ST. XAVIER'S SENIOR SECONDARY SCHOOL, DELHI – 110054
Final Examination in **CHEMISTRY – Std. 11**   M. Marks : 70
18-2-2015   Time : 3 hrs.

Roll No: [ ][ ]
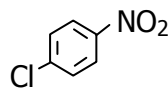
Total printed pages : 04
Total printed questions : 26

General Instructions : -
i)   All questions are compulsory.
ii)   Question numbers 1 to 5 carry 1 mark each.
iii)   Question numbers 6 to 10 carry 2 marks each.
iv)   Question numbers 11 to 22 carry 3 marks each.
v)   Question number 23 carries 4 marks.
vi)   Question numbers 24 to 26 carry 5 marks each.
vii)   Use of calculator is not allowed. You may use log book if required.

1.   Write any two similarities between beryllium and aluminium.   (1)

2.   Give any two anamalies shown by lithium.   (1)

3.   Draw the structure of the following organic compounds : -
      i)   2 methyl but 2 ene.
      ii)   2 phenyl butanal.   (1)

4.   What is the reduction potential of NHE? Give one use of it .   (1)

5.   a)   Name the type of isomerism in an organic compound with molecular formula $C_2H_2Cl_2$.
      b)   In the following organic compound mark asymmetric carbon atom : -

$$
\begin{array}{c}
Cl \\
| \\
CH_3CHCH_2CH_3
\end{array}
$$
                                                                                      (1)

6.   Assign IUPAC name to the following organic compounds:-
      a) $CH_3CH=CHCH_2 OH$ c)   Cl— benzene ring with NO_2

      b) $CH_3CH_2CHCH_2COOH$ d) NH_2 (2)
                     $|$ $|$
                     CH_3 $CH_3CH_2CHCH_3$

7.   Complete the following reactions and balance them : -
      a) $Mg + N_2 \longrightarrow$ b) $LiCO_3 \xrightarrow{Heat}$ (2)

8.   Define hydration enthalpy . How is it related to the cationic size?   (2)

9.   Explain the following terms : -
      a)   Inductive effect.   b)   Carbocation.
      c)   Nucleophlie.   d)   Polymerisation.   (2)

10.   a)   What is the value of change in free energy (ΔG) when the system is in the state of
              equilibrium?
      b)   For a reversible reaction K_C value for the forward reaction is 2×10^{15} what is the
              value of K_C for the backward reaction?
      c)   What is the effect of catalyst on the rate of reaction of a reversible reaction?
      d)   For the following reaction find the unit of K_C value : -
                      $A + 2B \rightleftharpoons C.$ (2)

11. a) Draw the structure of $AlCl_3$.
     b) What are Boranes? Give the formula of simplest borane.
     c) Presence of Carbon dioxide is essential for us but at the same time harmful also.
         Comment to justify both the aspects mentioned in this statement.   (3)

12. a) Write the reaction of aluminium with an acid and a base to show that
         aluminium is amphoteric in nature.
     b) Give reason for the following:-
         i) BF_3 acts as a Lewis acid.
         ii)   Carbon shows the property of catenation.
         iii) Boron compounds are covalent in nature.
         iv)   For group 13 members of the periodic table the stability of +1
               oxidation state increases down the group but stability of +3 oxidation
               state decreases.   (1,2)

13. a) An organic compound A combines with chlorine in presence of sunlight to form chloro
         derivative of compound A which reacts with magnesium metal in presence of dry ether
         to produce another compound B. B on reaction with water forms ethane.
         Identify compound A and B.
     b) Explain the following :-
         i)   Mechanism involved in chlorination of benzene.
         ii)   Functional isomerism with the help of an example.   (1,2)

14. a) Define Le-Chatlier's principle.
     b) Write the conjugate acid and conjugate base of water.
     c) Calculate the degree of ionisation of a dilute solution of acetic acid having
         molarity as 0.1. Dissociation constant of acetic acid is 1.8×10^{-5}.   (3)

15. a) An iron wire is immersed in a solution containing zinc sulphate and nickel sulphate.
         Predict giving reason which of the reactions is likely to proceed :-
         i) $Fe + ZnSO_4 \rightarrow FeSO_4 + Zn^{2+}$
         ii) $Fe + NiSO_4 \rightarrow FeSO_4 + Ni^{2+}$
     b) Balance the following reaction :-
               $Fe_2O_3 + C \rightarrow Fe + CO$
     c) For an electrochemical cell set up between Aluminium and Silver electrodes,
         write the cell representation of the cell under standard conditions and calculate
         standard cell potential of this cell.
         (Given that $E^o{}_{Al^{3+}/Al} = 1.66V$; $E^o{}_{Ag^+/Ag} = 0.88$ V)   (3)

16. a) Calculate the following in one mole of carbon tetrachloride :-
         i)   the number of moles of chlorine.
         ii)   the number of atoms of chlorine.
     b) A solution is prepared by dissolving 60g of methyl alcohol in 120g of water. What is
         the mole fraction of methyl alcohol and water? (At. mass of C=12, H=1,O=16)   (3)

17. Explain the following with the help of suitable chemical reactions :-
     a) Wurtz reaction.
     b) Decarboxylation reaction.
     c) Hydrogenation reaction.   (3)

18. With respect to Modern periodic table answer the following questions :-
    i)   d block elements are accommodated in which groups?
    ii)   What is the general configuration of d- block elements?
    iii)   How many elements are present in the first period?
    iv)   What is the common name assigned to lanthanoids and actinoids?
    v)   Name the noble gas which does not have 8 electrons in its valence shell.
    vi)   Name an element which does not have any neutrons in it.   (3)

