

**CHEMISTRY**  
**(Three hours and a quarter)**

*(The first 15 minutes of the examination are for reading the paper only. Candidate must NOT start writing during this time).*

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*Answer Question 1 (compulsory) from section A and any SIX questions from section B*

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**Section A (40 marks)**

**Compulsory:** Attempt all questions

**Question 1**

A. Each question in this section is provided with four possible options. Choose the most appropriate option. [1×15 = 15 marks]

- (i). In Friedel-Craft reaction besides  $\text{AlCl}_3$ . What are the other reactants?
- $\text{C}_6\text{H}_6$  and  $\text{CH}_3$
  - $\text{C}_6\text{H}_6$  and  $\text{NH}_3$
  - $\text{C}_6\text{H}_6$  and  $\text{NH}_2$
  - $\text{C}_6\text{H}_6$  and  $\text{CH}_3\text{Cl}$
- (ii). The IUPAC name of  $\text{C}_2\text{H}_5\text{OCH}_3$  is
- Methyl ethyl ether
  - Ethyl methyl ether
  - Methoxy ethane
  - Ethoxy methane
- (iii). Which one of the following is used to make non-stick cook wares?
- Polystyrene
  - Polyethylene terephthalate
  - Poly tetrafluoroethylene
  - Poly vinyl chloride
- (iv). Le-Chatelier principle is not applicable only at
- physical equilibrium
  - system not in equilibrium
  - homogenous equilibrium
  - heterogeneous equilibrium
- (v). Which of the following statement is not correct about order of reaction?
- The order of a reaction can be a fractional number
  - Order of a reaction is always equal to the sum of stoichiometric coefficient of reactants in the balance chemical equation for a reaction
  - Order of a reaction is experimentally determined quantity
  - The order of a reaction is the sum of the powers of molar concentration of the reactants in the rate law expression.

- (vi). Which of the following is used in the preparation of chlorine?
- Only  $\text{MnO}_2$
  - Only  $\text{KMnO}_4$
  - Both  $\text{MnO}_2$  and  $\text{KMnO}_4$
  - Neither  $\text{MnO}_2$  and  $\text{KMnO}_4$
- (vii). Suspension of slaked lime in water is known as
- Lime water
  - Milk of lime
  - Quick lime
  - Aqueous solution of slaked lime
- (viii). If  $\text{HNO}_3$  changes into  $\text{NO}_2$  the oxidation number is changed by:
- +2
  - 6
  - 0
  - +4
- (ix). Which of the following angle correspond to  $\text{SP}^3$  hybridization?
- $109^\circ$
  - $90^\circ$
  - $120^\circ$
  - $180^\circ$
- (x). The values of which property decreases from left to right in a period.
- Ionization potential
  - Electron affinity
  - Atomic size
  - Electronegativity
- (xi). Electronic configuration of  $\text{N}^-$  is
- $1\text{S}^2, 2\text{S}^2, 2\text{P}^4$
  - $1\text{S}^2, 2\text{S}^2, 2\text{P}^3$
  - $1\text{S}^2, 2\text{S}^2, 2\text{P}^5$
  - $1\text{S}^2, 2\text{S}^2, 2\text{P}^6$
- (xii). IUPAC name of  $\text{CH}_2\text{Cl}_2$  is
- Methylene Chloride
  - 2-chloro methane
  - Di Chloromethane
  - Chloromethane
- (xiii). Name of Grignard reagent required for converting formaldehyde to n-butyl alcohol is
- Methyl magnesium bromide
  - Methyl magnesium bromide

- c. n-ethyl magnesium bromide
- d. n- propyl magnesium bromide

- (xiv). Dipole moment is a vector quantity and is represented by an arrow with it's head pointing towards
- a. Positive center
  - b. Both positive and negative
  - c. Negative center
  - d. Neither positive nor negative

- (xv). Which of the following element will gain one electron more readily in comparison to other elements of their group
- a. F
  - b. S
  - c. C
  - d. Na

**B. Fill in the blanks by writing suitable word(s)** 5marks]

- (i). Electron affinity of chlorine is ..... Than that of fluorine.
- (ii). Formation of cation form neutral atom is favoured by.....
- (iii). The halogen having some metallic character is.....
- (iv). Cyclic hydrocarbons are called.....
- (v). With increase in the number of carbon atoms in alkane the number of chain isomers.....

