3 to 8 consists EIGHT (8) marks each for each correct response.
Part B – Chemistry (144 marks) – Question No. 31 to 39 and 46 to 60 consists FOUR (4) marks each and Question No. 40 to 45 consists EIGHT (8) marks each for each correct response.
Part C – Mathematics(144 marks) – Question No. 61 to 82 and 89 to 90 consists FOUR (4) marks each and Question No. 83 to 88 consists EIGHT (8) marks each for each correct response.
(iv) Candidates will be awarded marks as stated above for correct response of each question. 1/4th marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

PHYSICS

PART – A

1. The atom $_{100}Fm^{257}$ follows the Bohr model and the radius of $_{100}Fm^{257}$ is n times the Bohr radius. Then n is

(a) $\frac{1}{2}$ (b) $\frac{1}{8}$ (c) 1 (d) $\frac{1}{4}$

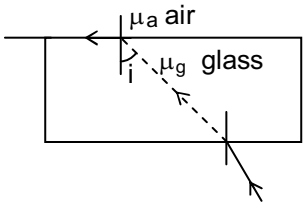
2. The nucleus of element X (A = 220) undergoes an α-decay. If Q-value of the reaction is 5.5 MeV, then approximate kinetic energy of α-particle is

(a) 5.5 MeV (b) 5.4 MeV (c) 4.5 MeV (d) 5.1 MeV

3. 2 kg of ice at –20°C is mixed with 5 kg of water at 20°C in an insulating vessel having a negligble heat capacity. It is given that the specific heats of water and ice are 1 kcal/kg/°C and 0.5 kcal/kg/°C while the latent heat of fusion of ice is 80 kcal/kg. Calculate the final mass of water remaining in the container.

(a) 5 kg (b) 6 kg (c) 7 kg (d) None of these

4. In the adjoining figure, at air glass interface the light ray is incident at critical angle. The value of μ_g will be



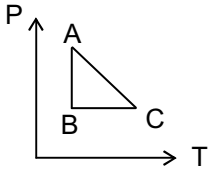
(a) $\frac{4}{3\sin i}$

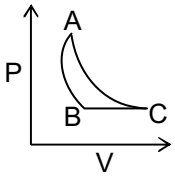
(b) $\frac{1}{\sin i}$

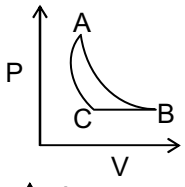
(c) $\frac{4\sin i}{3}$

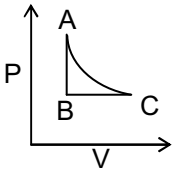
(d) none of these

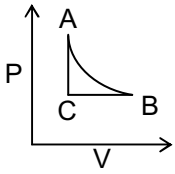
5. In the figure AC represents an Adiabatic process. The corresponding PV graph would be



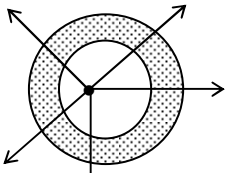
(a) 

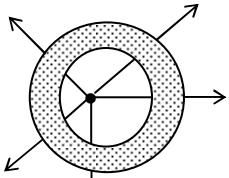
(b) 

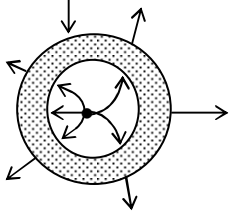
(c) 

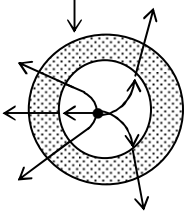
(d) 

6. A positive charge is placed inside a metallic spherical shell. The way of representation of electric field lines are

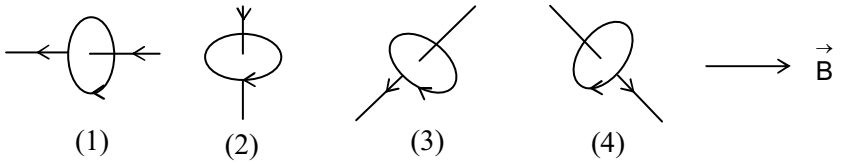
(a) 

(b) 

(c) 

(d) 

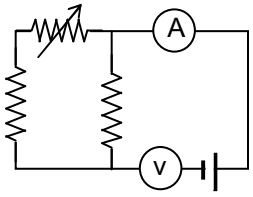
7. A current carrying loop is placed in a uniform magnetic field in four different orientations. Arrange them in the decreasing order of potential energy.

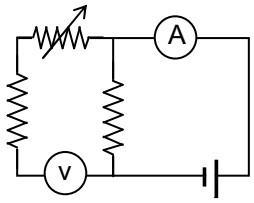


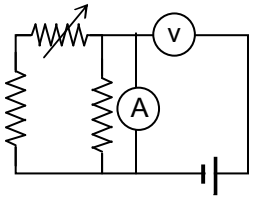
(a) 4 > 2 > 3 > 1 (b) 1 > 3 > 2 > 4

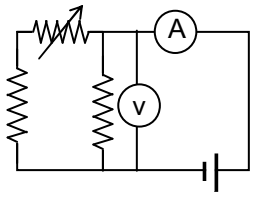
(c) 4 > 3 > 2 > 1 (d) 1 > 2 > 3 > 4

8. Correct setup to verify ohm's law is

(a) 

(b) 

(c) 

(d) 

9. An aluminium rod of length l_1 and coefficient of linear expansion α_A, and a steel rod of length l_2 and coefficient of linear expansion α_S are joined together. If the length of each rod increases by the same amount when their temperatures are raised by t°C, then $\frac{l_1}{l_1 + l_2}$ is

(a) $1 + \frac{\alpha_A}{\alpha_S}$ (b) $1 + \frac{\alpha_S}{\alpha_A}$ (c) $\frac{\alpha_S}{\alpha_A + \alpha_S}$ (d) $\frac{\alpha_A}{\alpha_S + \alpha_A}$

10. This question contains **Statement-1** and **Statement-2**. Of the four choices given after the statements, choose the one that best describes the two statements.

