KCET Board Exam – 2021

Subject: Chemistry **CODE: _____**

1. In Chrysoberyl, a compound containing Beryllium, Aluminium and oxygen, oxide ions form cubic close packed structure. Aluminium ions occupy $1/4$ th of tetrahedral voids and Beryllium ions occupy $1/4$ th of octahedral voids. The formula of the compound is

   (a) $BeAlO_4$ (b) $BeAl_2O_4$

   (c) Be_2AlO_2 (d) $BeAlO_2$

2. The correct statement regarding defects in solids is

   (a) Frenkel defect is a vacancy defect

   (b) Schottky defect is a dislocation defect

   (c) Trapping of an electron in the lattices leads to the formation of F-centre

   (d) Schottky defect has no effect on density.

3. A metal crystallises in BCC lattice with unit cell edge length of 300 pm and density 6.15 g cm^{-3}. The molar mass of the metal is

   (a) 50 g mol^{-1} (b) 60 g mol^{-1} (c) 40 g mol^{-1} (d) 70 g mol^{-1}

4. Henry's law constant for the solubility of N_2 gas in water at 298 K is 1.0×10^5 atm. The mole fraction of N_2 in air is 0.8. The number of moles of N_2 from air dissolved in 10 moles of water at 298 K and 5 atm pressure is

   (a) 4.0×10^{-4} (b) 4.0×10^{-5} (c) 5.0×10^{-4} (d) 4.0×10^{-6}

5. A pure compound contains 2.4 g of C, 1.2×10^{23} atoms of H, 0.2 moles of oxygen atoms. Its empirical formula is

   (a) C_2HO (b) $C_2H_2O_2$ (c) CH_2O (d) CHO

6. Choose the correct statement

   (a) K_H value is same for a gas in any solvent

   (b) Higher the K_H value more the solubility of gas

   (c) K_H value increases on increasing the temperature of the solution

   (d) Easily liquefiable gases usually has lesser K_H values

7. The K_H value (K bar) of Argon (I), Carbondioxide (II) formuldehyde (III) and methane (IV) are respectively $40.3, 1.67, 1.83\times10^{-5}$ and 0.413 at 298 K. The increasing order of solubility of gas in liquid is

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

8. The vapour pressure of pure liquids A and B are 450 and 700 mm of Hg at 350 K respectively. If the total vapour pressure of the mixture is 600 mm of Hg, the composition of the mixture in the solution is

   (a) $x_A = 0.4, x_B = 0.6$ (b) $x_A = 0.6, x_B = 0.4$ (c) $x_A = 0.3, x_B = 0.7$ (d) $x_A = 0.7, x_B = 0.3$

9. Consider the following electrodes

$P = Zn^{2+}(0.0001M)/Zn$ $Q = Zn^{2+}(0.1M)/Zn$

$R = Zn^{2+}(0.01M)/Zn$ $S = Zn^{2+}(0.001M)/Zn$

$E°Zn/Zn^{2+} = -0.76V$ Electrode potentials of the above electrodes in volts are in the order

(a) $P > S > R > Q$ (b) $S > R > Q > P$ (c) $Q > R > S > P$ (d) $P > Q > R > S$

10. The number of angular and radial nodes in $3p$ orbital respectively are

(a) 3, 1 (b) 1,1

(c) 2, 1 (d) 2, 3

11. The resistance of $0.01m\,KCl$ solution at 298 K is 1500 Ω. If the conductivity of $0.01m\,KCl$ solution at 298 K is $0.146\times10^{-3}S\,\text{cm}^{-1}$. The cell constant of the conductivity cell in cm^{-1} is

(a) 0.219 (b) 0.291 (c) 0.301 (d) 0.194

12. $H_{2(g)} + 2AgCl \rightleftarrows 2Ag_{(s)} + 2HCl_{(aq)}$

$E°_{\text{cell}}$ at $25°C$ for the cell is $0.22V$. The equilibrium constant at $25°C$ is

(a) 2.8×10^{7} (b) 5.2×10^{8} (c) 2.8×10^{5} (d) 5.2×10^{4}

13. For a reaction $A+2B\rightarrow$ Products, when concentration of B alone is increased half-life remains the same. If concentration of A alone is doubled, rate remains the same. The unit of rate constant for the reaction is

