

Final Examination - 2017-2018

CHEMISTRY

Time : 3 hrs. + 15 min.

F. M. : 80

Std. : XI

[Question 1 is of 20 marks which is compulsory. Question 2 to 8 carry 2 marks each. Question 9 to 15 carry 3 marks each and question 16 to 18 carry 5 marks each]

PART I

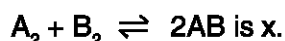
- Q1. a. Fill in the blanks : (4x1=4)
- The equilibrium concentration of x, y, z are 4, 2 and 2 moles respectively for the equilibrium $2x + Y \rightleftharpoons Z$, the value of K_c is _____
 - When spontaneous process takes place it is accompanied by an increase in the total _____ of the _____
 - Functional isomers of $C_2H_5NO_2$ are _____ and _____
 - The reaction of chlorine with methane is a _____ reaction which gives rise to _____ free radical
- b. Complete the following by selecting the correct alternatives from the choices given : (4x1=4)
- Formation of SO_3 takes place according to the reaction " $2SO_2 + O_2 \rightleftharpoons 2SO_3$, $\Delta H = -45.2 \text{ K Cal}$. Which of the following factors favours the formation of SO_3 ?
a. Increase in temperature b. Increase in pressure c. Removal of oxygen.
 - In which of the following, carbon has the highest oxidation number?
a. CH_4 b. $HCOOH$ c. CH_2O
 - The process employed to extract copper is
a. Cyanide process b. electrolytic reduction c. Magnetic separation
 - Which of the following will exhibit cis-trans isomer?
a. $CH_2Br - CH_2Br$ b. $CHBr = CHBr$ c. $CBr_2 = CH_2$
- c. Match the following :
- | | |
|-----------------------------|---|
| (i) Extensive property | a) Pyrolustite ore |
| (ii) Racemic mixture | b) Electrophile |
| (iii) Electron rich species | c) Nucleophile |
| (iv) Extraction of $KMnO_4$ | d) Volume |
| | e) Equimolar mixture of d & l compounds |
| | f) Leavorotatory compound |

d. Answer the following questions :

(4x2=8)

Write balanced equations for the following reactions ;

- a. Preparation of oxygen from potassium dichromate and concentrated sulphuric acid
- b. Self-reduction of cuprous oxide to copper by cuprous sulphide.
- ii. What happens to entropy of a solid on fusion and why?
- iii. Equilibrium constant for the following reaction :



What will be the equilibrium constant for the reaction $AB \rightleftharpoons \frac{1}{2} A_2 + \frac{1}{2} B_2$?

- iv. 40 ml of each gas A & gas B takes 150 and 200 seconds respectively for effusing through a pinhole under similar conditions. If molecular mass of gas B is 36, what is the molecular mass of gas A?

PART II

2. Predict whether there will be any participation by mixing 20 ml of 1.5×10^{-5} (M) $BaCl_2$ solution with 40 ml of 0.9×10^{-5} (M) Na_2SO_4 solution (K_{sp} of $BaSO_4 = 1 \times 10^{-10}$)

OR

Calculate the pH at which $Mg(OH)_2$ begins to precipitate from a solution containing 0.10 (M) Mg^{2+} ions. [K_{sp} for $Mg(OH)_2 = 1 \times 10^{-11}$]

3. A sample of an unknown liquid is introduced into a bulb having volume 272 ml and vaporised. The mass of bulb increases by 1.46g. Calculate the molecular mass of the liquid if pressure is 762 mmHg and temperature is 332 K.
4. Calculate the maximum work done when 64 kg of oxygen gas occupying a volume of 7L is expanded isothermally and reversibly to 14L at $27^\circ C$ [$R = 1.98 \text{ Cal.}$]
5. Calculate the entropy change involved in the vapourisation of water at 373 K to vapour at the same temperature (Latent heat of vapourisation = 2.275 kJ/g)
6. Account for the following :
 - a. Why is H_2S more acidic than H_2O ?
 - b. Basicity of hydrides of group 15 elements decreases down the group.

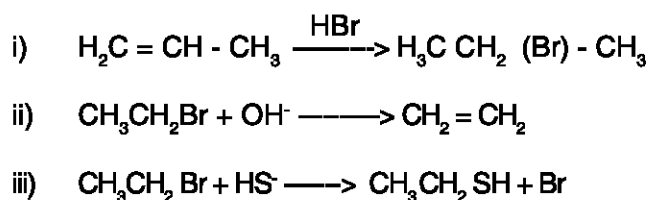
OR

- a) Phosphorus can form pentahalide (PCl_5) but nitrogen can not
- b) Water is liquid but hydrogen sulphide is gas at room temperature.
7. Write reactions of extraction of silver by cyanide process.
8. a) Write the following carbocations in increasing order of stability :
 $CH_3CH_2^+$, $CH_2=CH-CH_2^+$, $PhCH_2^+$
b) Explain the stability of alkenes : $CH_3-CH=CH_2$ > $CH_2=CH_2$ by hyperconjugation.
9. Alkaline hydrolysis of tertiary butyl bromide follows rate equation
$$\text{Rate} = K [\text{Alkyl} (\text{halide})]$$

- a) Name the mechanism of above reaction
 b) Show the mechanism
10. a) Write the increasing order of acidity for the following and justify your answer
 Cl_2CHCOOH , ClCH_2COOH , CH_3COOH
- b) Identify electrophiles and nucleophiles from the following :
 BF_3 , $\text{R COO}^\ominus$, RNH_2 , $(\text{CH}_3)_3\text{C}^\oplus$

Or

- a) identify the following types of reactions :



- b) Draw the resonance structures of chlorobenzene.

