

ASSOCIATION OF CHEMISTRY TEACHERS
NATIONAL STANDARD EXAMINATION IN CHEMISTRY 2012-2013
Date of Examination 24th November 2012
[Ques. Paper Code : 2-3-2]

1. An electron releasing group will not stabilize which of the following groups ?
(A) Carbocation (B) carbanion (C) Free radical (D) any of the above

Ans. [B]

Sol. Carbanion contain -ve which is destabilize by electron releasing group.

2. The bond order for a species with the configuration $\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma p_x^1$ will be -
(A) 1 (B) 1/2 (C) Zero (D) 3/2

Ans. [B]

Sol. $\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_x^1$

$$\text{Bond order} = \frac{N_b - N_a}{2}$$

$$\text{Bond order} = \frac{5 - 4}{2} = 0.5$$

3. The widest range over which electronic excitations in organic compounds occur, is -
(A) 200 nm- 780 nm (B) 220 nm- 500 nm (C) 250 nm – 700 nm (D) 290 nm – 1000 nm

Ans. [A]

Sol. 200 – 780 nm Rang is for uv-visible, spectrophotometry used for organic compound.

4. Which of the following compounds has the least tendency to form hydrogen bonds between molecules ?
(A) NH₃ (B) H₂NOH (C) HF (D) CH₃F

Ans. [D]

Sol. H-bond present when hydrogen directly bonded with highly electronegative atom F,O,N
 \therefore H-bond absent in CH₃F

5. The species in which the central atom uses sp^2 hybrid orbitals is -
(A) PH₃ (B) NH₃ (C) CH₃⁺ (D) SbH₃

Ans. [C]

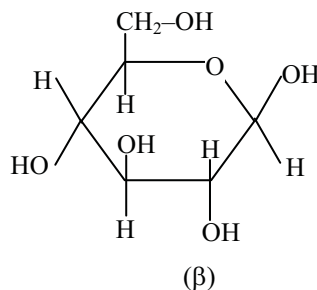
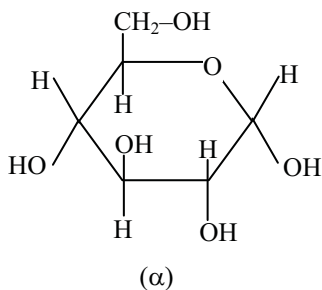
Sol. CH_3^{\oplus} sp^2 hybrid orbital (3 σ bond + 0 lonepair)

6. α -D(+) glucose and β -D(+) glucose are -
(A) Enantiomers
(B) Geometrical isomers
(C) Epimers
(D) Anomers

Ans. [D]

Sol. Anomers – cyclic diastereomer

Which differ at 1st carbon



7. The chemical formula of 'laughing gas' is -
(A) NO
(B) N₂O
(C) N₂O₄
(D) N₂O₅

Ans. [B]

Sol. N₂O is known as laughing gas.

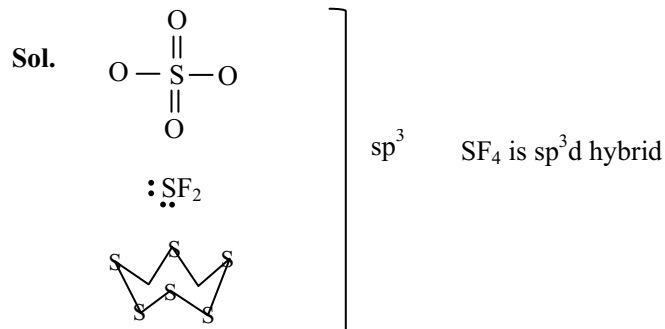
8. The enzyme which hydrolyses triglycerides to fatty acids and glycerol is -
(A) Lipase
(B) maltase
(C) pepsin
(D) zymase

Ans. [A]

Sol. Lipid $\xrightarrow{\text{lipase}}$ Glycerol + fatty acid

9. In which of the following ion/molecule, the 'S' atom does not assume sp³ hybridization?
(A) SO₄²⁻
(B) SF₄
(C) SF₂
(D) S₈

Ans. [B]



10. The most stable free radical which can be isolated is -
(A) Trityl radical (B) Diphenyl methyl radical
(C) 2,4,6-Tri-ter-butylphenoxy radical (D) tert-butyl radical

Ans. [C]

Sol. Due to Steric hinderance it do not undergo dimerisation.

11. Phosphine is prepared by the reaction of
(A) P and HNO₃ (B) P and H₂SO₄ (C) P and NaOH (D) P and H₂S

Ans. [C]

Sol. $P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$

12. Pheromones are chemical substances which are

- (A) formed by fermentation process of fungi (B) secreted by endocrine glands of man
(C) secreted by insects (D) plant growth hormones

Ans. [C]

Sol. Secreted by insect

13. Which of the following does not reduce Benedict's solution ?
(A) Glucose (B) Fructose (C) Sucrose (D) Aldehyde

Ans. [C]

Sol. Sucrose is non reducing sugar.

14. The inorganic precipitate which acts as a semipermeable membrane is
(A) Calcium phosphate (B) Nickel phosphate (C) Plaster of paris (D) Copper ferrocyanide

Ans. [D]

Sol. It is artificial SPM.