(a) S^{-1} (b) $L\,\text{mol}^{-1}\,S^{-1}$ (c) $\text{mol}\,L^{-1}\,S^{-1}$ (d) atm^{-1}

14. The third ionisation enthalpy is highest in

(a) Alkali metals (b) Alkaline earth metals

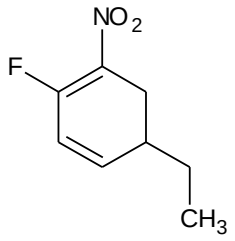
(c) Chalcogens (d) Pnictogens

15. If the rate constant for a first order reaction is k, the time (t) required for the completion of 99% of the reaction is given by

(a) $t = \frac{4.606}{k}$ (b) $t = \frac{2.303}{k}$ (c) $t = \frac{0.693}{k}$ (d) $t = \frac{6.909}{k}$

16. The rate of a gaseous reaction is given by the expression $k[A][B]^2$. If the volume of vessel is reduced to one life of the initial volume, the reaction rate as compared to original rate is

(a) $\frac{1}{16}$ (b) $\frac{1}{8}$ (c) 8 (d) 16

17. The correct IUPAC name of 

(a) 4-Ethyl-1-Fluoro-2-nitrobenzene (b) 1-Ethyl-4-Fluoro-3-nitrobenzene

(c) 3-Ethyl-6-Fluoronitrobenzene (d) 5-Ethyl-2-Fluoronitrobenzene

18. Higher order (>3) reactions are rare due to

(a) Shifting of equilibrium towards reactants due to elastic collisions

(b) Loss of active species on collision

(c) Low probability of simultaneous collision of all reacting species

(d) Increase in entropy as more molecules are involved

19. Arrange benzene, n-hexane and ethyne in decreasing order of their acidic behaviour

(a) Benzene > n-hexane > ethyne (b) n-hexane > Benzene > ethyne

(c) ethyne > n – hexane > Benzene (d) ethyne > Benzene > n- hexane

20. A colloidal solution is subjected to an electric field than colloidal particles more towards anode. The amount of electrolytes of $BaCl_3, AlCl_3$ and $NaCl$ required to coagulate the given colloid is in the order

(a) $NaCl > BaCl_2 > AlCl_3$ (b) $BaCl_2 > AlCl_3 > NaCl$

(c) $AlCl_3 = NaCl = BaCl_2$ (d) $AlCl_3 > BaCl_2 > NaCl$

21. Which of the following is an incorrect statement?

(a) Hydrogen bonding is stronger than dispersion forces

(b) Sigma bonds are stronger than π- bonds

(c) Ionic bonding are non-directional

(d) σ- electrons are referred to as mobile electrons

22. Zeta potential is

(a) Potential required to bring about coagulation of a colloidal sol

(b) Potential required to give the particle a speed of $1\,\text{cm}\,\text{S}^{-1}$

(c) Potential difference between fixed charged layer and the diffused layer having opposite charges

(d) Potential energy of the colloidal particles

23. Which of the following compound on heating gives N_2O?

(a) $Pb(NO_3)_2$ (b) NH_4NO_3 (c) NH_4NO_2 (d) $NaNO_3$

24. Which of the following property is true for the given sequence $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$?

(a) Reducing property (b) Thermal stability

(c) Bond angle (d) Both (b) and (c)

25. The correct order of boiling point in the following compounds is

(a) $HF > H_2O > NH_3$ (b) $H_2O > HF > NH_3$ (c) $NH_3 > H_2O > HF$ (d) $NH_3 > HF > H_2O$

26. XeF_6 on partial hydrolysis gives a compound X, which has square pyramidal geometry 'X' is

(a) XeO_3 (b) XeO_4 (c) $XeOF_4$ (d) XeO_2F_2

27. A colourless, neutral, paramagnetic oxide of Nitrogen 'P' on oxidation gives reddish brown gas Q. Q on cooling gives colourless gas R. R on reaction with P gives blue solid S. Identify P, Q, R, S respectively

