Q.P. Code :00095

[Time: Three Hours] **[Marks:100]**

Please check whether you have got the right question paper.

N.B:
1. All questions are compulsory.
2. **Answer to the same question must be written together**.
3. Figures to the right indicate full marks.
4. Use of non-programmable calculator is allowed.

Q.1.A **Select the correct option and complete the following sentences.** (12)

i) Change in enthalpy when one mole of compound is formed under standard conditions is called enthalpy of _____.
a) reaction b) formation c) combustion

ii) 10mg per dm^3 is _____solution.
a) 10ppm b) 100ppm c) 1000ppm

iii) $\Delta H > \Delta E$ When _____.
a) $\Delta n < o$ b) $\Delta n = o$ c) $\Delta n > o$

iv) The molar heat capacity at constant volume is equal to _____.
a) dH b) dE c) $\frac{dE}{dT}$

v) In long form of periodic table the number of groups are_____.
a) 15 b)18 c)12

vi) According to quantum theory E= _____.
a) hc b) $h\upsilon$ c)$\frac{h}{2\Pi}$

vii) The shell with $n = 2$, is commonly referred to as _____ shell.
a) K b) L c) M

viii) In ground state of an atom the electron occupies the_____ energy orbitals available to them.
a) highest b) lowest c) middle

ix) IUPAC name of CH_3CHO is _____.
a) Butanal b) Ethanal c) Pentanal

x) Sp^2 hybridization is present in _____.
a) Ethene b) Methane c) Ammonia.

xi) Inductive effect is high in _____.
a) $CH_3 - CH_3$ b) CH_4 c) CH_3Cl

xii) Carbocation has planar configuration with a bond angle of _____.
a) 30° b) 45° c) 120°

TURN OVER

Q.P. Code :00095

B **State whether the following statements are true or false.** (3)

i) Formality is weight basis method of expressing concentration.

ii) ∝ - particles are positively charged.

iii) In carbanion, trivalent carbon carries positive charge.

C **Match the Following columns:** (5)

Column A		Column B
i.	State function	a. homolytic fission
ii.	ppb	b. inner transition element
iii.	Carbon free radical	c. transition element
iv.	Copper	d. one part in 10^9 parts of solution
v.	f-block element	e. one part in 10^6 parts of solution
		f. internal energy

Q.2 A. i) Explain the terms: (5)

a)Standard states b) Resonance energy

ii) Define enthalpy. (3)

Calculate the value of change in enthalpy on heating 96 g of oxygen from 0°C to 95°C.

Given: $C_p = 29.29 JK^{-1}\ mol^{-1}$, Atomic weight of oxygen = 16.

OR

Q.2 A. i) What is enthalpy of combustion? Calculate the enthalpy of combustion of methane at 25°C and at one atmosphere pressure. (5)

$CH_4(g)+2O_2(g) \rightarrow CO_2(g)+2H_2O(l)$

$\Delta H^0_f(CO_2)$ = -393.5 KJ mol^{-1}

$\Delta H°_f(H_2O)$ = -285.9KJ mol^{-1}

$\Delta H°_f(CH_4)$ = -74.8KJ mol^{-1}

$\Delta H^0(O_2) = zero$

ii) State the first law of thermodynamics in any two forms. State its any one limitation. (3)

B i) Calculate q, w and ΔE for 3 moles of ideal gas at 2 atm pressure which expands isothermally to 3.5 times of its initial volume against external pressure of 1 atm at 300 K. (5)

Given: R=8.314 $JK^{-1}mol^{-1}$, 1atm=101.325 Pa

$1m^3 = 10^3 dm^3$

ii) Calculate the weight of the following substances that will be required to prepare 500$cm^3$of 0.1molar solution. (3)

a) KOH b) $(NH_4)_2SO_4$ c)$KMnO_4$

Given: Molecular weights KOH=56, $(NH_4)_2SO_4$= 132, $KMnO_4$= 158

OR

TURN OVER

Q.P. Code :00095

B i) Define internal energy. (5)

Four moles of an ideal gas at 10atm pressure and 0° C are converted to 2 atm. at 51° C. Find ΔE and ΔH for the change.