15. The genetic material of a cell is made of
(A) nucleic acids (B) proteins (C) carbohydrates (D) fats

Ans. [A]

Sol. Nucleic acid are responsible for heredity character.

16. Lanthanide contraction is caused due to
 (A) the appreciable shielding on outer electrons by 4f electrons from the nuclear charge
 (B) the appreciable shielding on outer electrons by 5d electrons from the nuclear charge
 (C) the same effective nuclear charge from Ce to Lu
 (D) the imperfect shielding on outer electrons by 4f electrons from the nuclear charge

Ans. [D]

Sol. Lanthanoid contraction is due to the imperfect shielding on outer electron by 4f electron from the nuclear charge.

17. Which of the following contain maximum number of electrons in the antibonding molecular orbitals
 (A) O_2^2 (B) O_2 (C) O_2^1 (D) O_2^+

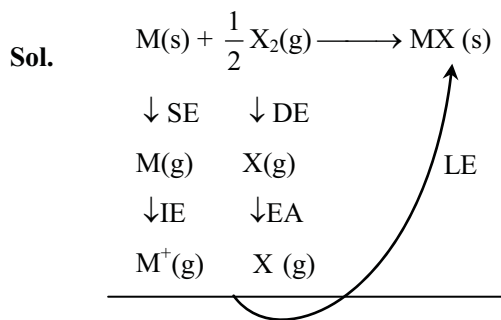
Ans. [A]

Sol. $O_2^2 \Rightarrow \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 (\pi 2p_x^2 = \pi 2p_y^2) (\pi^* 2p_x^2 = \pi^* 2p_y^2)$

Antibonding molecular	Orbital electron
O_2	6
O_2^+	5
O_2	7
O_2^{2-}	8

18. Lattice energy for an ionic compound is calculated by using
 (A) Kirchoff's equation (B) Markownikoff's rule
 (C) Born Haber cycle (D) Carnot cycle

Ans. [C]



$$\Delta H_f = SE + IE + \frac{DE}{2} - EA - LE$$

19. If the radius of the first Bohr orbit is r, then the de-Broglie wavelength in the third Bohr orbit is
 (A) $2\pi r$ (B) $9r$ (C) $r/3$ (D) $6\pi r$

Ans. [D]

Sol. $mvr = \frac{nh}{2\pi}$

$$mvr_1 = \frac{h}{2\pi}$$

$$r_1 = \frac{h}{2\pi m u}$$

$$r_1 = \frac{\lambda_1}{2\pi}$$

$$r_2 = \frac{3\lambda_2}{2\pi} \quad r \propto \frac{n^2}{Z}$$

$$\lambda_2 = \frac{2\pi r_2}{3}$$

$$= \frac{2\pi r_1 \times 3^2}{3} = 6\pi r$$

20. The IUPAC name of $[\text{Co}(\text{ONO})(\text{NH}_3)_5\text{Cl}_2]$ is

- (A) pentamminenitrocobalt(II)chloride (B) pentamminenitrosocobalt(III)chloride
 (C) pentamminenitritocobalt(III)chloride (D) pentamineoxo-nitrocobalt(III)chloride

Ans. [C]

Sol. $[\text{Co}(\text{ONO})(\text{NH}_3)_5]\text{Cl}_2$

Pentaamminenitrito-cobalt (III) chloride.

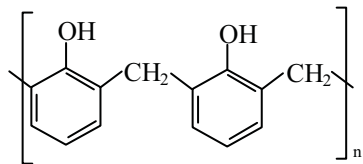
21. In the Vander wall equation of state for a non ideal gas the term that accounts for intermolecular force is

- (A) (V-b) (B) RT (C) $\left(P + \frac{a}{v^2}\right)$ (D) 1/RT

Ans. [C]

Sol. Intermolecular attraction = $\left(P + \frac{a}{v^2}\right)$

22. The structure given below represents

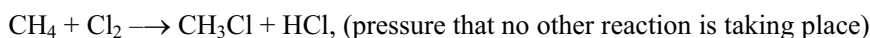


- (A) Isoprene Rubber (B) Bakelite (C) PVC (D) Nylon 6,6

Ans. [B]

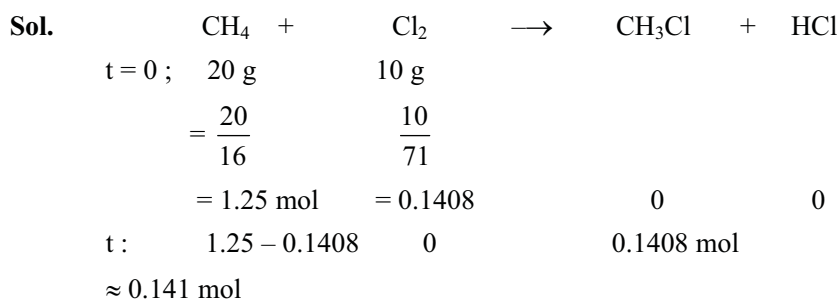
Sol. Bakelite, it is thermosetting polymer for med by reaction between phenol & HCHO.