(a) N_2O, NO, NO_2, N_2O_5 (b) $N_2O, NO_2, N_2O_4, N_2O_3$

(c) NO, NO_2, N_2O_4, N_2O_3 (d) NO, NO, N_2O_4, N_2O_5

28. Which of the following does not represent property stated against it?

(a) $CO^{+2} < Fe^{+2} < Mn^{+2}$ – Ionic size

(b) $Ti < V < Mn$ – Number of oxidation states

(c) $Cr^{+2} < Mn^{+2} < Fe^{+2}$ – Paramagnetic behaviour

(d) $Sc > Cr > Fe$ – Density

29. Which one of the following is correct for all elements from Sc to Cu?

(a) The lowest oxidation state shown by them is $+2$

(b) $4S$ orbital is completely filled in the ground state

(c) $3d$ orbital is not completely filled in the ground state

(d) The ions in +2 oxidation states are paramagnetic

30. When the absolute temperature of ideal gas is doubled and pressure is halved, the volume of gas

(a) will be half of original volume (b) will be 4 times the original volume

(c) will be 2 time the original volume (d) will be ¼ th times the original volume

31. Which of the following pairs has both the ions coloured in aqueous solution?

[Atomic numbers of $Sc = 21, Ti = 22, Ni = 28, Cu = 29, Mn = 25$]

(a) Sc^{3+}, Mn^{2+} (b) Ni^{2+}, Ti^{4+} (c) Ti^{3+}, Cu^{+} (d) Mn^{2+}, Ti^{3+}

32. For the crystal field splitting in octahedral complexes,

(a) the energy of the e_g orbitals will decrease by $(3/5)\Delta_0$ and that of the t_{2g} will increase by $(2/5)\Delta_0$

(b) the energy of the e_g orbitals will increase by $(3/5)\Delta_0$ and that of the t_{2g} will decrease by $(2/5)\Delta_0$

(c) the energy of the e_g orbitals will increase by $(3/5)\Delta_0$ and that of the t_{2g} will increase by $(2/5)\Delta_0$

(d) the energy of the e_g orbitals will decrease by $(3/5)\Delta_0$ and that of the t_{2g} will decrease by $(2/5)\Delta_0$

33. Peroxide effect is observed with the addition of HBr but not with the addition of HI to unsymmetrical alkene because

(a) $H-I$ bond is stronger that $H-Br$ and is not cleaved by the free radical

(b) $H-I$ bond is weaker than $H-Br$ bond so that iodine free radicals combine to form iodine molecules

(c) Bond strength of HI and HBr are same but free radicals are formed in HBr

(d) All of these

34. The IUPAC name of $\left[Co(NH_3)_3(CO_3)\right]Cl$ is

(a) Pentaamminecarbonatocobalt (III) Chloride

(b) Carbonatopentamminecobalt (III) Chloride

(c) Pentaamminecarbonatocobaltate (III) Chloride

(d) Pentaammine cobalt (III) Carbonate Chloride

35. Homoleptic complexes among the following are

(A) $K_3\left[Al(C_2O_4)_3\right]$, (B) $\left[CoCl_2(en)_2\right]^+$ (C) $K_2\left[Zn(OH)_4\right]$

(a) (A) only (b) (A) and (B) only (c) (A) and (C) only (d) (C) only

36. The correct order for wavelengths of light absorbed in the complex ions $\left[CoCl(NH_3)_5\right]^{2+}$, $\left[Co(NH_3)_6\right]^{3+}$ and $\left[Co(CN)_6\right]^{3-}$ is

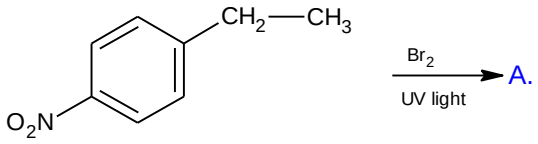
(a) $\left[CoCl(NH_3)_5\right]^{2+} > \left[Co(NH_3)_6\right]^{3+} > \left[Co(CN)_6\right]^{3-}$

(b) $\left[Co(NH_3)_6\right]^{3+} > \left[Co(CN)_6\right]^{3-} > \left[CoCl(NH_3)_5\right]^{2+}$

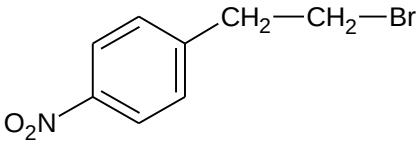
(c) $\left[CoCl(NH_3)_5\right]^{2+} > \left[Co(CN)_6\right]^{3-} > \left[Co(NH_3)_6\right]^{3+}$

