order of acidic character. Also give reason for your answer.
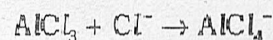
(c) What are the necessary conditions for any system to be aromatic?

Q26. (a) Describe the shapes of the following molecules on the basis of valence bond theory :

(i) BF_3 (ii) H_2O

(b) Explain why BeH_2 molecule has a zero dipole moment although the Be-H bonds are polar.

(c) Describe the change in hybridisation (if any) of the Al atom in the following reaction :

$AlCl_3 + Cl^- \rightarrow AlCl_4^-$

(d) Boiling point of HCl is lower than that of HF. Why?

OR

(a) What is meant by the term bond order? Calculate the bond order of O_2, O_2' and O_2^- and arrange them in order of their decreasing stabilities.

(b) Give any two points of difference in between sigma and pi-bonds.

(c) Write the state of hybridisation of sulphur in SF_6.

(6)

Time : 3 Hrs.   M.M.: 70

General Instructions :

i) All questions are compulsory.

ii) Question numbers 1 to 5 are very short answer type questions of 1 mark each.

iii) Question numbers 6 to 10 are short answer type questions of 2 marks each.

iv) Question numbers 11 to 22 are also short answer type questions of 3 marks each.

v) Question number 23 is a value based question carrying 4 marks.

vi) Question numbers 24 to 26 are long answer type questions of 5 marks each.

vii) Use log tables, if necessary. Use of calculators is not allowed.

Q1. Write the general electronic configuration of f-block elements.

Q2. Write the number of significant figures in 0.00384.

Q3. How does the entropy change occur in the process of evaporation of a liquid?

Q4. What is the oxidation state of phosphorus in P_4?

Q5. Why does water show amphoteric character?

Q6. Calculate the momentum of a particle which has a de Broglie wavelength of $1A°$. (Given $h = 6.6 \times 10^{-34}$ kg $m^2 s^{-1}$)

Q7. At 500°C, the equilibrium constant (K_c) for the reaction N_2 (g) + $3H_2$ (g) $\rightleftharpoons$ $2NH_3$ (g) is 6.02×10^{-2} litre^2 mol^{-2}. What is K_p at this temperature?

Q.8 Write the electronic configuration of
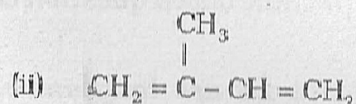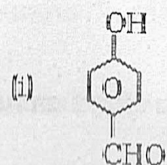
(a) Chromium (Atomic number -24)

(b) Aluminium (Atomic number -13)

Q.9 Convert

(a) 2-Bromopropane to 1-Bromoprpane.

(b) Ethane to Ethene

Q10. Write down the IUPAC names of the following organic compounds :

(i)

(ii) $CH_2 = \overset{\overset{\displaystyle CH_3}{|}}{C} - CH = CH_2$

Q11. A substance on analysis gave the following percentage composition : Na = 43.4%, C = 11.3% and O = 45.3%. Its molar mass was determined to be 106 g mol^{-1}. Determine its empirical and molecular formulae. (Given atomic mass of Na = 23, C = 12, O = 16 u)

Q12. (i) Arrange the following elements in the increasing order of metallic character.

B, Al, Mg, K

(ii) Predict the position of the element in the periodic table satisfying the electronic configuration $(n - 1) d^1 ns^2$ for n = 4.

(iii) Which out of F or Cl has more negative electron gain enthalpy.

Q13. 2.9g of a gas at 95°C occupied the same volume as 0.184g of hydrogen at 17°C, at the same pressure. What is the molar mass of the gas?

Q14. Balance the given redox reaction in acidic medium :

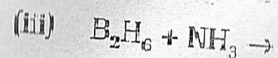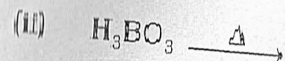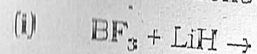$Cr_2O_7^{2-} + SO_2 \rightarrow Cr^{3+} + SO_4^{2-}$
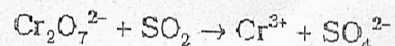
(2)

Q15. Assign reasons for the following observations :

(i) Sodium is less reactive than potassium.

(ii) Alkali and alkaline earth metals can not be obtained by chemical reduction methods.

(iii) Lithium shows similarities to magnesium in its chemical behaviour.