Statement-1: When changing magnetic flux is applied to the bulk piece of conducting material, circulating currents, called eddy currents are induced in the material.

Statement-2: Eddy current losses can be eliminated completely by cutting slots into moving metallic parts of machinery.

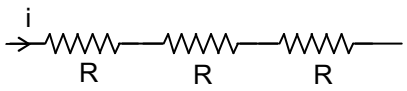
(1) Statement-1 is true, Statement-2 is false

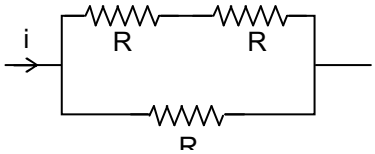
(2) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation of Statement-1.

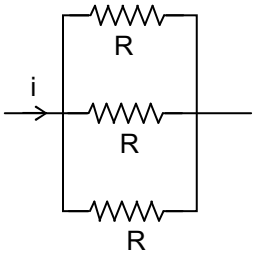
(3) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation of Statement-1.

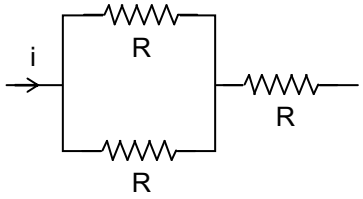
(4) Statement-1 is false, Statement-2 is true

11. The three resistances of equal value are arranged in different combinations as shown below. Arrange them in increasing order of power dissipation.

I. 

II. 

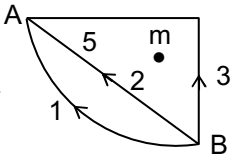
III. 

IV. 

(a) I > IV > II > III (b) III > IV > I > II

(c) IV > III > I > II (d) II > I > IV > III

12. If W_1, W_2 and W_3 represent the work done in moving a particle from A to B along three different paths 1, 2 and 3 respectively (as shown in the adjoining figure) in a gravitational field of point mass m, then



(a) $W_1 = W_2 = W_3$ (b) $W_1 > W_2 > W_3$

(c) $W_1 < W_2 > W_3$ (d) $W_1 < W_3 < W_2$

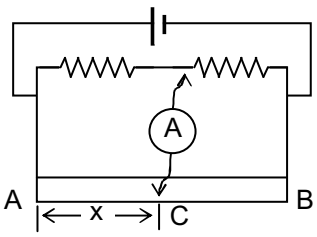
13. This question contains Statement-1 and Statement-2. Of the four choices given after the statements, choose the one that best describes the two statements.

Statement-1: In an electric field, an electron beam perpendicular to the field is deflected along a parabola and in a magnetic field, the electron path, perpendicular to the field, will be circular.

Statement-2: In electric field, force is perpendicular to path and along the field and in magnetic field, force is perpendicular to both, the magnetic field and path of beam.

(1) Statement-1 is true, Statement-2 is false
(2) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation of Statement-1.
(3) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation of Statement-1.
(4) Statement-1 is false, Statement-2 is true

14. In the shown arrangement of the experiment of the meter bridge if AC corresponding to null deflection of galvanometer is x, what will be its value if the radius of the wire AB is doubled ?



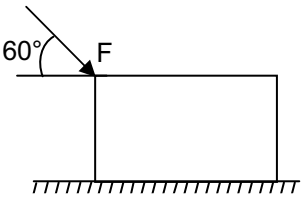
(a) 2x (b) x/4

(c) 4x (d) x

15. The volume of nucleus with mass M is related as

(a) $V \propto \frac{1}{M}$ (b) $V \propto M$ (c) $V \propto M^{1/3}$ (d) $V \propto M^3$

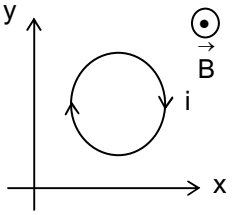
16. A block of mass $\sqrt{3}$ kg is kept on a frictional surface with $\mu = \frac{1}{2\sqrt{3}}$. The minimum force to be applied (as shown) to move the block is



(a) 15 N (b) 20 N

(c) $\frac{10}{\sqrt{3}}$ N (d) $\frac{20}{\sqrt{3}}$ N

17. A current carrying circular loop is placed in x-y plane. Magnetic field is switched in z-axis. The loop



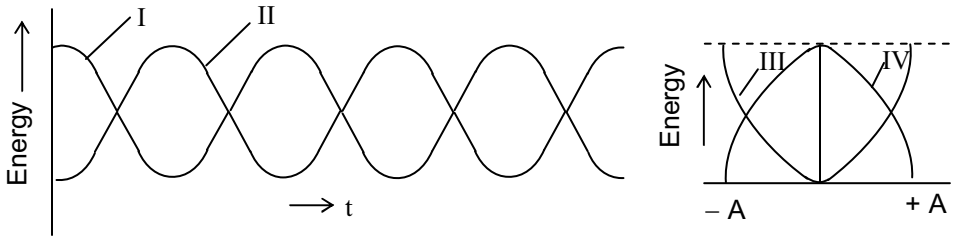
(a) moves towards +x

(b) moves towards –x

(c) contracts

(d) expands

18. For a particle executing simple harmonic motion, the displacement x is given by $x = A \sin \omega t$. Identify the graph which represents the variation of potential energy (P.E.) as a function of time t and displacement x.