(d) $\left[Co(NH_3)_6\right]^{3+} > \left[CoCl(NH_3)_5\right] > \left[Co(CN)_6\right]^{3-}$

37. Question:



The compound A (major product) is

(a)


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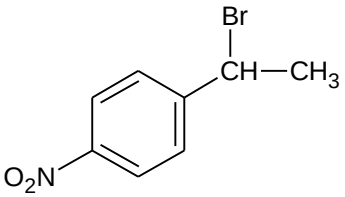

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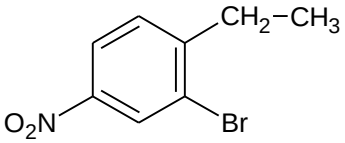

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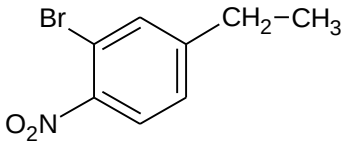
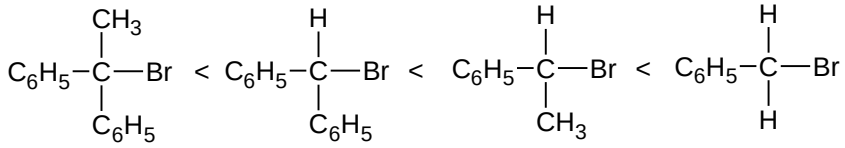


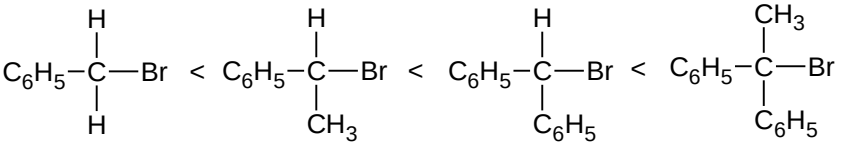
38. Bond enthalpies of A_2, B_2 and AB are in the ratio $2:1:2$. If bond enthalpy of formation of AB is $-100\ \text{kJ mol}^{-1}$. The bond enthalpy of B_2 is

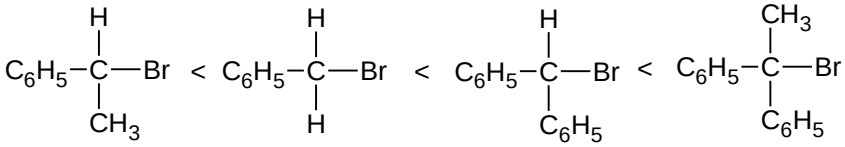
(a) $100\ \text{kJ mol}^{-1}$ (b) $50\ \text{kJ mol}^{-1}$ (c) $200\ \text{kJ mol}^{-1}$ (d) $150\ \text{kJ mol}^{-1}$

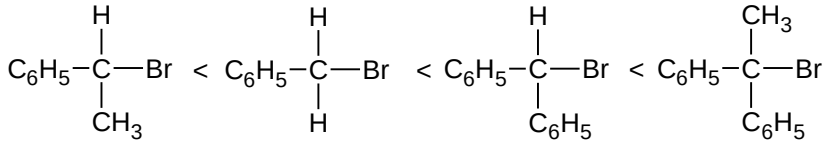
39. The order of reactivity of the compounds

$C_6H_5CH_2Br, C_6H_5CH(C_6H_5)Br, C_6H_5CH(CH_3)Br$ and $C_6H_5C(CH_3)(C_6H_5)Br$ in S_N2 reaction is

(a) 

(b) 

(c) 

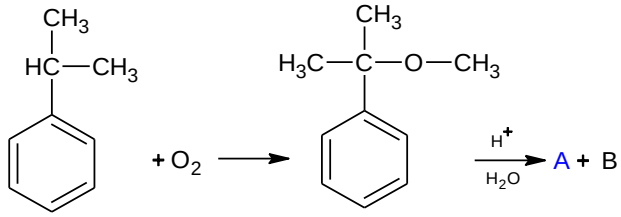
(d) 

40. The major product of the following reaction is $CH_2 = CH - CH_2 - OH \xrightarrow[Excess]{HBr}$ product [CET 2021]

(a) $CH_3 - CHBr - CH_2Br$ (b) $CH_2 = CH - CH_2Br$

(c) $CH_3 - CHBr - CH_2 - OH$ (d) $CH_3 - CHOH - CH_2OH$

41. Question:



The product 'A' Gives white precipitate when treated with bromine water. The product 'B' is treated with Barium hydroxide to give the product C. The compound C is heated strongly to form product D. The product D is