Q16. Complete the following chemical equations :

(i) $BF_3 + LiH \rightarrow$

(ii) $H_3BO_3 \xrightarrow{\Delta}$

(iii) $B_2H_6 + NH_3 \rightarrow$

Q17. (i) Calculate the standard enthalpy of reaction from the data given below :

$2H_2S (g) + 3O_2 (g) \rightarrow 2H_2O (l) + 2SO_2 (g)$
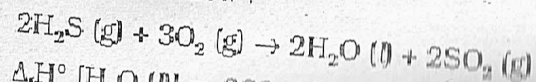
$\Delta_f H° [H_2O (l)] = -286$ KJ mol^{-1}

$\Delta_f H° SO_2 (g) = -296.9$ KJ mol^{-1}

$\Delta_f H° [H_2S (g)] = -20.17$ KJ mol^{-1}

(ii) How is $\Delta G°$ related to the equilibrium constant K?

Q18. (i) An Alkene 'A' on ozonolysis gives a mixture of ethanal and pentan-3-one. Write the structure and IUPAC name of 'A'.

(ii) Write the structural formula of 3,4,4,5-Tetramethylheptane.
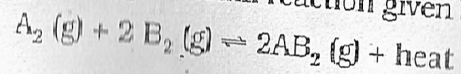
Q19. What happens when :

(i) 1-bromopropane is heated with alcoholic KOH.

(ii) benzene is treated with a mixture of concentrated sulphuric and nitric acid.

(iii) benzene is treated with bromine in the presence of aluminium bromide as catalyst.

Q20. In the equilibrium reaction given below :

$A_2 (g) + 2 B_2 (g) \rightleftharpoons 2AB_2 (g) + heat$

(3)

What would be the effect on direction of equilibrium if (a) more A_2 is added (b) pressure is decreased (c) temperature is increased?

OR

Calculate the pH of the resultant mixture obtained by mixing 10 ml of 0.01 M H_2SO_4 and 10 ml of 0.01 M Ca $(OH)_2$.

Q21. (a) What is inert-pair effect? Illustrate it with a suitable example.

(b) BF_3 is a weaker lewis acid than BCl_3. Explain.

Q22. (i) Why do gases show deviation from ideal behaviour?

(ii) Write the Vander Waal's equation for n moles of a gas and give the physical significance of Vander Waal's parameters.

Q.23 Sunil had set up an industrial plant for the production of Ammonia(NH_3) from N_2 and H_2 by Haber's process. Due to low yield of Ammonia he was suffering huge loss. His nephew Mayur advised him to vary the temperature and pressure conditions which increased the yield.

(a) What were the appropriate conditions suggested by Mayur?

(b) This reaction is governed by which principle?

(c) What values are shown by Mayur through his advice?

Q24. (i) What is the wavelength of light emitted when the electron in a hydrogen atom undergoes transition from an energy level with n = 4 to an energy level with n = 2? Given that $E_n = \dfrac{-2.18 \times 10^{-18}}{n^2}$ J atom^{-1}.

(ii) What designation is given to an orbital having n = 3 and $l = 2$.

(iii) How many electrons in an atom may have the following quantum numbers : n = 4, $m_s = -\frac{1}{2}$

(a) The uncertainity in the position and velocity of a particle are 10^{-2} m and 5.27×10^{-24} ms^{-1} respectively. Calculate the mass of the particle. ($h = 6.626 \times 10^{-34}$ kg m^{2}s^{-1})
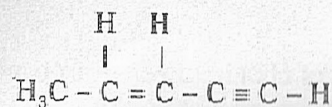
(b) Why is the electronic configuration $1s^2 2s^2 2p^2_x 2p^0_y$ not correct for the ground state of nitrogen?

(c) Explain, why the filling of 4s orbital takes place before the 3d orbital?

(d) How many subshells are associated with n = 4?

Q25. (i) What is the total number of sigma and pi bonds in the molecule given below :

$$\begin{array}{cc} H & H \\ | & | \\ H_3C - C = C - C \equiv C - H \end{array}$$

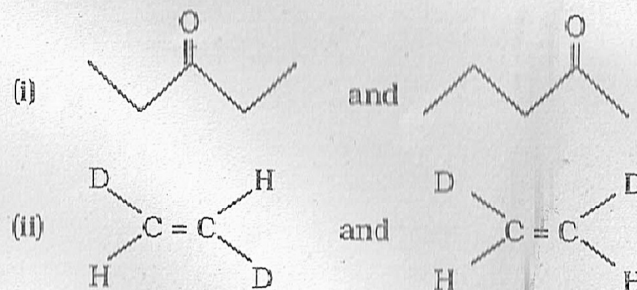(ii) Draw the resonating structures of C_6H_5OH (phenol).

(iii) Explain the following name reaction giving on example of each :

(a) Friedal-Craft acylation

(b) Wurtz reaction

OR

(a) What is the relationship between the members of the following pairs of isomeric structures? Are they identical, structural or geometrical isomers or resonance contributors?

(i) [structure] and [structure]

(ii) [structure] and [structure]

(5)