(a) I, III (b) II, III (c) I, IV (d) II, IV

19. A particle is moving in horizontal uniform circular motion. The angular momentum of the particle is constant about

(a) centre of circle

(b) point on circumference of circle

(c) at any tangent to circle

(d) point inside the circle but not the centre

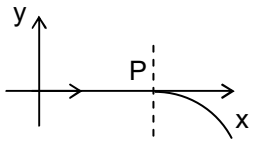
20. A thin convex lens of focal length 30 cm forms the image of an object placed at infinity of size 2 cm. Now a concave lens of focal length 20 cm is placed 26 cm towards the image. The size of final image formed is

(a) 2.5 cm (b) 3.5 cm (c) 1 cm (d) 8 cm

21. A police car moving at 22 m/s, chases a motorcyclist. The policeman sounds his horn at 176 Hz, while both of them move towards a stationary siren of frequency 165 Hz. Calculate the speed of the motorcycle, if it is given that he does not observe any beats.

(a) 33 m/s (b) 22 m/s (c) zero (d) 11 m/s

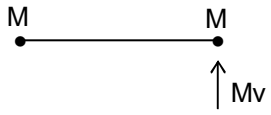
22. For a positively charged particle moving in x-y plane initially along the x-axis, there is a sudden change in its path due to the presence of electric and magnetic fields beyond P. The curved path is shown in the x-y plane and is found to be non-circular. Which one of the following combinations is possible ?



(a) $\vec{E} = 0, \quad \vec{B} = b\hat{i} + c\hat{k}$ (b) $\vec{E} = a\hat{i}, \quad \vec{B} = c\hat{k} + a\hat{i}$

(c) $\vec{E} = 0, \quad \vec{B} = c\hat{j} + b\hat{k}$ (d) $\vec{E} = a\hat{i}, \quad \vec{B} = c\hat{k} + b\hat{j}$

23. A rod of negligible mass of length l connected with two identical masses at both ends, placed on horizontal surface (frictionless). Asudden impulse of Mv is given (as shown in figure). Calculate the angular velocity of the rod.

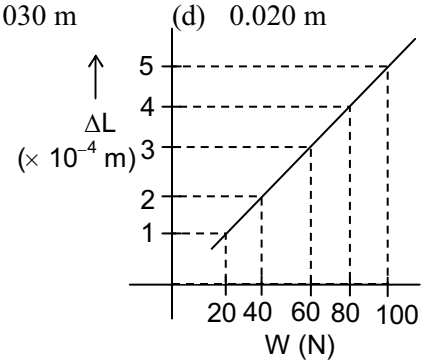


(a) $4v / l$ (b) v / l (c) $2v / l$ (d) $3v / l$

24. In the experiment for the determination of the speed of sound in air using the resonance column method, the length of air column that resonates in the fundamental mode, with a tuning fork is 0.1 m. When this length is changed to 0.35 m, the same tuning fork resonates with the first overtone. The end correction is

(a) 0.025 m (b) 0.015 m (c) 0.030 m (d) 0.020 m

25. Adjoining graph shows the extension (Δl) of a wire of length 1 m suspended from the top of a roof at one end and with a load W connected to the other end. Area of cross-section of wire is 10^{-6} m^2. Find Y in SI units.



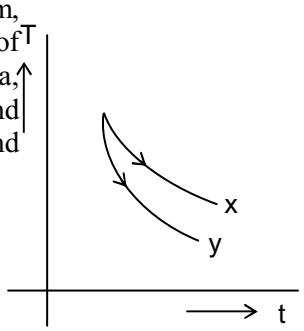
(a) 2×10^6 N/m^2

(b) 5×10^6 N/m^2

(c) 2×10^{11} N/m^2

(d) 5×10^{11} N/m^2

26. The graph, shown in the adjacent diagram, represents the variation of temperature (T) of two bodies, x and y having same surface area, with time (t) due to emission of radiation. Find the correct relation between the emissive and absorptive power of the two bodies.



(a) $E_x > E_y$, $A_x > A_y$

(b) $E_x > E_y$, $A_x < A_y$

(c) $E_x < E_y$, $A_x > A_y$

(d) $E_x < E_y$, $A_x < A_y$

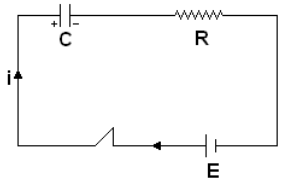
27. Length of a cube is measured to be 1.2×10^{-2} m. Volume of the cube corresponding to the measured length is

(a) 1.7×10^{-6} m^3 (b) 1.73×10^{-6} m^3

(c) 1.728×10^{-6} m^3 (d) 1.72×10^{-6} m^3

Directions: Question numbers 28, 29 and 30 are based on the following paragraph.