(a) 4-Methylpent-3-en-2-one (b) But-2-enal

(c) 3-Methylpent-3-en-2-one (d) 2-Methylbut-2-enal

42. For the reaction $A(g) + B(g) \rightleftharpoons C(g) + D(g)$; $\Delta H = -QKJ$

The equilibrium constant cannot be disturbed by

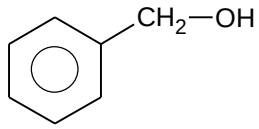
(a) Addition of A (b) Addition of D

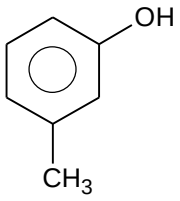
(c) Increasing of pressure (d) Increasing of temperature

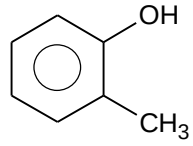
43. An organic compound 'X' on treatment with PCC in dichloromethane gives the compound Y. Compound 'Y' reacts with I_2 and alkali to form yellow precipitate of trilodomethane. The compound X is

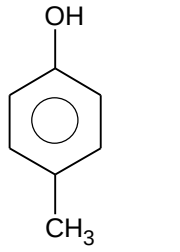
(a) CH_3CHO (b) CH_3COCH_3 (c) CH_3CH_2OH (d) CH_3COOH

44. A compound 'A' (C_7H_5O) is insoluble in $NaHCO_3$ solution but dissolve in $NaOH$ and gives a characteristic colour with neutral $FeCl_3$ solution. When treated with Bromine water compound 'A' forms the compound B with the formula $C_7H_5OBr_3$, 'A' is

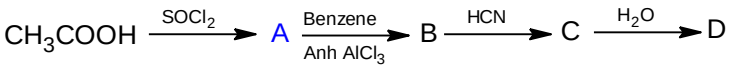
(a) 

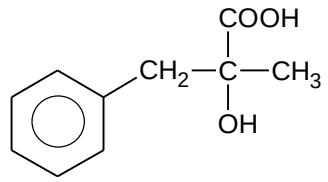
(b) 

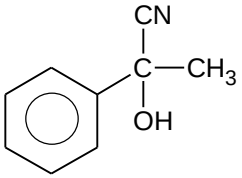
(c) 

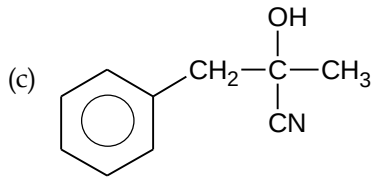
(d) 

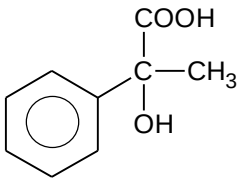
45. In set of reactions, identify D



(a) 

(b) 

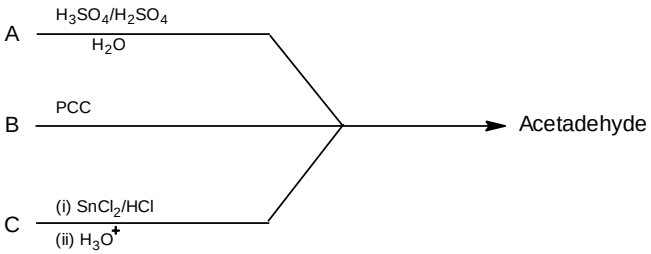
(c) 

(d) 

46. K_B values for acids H_2SO_3, HNO_2, CH_3OOH and HCN are respectively $1.3\times10^{-2}, 4\times10^{-4}$, 1.8×10^{-5} and 4×10^{-10}, which of the above acids produces stronger conjugate base in aqueous solution?

