HALF-YEARLY EXAMINATION-2010-2011
CHEMISTRY (Theory)

CLASS - XII

**Time: Three Hours**   **Max. Marks: 70**

General Instructions

1. All questions are compulsory.
2. Question nos. 1 to 8 are very short answer questions and carry 1 mark each.
3. Question nos. 9 to 18 are short answer questions and carry 2 marks each.
4. Question nos. 19 to 27 are also short answer questions and carry 3 marks each
5. Question nos. 28 to 30 are long answer questions and carry 5 marks each
6. Use log tables if necessary, use of calculators is not allowed.

1. What is the expected van't Hoff factor for $K_3[Fe(CN)_6]$.   1

2. Identify the reaction order from the rate constants. $K = 2.3 \times 10^{-5}$ L mol^{-1} s^{-1} 1

3. Explain why Fe_3O_4 is ferrimagnetic at room temperature and becomes paramagnetic at 850 K.   1

4. An ore sample of galena (PbS) is contaminated with zinc blende (ZnS). Name one chemical which can be used to concentrate galena selectively by froth floatation method.   1

5. Λ°_m for NaCl, HCl and NaAc are 126.4, 425.9 and 91.0 S cm^2 mol^{-1} respectively. Calculate Λ°_m for HAc.   1

6. Give plausible explanation why Cyclohexanone forms cyanohydrin in good yield but 2,2,6-trimethylcyclohexanone does not.   1

7. Write the IUPAC name of: 1
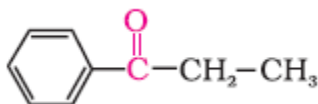
8. Predict the products of electrolysis of the dilute solution of H_2SO_4 with platinum electrodes.   1

9. The initial concentration of N_2O_5 in the following first order reaction   2
$N_2O_{5(g)} \rightarrow 2 NO_{2(g)} + 1/2 O_{2(g)}$ was 1.24×10^{-2} mol L^{-1} at 318 K. The concentration of N_2O_5 after 60 minutes was 0.20×10^{-2} mol L^{-1}. Calculate the rate constant of the reaction at 318 K.

10. The value of G^0_f for formation of Cr_2O_3 is – 540 kJ mol^{-1} and that of Al_2O_3 is – 827 kJ mol^{-1} Is the reduction of Cr_2O_3 possible with Al?   2

11. Write the names of the reagents and equations in the conversion of
(i) Phenol to salicylaldehyde
(ii) Anisole to p-methoxyacetophenone   2

12. Write balanced chemical equations for the following reactions: 2
(a) $XeF_2 + PF_5 \rightarrow$

(b) $P_4 + NaOH + H_2O \rightarrow$

13. Account for the following: 2

(i) Alkaline medium inhibits the rusting of iron.
(ii) Iron does not rust even if the zinc coating is broken in a galvanized iron pipe.
                                                            OR
Calculate the equilibrium constant of the reaction: $Cu_{(s)} + 2Ag^+_{(aq)} \rightarrow Cu^{2+}_{(aq)} + 2Ag_{(s)}$; $E^0_{cell} = 0.46$

14. Consider the adsorption isotherms given below and interpret the variation in the extent of adsorption (x/m) when   2
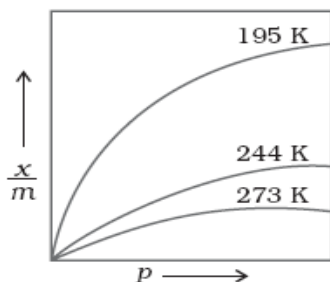
   (i) temperature increases at constant pressure

   (ii) pressure increases at constant temperature

15. Account for the following: 2
(a) Aniline does not undergo Friedel Crafts alkylation

(b) Although - NH2 group is an ortho and para-directing group, nitration of aniline gives alongwith
    ortho & para derivatives meta-derivative also.

16. In the following pairs of halogen compounds, which would undergo SN^2 reaction faster?   2
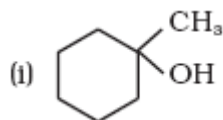   (i)   (i)

17. Show how would you synthesise the following alcohols from appropriate alkenes?   2
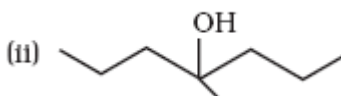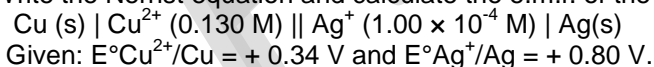

18. Give simple chemical tests to distinguish between the following pairs of compounds.   2
 (i) Propanal and Propanone
(iii) Ethylamine and aniline

19. CsCl forms a bcc lattice Cs and Cl ions are in contact along the body diagonal of the cell. The length of the side of the unit cell is 412pm and Cl⁻ has a radius 181pm. Calculate the radius of Cs⁺ ion. Also calculate the distance of closest approach between Cs⁺ and Cl⁻.   3

20. Write the Nernst equation and calculate the e.m.f. of the following cell at 298 K: 3
    Cu (s) | Cu^{2+} (0.130 M) || Ag^+ (1.00 × 10^{-4} M) | Ag(s)
    Given: $E°Cu^{2+}/Cu$ = + 0.34 V and $E°Ag^+/Ag$ = + 0.80 V.