When a capacitor C is connected to a battery through a resistance R, the plates of the capacitor will acquire equal and opposite charge and potential difference across it become equal to the emf of battery. The process called charging takes sometime and during this time there is an electric current through the resistance. If at any time t, q is the charge on capacitor, then from Kirchoff's law, $R\frac{dq}{dt}+\frac{q}{C}=E$

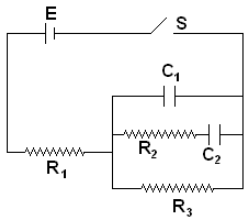


Which on solving for q gives $q = q_0(1-e^{-t/CR})$ with q = CE (for $t = \infty$)

If a charged capacitor having charge q_0 is discharged through a resistor R then at any time discharge equation can be written as $q = q_0 e^{-t/CR}$

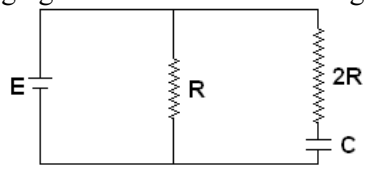
Where CR = τ = time constant of circuit

28. In the circuit diagram shown, the current through the battery immediately after the switch S is closed is:



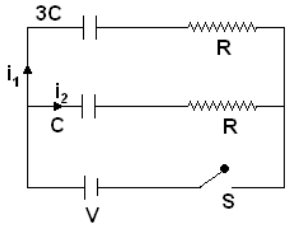
a) zero b) $\frac{E}{R_1}$ c) $\frac{E}{R_1+R_3}$ d) $\frac{E}{R_1+\frac{R_2R_3}{R_2+R_3}}$

29. The time constant of charging of the circuit shown in figure is:



a) $\frac{2}{3}RC$ b) $\frac{3}{2}RC$ c) 2RC d) 3RC

30. In the circuit shown, switch S is closed at t = 0. Let i_1 and i_2 be the currents at any finite time t, then the ratio $\frac{i_1}{i_2}$:



a) is constant. b) increases with time.
c) decreases with time. d) first increases and then decreases.

CHEMISTRY

PART – B

31. From the four given samples, select the sample which has maximum number of atoms

(a) 24 g of C (12) (b) 56 g of Fe (56)

(c) 27 g of Al (27) (d) 108 g of Ag (108)

32. During depression of freezing point in a solution, which of the following are in equilibrium ?

(a) Liquid solvent, solid solvent (b) Liquid solvent, solid solute

(c) Liquid solute, solid solute (d) Liquid solute, solid solvent

33. On hydrolysis, $(Me)_2SiCl_2$ will produce

(a) $(Me)_2Si(OH)_2$ (b) $(Me)_2Si{=}O$

(c) $-[-O-(Me)_2Si-O-]_n-$ (d) $Me_2SiCl(OH)$

34. An enantiomerically pure acid is treated with racemic mixture of an alcohol having one chiral carbon. The ester formed will be

(a) optically active mixture (b) pure enantiomer

(c) meso compound (d) racemic mixture

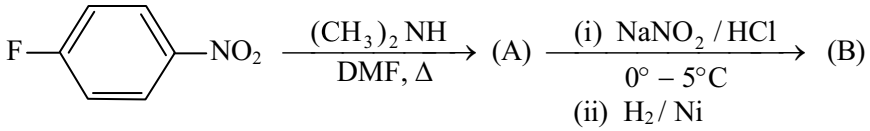
35. Identify [A] and [B] in the following reactions

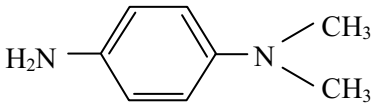
$[A] + H_2SO_4 \rightarrow [B]$, a colourless gas with irritating smell

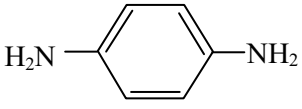
$[B] + K_2Cr_2O_7 + H_2SO_4 \rightarrow$ green solution

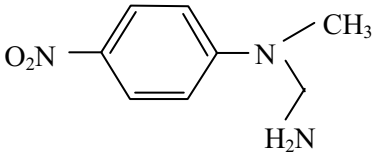
(a) CO_3^{2-}, CO_2 (b) Cl^-, HCl (c) S^{2-}, H_2S (d) SO_3^{2-}, SO_2

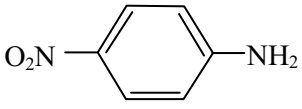
36. Identify B in the following reaction



(a) 

(b) 

(c) 

(d) 

37. A coloured compound is formed when MnO_2 is fused with KOH. Identify the compound and its colour.

(a) $KMnO_4$, purple (b) K_2MnO_4, purple green

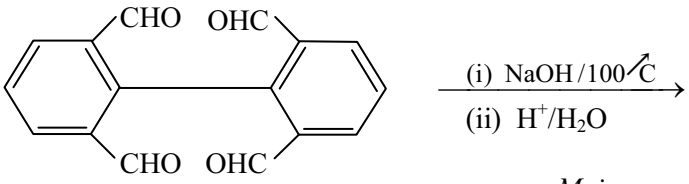
(c) Mn_2O_3, brown (d) Mn_3O_4, black

38. Which of the following are isoelectronic and isostructural ?

NO_3^-, CO_3^{2-}, ClO_3^-, SO_3

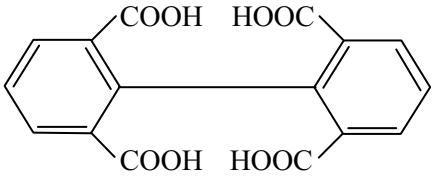
(a) NO_3^-, CO_3^{2-} (b) SO_3, NO_3^- (c) ClO_3^-, CO_3^{2-} (d) CO_3^{2-}, SO_3

39. Identify the major product in the following reaction

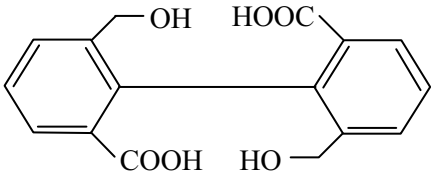


Major product + Minor product

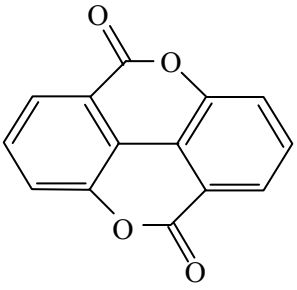
(a)



