

**BOARD OF INTERMEDIATE AND SECONDARY EDUCATION
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Chemistry – I

SECTION – A (Multiple Choice Questions)

Note: This section consists of 33 part questions and all are to be answered. Each question carries one mark. (33 Marks)

Q.1

- (i) The total number of ions in one formula unit of FeCl_3 are:
(a) 6.02×10^{23} (b) 12.04×10^{23}
(c) 18.06×10^{23} (d) 24.08×10^{23}
- (ii) When 7.0×10^{12} is multiplied by 2.0×10^{-3} , the answer will be:
(a) 1.4×10^9 (b) 1.4×10^{10}
(c) 1.4×10^{-15} (d) 1.4×10^{-36}
- (iii) Quantum number value for 3d orbitals are:
(a) $n = 2, \ell = 1$ (b) $n = 3, \ell = 2$
(c) $n = 3, \ell = 3$ (d) $n = 2, \ell = 3$
- (iv) The range of wavelength of x-rays lies between;
(a) 0.1\AA to 10\AA (b) 10\AA to 100\AA
(c) 100\AA to 500\AA (d) 4000\AA to 7000\AA
- (v) Bohr's theory cannot be applied on:
(a) H (b) H^+
(c) He^{+1} (d) Li^{+2}
- (vi) What is the hybrid state of carbon in C_2H_2 molecule:
(a) sp^3 (b) sp^2
(c) sp (d) dsp^2
- (vii) This molecule has zero dipole moment:
(a) C_6H_6 (b) NH_3
(c) H_2S (d) NO_2
- (viii) The geometry of BF_3 is planar trigonal, its bond angle should be:
(a) 104.5° (b) 109.5°
(c) 107° (d) 120°
- (ix) VBT tells us about all of the following facts except:
(a) Bond length (b) Bond strength
(c) Bond energy (d) Bond order
- (x) Cooling appliances like air conditioners and refrigerators are working on the principle of:
(a) Common ion effect (b) Joule-Thomson effect
(c) Pauli's exclusion principle (d) Le-Chatelier's principle

- (xi) The rate of diffusion of Helium (He) compared with CH₄ is:
 (a) 0.5 time (b) Two times
 (c) Three times (d) Four times
- (xii) The molar volume of Oxygen (O₂) is highest at:
 (a) 100°C and 1 atm (b) 25°C and 2 atm
 (c) 200°C and 0.5 atm (d) 40°C and 0.5 atm
- (xiii) Plasma is the fourth state of matter, it consists of:
 (a) Neutral molecules (b) Positive ions
 (c) Negative electrons (d) All of these
- (xiv) Cooking time is reduced in a pressure cooker because:
 (a) Boiling point of water rises (b) Heat is stored in pressure cooker
 (c) Vapor pressure of liquid is reduced (d) Heat is uniformly distributed
- (xv) Which of the following molecule possess strongest London forces:
 (a) H₂ (b) He
 (c) CH₄ (d) Ne
- (xvi) Which of the following pair of compounds may represents isomorphism:
 (a) NaCl and KNO₃ (b) MgO and NaF
 (c) NaNO₃ and CdS (d) NaF and CaCO₃
- (xvii) A big crystal can be cut or split into smaller size of identical shape; this phenomenon is called:
 (a) Anisotropy (b) Cleavage
 (c) Symmetry (d) Isomorphism
- (xviii) $K_p = K_c$ when Δn is equal to:
 (a) zero (b) 1
 (c) -1 (d) 2
- (xix) The solubility of MgCl₂ is X, its K_{sp} will be:
 (a) x^2 (b) $2x^2$
 (c) $4x^2$ (d) $4x^3$
- (xx) The unit of rate constant for the first order reaction is:
 (a) $M s^{-1}$ (b) s^{-1}
 (c) $M^{-1} s^{-1}$ (d) $M^{-2} s^{-1}$
- (xxi) Amphoteric substance among the following is:
 (a) K₂O (b) CO₂
 (c) ZnO (d) MgO
- (xxii) Which of the following salt is hydrolyzed in water:
 (a) Na₂SO₄ (b) KCl
 (c) NH₄Cl (d) NaNO₃
- (xxiii) Conjugate base of HCO₃⁻ is:
 (a) H₂CO₃ (b) CO₃⁻²
 (c) H⁺ (d) H₂O

- (xxiv) The decomposition of H_2O_2 is inhibited by:
(a) Ethanol (b) Glycerine
(c) MnO_2 (d) V_2O_5
- (xxv) The rate constant of a reaction depends upon:
(a) Temperature (b) Initial concentration
(c) Time of reaction (d) Extent of reaction
- (xxvi) Effect of pressure change play significant role in the solubility of:
(a) Solid into liquid (b) Liquid into liquid
(c) Gas into liquid (d) All of them
- (xxvii) Milk is an example of this type of colloid:
(a) Gel (b) Aerosol
(c) Emulsion (d) Foam
- (xxviii) Parts per trillion means:
(a) 10^3 (b) 10^6
(c) 10^9 (d) 10^{12}
- (xxix) Which of the following enthalpy change is always negative:
(a) Enthalpy of formation (b) Enthalpy of decomposition
(c) Enthalpy of combustion (d) Enthalpy of reaction
- (xxx) Which of the following is not a state function of a system?
(a) Pressure (b) Enthalpy
(c) Internal energy (d) Work done
- (xxxii) Oxidation number of Cr in $\text{Na}_2\text{Cr}_2\text{O}_7$ is:
(a) +3 (b) +6
(c) +8 (d) +12
- (xxxiii) Galvanized rode of iron is coated with:
(a) Nickel (b) Zinc
(c) Chromium (d) Carbon
- (xxxiiii) KOH is used as electrolyte in:
(a) Lead accumulator (b) Fuel cell
(c) Alkaline battery (d) Dry cell

