# CHEMISTRY

Time: 1 Hour                                                                       Max.Marks : 50

**Instructions:**
(1)    *Answer must be written either in English or the medium of instruction of the candidate in high school.*
(2)    *There will be no negative marking*
(3)    *Use of calculators or graph papers is not permitted*
(4)    *Answer all the questions.*

1.    To the mixture of aqueous solution of a Nitrate salt and Ferrous sulphate, con.$H_2SO_4$ is slowly added through the slanted walls of the test tube. A brown ring is formed little above (nearly middle) the bottom of the test tube.          [**9 Marks**]
      **a)** What is the significance of this test?
      **b)** Which acts as reductant?
      **c)** What is the change of oxidation state of oxidant?
      **d)** What is the chemical composition of the Brown's ring?
      **e)** Why con.$H_2SO_4$ is added only through the slanted walls of the test tube?
      **f)** Write the related chemical equations for above chemical changes.

2.    It is observed that a solid mixture of chloride salt and potassium dichromate is heated with con.$H_2SO_4$ red vapours are formed. When these vapours are passed into aqueous caustic soda solution yellow solution is formed.  This on further treatment with lead acetate solution, a yellow precipitate is formed.     [**7½ Marks**]
      **a)** What is significance of the sequence of reactions?
      **b)** What is the name and formula of the red vapours?
      **c)** Why red vapours are changed to yellow solution?  And write its formula
      **d)** What is the yellow precipitate formed in the last step and its formula?
      **e)** Write the related chemical equations for above chemical changes.

3.    **a)** What is carbohydrate?                                               [**8 Marks**]
      **b)** How atmospheric $CO_2$ is transformed into carbohydrate in green plants? Indicate through chemical equation?
      **c)** What is Tollen's test?
      **d)** What is significance of Tollen's test in carbohydrates?
      **e)** What chemical changes takes place during the test?
      **f)** Glucose gives Tollen's test but not sucrose why?
      **g)** What is oxidant in this reaction?
      **h)** What is the formula of the red precipitate formed in Benedict's test conducted on carbohydrates?

4.    0.1 moles/lit of a weak acid solution contains 0.001 moles/lit of the conjugate base ($B^-$).                                                           [**7½ Marks**]
      **a)** What is the dissociation constant ($K_a$) of the acid?
      **b)** Calculate the pH of 0.1M solution of weak acid (AH)?
      **c)** This acid is neutralized by adding required quantity of aqueous NaOH solution. What is the approximate the range of pH of solution?
      **d)** To the original solution HCl is added.  What happens to the ratio of conjugate base to the acid and how Ka of the acid is affected?
      **e)** To the above original solution sodium salt of same weak acid is added.  What happens to the pH of the solution?

5.  In each sub question below a statement S and an explanation E is given. Choose the correct answer from the codes A,B,C,D,E given below for each question.

**[8Marks]**

(A)   S is correct but E is incorrect
(B)   S is incorrect but E is correct
(C)   Both S and E are correct and E is correct explanation of S
(D)   Both S and E are correct but E is not correct explanation of S
(E)   Both S and E are incorrect

|   | Statement | Explanation |
|---|---|---|
| i | The third period contains only 8 elements and not 18 like $4^{th}$ period | In III period filling starts from $3s^1$ and complete at $3p^6$ whereas in IV period it starts from $4s^1$ and complete after $3d^{10}$ and $4s^2$ |
| ii | Transition elements show horizontal as well as vertical relationship | This is due to shielding effect and similar electronic configuration |
| iii | Cs and $F_2$ combines violently to form CsF | Cs is most electropositive and F is most electronegative |
| iv | A jump in $3^{rd}$ ionisation energy is noticed in case of alkaline earth metals | The jump in ionisation energy is due to change in major energy shell during successive removal of electron |
| v | First ionisation energy of Be is more than that $IE_1$ of B | Removal of electron in Be occurs from 2s subshell whereas in B from 2p subshell |
| vi | Formation of $Cl^-$ is exothermic whereas formation of $O^{2-}$ endothermic | $EA_2$ of oxygen is endothermic and greater than its exothermic value $EA_1$ of oxygen |
| vii | $BiCl_5$ does not exist | In Bi inert pair effect is more predominant |
| viii | Second EA for halogens is zero | Fluorine has maximum value of electron affinity |

6.  Match each of the molecules in **Column I** with its property / properties given in corresponding **Column II.**                                    [**10 Marks**]

| Column-I | Column-II |
|---|---|
| a) $NH_3$ | 1. $sp^3$ hybridisation |
| b) $CH_4$ | 2. $sp^3d$ hybridisation |
| c) $PCl_5$ | 3. $sp^2$ hybridisation |
| d) $C_2H_4$ | 4. sp hybridisation |
| e) $BeCl_2$ | 5. $sp^3d^2$ hybridisation |
| f) $PCl_3$ | 6. Tetrahedral |
| g) $CO_2$ | 7. Trigonal Bipyramidal |
| h) $H_2O$ | 8. Trigonal pyramidal |
| i) $SO_2$ | 9. Planar |
| j) $SO_3$ | 10. Linear |
|  | 11. Collected by downward displacement of air |
|  | 12. Refrigerant |
|  | 13. V-shape |
|  | 14. Bleaching agent |
|  | 15. All bond angles are not equivalent |
|  | 16. Lighter than air |
|  | 17. On burning $CO_2$ and $H_2O$ are formed |