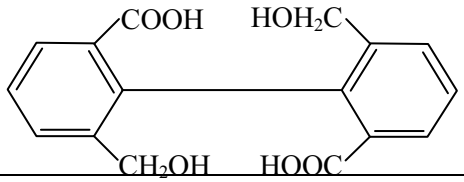
(b)



(c)



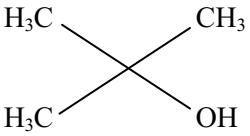
(d)

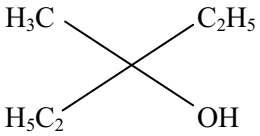


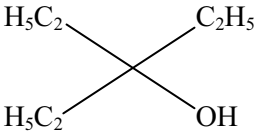
40. The product P of the reaction

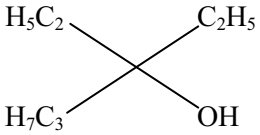
$$\text{Ethyl ester} \xrightarrow[\text{excess}]{CH_3MgBr} P$$

will be

(a) 

(b) 

(c) 

(d) 

41. Which of the following reaction defines ΔH_f° ?

(a) $C(diamond) + O_2(g) \rightarrow CO_2(g)$

(b) $\frac{1}{2}H_2(g) + \frac{1}{2}F_2(g) \rightarrow HF(g)$

(c) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

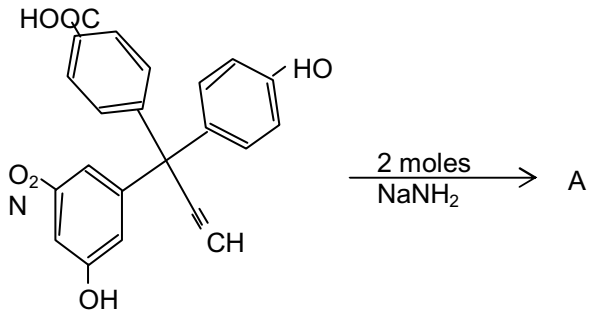
(d) $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g)$

42. Find the molecule with highest dipole moment amongst the following

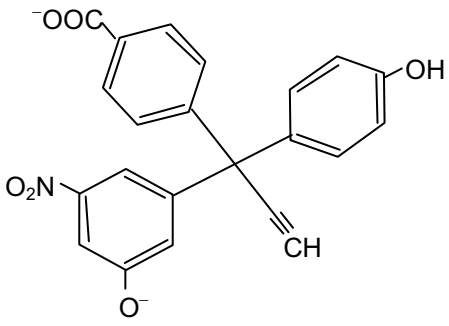
(a) $CHCl_3$ (b) CH_2Cl_2

(c) CH_3Cl (d) CCl_4

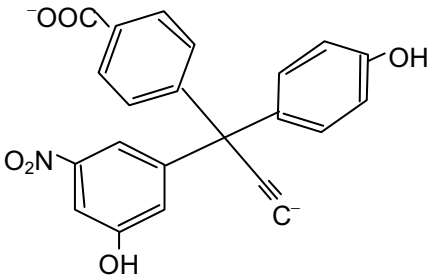
43. Identify the product A in the following reaction

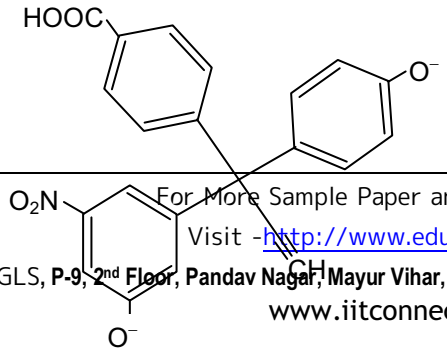


(a)

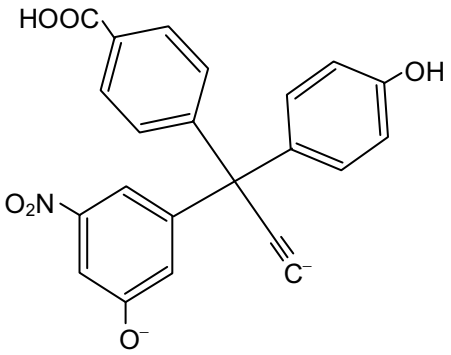


(b)





(c)

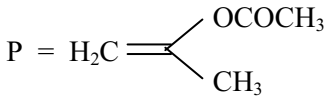
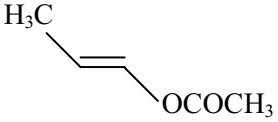
(d) 

44. Rate of physiorption increases with

(a) increase in temperature (b) decrease in temperature

(c) decrease in pressure (d) decrease in surface area

45. The product of acid hydrolysis of P and Q can be distinguished by

P =  ; Q = 

(a) Lucas reagent (b) 2, 4-DNP

(c) Fehling's solution (d) $NaHSO_3$

46. In a first order reaction the concentration of reactant decreases from 800 mol/dm^3 to 50 mol/dm^3 in 2×10^4 sec. The rate constant of reaction in sec^{-1} is

(a) 2×10^4 (b) 3.45×10^{-5} (c) 1.386×10^{-4} (d) 2×10^{-4}

47. ^{23}Na is the more stable isotope of Na. $^{24}_{11}Na$ decys and ultimately forms ^{23}Na. The radioactive decay in this process is expressed by

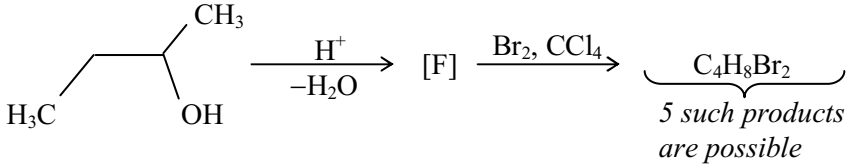
(a) β^- emission (b) α-emission

(c) β^+ emission (d) K electron capture

48. A solution which is 10^{-3} M each in Mn^{2+}, Fe^{2+}, Zn^{2+} and Hg^{2+} is treated with 10^{-16} M sulphide ion. If K_{sp} of MnS, FeS, ZnS and HgS are 10^{-15}, 10^{-23}, 10^{-20} and 10^{-54} respectively, which one will precipitate first ?

