Roll No. .....

Z–9–X

Total No. of Questions : **4**] [Total No. of Printed Pages : **8**

11th ARM(SZ)JKUT2024
1209–X
CHEMISTRY

Time : 3 Hours] **[Maximum Marks : 70**

General Instructions :–

(i) There are total four Sections in the question paper. All questions are compulsory.

Section–A contains *ten* Objective Type Questions/Multiple Choice Questions of 1 mark each. (1×10=10)

Section–B contains *nine* Very Short Answer Type Questions of 2 marks each to be answered in **20** to **30** words. (2×9=18)

Section–C contains *nine* Short Answer Type Questions of 3 marks each to be answered in **100** to **150** words. (3×9=27)

Section–D contains *three* Long Answer Type Questions of 5 marks each to be answered in **150** to **200** words. (5×3=15)

(ii) Use logtables, if necessary. Use of scientific calculators is not allowed.

Setion–A

(Objective Type Questions/Multiple Choice Questions) 1 each

1. Select the correct one :

(i) The empirical formula of Benzene is :

(A) C_6H_6 (B) CH

(C) CH_3 (D) C_2H_6

(ii) The number of molecules present in 8 g of oxygen is :

(A) 6.02×10^{23} (B) 12.04×10^{23}

(C) 3.01×10^{23} (D) 1.55×10^{23}

(iii) The correct ground state of electronic configuration of chromium atom is :

(A) [Ar] $3d^5\ 4s^1$ (B) [Ar] $3d^4\ 4s^2$

(C) [Ar] $3d^6\ 4s^0$ (D) [Ar] $4d^5\ 4s^1$

(iv) Aluminium is diagonally related to :

(A) Li (B) Be

(C) C (D) B

(v) In which of the following compounds does hydrogen bond occur ?

(A) SiH_4 (B) LiH

(C) HI (D) NH_3

(vi) In which of the following molecules the central atom has sp^2 hybridization ?

(A) BeF_2 (B) BF_3

(C) C_2H_2 (D) NH_3

(vii) Which of the following is an intensive property ?

(A) Heat capacity (B) Mass

(C) Density (D) Volume

(viii) The oxidation number of the two Cl atoms in bleaching powder, $CaOCl_2$ are :

(A) –1, –1 (B) +1, –1

(C) +1, +1 (D) 0, –1

(ix) Which of the following is an electrophile ?

(A) $AlCl_4^{\ominus}$ (B) BCl_3

(C) NH_3 (D) CH_3OH

(x) Which of the following is aromatic ?

(A)  (B) 

(C)  (D) 

Section–B

(Very Short Answer Type Questions)

2 each

2. Answer the following questions :

(i) What do you understand by the terms ?

(a) Empirical formula

(b) Molecular formula.

How are they related ?

(ii) What are *d*-block elements ? Write the general electronic configuration of *d*-block elements.

(iii) Draw resonating structure of ozone molecule.

(iv) What is an isothermal process ?

(v) Define pH. What is the pH of a solution whose $[H_3O^+] = 2\times10^{-5}$ M ?

(vi) What do you mean by Buffer solution ? Give one example.

(vii) Define Functional Group. Write functional groups of alcohols, aldehydes, ketones and carboxylic acids.

(viii) What are Conformations ? Draw the sawhorse projection of ethane.

(ix) Complete the following reactions :

(A) $CH_3CH = CH_2 + O_3 \xrightarrow{Zn/H_2O}$ .....

(B) $CH_2 = CH_2 + H_2O + [O] \xrightarrow{\text{dil. } KMnO_4}$ .....

(C) $HC \equiv CH \xrightarrow{NaNH_2,\ CH_3Br}$ .....

(D) $HC \equiv CH \xrightarrow{H_2O,\ HgSO_4/H_2SO_4}$ .....

Section–C

(Short Answer Type Questions) 3 each

3. Answer the following questions :

(i) Determine the empirical formula of an oxide of iron which has 69.9% iron and 30.1% oxygen by mass.

(Atomic mass of Fe = 56 and O = 16).

(ii) Define an atomic orbital. Differentiate between orbit and orbital.

(iii) Account for the following :

(a) Ionization enthalpy of nitrogen is more than oxygen.

(b) Electron gain enthalpy of fluorine in lesser than chlorine

(iv) Draw the molecular orbital diagram for O_2 molecule. Write its molecular orbital electronic configuration and predict its magnetic behaviour.

(v) State first law of Thermodynamics. Derive its mathematical relation.

(vi) Define entropy and free energy. How are they related to each other ?

(vii) (a) Define oxidation and reduction on the basis of electron transfer concept. Give example in each case.

(b) In the reactions given below, identify the species undergoing oxidation and reduction :

$$2H_2S + O_2 \rightarrow 2S + 2H_2O$$

$$Sn + 2HCl \rightarrow SnCl_2 + H_2$$

(viii) State Le-Chatelier's principle. Apply this principle on the following reaction in terms of concentration, temperature, and pressure to obtain maximum yield of ammonia :

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) \; ; \; \Delta H = -92.38 \text{ kJmol}^{-1}$$

(ix) Give a brief description of the principles of the following techniques taking an example in each case :

(a) Crystallisation

(b) Distillation

(c) Chromatography

Section–D

(Long Answer Type Questions) 5 each

Answer the following questions :

(i) What are Quantum Numbers ? Briefly explain the significance of each quantum number.

Or

Write the main postulates of Bohr's theory and what are its limitations ? How this model helped in calculating the energy of an electron in different energy levels of hydrogen atom ?

(ii) What are Carbcations and Carbanions ? How are they generated ? Explain the relative stability of alkyl carbocations and carbanions.

Or

Write IUPAC names of the following compounds :

(a) $CH_2 = CH - CN$

(b) $CH_3—CH_2—\underset{\displaystyle CH_3}{\underset{|}{CH}}—COOH$

(c) $H_2C = CH—C \equiv CH$

(d) $\begin{matrix} CHO \\ | \\ CHO \end{matrix}$

(e) $OHC—CH_2—CH_2—CHO$

(iii) How will you prepare the following compounds from benzene ?

(a) Chlorobenzene

(b) Nitrobenzene

(c) Benzene sulphonic acid

(d) Toluene

(e) Benzene hexachloride

Give the mechanism of electrophilic substitution in benzene.

Or

Write notes on the following :

(a) Markownikoff's rule

(b) Peroxide effect

(c) Friedel-Crafts reaction