23. The maximum amount of CH_3Cl that can be prepared from 20g of CH_4 and 10g of Cl_2 by the following reaction, is



- (A) 3.625 mole (B) 0.141 mole (C) 1.41 mole (D) 0.365 mole

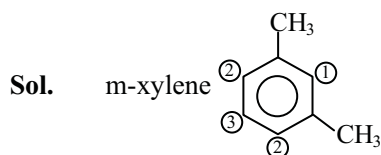
Ans. [B]



24. Which isomer of xylene can give three different monochloroderivative ?

- (A) o-xylene (B) m-xylene
(C) p-xylene (D) xylene cannot give a monochloro derivative

Ans. [B]



25. The most Carbocations, carbanions, free radicals and radical cation are reactive carbon intermediates. Their hybrid orbitals respectively are

- (A) sp^2, sp^2, sp^3, sp (B) sp^2, sp^2, sp, sp^3 (C) sp^2, sp^3, sp^2, sp (D) sp^3, sp^2, sp, sp^2

Ans. [C]

Sol. sp^2, sp^3, sp^2, sp

26. effective electrolyte to cause the flocculation of a negatively charged arsenium sulphide colloid is :

- (A) NaCl (B) BaCl₂ (C) K₃Fe(CN)₆ (D) AlCl₃

Ans. [D]

Sol. +ve ion flocculate the -ve sol more effectively

flocculation \propto valency
power of ion

27. The electronegativities of acetylene, ethylene and ethane are in the order

- (A) ethylene > acetylene > ethane (B) acetylene > ethylene > ethane
(C) ethane > acetylene > ethylene (D) acetylene > ethane > ethylene

Ans. [B]

Sol. $\text{CH}\equiv\text{CH} > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{CH}_3$

50% 33.33% 25%
s char s char s char

28. A catalyst accelerates a reaction primarily by stabilizing the
 (A) substrate (B) product (C) intermediate (D) transition state

Ans. [D]

Sol. Catalyst stabilize transition state.

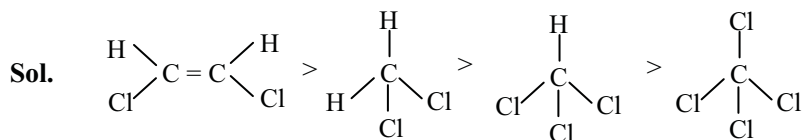
29. The number of transition states in a unimolecular nucleophilic substitution (S_N^1) reaction is
 (A) 0 (B) 1 (C) 2 (D) 3

Ans. [C]

Sol. As it involve formation of carbocation but if nucleophile is neutral then it can be 3.

30. The dipole moments of halo compounds are in the order
 (A) $\text{CHCl}_3 > \text{CCl}_4 > \text{CHCl}_2 > \text{cis-CHCl} = \text{CHCl}$ (B) $\text{cis-CHCl} = \text{CHCl} > \text{CHCl}_3 > \text{CH}_2\text{Cl}_2 > \text{CCl}_4$
 (C) $\text{cis-CHCl} = \text{CHCl} > \text{CH}_2\text{Cl}_2 > \text{CHCl}_3 > \text{CCl}_4$ (D) $\text{CHCl}_3 > \text{CHCl}_2 > \text{cis-CHCl} = \text{CHCl} > \text{CCl}_4$

Ans. [C]



31. Which of the following information is not provided by a reaction mechanism ?

- (A) Which bonds are formed and which bonds are broken
 (B) Which intermediates and transition states are formed
 (C) Energy content of the reacting species
 (D) Which is the slowest step

Ans. [C]

Sol. Energy content of the reading species

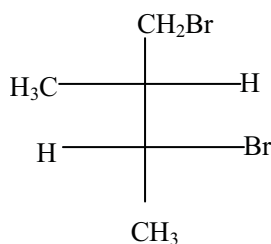
32. Tollen's reagent is
 (A) Cu_2O (B) $[\text{Cu}(\text{OH})_4]^{2-}$ (C) Ag_2O (D) $[\text{Ag}(\text{NH}_3)_2]^+$

Ans. [D]

Sol. $[\text{Ag}(\text{NH}_3)_2]^+$

Ammonical silver nitrate

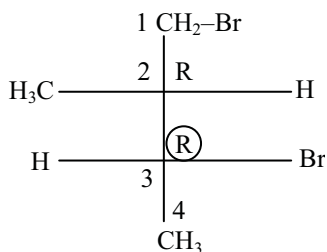
33. The R/S designation for the following stereoisomer of 1,3-dibromo-2-methylbutane is



- (A) 2R, 3R (B) 2R, 3S (C) 2S, 3R (D) 2S, 3S

Ans. [A]

Sol. 2R, 3R

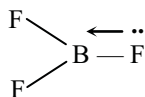


34. The bond energy of B-F bond in BF_3 is 646 kJ. mol^{-1} , while that of N-F bond in NF_3 is 280 kJ. mol^{-1} . This is because

- (A) N is more electronegative than B
 (B) The atomic mass of N is higher than that of B
 (C) The B-F bond gets a partial double bond character due to p-p overlap
 (D) N has a lone pair of electrons while B does not have