(a) FeS (b) MgS (c) HgS (d) ZnS

49. In the reaction given below how many structures of F are possible ?



(a) 2 (b) 5 (c) 6 (d) 3

50. Which statement given below is correct about H_3PO_3 ?

(a) H_3PO_3 is tribasic and reducing.

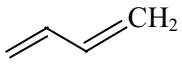
(b) H_3PO_3 is tribasic and non-reducing.

(c) H_3PO_3 is dibasic and reducing.

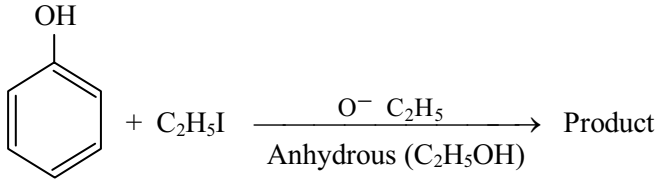
(d) H_3PO_3 is dibasic and non-reducing.

51. Identify the molecule which has sp^2–sp^2–sp–sp (from left to right) type of hybridization in the molecules given below

(a) $H_2C{=}CH{-}C{\equiv}N$ (b) $HC{\equiv}C{-}C{\equiv}CH$

(c) $H_2C{=}C{=}C{=}CH_2$ (d) 

52. Identify the product in the following reaction



(a) $C_6H_5OC_2H_5$ (b) $C_2H_5OC_2H_5$

(c) $C_6H_5OC_6H_5$ (d) C_6H_5I

53. Positive deviation from ideal behaviour takes place because of

(a) molecular interaction between atoms and $PV/nRT > 1$

(b) molecular interaction between atoms and $PV/nRT < 1$

(c) finite size of atoms and $PV/nRT > 1$

(d) finite size of atoms and $PV/nRT < 1$

54. Mixture of 0.02 mol of $[Co(NH_3)_5SO_4]Br$ and 0.02 mol of $[Co(NH_3)_5Br]SO_4$ was prepared in 2 litre of solution

1 litre of mixture + excess $AgNO_3 \rightarrow Y$

1 litre of mixture + excess $BaCl_2 \rightarrow Z$

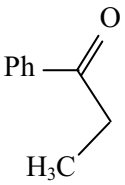
Number of moles of Y and Z are respectively

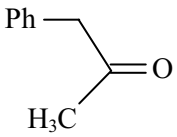
(a) 0.02, 0.02 (b) 0.02, 0.01

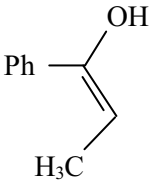
(c) 0.01, 0.02 (d) 0.01, 0.01

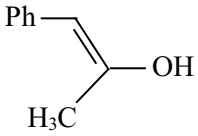
55. Identify A in the reaction given below

$$Ph{-}C{\equiv}C{-}CH_3 \xrightarrow{Hg^{2+}/H^+} A$$

(a) 

(b) 

(c) 

(d) 

56. H_3BO_3 is

(a) monobasic and strong Lewis acid (b) tribasic and weak Bronsted acid

(c) monobasic and weak Lewis acid (d) monobasic and weak Bronsted acid

57. The reactions given below express the extraction process of god. Identify complexes [X] and [Y].

$$\text{Roasted gold ore} + CN^- + H_2O \xrightarrow{O_2} [X] + OH^-$$

$$[X] + Zn \rightarrow [Y] + Au$$

(a) $X = [Au(CN)_2]^-$, $Y = [Zn(CN)_4]^{2-}$ (b) $X = [Au(CN)_4]^{3-}$, $Y = [Zn(CN)_4]^{2-}$

(c) $X = [Au(CN)_2]^-$, $Y = [Zn(CN)_6]^{4-}$ (d) $X = [Au(CN)_4]^-$, $Y = [Zn(CN)_4]^{2-}$

58. In the electrolytic cell, electrons flow from

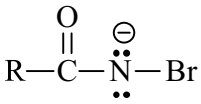
(a) cathode to anode in solution

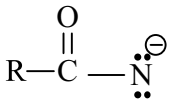
(b) cathode to anode through external supply

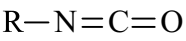
(c) cathode to anode through internal supply

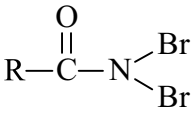
(d) anode to cathode through internal supply

59. Which of the following is not an intermediate in Hofmann bromamide reaction?

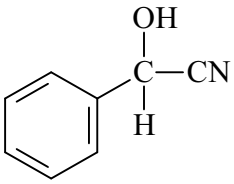
a) 

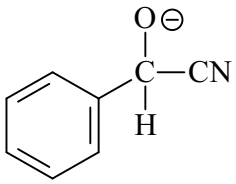
b) 