SECTION – B (Short Answered Questions)

Note: Attempt any eight parts questions. All questions carry equal marks. (32 Marks)

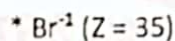
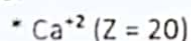
Q.2

- (i) (a) What is meant by actual yield? Why it is always less than theoretical yield in a reaction.
 (b) The volume of a sample of Nitrogen gas (N_2) at STP is 1120cm^3 ; calculate the mass and number of molecules of N_2 in the sample.
- (ii) Aluminum Sulphide is prepared by the reaction of Aluminum metal and sulphur powder at elevated temperature.



If 135g Aluminum and 160g sulphur are taken for the reaction, calculate what mass of Al_2S_3 will be formed.

- (iii) State Pauli and Hund's rule. Write the electronic configuration of the following species:



- (iv) Draw molecular orbital diagram of O_2 molecule. Find bond order of O_2 molecule and explain why O_2 molecule is paramagnetic?
- (v) Oxygen gas was collected over water at 24°C and a total pressure of 762 torr. If the volume of the gas collected was 300cm^3 . Calculate the number of moles and the mole fraction of oxygen gas in the mixture (the vapour pressure of water at 22.4 torr).
- (vi) (a) What is Viscosity? Why viscosity decreases with the rise of temperature?
 (b) Differentiate between any one of the following:
 * Isomorphism and polymorphism * Ionic solids and covalent solids
- (vii) State Le-Chatlier principle and discuss its application in the synthesis of ammonia by Haber's process.
- (viii) What is Buffer solution? Explain how it resists the change of pH by adding small amount of acid and base
- (ix) Enlist various factors which influence on the rate of chemical reaction and describe the effect of temperature on reaction rate.
- (x) The reaction $2\text{NO} + \text{Cl}_2 \rightarrow 2\text{NOCl}$ was studied at 25°C . the following results were obtained.

Experiment No.	Initial concentration (mol/dm^3)		Initial rate ($\text{mol}/\text{dm}^3 \text{ s}$)
	NO	Cl_2	
1	0.1	0.1	2.52×10^{-3}
2	0.1	0.2	5.04×10^{-3}
3	0.2	0.1	10.08×10^{-3}

Determine the rate law and order of reaction.

- (xi) (a) How is a true solution differentiate from suspension.
 (b) A solution is prepared by dissolving 45g glucose in 72g water determine mole fraction of glucose and water in the solution.
- (xii) State Raoult's law and derive its mathematical expression in three forms.
- (xiii) State and explain First Law of thermodynamics. Derive pressure-volume work of a system.
- (xiv) Calculate the standard enthalpy of formation of carbon disulphide from the given data.
- | | | |
|-----------------------------------|------------------------------------|--|
| C + 2S | CS ₂ | ($\Delta H_f = ?$) |
| C + O ₂ | CO ₂ | ($\Delta H = -393.5 \text{ KJ/mol}$) |
| S + O ₂ | SO ₂ | ($\Delta H = -296.8 \text{ KJ/mol}$) |
| CS ₂ + 3O ₂ | CO ₂ + 2SO ₂ | ($\Delta H = -1075 \text{ KJ/mol}$) |

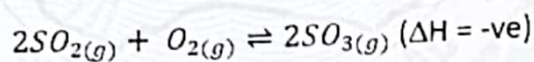
SECTION – C (Detailed Answer Questions)

Note: Answer any two questions. All questions carry equal marks. (20 Marks)

- Q.3 (a) What is an Ideal gas? What are the causes of deviation of real gas from ideal behavior? Explain these deviations at low temperature and high pressure.
 (b) Derive an expression for the radius of hydrogen atom in the nth orbit by using Bohr model.
- Q.4 (a) Write down the postulates of valence shell electron pair repulsion theory (VSEPR) and predict the shape of the following molecules on the bases of VSEPR theory.

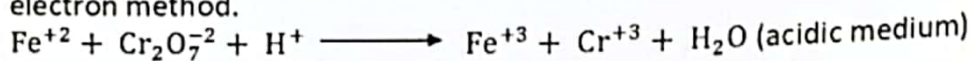


(b) For the reaction



If there are 5 moles of SO₂, 3 moles of O₂ and 8 moles of SO₃ are present at equilibrium in a 1dm³ flask, at 323K temperature, calculate its K_c and K_p.

- Q.5 (a) What are colligative properties of solution explain elevation of boiling point and depression of freezing point.
 (b) Define redox reaction and balance any one of the following equations by ion electron method.



OR

Define electrode potential. Draw a cell diagram of zinc hydrogen galvanic cell. Write down the redox reaction and explain how is the electrode potential of zinc determined.