- II. a. Enthalpy change for the reaction $\text{Ag}_2\text{O}_{(\text{s})} \longrightarrow 2\text{Ag}_{(\text{g})} + \frac{1}{2}\text{O}_{2(\text{g})}$ is 32.0 KJ mol^{-1} and $\Delta S = 0.08 \text{ KJ K}^{-1} \text{ mol}^{-1} (\text{s})$ at 1 atm. Calculate the temperature at which ΔG is zero. Also predict the direction of reaction at a temperature below the calculated temperature
- b. What happens to the entropy when a rubber band is stretched?

OR

- a. Calculate the enthalpy of formation of acetic acid (liq) under the standard conditions from the following data at 25°C .
- i. $\text{C}_{(\text{s})} + \frac{1}{2}\text{O}_{2(\text{g})} \longrightarrow \text{CO}_{2(\text{g})} \Delta_f H^\circ = -380.4 \text{ kJ}$
- ii. $\text{H}_{2(\text{g})} + \frac{1}{2}\text{O}_{2(\text{g})} \longrightarrow \text{H}_2\text{O}_{(\text{l})} ; \Delta_f H^\circ = -275.5 \text{ KJ}$
- iii. $\text{CH}_3\text{COOH}_{(\text{l})} + 2\text{O}_{2(\text{g})} \longrightarrow 2\text{CO}_{2(\text{g})} + 2\text{H}_2\text{O}_{(\text{l})} \Delta_c H^\circ = -876.6 \text{ KJ}$
12. a. List the atoms with following electronic configuration in order of increasing ionisation energy?
- i. $[\text{He}] 2p^6 3s^1$ ii. $[\text{He}] 2p^5$ iii. $[\text{He}] 2s^2 2p^6$
- b. What is the type of hybridisation in each carbon atom in the compound $\text{H}_3\text{C} - \text{C} \equiv \text{CH}$
13. a. For the reaction $2\text{CO}_{(\text{g})} + \text{O}_{2(\text{g})} \rightleftharpoons 2\text{CO}_{2(\text{g})} + \text{heat}$

What happens to the equilibrium if

- i. CO_2 gas is removed ii. temperature is decreased iii. pressure is increased
- b. Show that for a reaction of the type $\text{AB} \rightleftharpoons \text{A} + \text{B}$ the total pressure at which AB is 50% dissociated will be numerically equal to three times the K_p value.

14. Write balanced equations for the following :

- Potassium iodide is treated with acidified KMnO_4 solution
- Potassium dichromate (acidified) reacts with hydrogen sulphide
- Acidified potassium dichromate reacts with oxalic acid.

15. For extraction of iron, write the reactions in zone of combustion, zone of fusion and zone of slag formation.

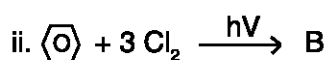
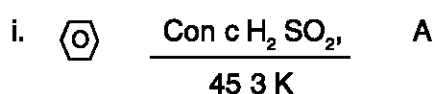
16. a. Name the type of isomerisms exhibited by lactic acid $[\text{CH}_3\text{CH}(\text{OH})\text{COOH}]$ giving reason for your answer.
- b. Name any three types of isomerisms and draw structure of isomers for a compound with molecular formula $\text{C}_4\text{H}_7\text{Cl}$

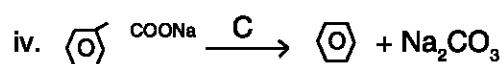
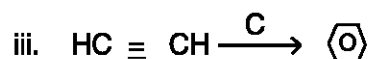
OR

- a. Draw the isomers of the following compounds and name them :
- (i) $\text{C}_4\text{H}_{10}\text{O}$ (ii) $\text{C}_3\text{H}_6\text{O}$ (iii) $\text{C}_3\text{H}_9\text{N}$
- b. Why is mesotartaric acid optically inactive ? Explain with diagram
17. a. Carry out the following conversions ;
- Methane to ethene
 - 1 chloropropane to 2 chloropropane
- b. Distinguish between the two (write a chemical list) :
- But - 1 - yne and but - 2 - yne
 - Propene and Propyne

OR

- a. Write balanced equations for the following named reactions
- Friedel - Craft acylation
 - Corey - house reaction
 - Clemmensen reduction
- b. Identify ABCD :





18. a. Write Vanderwaal's equation of state defining all the terms
- b. Enthalpy change and entropy change of a chemical reaction at 25°C are 177 kJ and 160.4 Jk⁻¹ respectively. Calculate free energy change of the reaction and predict whether the reaction is spontaneous or non-spontaneous.
- c. Determine the pH of a solution obtained by mixing equal volume of 0.1 (N) ammonium nitrate and 0.02 (N) ammonium hydroxide K_b for NH₄OH being 1.8 x 10⁻⁵.

OR

- a. Which gases behave like ideal gas at room temperature and why?
- b. ΔH and ΔS for vapourisation of water at 1 atm pressure are 40.63 kJ mol⁻¹ and 108.8 Jk⁻¹ mol⁻¹ respectively. Calculate the temperature at which the free energy change for the transformation will be zero. Predict the sign of free energy change below this temperature.
- c. What will be the pH value of a solution obtained by mixing 5g of CH₃COOH and 7.5 g of CH₃COONa and making the volume to 500 ml. (Dissociation constant of acetic acid = 1.8 X 10⁻⁵ at 25°C)