**C. Match each item under column A with the most appropriate item in the column B. Rewrite the correct matching pairs in the answer sheet provided.** [5marks]

Sl.no	Column A		Column B
1	Oxidation of substances in the presence of another substance	a	Bromine
2	CaSO <sub>4</sub>	b	Induced oxidation
3	Reddish Brown	c	Dentistry, ornamental work
4	Molecularity	d	Principle of equilibrium
5	Le-Chatelier	e	Acidic salt
		f	Cannot be zero or fraction

**D. Correct the following statements** [1×5 = 5 marks]

- (i). Effect of temperature on equilibrium constant is given by Van't Hoff equation,  

$$\log = (k_p)_1 / (k_p)_2 = \Delta H / 2.303R \{ (T_2 - T_1) / (T_1 T_2) \}$$
- (ii). Rutherford put concept of atom forward in 1808.
- (iii). Alkyl halide undergo nucleophilic addition reaction.
- (iv). Nucleophilicity of halide ions I<sup>-</sup> > Cl<sup>-</sup> > F<sup>-</sup> > Br<sup>-</sup>
- (v). Carbon atoms of a double bond are SP<sup>3</sup> hybridization.

E. Answer the following questions

[10 marks]

- (i). Explain why not all d-block elements are transition element.
- (ii). Draw electron dot diagram of formation of magnesium fluoride.
- (iii). What is the oxidation number of carbon in  $\text{CH}_2\text{Cl}_2$ .
- (iv). Which acid is used to obtain sulphate of alkaline earth metal with metal?
- (v). Why halogen have high value of electron affinities?
- (vi). Draw shapes of S and P orbitals.
- (vii). Define the following:
  - a. Tautomerism
  - b. Position isomers
  - c. Order of reaction
  - d. Primary alcohols

**Section B (60 marks)**

*Attempt any SIX questions.*

**Question 2.**

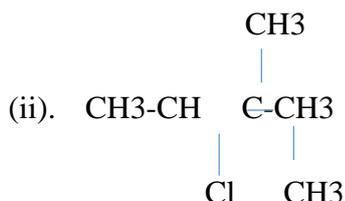
- a. How does atomic radii vary in period and in-group? Explain. [2 marks]
- b. To which block do transition elements belong? [1 marks]
- c. Explain the basis of classification of elements into s, p, d and f- blocks? [2 marks]
- d. Among the following which is most soluble in water,  $\text{LiOH}$ ,  $\text{NaOH}$ ,  $\text{KOH}$ ,  $\text{RbOH}$  [1 mark]
- e. Which one  $\text{K}$  or  $\text{K}^+$  would have larger size. Explain. [1 mark]
- f. Which one of these three are more acidic? Phenol, water or ethanol. Why? [1 mark]
- g. Draw structural formula : [2marks]
  - (i). methylphenol
  - (ii). 1,2-dihydroxy benzene

**Question 3**

- a. Why do alkanes prefer to undergo electrophilic addition reaction while arenes prefer electrophilic substitution reactions explain? [2mark]
- b. Name the chain isomer of  $\text{C}_5\text{H}_{12}$  which has tertiary hydrogen atoms? [1mark]
- c. Classify the following hydrocarbons into alkanes, alkenes, alkynes and arenes. [2marks]
  - i).  $(\text{CH}_3)_4\text{C}$
  - ii).  $\text{CH}_3\text{CH}_2\text{CCH}$
  - iii).  $\text{CH}_3\text{CHCH}_2$
  - iv).  $\text{C}_6\text{H}_5\text{CH}_3$
- d. A compound is formed by the substitution of two chlorine atoms for two hydrogen atoms in butane? What is the number of isomers possible? Name all isomers ? [2marks]
- e. Draw structural formula of 1-chloro-2methyl propane [1 mark]
- f. What is the shape of  $\text{IF}_5$  and draw the shape [1 mark]
- g. Write balanced equation for the preparation of Chlorine using  $\text{MnO}_2 + \text{HCl}$  [1 mark]