Ans. [C]

Sol. Bond energy of B-F bond in BF_3 is greater because B-F bond gets a partial double bond character due to $p\pi-p\pi$ back bonding



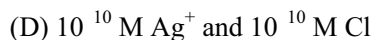
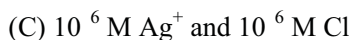
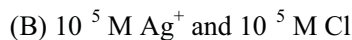
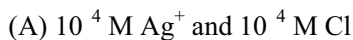
35. The amino acid that cannot be obtained by hydrolysis of proteins is -

- (A) $\text{HOOCCH}_2\text{CH}(\text{NH}_3^+)\text{COO}^-$ (B) $\begin{array}{c} \text{CH}_2\text{COO}^- \\ | \\ \text{H} - \text{C} - \text{NH}_3^+ \\ | \\ \text{SH} \end{array}$
- (C) $\begin{array}{c} \text{CH}_2 - \text{CH} - \text{COO}^- \\ | \\ \text{NH}_3^+ \\ | \\ \text{HN} \quad \text{N} \end{array}$ (D) $\text{NH}_3^+(\text{CH}_2)_4\text{CH}(\text{NH}_2)\text{COO}^-$

Ans. [B]

Sol. Protein is formed by α -amino acid. B is not amino acid

36. When equal volumes of the following solutions are mixed precipitation of AgCl ($K_{sp} = 1.8 \times 10^{-10}$) will occur only with -



Ans. [A]

Sol. $Q > K_{sp}$ for ppt

$$Q = [Ag^+][Cl^-]$$

$$Q = \left(\frac{10^{-4}}{2}\right) \left(\frac{10^{-4}}{2}\right) = 0.25 \times 10^{-8}$$

$$= 2.5 \times 10^{-9}$$

$$Q > K_{sp}$$

37. The quantum numbers for the 19th electron of Cr ($Z = 24$) are -

(A) $n = 3, l = 0, m = 0, s = +\frac{1}{2}$

(B) $n = 4, l = 0, m = 0, s = +\frac{1}{2}$

(C) $n = 3, l = 2, m = 2, s = +\frac{1}{2}$

(D) $n = 4, l = 2, m = 2, s = +\frac{1}{2}$

Ans. [B]

Sol. Cr(24) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

$$19^{\text{th}} \text{ e in } 4s \text{ so } n = 4 \quad \ell = 0 \quad m = 0 \quad s = +\frac{1}{2} \text{ or } -\frac{1}{2}$$

38. The oxidation of SO₂ by O₂ to SO₃ is an exothermic reaction. The yield of SO₃ can be maximized if -

(A) temperature is increased and pressure is kept constant

(B) temperature is decreased and pressure is increased

(C) both temperature and pressure are increased

(D) both temperature and pressure are decreased

Ans. [B]

Sol. $2SO_2 + O_2 \rightleftharpoons 2SO_3 \quad \Delta H = -ve$

$T \downarrow$ and $P \uparrow$ is favorable

$$x \propto \left(\frac{1}{P}\right)^{\frac{\Delta n_g}{\text{moles of product}}}$$

$$x \propto \left(\frac{1}{P}\right)^{\frac{1}{2}}$$

$$x \propto \sqrt{P}$$

39. Which of the following ion is colourless -
 (A) Mn^{2+} (B) Cu^+ (C) Cr^3 (D) Fe^{2+}

Ans. [B]

Sol. $Cu^+ = [Ar] 3d^{10} \quad n = 0$ Diamagnetic & colourless

40. Which of the following has a positive entropy change ?
 (A) $H_2O_{(g)} \longrightarrow H_2O_{(l)}$ (B) $BF_3(g) + NH_3(g) \longrightarrow F_3B.NH_3(s)$
 (C) $2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$ (D) $2 NH_4NO_3(s) \longrightarrow 2N_2(g) + 4 H_2O_{(l)} + O_2(g)$

Ans. [D]

Sol. \therefore solid is converted into liquid and gas

41. Equal volumes of two solutions of pH = 2 and pH = 4 are mixed together. The pH of the resulting solution will be -
 (A) 2.0 (B) 3.1 (C) 4.2 (D) 2.3

Ans. [D]

Sol.

	pH = 2	pH = 4
Volume	V	V
	$[H^+] = 10^{-2}$	$[H^+] = 10^{-4}$

$$N_1V_1 + N_2V_2 = NV$$

$$10^{-2} \times V + 10^{-4} \times V = N \times 2V$$

$$V [10^{-2} + 10^{-4}] = N \times 2V$$

$$\therefore N = \frac{1.01}{2} \times 10^{-2} = 0.5 \times 10^{-2}$$

$$\therefore \text{pH} = 3 - \log 5 = 2.3$$

42. A first order reaction is 20% complete in 600 s. The time required to complete 75% of the same reaction will be -
 (A) 3120 s (B) 3720 s (C) 4320 s (D) 4920 s

Ans. [B]