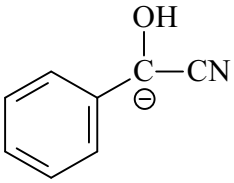
c) 

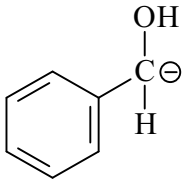
d) 

60. The intermediate which is not formed in benzoin condensation is

a) 

b) 

c) 

d) 

MATHEMATICS

PART – C

61. The angles of a triangle are in the ratio 4 : 1 : 1, then the ratio of the largest side to the perimeter is

(a) $1 : 1 + \sqrt{3}$ (b) $2 : 3$

(c) $\sqrt{3} : 2 + \sqrt{3}$ (d) $1 : 2 + \sqrt{3}$

62. Function I (m, n) is defined as $I(m, n) = \int_0^1 t^m (1+t)^n \, dt$; where $m, n \in R$, then I (m, n) can also be represented as

(a) $\frac{n}{1+m} I[(m+1), (n-1)]$ (b) $\frac{m}{n+1} I[(m+1), (n-1)]$

(c) $\frac{2^n}{1+m} - \frac{n}{1+m} I[(m+1), (n-1)]$ (d) $\frac{2^n}{1+m} - \frac{m}{1+n} I[(m-1), (n-1)]$

63. For the hyperbola given below, which one of the following is independent of α ; where $0 < \alpha < \pi/2$

$$\frac{x^2}{\cos^2\alpha} - \frac{y^2}{\sin^2\alpha} = 1$$

(a) Eccentricity (b) Abscissa of foci

(c) Directrix (d) Vertex

64. A triangle is formed by the coordinates O (0, 0), A (0, 21) and B (21, 0). The number of integral coordinates strictly inside the triangle (integral coordinate has both x and y) is

(a) 190 (b) 305

(c) 181 (d) 206

65. For what value of a the volume of parallelopiped formed by vectors $\hat{i} + a\hat{j} + \hat{k}$, $\hat{j} + a\hat{k}$, $a\hat{i} + \hat{k}$ is minimum ?

(a) $\sqrt{3}$ (b) $2\sqrt{3}$ (c) $\frac{1}{\sqrt{3}}$ (d) $3\sqrt{2}$

66. A tangent is drawn at the point $(3\sqrt{3}\cos\theta, \sin\theta)$ for $0 < \theta < \frac{\pi}{2}$ of an ellipse $\frac{x^2}{27} + \frac{y^2}{1} = 1$. The least value of the sum of the intercepts on the coordinate axis by this tangent is attained at θ is equal to

(a) $\frac{\pi}{6}$ (b) $\frac{2\pi}{3}$ (c) $\frac{3\pi}{8}$ (d) $\frac{3\pi}{4}$

67. Orthocentre of triangle whose vertices are given by the coordinates (0, 0), (3, 4), (4, 0), is

(a) $\left(\frac{3}{4}, 3\right)$ (b) $\left(\frac{5}{4}, 3\right)$ (c) (5, –2) (d) $\left(3, \frac{3}{4}\right)$

68. Value of $\sqrt{x^2+x} + \frac{\tan^2\alpha}{\sqrt{x^2+x}}$, $x > 0$, $\alpha \in \left(0, \frac{\pi}{2}\right)$ is always greater than or equal to

(a) $2\cos\frac{\alpha}{2}$ (b) $\sin\alpha$ (c) $2\tan\alpha$ (d) $\sec\alpha$

69. If $A=\begin{bmatrix}\alpha & 0\\ 1 & 1\end{bmatrix}$ and $B=\begin{bmatrix}1 & 0\\ 5 & 1\end{bmatrix}$, whenever $A^2 = B$, the value of α is

(a) 5 (b) -1

(c) 11 (d) no real value of α

70. The focal chord of $y^2 = 16x$ is tangent to $(x-6)^2 + y^2 = 2$, then the possible values of the slope of this chord are

(a) $(1, -1)$ (b) $(-1/2, 2)$ (c) $(-2, 1/2)$ (d) $(1/2, 2)$

71. The line $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2}$ lies exactly on the plane $2x - 4y + z = 7$, then value of k is

(a) 7 (b) -7 (c) 1 (d) no real value

72. There are three events A, B and C and three statements are made (i) $P(B) = \frac{3}{4}$, (ii) $P(\bar{A} \cap B \cap \bar{C}) = \frac{1}{3}$, (iii) $P(A \cap B \cap \bar{C}) = \frac{1}{3}$, then value of $P(B \cap C)$ is

(a) 1/12 (b) 7/12 (c) 5/12 (d) 11/21

73. Area bounded by the curves $y = \sqrt{x}$, $x = 2y + 3$ in first quadrant and x-axis is

(a) $2\sqrt{3}$ (b) 18 (c) 9 (d) 34/3

74. For the function $f(x) = \int_{x^2}^{x^2+1} e^{-t^2} dt$, the interval in which f (x) is increasing is given as

(a) $(0, \infty)$ (b) $(-\infty, 0)$ (c) $[-1, 1]$ (d) $[0, \infty)$

75. Range of the function $f(x) = \frac{x^2 + x + 2}{x^2 + x + 1}$, where x is a real number, is

(a) (3, 5) (b) [1, 3] (c) $\left[1, \frac{7}{5}\right)$ (d) $\left(1, \frac{7}{3}\right]$

76. Which of the following function does not obey Mean Value Theorem in the interval [0, 1] ?

(a) $f(x) = \begin{cases} \frac{1}{2} - x, & x < \frac{1}{2} \\ \left(\frac{1}{2} - x\right)^2, & x \geq \frac{1}{2} \end{cases}$ (b) $f(x) = \begin{cases} \frac{\sin x}{x}, & x \neq 0 \\ 1, & x = 0 \end{cases}$

