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 :–

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(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

Roll No.....

Z–9–Y

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11th ARM(SZ)JKUT2024

1209–Y

CHEMISTRY

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

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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 a compound is CH_2O_2, the probable molecular formula of the compound may be :

(A) $C_2H_4O_2$ (B) $C_3H_6O_4$

(C) $C_2H_4O_4$ (D) CH_2O_2

(ii) One mole of CO_2 contains :

(A) 6.02×10^{23} atoms of C

(B) 6.02×10^{23} atoms of O

(C) 18.1×10^{23} molecules of CO_2

(D) 3 atoms of CO_2

(iii) The correct ground state of electronic configuration of Copper atoms is :

(A) [Ar] $3d^{10}\ 4s^0$ (B) [Ar] $3d^{10}\ 4s^1$

(C) [Ar] $3d^9\ 4s^2$ (D) [Ar] $4d^{10}\ 5s^1$

(iv) Diagonal relationship is shown by :

(A) Li and Mg (B) Na and Mg

(C) K and Mg (D) Al and Mg

(v) H—O—H bond angle in water is :

(A) 90° (B) 180°

(C) 104.5° (D) 109.5°

(vi) Structure of ammonia is :

(A) Tetrahedral (B) Square planar

(C) Trigonal Pyramidal (D) Hexagonal

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

(A) Temperature (B) Pressure

(C) Enthalpy (D) Viscosity

(viii) The oxidation state of oxygen in Hydrogen peroxide is :

(A) –1 (B) +1

(C) 0 (D) –2

(ix) Which of the following is not a nucleophile ?

(A) CN^- (B) H_2O

(C) BF_3 (D) Carbanion.

(x) Acidic hydrogen is present in :

(A) Ethyne (B) Ethene

(C) Benzene (D) Ethane

Section–B

(Very Short Answer Type Questions) 2 each

2. Answer the following questions :

(i) Define Molecular Mass. What is the relation between vapour density and molecular mass of a gas ?

(ii) In how many blocks have the elements of long form periodic table been divided ? Name them.

(iii) Draw the shapes of XeF_2 and SF_6 on the basis of VSEPR theory.

(iv) What is an adiabatic 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) $CH_3CH = CH_2 + O_3 \xrightarrow{Zn/H_2O}$ .....

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(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

4. 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) $CH_3—CH_2—\underset{\displaystyle CH_3}{\underset{|}{CH}}—COOH$

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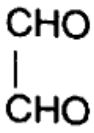

(e) $OHC—CH_2—CH_2—CHO$

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

(a) Chlorobenzene

(b) Nitrobenzene

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(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

Roll No. .....

Z–9–Z

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Setion–A

(Objective Type Questions/Multiple Choice Questions) 1 each

1. Select the correct one :

(i) The vapour density of a gas is 22. Its molecular mass will be :

(A) 33 (B) 22

(C) 44 (D) 11

(ii) Number of molecules present in 36 g of H_2O is :

(A) 1.204×10^{24} (B) 6.023×10^{23}

(C) 3×10^{23} (D) 2×10^{25}

(iii) The electronic configuration of Fe^{2+} is :

(A) [Ar] $4s^2\ 3d^4$ (B) [Ar] $4s^0\ 3d^6$

(C) [Ar] $4s^1\ 3d^5$. (D) [Ar] $4s^2\ 3d^6$

(iv) The diagonal relationship is shown by :

(A) Ist and 2nd period elements

(B) Ist and 3rd period elements

(C) 2nd and 3rd period elements

(D) 3rd and 4th period elements

(v) The bond order of N_2 molecule is :

(A) 1 (B) 2

(C) 3 (D) Zero

(vi) Which of the following geometrical configurations correspond to dsp^2 hybridisation ?

(A) Tetrahedral (B) Pentagonal bipyramidal

(C) Square planar (D) Octahedral

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

(A) Enthalpy (B) Entropy

(C) Internal energy (D) Specific heat

(viii) The oxidation state of Cr in CrO_5 is :

(A) +10 (B) –10

(C) +6 (D) –6

(ix) An atom or group of atoms having odd or unpaired electrons is called :

(A) Carbonium ion (B) Carbanion

(C) Free radical (D) Carbene

(x) According to Huckel rule, a cyclic compound is aromatic if it has :

(A) 4 π electrons (B) 6 π electrons

(C) 8 π electrons (D) No π electrons

Section–B

(Very Short Answer Type Questions) 2 each

2. Answer the following questions :

(i) State law of constant proportions. Give one example.

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

(iii) Draw the shapes of SF_4 and BeF_2 on the basis of VSEPR theory.

(iv) What is an isobaric process ?

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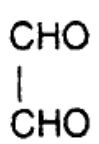

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