Sol. $t = \frac{2.303}{k} \log \frac{a}{(a-x)}$

$$600 = \frac{2.303}{k} \log \frac{100}{80}$$

$$t = \frac{2.303}{k} \log \frac{100}{25}$$

$$\frac{600}{t} = \frac{\log \frac{5}{4}}{\log 4}$$

$$\frac{600}{t} = \frac{\log 5 - \log 4}{\log 4}$$

$$t = 3720 \text{ s}$$

43. The vapour density of gas A is four times that of B. If the molecular mass of B is M then molecular mass of A is -

- (A) M (B) 4M (C) M/4 (D) 2M

Ans. [B]

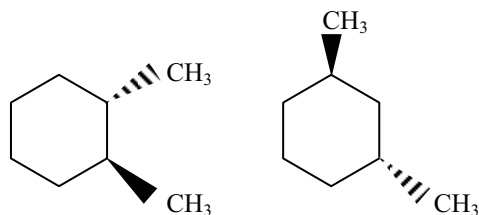
Sol. Mol. wt = 2 × V.D. = 4M

44. Among the isomers of dimethylcyclohexanes, the chiral ones are -

- (A) 1,2-trans and 1,3-cis (B) 1,2-cis and 1,3-trans
(C) 1,3-trans and 1,4-trans (D) 1,2-trans and 1,3-trans

Ans. [D]

Sol.



45. The relative basic strengths of NH_3 , CH_3NH_2 and NF_3 are in the order -

- (A) $\text{CH}_3\text{NH}_2 > \text{NH}_3 > \text{NF}_3$ (B) $\text{NH}_3 > \text{CH}_3\text{NH}_2 > \text{NF}_3$
(C) $\text{NF}_3 > \text{CH}_3\text{NH}_2 > \text{NH}_3$ (D) $\text{CH}_3\text{NH}_2 > \text{NF}_3 > \text{NH}_3$

Ans. [A]

Sol. $\overset{+I}{\boxed{\text{CH}_3}}\text{—NH}_2 > \text{NH}_3 > \text{N}\overset{-I}{\boxed{\text{F}_3}}$ – I effect

46. The outermost electronic configuration of the most electronegative element is -

- (A) ns^2, np^3 (B) $ns^2, np^6 (n-1)d^5$
(C) ns^2, np^5 (D) ns^2, np^6

Ans. [C]

Sol. Halogen (ns^2np^5) are highly electronegative due to high Z_{eff} & small size.

47. The conductivity of a metal decreases with increase in temperature because -
 (A) the kinetic energy of the electrons increases
 (B) the movement of electrons becomes haphazard
 (C) the ions start vibrating
 (D) the metal becomes hot and starts emitting radiation

Ans. [B]

Sol. Movement of electrons become haphazard due to increase in vibrational motion.

48. The lanthanide compound which is used as a most powerful liquid laser after dissolving in selenium oxychloride is
 (A) Cerium oxide (B) Neodymium oxide
 (C) Promethium sulphate (D) Cerium sulphate

Ans. [B]

Sol. Neodymium oxide dissolved in selenium oxychloride is used as powerful liquid laser.

49. The solubility of SrF_2 in water at 303 K is $9.55 \times 10^{-5} \text{ mol.dm}^{-3}$. The solubility product of the salt is -
 (A) 8.7×10^{-17} (B) 9.1×10^{-11} (C) 9.55×10^{-5} (D) 3.48×10^{-12}

Ans. [D]

Sol. SrF_2

$$K_{sp} = 4S^3 = 4(9.55 \times 10^{-5})^3 = 3.48 \times 10^{-12}$$

50. The amount of electricity required to deposit 1.0 mole of aluminium from a solution of AlCl_3 will be -
 (A) 1 faraday (B) 3 faraday (C) 0.33 faraday (D) 1.33 faraday

Ans. [B]

Sol. No. of equivalent = $1 \times 3 = 3$

$$\therefore \text{No. of faraday} = 3$$

51. In the reaction, $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$ when 36.75 g of KClO_3 is heated, the volume of oxygen evolved at N.T.P. will be -
 (A) 9.74 dm^3 (B) 8.92 dm^3 (C) 10.08 dm^3 (D) 22.4 dm^3

Ans. [C]

Sol. $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$

245 g KClO_3 gives $3 \times 22.4 \text{ lit O}_2$

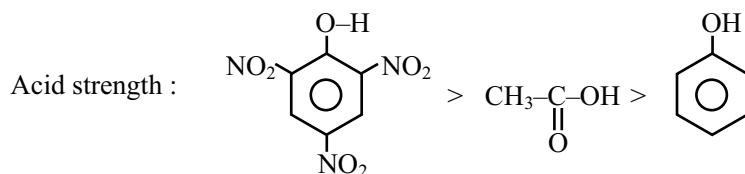
$\therefore 36.75 \text{ g KClO}_3$ gives ?

$$= \frac{3 \times 22.4 \times 36.75}{245} = 10.08 \text{ lit}$$

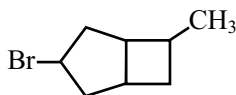
52. The pKa value of H₂O of picric acid, acetic acid and phenol are in the order -
 (A) picric acid 0.4, acetic acid 4.75, phenol 10.0 (B) acetic acid 0.4, picric acid 4.75, phenol 10.0
 (C) picric acid 0.4, phenol 4.75, acetic acid 10.0 (D) phenol 0.4, acetic acid 4.75, picric acid 10.0

