[Time: 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 logtable / non-programmable calculator is allowed.
4. Answers for the same question must be written together.

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

i) During endothermic process, work done, w is _____.
a) negative b) positive c) zero

ii) The Kirchhoff's equation is _____.
a) $(\Delta H_2 - \Delta H_1) = \Delta C_p(T_2 - T_1)$
b) $(\Delta H_1 - \Delta H_2) = \Delta C_p(T_2 - T_1)$
c) $(\Delta H_2 - \Delta H_1) = \Delta C_p(T_1 - T_2)$

iii) Molar heat capacity is _____.
a) extensive property b) intensive property c) neither 'a' or 'b'

iv) _____ is not a state function.
a) concentration b) internal energy c) enthalpy

v) The number of moles present in 18g of water is _____.
a) one b) 18 c) 1.8

vi) Equivalent weight of $KMnO_4$ acting as an oxidant in acidic medium is _____.
a) half of its molecular mass b) one fifth of its molecular mass
c) same as its molecular mass

vii) According to Quantum theory E = _____
a) hc b) hν c) n/2$\bar{\lambda}$

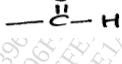
viii) For an electron if m_i = +1, 0, -1 then electron is present in _____.
a) s b) p c) d

ix) The fine spectra of hydrogen atom are explained by _____ theory.
a) Rutherford b) Bohr c) Dalton

x) The elements after uranium are called _____ elements.
a) Transuranic b) Transplutonic c) uranic

xi) The general electronic configuration of an inert elements is _____.
a) ns^2, np^4 b) ns^2, np^5 c) ns^2, np^6

xii) _____ proposed the rules for calculating shielding constants.
a) Mulliken b) Slater c) Pauling

xiii) Prefix  of group in IUPAC nomenclature is _____.
a) aldehyde b) formyl c) carbaldehyde

xiv) Hybridization of 'O' in dimethyle ether is _____.
a) sp^3 b) sp^2 c) sp

xv) Nucleophiles are _____ species.
a) electron rich b) electron deficient
c) electron accepting

xvi) The bond angle of carbon in methanol is _____.
a) 120° b) 180° c) 109°28'
xvii) The percentage of s character is maximum in _____ hybridized species.
a) sp b) sp^2 c) sp^3
xviii) Eelctromeric effect is a _____ effect.
a) permanent b) temporary c) constant

B) **State whether the following statements are True or False. (Attempt any three)** **03**

i) Work is a function and dw is exact differential.
ii) Molarity of a solution is the number of moles of solute per kg of solvent.
iii) The shell with n=3 is represented as k.
iv) According to Pauling the electronegativity difference between two atoms is 0.088δ.
v) $\rightarrow$ indicates inductive effect.
vi) IUPAC name of $CH_3COO\ C_2H_5$ is ethyl methanoate.

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

Column A	Column B
1) Path function	a) Visible
2) Normality	b) 5^{th} period and VII group
3) Balmer	c) Work done by the system
4) Position of Pt	d) Polarizability effect
5) Electromeric effect	e) Gram equivalent / L
6) Sp hybridization	f) 120°
	g) 6^{th} period & VIII B group
	h) 180°

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

A. State first law of thermodynamics in any three form. Give any two limitations of it. **05**
B. Define thermodynamic term system and surrounding. Explain different types of system. **05**
C. Define the thermodynamic term 'boundary'. Calculate the work done, when 1.5 moles of an ideal gas are expanded isothermally and reversibly at 298K to twice the original volume **05**
(Given: R = $8.314 JK^{-1}\ mol^{-1}$).
D. Explain the term i) Enthalpy ii) Internal energy. How are they related? **05**
E. Define the following terms: **05**
i) Acidity ii) Basicity iii) Reacting units iv) milli mole
v) parts per million
F. What is the weight of solute dissolved in 0.5L of 0.1M $AlCl_3$ (Mol. wt 133.5)? **05**

Q.3 Attempt **any four** of the following.

A. What is a node? Discuss the angular shape of any one orbital? **05**

B. Explain principal quantum number 'n' and orbital angular momentum (l). **05**

C. Discuss penetration and shielding in orbitals. **05**

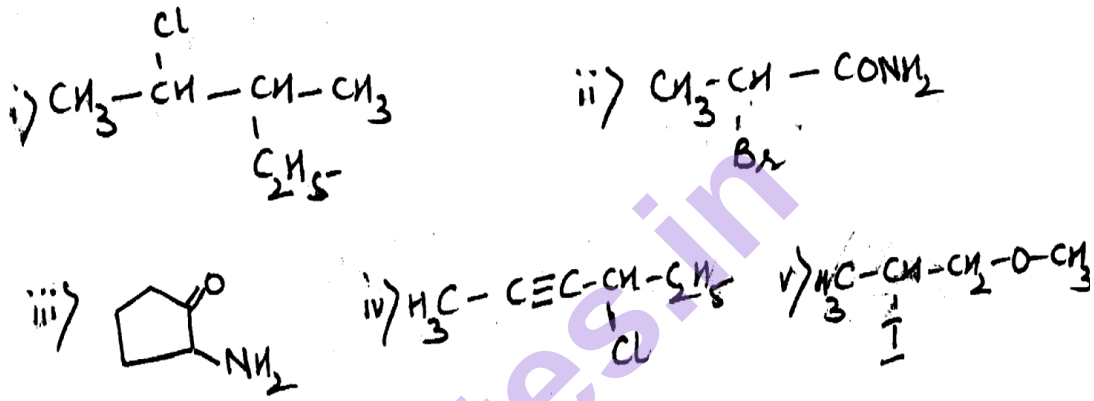
D. Explain all periods with their elements in the long form of the periodic table. **05**

E. Write a note on effects of atomic and ionic radii on elements. **05**

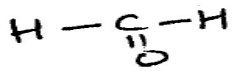
F. Define electron gain enthalpy and explain factors affecting it. **05**

Q.4 Attempt **any four** of the following.

A. Give IUPAC names of the following. **05**



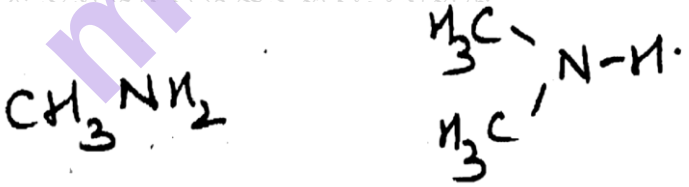
B. Identity the type of hybridization of 'O' in **05**



. Describe the structure with a orbital diagrams.

C. Distinguish between sp and sp^2 hybridization. **05**

D. i) Identify which of the following is a stronger base. Give reasons for your answer. **03**



ii) Explain why pi bonds are more reactive than sigma bonds. **02**

E. Draw the structure of primary, secondary and tertiary carbanions. Compare their relative stabilities giving reasons. **05**

F. Draw structures for the following. **05**

i) 2 - methyl – 2 butanol ii) 4 – chlorobutanic acid

iii) 3 – ethyl cyclobutane carbaldehyde iv) cyclopentanone v) ethanoic anhydride

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

A. Explain enthalpy of combustion and give its applications. **05**

B. If lead content in Venegar is 0.2mg/L, how much is that in parts per billion. **05**

C. Calculate the effective nuclear charge of the last electron in an atom whose configuration is $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^5$. **05**

D. Discuss Mulliken's method for calculating electronegativity of elements. **05**

E. Explain Inductive effect. Using suitable examples. Explain its effect on acid strength. **05**

F. i) Distinguish between homolytic and heterolytic fission. **04**

ii) Give an example of a substitution reaction. **01**

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