21. Explain the following terms: 3
   (i) Peptisation
  (ii) Electrophoresis
  (iii) Hardy-Schulze rule
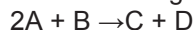   **OR**
  Explain the following terms:
  (i) Tyndall effect
  (ii) Shape-selective catalysis
  (iii) Coagulation

22. The following results have been obtained during the kinetic studies of the reaction: 3

$$2A + B \rightarrow C + D$$

Experiment	[A]/mol L^{-1}	[B]/mol L^{-1}	Initial rate of formation of D/mol L^{-1} min^{-1}
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.2×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.40×10^{-2}

Determine the rate law and the rate constant for the reaction.

23. Explain the various steps involved in the extraction of copper from its sulphide ore?   3

24. (a)Calculate the overall complex dissociation equilibrium constant for the $[Cu (NH)_3]^{2+}$ ion, given that $\beta_\square$ for this complex is 2.1×10^{13}.   1

(b) A solution of $[Ni (H_2O)_6]^{2+}$ is green but a solution of $[Ni (CN)_4]^{2-}$ is colourless. Explain.   1

(c)Write the name of linkage isomer of $[Co(ONO)(NH_3)_5]^{2+}$ 1

25. (a)Why does $R_3P=O$ exist but $R_3N=O$ doesnot (R= alkyl group)   1

(c) Explain the acidity of oxo acid of chlorine is $HOCl < HOClO < HOClO2 < HOClO3$ 1

(b) Draw the structures of the following species: 1
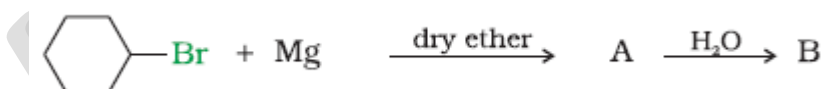
    (i) PCl_5 (ii) XeF_4
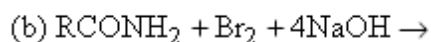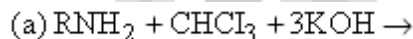
26. Identify A, B, C, D, E, and R^1 in the following: 3

   (i)

   (ii) Complete and name the following reactions:

     (a) $RNH_2 + CHCl_3 + 3KOH \rightarrow$
     (b) $RCONH_2 + Br_2 + 4NaOH \rightarrow$

27. Arrange the following in the order of property indicated for each set: 3

(i) F_2, Cl_2, Br_2, I_2 - increasing bond dissociation enthalpy.
(ii) HF, HCl, HBr, HI - increasing acid strength.
(iii) NH_3, PH_3, AsH_3, SbH_3, BiH_3 – increasing base strength.

28. (a) Why is that orange solution of $K_2Cr_2O_7$ turns yellow on adding NaOH?
 (b) Explain:
(i) Why do transition metals act as catalyst?

(ii) Zr and Hf have identical sizes.

(iii) Why is Ni^{2+} more stable than Pt^{2+} where as Pt^{4+} is more stable than Ni^{4+}?

(iv) Mn (II) shows maximum paramagnetic character amongst the divalent ions of the first transition series.

OR

5

(a) In the titration of $FeSO_4$ with $KMnO_4$ in the acidic medium, why is dil H_2SO_4 used instead of dil HCl?
(b) Give reasons:
(i) Why do transition metals ions have high enthalpy of hydration?
(ii) Ce^{4+} is used as an oxidizing agent in volumetric analysis.
(iii) Transition metals form a number of interstitial compounds.
(iv) Zn^{2+} salts are white while Cu^{2+} salts are blue.

29. (a) . Describe the mechanism of the formation of diethyl ether from ethanol in the presence   2
of concentrated sulphuricacid.
b. Write one chemical equation each to exemplify the following reactions :   3

(i) Aldol condensation

(ii) Hell-Volhard-Zelinsky reaction

c. Although phenoxide ion has more number of resonating structures than carboxylate ion, carboxylic acid
   is a stronger acid than phenol. Why?

OR

a.Describe the mechanism of the formation of ethene from ethanol in the presence   2
of concentrated sulphuricacid.

b. Write one chemical equation each to exemplify the following reactions :

(i) Cannizzaro's reaction

(ii) **Rosenmund reduction**

c. Arrange the following compounds in increasing order of their acid strength:
   Benzoic acid, 4-Nitrobenzoic acid, 3, 4-Dinitrobenzoic acid, 4-Methoxybenzoic acid

30. a. (i) Why is $CaCl_2$ used to remove snow on roads?   1

   (ii) When fruits and vegetables are dried and placed in water, they slowly swell and return to

   original shape, why?   1

  (b) Two elements A and B form compounds having molecular formulae AB_2 and AB_4.   3
    When dissolved in 20 g of benzene, 1 g of AB_2 lowers the freezing point by 2.3 K,
    whereas 1 g of AB_4 lowers it by 1.3 K. The molar depression constant for benzene
    is 5.1 K kg mol^{-1}. Calculate the atomic masses of A and B.
                    OR

a. (i) State Henry's law and mention one important application?   1

(ii) What type of deviation from ideal behavior will be shown by a solution of cyclohexane and ethanol and why?   1

b. The boiling point of benzene is 353.23 K. When 1.80 g of a non-volatile solute was dissolved in 90 g of benzene, the
boiling point is raised to 354.11 K. Calculate the molar mass of the solute. K_b for benzene is 2.53 K kg mol^{-1}.   3