Ans. [A]

Sol. Acidic strength $\propto K_a \propto \frac{1}{pK_a}$

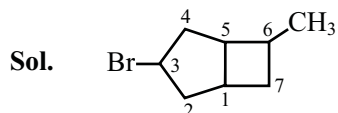


53. The correct IUPAC name of the following compound is -



- (A) 2-Bromo-5-methylbicyclo[5.4.0] heptanes (B) 3-Bromo-7-methylbicyclo[3.2.0] heptanes
 (C) 3-Bromo-6-methylbicyclo[3.2.0] heptanes (D) 2-Methyl-6-bromobicyclo[2.3.0] heptanes

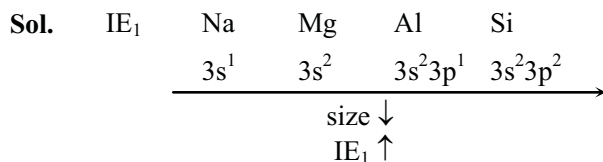
Ans. [C]



54. The first ionization potential of Na, Mg, Al and Si are in the order -

- (A) Na < Mg > Al < Si (B) Na > Mg > Al > Si
 (C) Na < Mg < Al > Si (D) Na > Mg > Al < Si

Ans. [A]



IE₁ of Mg greater than Al because Mg has stable 3s² configuration

∴ IE₁ Na < Mg > Al < Si

55. The first four ionization energy values of a metal are 191, 587, 872 and 5962 kcal/mol respectively. The number of valence electrons in the element is -

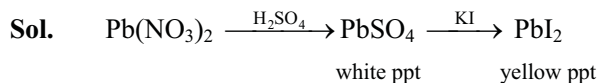
- (A) 1 (B) 2 (C) 3 (D) 5

Ans. [C]

Sol. IE₄ increases abnormally there for valence electron = 3

56. An aqueous solution of a salt 'X' gives white precipitate with dilute H_2SO_4 . The same solution with a few drops of aq. KI gives golden yellow precipitate which dissolves on heating. The salt 'X' is -
 (A) $\text{Ba}(\text{NO}_3)_2$ (B) $\text{Sr}(\text{NO}_3)_2$ (C) $\text{Pb}(\text{NO}_3)_2$ (D) $\text{Zn}(\text{NO}_3)_2$

Ans. [C]



57. The rate of the reaction $\text{MnO}_4(\text{aq.}) + 8\text{H}^+(\text{aq.}) + 5\text{Fe}^{2+}(\text{aq.}) \longrightarrow \text{Mn}^{2+}(\text{aq.}) + 5\text{Fe}^{3+}(\text{aq.}) + 4\text{H}_2\text{O}$ can be best measured by monitoring colorimetrically the concentration of -

- (A) $\text{MnO}_4(\text{aq.})$ (B) $\text{Mn}^{2+}(\text{aq.})$ (C) $\text{Fe}^{2+}(\text{aq.})$ (D) $\text{Fe}^{3+}(\text{aq.})$

Ans. [A]

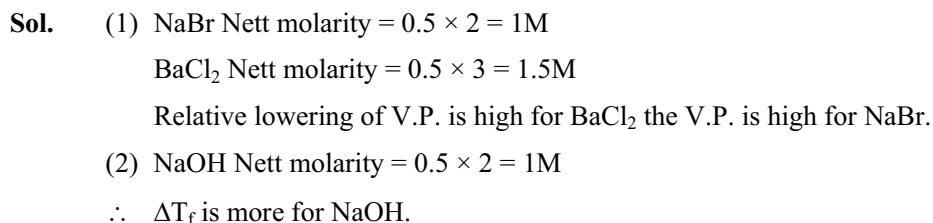
Sol. Fact

58. Which of the following observation indicates colligative properties ?

- I. A 0.5 M NaBr solution has a higher vapour pressure than 0.5 M BaCl_2
 II. A 0.5 M NaOH solution freezes at a lower temperature than pure water.
 III. Pure water freezes at a higher temperature than pure ethanol

- (A) only I (B) only II (C) only III (D) I and II

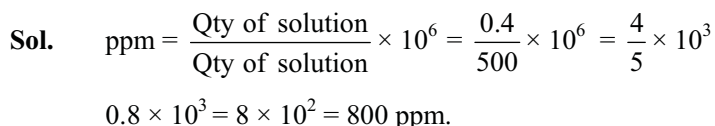
Ans. [D]



59. A 500g toothpaste sample has 0.4g fluoride concentration. The fluoride concentration in terms of ppm will be -

- (A) 200 (B) 400 (C) 500 (D) 800

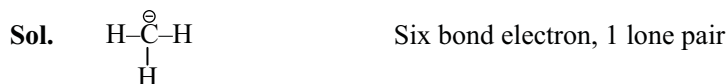
Ans. [D]



60. Among the following carbon centered reactive intermediates, the carbon that has octet of electrons is -

- (A) carbocation (B) carbanion (C) carbene (D) radical

Ans. [B]



61. The molecule that has maximum covalent character -
 (A) NaH (B) Na₂S (C) CaCl₂ (D) SnCl₄

Ans. [D]

Sol. Covalent character \propto polarisation \propto charge

62. The mode of expression in which the concentration remains independent of temperature is -
 (A) molarity (B) normality (C) formality (D) molality

Ans. [D]

Sol. Molality is independent of temperature.

