[3 Hours] **[Marks: 100]**

Please check whether you have got the right question paper.

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

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

i) A system which exchange only energy with the surrounding but not the matter is called _____.
   a) Open system b) Closed system c) Isolated system

ii) _____ is not a state function.
   a) Concentration b) Internal energy c) Enthalpy

iii) The molar heat capacity at constant volume, Cv = _____.
   a) $\left[\frac{\delta U}{\delta T}\right]_V$
   b) $\left[\frac{\delta H}{\delta T}\right]_V$
   c) $\left[\frac{\delta S}{\delta T}\right]_V$

iv) The enthalpy of combustion of a substance is _____ .
   a) always positive b) always negative c) always equal to zero

v) 0.1 N solution means _____ .
   a) decinormal solution b) decanormal solution c) seminormal solution

vi) Solutions are examples of _____ .
   a) compounds b) homogeneous mixture c) heterogeneous mixture

vii) The shell with n = 2, l = 1 is _____.
   a) 3 p b) 2 p c) 3 d

viii) The charge of the alpha particles is _____.
   a) positive b) negative c) neutral

ix) Louis de-Broglie's relation is _____ .
   a) $\lambda = h/p$ b) $\lambda = p/h$ c) $h = p x \lambda$

x) In second period, there are _____ elements.
   a) 6 b) 7 c) 8

xi) All VII A group elements are called _____ elements.
   a) normal b) respective c) inert

xii) Greater the charge on nucleus of an atom _____ will be the attraction between nucleus and outer most electrons.
   a) greater b) lesser c) moderate

xiii) In methanol, oxygen is _____ hybridized.
   a) sp^3 b) sp^2 c) Sp

xiv) The carbanion is _____ species.
a) Electron rich b) Electron deficient c) Neutral

xv) Ethanamide has _____ carbon.
a) One b) Two c) Three

xvi) Unit of dipole moment is_____ .
a) Debyes b) Pascal c) Newton/meter

xvii) The carbanion has _____ shape
a) pyramidal b) planar c) tetrahedral

xviii) Alkaline hydrolysis of alkyl halide is an _____ reaction.
a) elimination b) addition c) substitution

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

i) The properties which depend on the amount of a matter are called extensive properties.
ii) A solution which contain l mole of solute dissolved in 1000 cm^3 of water is designated by 1N.
iii) Electron enters in shells in the order of decreasing energy.
iv) The horizontal rows of long form of periodic table are called groups.
v) Phenol is more acidic than acetic acid.
vi) Sigma bonds are stronger than pi-bonds.

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

1) Enthalpy	a) R-CO-X
2) 1μg/L	b) H^+
3) Number of electrons in p – orbital	c) U + PV
4) Bond length between Cl-Cl in chlorine molecule	d) parts per billion
5) Acid halide	e) 6
6) Electrophile	f) 19.8 x 10^{-2} nm
	g) 9.9 x 10^{-2} nm
	h) R - X

2. Attempt **any four** of the following

A) Explain the concept of heat and work in thermodynamics along with it's sign conventions. **05**

B)i) Distinguish between endothermic and exothermic reactions. **03**

ii) Explain the term path function **02**

C) Calculate change in internal energy and change in enthalpy of a system when 96 g of oxygen is heated from O^0C to 95^0C. **05**
[Given : Cv = 20.92 JK^{-1} mol^{-1}, Cp = 29.29$Jk^{-1}mol^{-1}$, 0 =16]

D) Derive Kirchhoff's equation. Give it's applications. **05**

E) Define equivalent weight. Explain equivalent weight with respect to redox reactions. **05**

F) In 250 cm^3 of 0.12 N of H_2SO_4, what is the weight of H_2SO_4? (Mo1.wt 98) **05**

3. Attempt any **Four** of the following.

A) Give Slater rules for shielding constant. **05**

B) Define the terms shells, subshells and orbitals. **05**

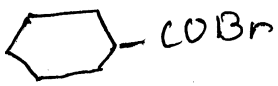
C) Discuss the limitations of Bohr's atomic model. **05**

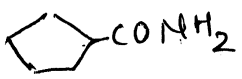
D) Discuss electronegativity of elements determined by Alfred and Rochow method **05**

E) Explain the periodic table with reference to f blocks elements. **05**

F) What is ionization enthalpy? **05**

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

1) 

2) 

3) $CH_3 - CH_2 - CH_2 - NH_2$

4) $CH_3 - CH_2 - CO - OCH_2 - CH_3$

5) $CH_3 - CH = \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}} - CH_2 - CH_3$

B) Explain sp^2 hybridization of oxygen with suitable example. Draw orbital picture of dimethyl ether. **05**

C) What are carbocations? Discuss the structure and shape of carbocation. **05**

D) What are free radicals? Explain stability of benzyl radical on the basis of resonance. **05**

E) i) Explain sp^2- hybridization of carbon with suitable example. **03**

ii) Alcohols are weak acids as compared to carboxylic acids, Explain. **02**

F) i) Draw the structure of the following compounds. **03**

1) 2 – methyl pentanoic acid.
2) 2 – Butyne.
3) Ethyl cyclobutane carboxylate.

ii) Indicate type of hybridization of C and O atoms in formaldehyde. **02**

5. Attempt **any four** of the following.

A) State first law of thermodynamics in any three forms. Give any two limitations of it. **05**

B) Define Molarity. Calculate the molarity of the solution when 9.8 g of $K_2Cr_2O_7$ is dissolved in 100 cm^3 of water. **05**

C) Explain the distribution curve for radial wave function of 1s and 2s orbital. **05**

D) What is effective nuclear change, explain in brief **05**

E) Discuss stability of carbanion on the basis of inductive effect and 's' character. **05**

F) i) Discuss orbital structure of Ethyne. **03**

ii) Give one example each of addition and eliminations reactions. **02**