**Question 4**

- a. Explain the factors that determine the shape of molecules? [2 marks]
- b. Explain why molecule of  $\text{MgCl}_2$  is linear what that of stannous Chloride is angular [2 marks]
- c. Write two difference between metallic bond and ionic bond [1 mark]
- d. Explain in brief why the dipole moment of  $\text{NH}_3$  is more than that of  $\text{NF}_3$  [1 mark]
- e. Show with equation that  $\text{SO}_2$  acts as both oxidant and a reductant. [2 marks]
- f. Write IUPAC names of the following. [1 mark]



g. What is the product formed by treatment of isobutylene with HBr? [1 mark]

### Question 5

a. What is the effect of increasing pressure on the following equilibrium? [1 mark]



b. Write an expression for the equilibrium constant for this reaction [1 mark]



c. For the following reaction, write how each of the changes will affect the indicated quality, assuming a container of fixed size. Write “increase”, “decrease” or “no change”. [4 marks]

Sl.No	Change	[H <sub>2</sub> ]	[Br <sub>2</sub> ]	[HBr]	K value
1	Some H <sub>2</sub> added				
2	Some HBr added				
3	Some H <sub>2</sub> removed				
4	Some HBr removed				
5	Temperature is increased				
6	Temperature is decreased				
7	Pressure is increased and container volume decreased				
8	Pressure is decreased and container volume increased				

Mention two factors affecting the state of equilibrium. [1 mark]

d. The electronic configurations of some neutral atoms are given below [1 mark]



e. Which of these electronic configurations would be expected to have the highest:- [1 mark]



f. What are the main factors due to the ionization enthalpy of the main group elements tends to decrease down a group. [2 marks]

### Question 6

a. An organic compound was found to contain C, H, N. the percentage of C, H and N are 78.64%, 8.40% and 12.96% respectively. The molecular weight of the compound is 107. Determine the molecular formula. [4 marks]

b. What is the IUPAC name of  $\text{CH}_2\text{CHCH}_2\text{CH}_2\text{OH}$  [1 mark]

c. Write structural formula of:



d. When Sulphur burns in air to form  $\text{SO}_2$ . What happens to oxidation number of Sulphur and oxygen? Mention what is oxidized and what is reduced? [2 marks]

- e. For the reaction  $\text{N}_2\text{O}_4 \rightleftharpoons 2\text{NO}_2(\text{g})$  the concentrations of an equilibrium mixture of 298K are  $\text{N}_2\text{O}_4 = 4.50 \times 10^{-2}$  moles/liter and  $\text{NO}_2 = 1.61 \times 10^{-2}$  mole/liter. What is the value of equilibrium constant? [1 mark]

### Question 7.

- a. Explain why the electronic configuration of Cu is  $3d^{10}, 4s^1$  and not  $3d^9, 4s^2$ ? [1 mark]
- b. An atom has mass number of 37 atomic number 17. How many protons does it have? [1 mark]
- c. Which metal did Rutherford use in his alpha scattering experiment? [1 mark]
- d. Mention the rules and principle in filling electrons in various orbitals? [2 marks]
- e. Explain why and arrange the following in order of decreasing Van Waal's radii: Cl, H, O and N? [2 marks]
- f. Explain what is the shapes of  $\text{BeF}_2$ ,  $\text{H}_2\text{O}$  and  $\text{NH}_3$  based on orbital overlap? [3 marks]

### Question 8

- a. Mention two applications of photochemistry in everyday life? [1 mark]
- b. Explain how a catalyst work relative to activation energy? [2 marks]
- c. What is rate of chemical reaction? [1 mark]
- d. What is active collision? [1 mark]
- e. Write two differences between order of reaction and molecularity of reaction? [2 marks]
- f. Explain laboratory preparation of alcohols by the hydrolysis of halo alkanes? [3 marks]