63. The enthalpy changes for the following reactions are



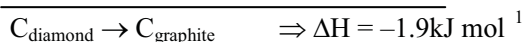
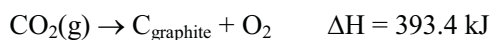
The enthalpy change for the transition

$C_{\text{diamond}} \rightarrow C_{\text{graphite}}$ will be -

- (A) -3.8 kJ mol^{-1} (B) $+3.8 \text{ kJ mol}^{-1}$ (C) -1.9 kJ mol^{-1} (D) $+1.9 \text{ kJ mol}^{-1}$

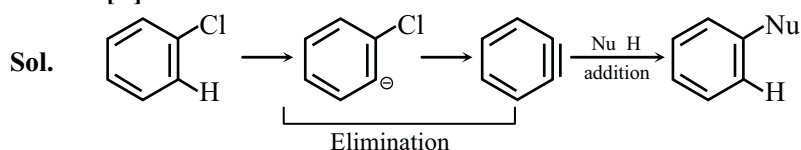
Ans. [C]

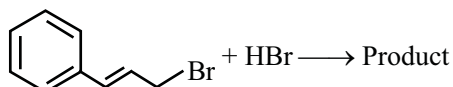
Sol. $C_{\text{diamond}} + O_2 \rightarrow CO_{2(g)} \quad \Delta H = -395.3 \text{ kJ}$



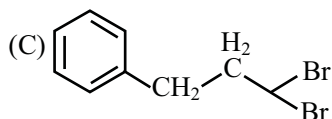
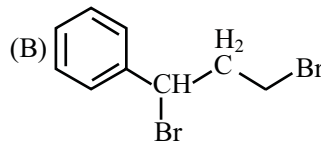
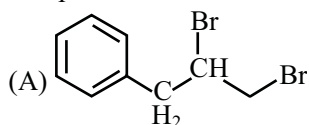
64. The sequence of steps involved in aromatic nucleophilic substitution involving a benzyne intermediate is -
 (A) addition-elimination (B) elimination-addition
 (C) addition-rearrangement (D) elimination-rearrangement

Ans. [B]



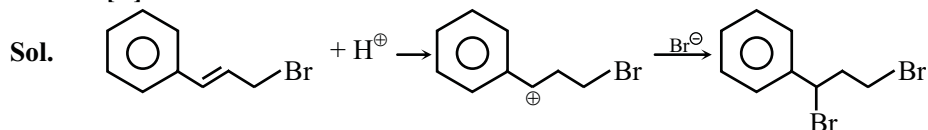
65.  + HBr \rightarrow Product

The product in the above reaction is -



(D) This reaction cannot take place

Ans. [B]



66. The commercial name of calcium hydride is -
 (A) lime (B) hydrolyth (C) slaked lime (D) calgon

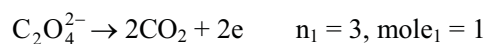
Ans. [B]

Sol. Hydrolyth is commercial name of calcium hydride (CaH₂).

67. The number of moles of KMnO₄ that will be needed to react completely with one mole of ferrous oxalate [Fe(C₂O₄)] in acidic solution is -
 (A) 1 (B) 2/5 (C) 3/5 (D) 4/5

Ans. [C]

Sol. $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + e$



$$\text{mole}_2 = \frac{3 \times 1}{5} = \frac{3}{5}$$

68. Protein and DNA being charged molecules, can be separated by -
 (A) Electrophoresis (B) Centrifugation (C) Filtration (D) Spectrophotometry

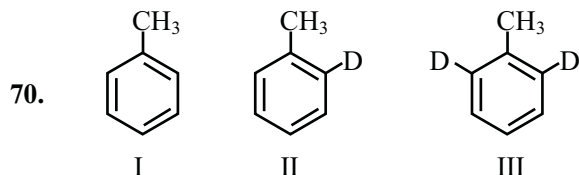
Ans. [A]

Sol. Electrophoresis : charged particle can be separated.

69. The biomolecule which does not have a secondary structure is -
 (A) protein (B) lipid (C) DNA (D) RNA

Ans. [B]

Sol. Lipid do not have secondary structure.



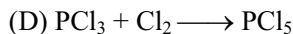
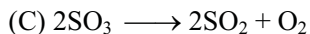
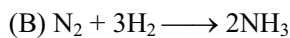
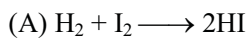
The rate of o-nitration of the above compounds, (I) toluene, (II) 2-D-toluene and (III) 2,6-D₂-toluene are is in the following order -

- (A) I > II > III (B) II > I > III
 (C) III > I > II (D) The rate is the same for all the three compounds

Ans. [D]

Sol. Isotopic effect is not observed in nitration of benzene because C-H bond do not break in RDS.