(c) $f(x) = x|x|$ (d) $f(x) = |x|$

77. If $(t+1)\frac{dy}{dt} - ty = 1$ and $y(0) = -1$, then at $t = 1$ the solution of the differential equation is

(a) $\ln 2 + \frac{1}{2}$ (b) $-\frac{1}{2}$ (c) $\frac{5}{4}$ (d) $e - \frac{1}{2}$

78. A square is formed by following two pairs of straight lines $y^2 - 14y + 45 = 0$ and $x^2 - 8x + 12 = 0$. A circle is inscribed in it. The centre of circle is

(a) (7, 4) (b) (4, 7)

(c) (6, 5) (d) (5, 6)

79. A function $f : [0, \infty) \to [0, \infty)$ defined as $f(x) = \frac{x}{1+x}$ is

(a) one-one and onto (b) one-one but not onto

(c) onto but not one-one (d) neither one-one nor onto

80. $f(x)$ is differentiable function, given $f'(1) = 4$, $f'(2) = 6$, where $f'(c)$ means the derivative of function at $x = c$, then

$$\lim_{h \to 0} \frac{f(2 + 2h + h^2) - f(2)}{f(1 + h - h^2) - f(1)}$$

(a) does not exist (b) -3 (c) 3 (d) $-\frac{5}{4}$

81. The coefficient of t^{24} in $(1 + t^2)^2 (1 + t^{12}) (1 + t^{24})$ is

(a) ${}^{12}C_6 + 3$ (b) ${}^{12}C_6$ (c) ${}^{12}C_6 + 1$ (d) ${}^{12}C_6 + 2$

82. The complex number z is such that $|z| = 1$, $z \neq -1$ and $\omega = \frac{z-1}{z+1}$. Then real part of ω is

(a) $\frac{|z-1|^2}{|z+1|^2}$ (b) -1 (c) $\frac{\sqrt{3}}{|z|^2}$ (d) 0

83. A system of three equations is given by $x + ay = 0$, $y + az = 0$, $z + ax = 0$. Find the value of a for which the system of equation has infinitely many solutions.

(a) $a = 1$ (b) $a = 0$ (c) $a = -1$ (d) No value

84. Two numbers are chosen from {1, 2, 3, 4, 5, 6} one after another without replacement. Find the probability that one of the smaller value of two is less than 4.

(a) 4/5 (b) 1/15 (c) 1/5 (d) 14/15

85. Tangents are drawn to the ellipse $\frac{x^2}{9} + \frac{y^2}{5} = 1$ at end of latus rectum. Find the area of quadrilateral so formed.

(a) 27 (b) 13/2 (c) 15/4 (d) 45

86. $\lim_{x \to 0} \frac{\sin nx\,[(a-n)\,nx - \tan x]}{x^2} = 0$, where n is non-zero positive integer, then a is equal to

(a) $\frac{n+1}{n}$ (b) $n^2 + 1$ (c) $\frac{1}{n+1}$ (d) $n + \frac{1}{n}$

Directions: Question number 86 to 90 are Assertion – Reason type questions. Each of these questions contains two statements **Statement-1 (Assertion) and Statement-2 (Reason).**
Each of these questions also have four alternative choices, only one of which is the correct answer. You have to select the correct choice

87. **Statement-1** *:* For $a = \frac{-1}{\sqrt{3}}$ the volume of the parallelopiped formed by the vectors $i + aj$, $ai + j + k$ and $j + ak$ is maximum.

Statement-2*:* The volume of the parallelopiped having three coterminous edges $\bar{a}, \bar{b}, \bar{c}$ is $\left|\left[\bar{a}\bar{b}\bar{c}\right]\right|$

(1) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1
(2) Statement-1 is true, Statement-2 is true; Statement-2 is **not** a correct explanation for Statement-1
(3) Statement-1 is true, Statement-2 is false
(4) Statement-1 is false, Statement-2 is true

88. **Statement-1***:* If $|\bar{a}| = 2; |\bar{b}| = 3; |2\bar{a} - \bar{b}| = \bar{5}$ then $|2\bar{a} + \bar{b}| = 5$

Statement-2*:* $|\bar{p} - \bar{q}| = |\bar{p} + \bar{q}|$

(1) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1
(2) Statement-1 is true, Statement-2 is true; Statement-2 is **not** a correct explanation for Statement-1
(3) Statement-1 is true, Statement-2 is false
(4) Statement-1 is false, Statement-2 is true

89. **Statement-1 :** The shortest distance between the skew lines $\frac{x+3}{-4}=\frac{y-6}{3}=\frac{z}{2}$ and $\frac{x+2}{-4}=\frac{y}{1}=\frac{z-7}{1}$ is 9

Statement-2: Two lines are skew lines if there exists no plane passing through them

(1) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1
(2) Statement-1 is true, Statement-2 is true; Statement-2 is **not** a correct explanation for Statement-1
(3) Statement-1 is true, Statement-2 is false
(4) Statement-1 is false, Statement-2 is true

90. **Statement-1:** $2222^{5555}+5555^{2222}$ is divisible by 7

Statement-2: x^n-a^n is divisible by x – a, for n is even or odd and x^n+a^n is divisible by x + a for n is odd

(1) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1
(2) Statement-1 is true, Statement-2 is true; Statement-2 is **not** a correct explanation for Statement-1
(3) Statement-1 is true, Statement-2 is false
(4) Statement-1 is false, Statement-2 is true