Given: R = 8.314 $JK^{-1}mol^{-1}$, C_v = 20.92 $JK^{-1}mol^{-1}$

Cp = C_v + R

ii) Calculate the normality of $FeSO_4.7H_20$ solution containing 14 g per 500 cm^3 of solution. (3)

(Fe=56, H=1, S=32, 0=16)

C i) Define:- a) closed system b) work (2)

ii) Explain the term molality of a solution (2)

OR

C i) Define:- a) isolated system b) heat (2)

ii) Explain the term milliequivalent. (2)

Q.3 A. i) Why did Rutherford's atomic model fail to explain stability of the atom? Explain the term stationary states based on Bohr's atomic theory. (5)

ii) Write detailed electronic configuration of sodium (Atomic no. 11). What are the values of quantum number l and m if $n = 2$? (3)

OR

A i) What are radial and angular nodes? How many radial nodes do 3p, 3d and 4f orbitals have? (5)

ii) Explain radial distribution curve for 2s orbital with appropriate diagram. (3)

B i) What is Pauling's definition of electronegativity? Explain variation in electronegativity values of elements. (5)

a) across the period b) down the group

ii) What is covalent radius of an atom? Calculate covalent radius of chlorine given that bond length of chlorine molecule is 19.8×10^{-2}nm. (3)

OR

B i) Explain the term electron gain enthalpy. Why are electron gain enthalpy values of halogens so high? (5)

ii) Calculate the effective nuclear charge, felt by a 2p electron in oxygen atom. (3)

(Oxygen atomic number = 8).

C How does Bohr's atomic model explain the atomic spectrum of hydrogen? (4)

OR

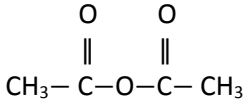
TURN OVER

Q.P. Code :00095

C State and explain Heisenberg Uncertainty principle. (4)

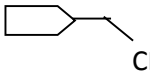
Q.4 A i) Write IUPAC names of the following compounds: (5)

.

a) 

b) $CH_3 - CH_2 - CHO$

c) $CH_3 - CH_2 - OH$

d) 

e) $(CH_3)_2\,C = CH.CH_3$

ii) Describe hybridization of ethene molecule. (3)

OR

A i) Give structures of the following compounds: (5)

a) pentan-1, 3-diene
b) 2-pentenoic acid
c) Methoxy methane
d) Propene
e) cyclohexane

ii) Describe hybridization of ammonia molecule. (3)

B i) Explain inductive effect in detail. (5)

ii) Give an example each for addition, elimination and substitution reaction. (3)

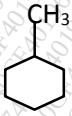
OR

B i) Explain the following terms: (6)

a)Electrophilic reagents
b)Homolytic fission
c)Dipole moment

ii) Describe the structure of carbocation. (2)

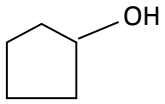
C Write IUPAC names of following compounds: (4)

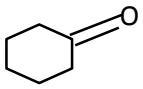
a) 

b) 

TURN OVER

Q.P. Code :00095

c) 

d) 

OR

C Give structures of following compounds: (4)
- a) cyclopentene
- b) n-propanol
- c) 1,2-ethandiol
- d) 2- butene

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

.

A) Derive the relationship (5)

$$\Delta H_2 - \Delta H_1 = \Delta C_p\,(T_2 - T_1)$$

B) 15 g of cane sugar $C_{12}H_{22}O_{11}$ is dissolved in 500 g of water. Calculate mole fraction of each component. (5)
Given: Molecular weight of cane sugar = 342, Molecular weight of water = 18.

C) Explain dual nature of electron with reference to de Broglie equation. (5)

D) Explain all four quantum numbers. (5)

E) Explain relative stability of primary, secondary and tertiary carbanions. (5)

F) How are sigma and pi bonds formed? Why pi bond is weaker than sigma bond? (5)

****