19. a)   Predict the hybridization state of phosphorous in phosphorous pentachloride.
          (At. No. P=15, Cl=17). Explain with the help of box diagram.
    b)   Differentiate between sigma and pi bond. (Give two points only)
    c)   Define bond energy. Arrange $C - C$, $C = C$, $C \equiv C$ in the order of increasing
          bond energy.   (3)
                                      (OR)
    a)   Give any two limitations of valence bond theory.
    b)   Explain the formation of NH_4^+ on the basis of Lewis dot concept.
          (At. No. of N = 14, H = 1)
    c)   Differentiate between an electrovalent compound and covalent compound.
          (Give two points only)

20. a)   Define electron affinity. Electron affinity of halogens is exceptionally high. Give reason.
    b)   State and explain two points to justify that modern periodic table is superior in
          comparison to Mendeleev's table.   (1,2)

21. a)   How would you distinguish between an alkane and an alkene.
          (Write the answer in a tabular form and write the reaction also)
    b)   Give reason for the following :-
          i)   Boiling point of homologues in an alkane series increases down the series.
          ii)   Hydrocarbons are insoluble in water but they are soluble in organic solvents. (1,2)

22. a)   The internuclear separation in HCl is 0.283nm. Calculate the dipole moment of HCl.
          Charge on electron is 1.6×10^{-19}C.
    b)   Write the molecular orbital configuration of N_2. Calculate its bond order and predict
          the magnetic nature.   (1,2)

23. Coins in United States consist of Zinc core that is coated electroplated with a thin coating of
    copper. Zinc dissolves in HCl but copper does not. If there is a scratch on the coin zinc will
    get dissolved leaving behind only a thin layer of copper. Answer the following questions :-
    a)   Why copper does not react with HCl?
    b)   Can all coins be made using silver metal? Give reason for your answer.
    c)   Write the reaction between zinc and HCl and balance it.
    d)   Give any two examples to prove that knowledge of science is helpful in our daily life.   (4)

24. a)   Write the procedure for the preparation of Lassaigne's extract.
    b)   With the help of reactions only explain the procedure for detection of chlorine in
          an organic compound.
    c)   What is the principle involved in chromatography? Calculate the value of retention
          factor of component A given that height attained by component A = 0.9cm and by
          the solvent = 1.1cm.
    d)   In an experiment for estimation of sulphur by Carius method 0.2175g of a compound
          gave 0.5825g of $BaSO_4$. Calculate the percentage of sulphur.
          (At. No. of Ba=137, S=32, O=16)   (1,1,1,2)
                                      (OR)

a) Explain the procedure to detect bromine in an organic compound.
b) In Duma's method 0.206g of an organic compound gave 18.8ml of moist nitrogen gas at 290K temperature and 760mm of Hg pressure. If aqueous tension at this temperature is 14.5mm of Hg. Calculate the percentage of nitrogen present in the organic compound. (At. Mass of N=14)   (2,3)

25. In the following reactions identify products A, B etc. :-
a) $CH_3CH_2CH = CH_2 + HBr \rightarrow A$
b) $CH_3CH_2CH_2OH \xrightarrow{\text{Conc. } H_2SO_4, \, 440K} A$
c) $CH_3CH_2CH_2Cl \xrightarrow{\text{Aq. KOH}} A$
d) $CH_2 = CH_2 + O_3 \rightarrow A \xrightarrow{Zn / H_2O} B$
e) $CH_3C \equiv CH_2 \xrightarrow[H_2SO_4/HgSO_4]{H_2O} A \longleftrightarrow B$ (5)

(OR)

a) An alkene A has the molecular formula C_6H_{12}. It undergoes ozonolysis followed by with Zn/H_2O to produce two molecules of propanone. Identify the structural formula of compound A.
b) Write the reaction involved when :-
    i)   Ethyne reacts with ammonical solution of cuprous chloride.
    ii) 2 Chloro butane reacts with alcoholic potassium hydroxide solution.
c) Identify products A, B etc. in the following reactions :-
    i) $CaC_2 + H_2O \rightarrow A$
    ii) $C_6H_6 \xrightarrow{\text{Conc. } H_2SO_4/\text{Conc. } HNO_3} A \xrightarrow{Br_2 /AlBr_3} B$
    iii) $C_6H_6 \xrightarrow{CH_3COCl / AlCl_3} A$ (1,2,2)

26. a) i)   Calculate the pH value of a solution having concentration of $H^+ = 10^{-4}$M.
         ii) In group three analysis of cations ammonium chloride is added before adding the group reagent ammonium hydroxide. Why?
     b) Solubility of strontium fluoride (SrF_2) in water is 9.55×10^{-5} moles/litre. Calculate the solubility product of the salt at room temperature.
     c) 2 Moles of hydrogen iodide was heated at 444K temperature; 22% of it was decomposed to produce hydrogen and iodine. Calculate the dissociation constant of the reaction.   (1,2,2)

(OR)

a) i)   In qualitative analysis of group two cations the solution is made acidic before passing hydrogen sulphide gas as the group reagent. Why?
    ii) If pOH of a solution is 9 find pH of this solution.
b) $Ag^+(aq.) + Cl^-(aq.) \rightarrow AgCl (s)$
    In the above chemical reaction if the concentration of silver ions is 0.005 M find the concentration of chloride ions required for the formation of silver chloride precipitate if the solubility product of silver chloride is 2.5×10^{-4}.
c) In the following reaction : -
        $A + B \rightarrow C + D$
    One mole of A reacts with 0.5 mole of B. As the reaction proceeds for sometime concentration of C is found to be 0.214 moles. If the value of equilibrium constant for this reaction is 4; is the reaction at equilibrium if not then the reaction is expected to proceed in which direction?   (1,2,2)

-x-x-x-x-x-x-