(a) H_2SO_3 (b) HNO_2 (c) CH_3COOH (d) HCN

47. Question:



A, B and C respectively are

(a) ethanol, ethane nitrile and ethyne (b) ethane, nitrile, ethanol and ethyne

(c) ethyne, ethanol and ethane nitrile (d) ethyne, ethane nitrile and ethanol

48. The reagent which can do the conversion $CH_3COOH \longrightarrow CH_3 - CH_2 - OH$ is

(a) $LiAlH_4$ / ether (b) H_2, Pt (c) $NaBH_4$ (d) Na and C_2H_5OH

49. $CH_3CHO \xrightarrow[(ii)\ H_3O^+]{(i)\ CH_3MgBr} A \xrightarrow[\Delta]{\text{Conc } H_2SO_4} B \xrightarrow[(ii)\ H_2O, OH^-]{(i)\ B_2H_6} C$

A and C are

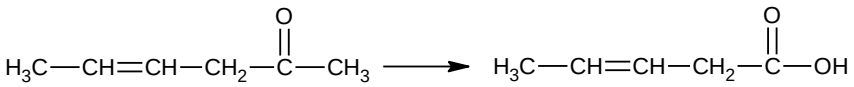
(a) Identical (b) Position isomers (c) Functional isomers (d) Optical isomers

50. Which of the following is not true for oxidation?

(a) addition of oxygen (b) addition of electronegative element

(c) removal of hydrogen (d) removal of electronegative element

51. Which is the most suitable reagent for the following conversion?



(a) Tollen's reagent

(b) Benzoyl peroxide

(c) I_2 and $NaOH$ solution with subsequent acidification

(d) Sn and $NaOH$ solution

52. $C_6H_5CH_2Cl \xrightarrow{alc.\ NH_3} A \xrightarrow{2CH_3Cl} B$

The product B is

(a) N, N- dimethyl phenyl methanamine (b) N, N- Dimethyl benzenamine

(c) N – Benzyl – N – methyl methanamine (d) phenyl – N, N – dimethyl methanamine

53. The method by which aniline cannot be prepared is

(a) Nitration of benzene followed by reduction with Sn and con HCl

(b) Degradation of benzamide with bromine in alkaline solution

(c) Reduction of nitrobenzene with H_2 / Pd is ethanol

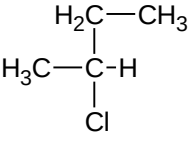
(d) Potassium salt of phthalimide treated with chlorobenzene followed by the hydrolysis with aqueous $NaOH$ solution

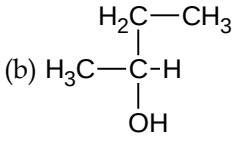
54. Permanent hardness cannot be removed by

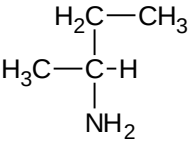
(a) Using washing soda (b) Calgon's method

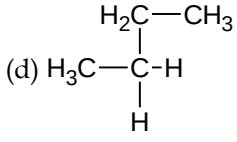
(c) Clark's method (d) Ion exchange method

55. A hydrocarbon $A(C_4H_8)$ on reaction with HCl gives a compound $B(C_4H_9Cl)$ which on reaction with $1\,\text{mol}$ of NH_3 gives compound $C(C_4H_{11}N)$. On reacting with $NaNO_2$ and HCl followed by treatment with water, compound C yields an optically active compound D. The D is

(a) 

(b) 

(c) 

(d) 

56. RNA and DNA are chiral molecules, their chirality is due to the presence of

(a) $D-$Sugar component (b) $L-$Sugar component

(c) Chiral bases (d) Chiral phosphate ester unit

57. The property of the alkaline earth metals that increases with their atomic number is

(a) Ionisation enthalpy (b) Electronegativity

(c) Solubility of their hydroxide in water (d) Solubility of their sulphate in water

58. Primary structure in a nucleic acid chain contains bases as $G\,A\,T\,G\,C$…… The chain which is complementary to this chain is

(a) $G\,G\,T\,G\,A$..... (b) $T\,G\,A\,A\,G$ ..... (c) $C\,T\,A\,C\,G$ ..... (d) $T\,T\,T\,A\,G$ .....

59. In the detection of II group acid radical, the salt containing chloride is treated with concentrated sulphuric acid, the colourless gas is liberated. The name of the gas is

(a) Hydrogen chloride gas (b) Chlorine gas

(c) Sulphur dioxide gas (d) Hydrogen gas

60. The number of six membered and five membered rings in Buckminster Fullerene respectively is

(a) $20, 12$ (b) $12, 20$ (c) $14, 18$ (d) $14, 11$