(Duration: 3 Hours) **Marks :- 100**

Please check whether you have got the right question paper.

N.B.: 1) All questions are compulsory.
2) Figure to the right indicate full marks.
3) Use of log-table / nonprogrammable calculator is allowed.
4) Answer for the same question as for as possible should be written together.

Q1 A) **Select the correct option and complete the following sentences (Attempt any twelve)** **12**

i) _____ is an intensive property of the system.
a) Mass
b) Density
c) Volume

ii) …….. is a path function.
a) Internal energy
b) Work done
c) Entropy

iii) An endothermic reaction accurs with…….
a) evolution of heat
b) absorption of heat
c) no change in heat content.

iv) The variation is enthalpy of a reaction with temperature is given by……..
a) Kirchhoff's equation
b) Hess law
c) Van't Hoffs equation.

v) 10 N solution means _____.
a) decinormal solution
b) decanormal solution
c) seminormal solution

vi) The amount of solute present in the given amount of solvent is ____.
a) concentration
b) molality
c) molarity

vii)_____ are the particles which are electrically neutral.
a) Protons
b) Neutrons
c) Electrons

viii) 3s orbital has _____ radial node.
a) 2
b) 1
c) 0

ix)_____ is an example of hydrogenic atom.
a) He
b) He^{2+}
c) C^{+5}

x) The enthalpy of ionisation _____ with increase in atomic size.
a) increases
b) decreases
c) remains the same.

xi) Rb is the member of _____ group.
a) IA
b) IIA
c) IIIA

xii) $Cl_{(g)} + e^- \rightarrow ?$
a) Cl
b) $Cl^-_{(s)}$
c) $Cl^-_{(g)}$

xiii) In acetone, oxygen is _____ hybridised.
a) sp^3
b) sp^2
c) sp

xiv) Carbon-carbon bond length is minimum in _____ bond.
a) triple
b) double
c) single

xv) _____is non-polar molecule.
a) CCl_4
b) H_2O
c) HCl

xvi) _____ is nucleophilic reagent.
a) CH_3OH
b) HBr
c) $FeCl_3$

xvii) Pentanal contains _____ functional group.
a) alcohol
b) aldehyde
c) ketone

xviii) Dehydrogenation reaction is an example of _____ reaction.
a) addition
b) substitution
c) elimination

Q.1 B State whether the following sentences are true or false. (Attempt any three.) 03

i) Volume is an extensive property of the system.
ii) The unit of mole fraction is moles/kg.
iii) 1s orbital has one node.
iv) 5f block elements are called actinide elements.
v) Nucleophiles are electron deficient species.
vi) Inductive effect is permanent effect.

C **Match the following (Attempt any five)** **05**

Column A	Column B
i) First law of thermodynamics	a) NH_3
ii) 1 mg/l	b) R-CO-R
iii) Paschen	c) $\Delta U = q - w$
iv) Slater rule	d) R-O-R
v) Lewis acid	e) parts per million
vi) Ether	f) Infrared
	g) Zeffective
	h) SO_3

Q.2 Attempt any four of the following.

A) Define thermodynamic terms system and surrounding. Explain different types of systems with suitable example. **05**

B) Explain the terms. **05**
i) Internal energy ii) Bond dissociation energy

C) Three moles of an ideal gas at 8.0 atmosphere and 0^0C are converted to 2.0 atmosphere at 45^0C. Find change in internal energy & change in enthalpy of the system. **05**
(given: $C_v = 20.92\ JK^{-1}\ mol^{-1}$, $R = 8.314\ JK^{-1}mol^{-1}$)

D) Explain molar heat capacity & derive relationship between C_p & C_v. **05**

E) How will you interconvert normality to molarity & molality to mole fraction? Explain. **05**

F) What is the weight of solute dissolved in 400 cm^3 of 2M K_2CO_3. (Mol. wt.= 138.2) **05**

Q.3 Attempt any four of the following

A) Discuss the limitations of Bohr's atomic model. **05**

B) Explain Rutherford's atomic model. **05**

C) Calculate effective nuclear charge ($Z_{eff.}$) for 4s electrons of potassium. Atomic number of K (Z = 19). **05**

D) How does atomic & ionic radii affect on chemical behavior of an elements. **05**

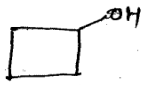
E) Write a note on electron gain enthalpy. **05**

F) Describe quantitative measurement of electronegativity by Mulliken's method. **05**

Q.4 Attempt any four of the following.

A) Write IUPAC name of the following compounds **05**

1) 

2) 

3) $CH_3-CH_2-O-CH_2-CH_2-CH_3$

4) $CH_3-CH_2-CH_2-CH_2-CO-NH_2$

5) $CH_3-CH_2-\underset{\displaystyle CH_3}{\underset{|}{CH}}-COOH$

B) Explain sp^2-hybridisation of nitrogen with suitable example. Draw orbital diagram of HCN. **05**

C) What are carbanions? Discuss the shape & structure of carbanion. **05**

D) Explain stability of free radicals on the basis of hyperconjugation & resonance effect. **05**

E) i) Explain sp^3- hybridization of oxygen with suitable example **03**

ii) Explain: Acetic acid is weaker than monochloro acetic acid. **02**

F) i) Draw the structure of the following compounds **03**
a) Cyclopropanone b) Methylcyclo butane carboxylate c) 2-Pentanol.
ii) Indicate the type of hybridization of C, O atoms in acetic acid. **02**

Q.5 Attempt any four of the following

A) Explain the term enthalpy & drive the relation between change in enthalpy & change in internal energy of the system. **05**

B) Determine the mole fraction of both components in a solution containing 36.0 g of water & 46 g of glycerine ($C_3H_5(OH)_3$) (Mol. Wt = 92). **05**

C) Write a note on Aufbau principle. **05**

D) Explain the periodic trends in atomic & ionic size of elements in periods. **05**

E) i) Discuss the orbital structure of ethene. **03**
ii) Explain the term electrophiles with suitable examples. **02**

F) Give an account of electromeric effect. **05**

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