71. In which of the following reaction is $K_p > K_c$

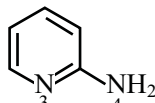
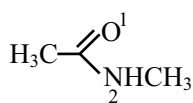


Ans. [C]

Sol. $K_p = K_c (RT)^{\Delta ng}$

$\therefore \Delta ng = +1$

72. The preferred sites of protonation in the following compounds are



(A) 1 and 3

(B) 2 and 4

(C) 1 and 4

(D) 2 and 3

Ans. [A]

Sol. +ve charge is more stabilize by resonance in 1st in I & 3rd in II.

73. Which of the following vibrational modes show no IR absorption bands

(A) Symmetric CO_2 stretch

(B) Antisymmetric CO_2 stretch

(C) Symmetric $S=C=O$ stretch

(D) Antisymmetric $S=C=O$ stretch

Ans. [A]

Sol. Symmetric stretch of symmetrical molecule do not show IR absorption it need Raman absorption band.

74. The crimson colour imparted to flame is due to a salt of -

(A) barium

(B) copper

(C) calcium

(D) strontium

Ans. [D]

Sol. Colour

Ca Brick red

Sr Crimson red

Ba Apple green

75. Which of the following weighs less when weighed in magnetic field ?

(A) $ScCl_3$

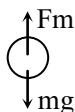
(B) $FeCl_3$

(C) $TiCl_3$

(D) VCl_3

Ans. [A]

Sol. Diamagnetic species are repel by the magnet so weight is decreased



76. Essential vitamin required for the production of RBCs is -
 (A) Folic acid (B) Nicotinic acid (C) Pantothenic acid (D) None of the above

Ans. [A]

Sol. Folic acid are prescribed to increase blood cell count.

77. For the reaction $\text{NH}_4^+ + \text{NO}_2^- \longrightarrow \text{N}_2 + 2\text{H}_2\text{O}$ the following data was recorded

Set	NH_4^+/M	NO_2^-/M	Rate/ MS^{-1}
1	0.010	0.020	0.020
2	0.015	0.020	0.030
3	0.010	0.010	0.005

(A) rate = $K [\text{NH}_4^+] [\text{NO}_2^-]$

(B) rate = $K [\text{NH}_4^+]^2 [\text{NO}_2^-]$

(C) rate = $K [\text{NH}_4^+] [\text{NO}_2^-]^2$

(D) rate = $K [\text{NH}_4^+]^2 [\text{NO}_2^-]^2$

Ans. [C]

Sol. $r = k [\text{NH}_4^+]^m [\text{NO}_2^-]^n$

$0.02 = k [0.01]^m [0.02]^n \dots(1)$

$0.03 = k [0.015]^m [0.02]^n \dots(2)$

$0.005 = k [0.01]^m [0.01]^n \dots(3)$

Equation $\frac{(1)}{(3)}$

$\therefore \frac{4}{1} = (2)^n$

$\therefore n = 2$

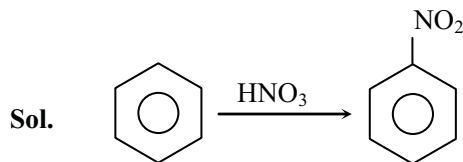
Equation $\frac{(1)}{(2)}$

$\therefore \frac{2}{3} = \left(\frac{2}{3}\right)^m$

$\therefore m = 1$

78. In a nitration experiment, 10.0 g of benzene gave 13.2 g of nitrobenzene. The percentage yield is -
 (A) 83.5% (B) 62.7% (C) 88.9% (D) 26.7%

Ans. [A]



$\frac{10}{78} \text{g} = 0.1282 \text{ moles}$ 0.1282 moles

mass = 15.76g

$\% \text{ yield} = \frac{13.2}{15.76} \times 100 = 83.7\%$

79. The rate constant of a reaction increases by 5% when the temperature is increased from 27°C to 28°C.

Therefore, the energy of activation of the reaction is -

- (A) 36.6 kJ mol⁻¹ (B) 46.6 kJ mol⁻¹ (C) 16.6 kJ mol⁻¹ (D) 26.6 kJ mol⁻¹

Ans. [A]

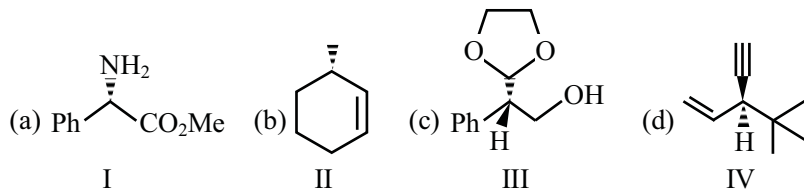
Sol.
$$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left[\frac{T_2 - T_1}{T_1 T_2} \right]$$

$$\log 1.05 = \frac{E_a}{2.303 \times 8.31} \left[\frac{1}{300 \times 301} \right]$$

$$E_a = 2.303 \times 8.314 \ln 1.05 \times 300 \times 301$$

$$= 36879 \text{ J or } 36.87 \text{ kJ}$$

80. Which one of the following compounds has R configuration ?



(A) I

(B) II

(C) III

(D) IV

Ans. [D]