Q.P. Code :19995

[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. Figure 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) $\Delta H > \Delta E$ when _____.
a) $\Delta n < 0$ b) $\Delta n = 0$ C) $\Delta n > 0$

ii) The normality of 0.1M NaCl solution is _____.
a) 0.1 N b) 0.2 N c) 0.05 N

iii) Which of the following is an intensive property _____.
a) Molar entropy b) Mass c) Volume

iv) If work is done by the system then w is taken as _____.
a) Negative b) Positive c) Zero

v) Half filled and completely filled orbitals are _____ stable. .
a) not b) more c) less

vi) The radial wave function gives the _____ of the orbitals.
a) Size b) Shape c) Orientation

vii) Splitting of the spectral lines in presence of magnetic field is called _____
a) Stark effect b) Zeeman effect c) Photo electric effect

viii) Shielding constant is calculated using _____ rules.
a) Slater b) Mulliken c) Fajan

ix) Butanol contains _____ carbon atoms.
a) 1 b) 2 c) 4

x) Phenol is more _____ than alcohol.
a) Acidic b) Basic c) Neutral

xi) _____ electrons are present in valence shell of nitrogen atom.
a) 5 b) 3 c) 4

xii) _____ is electron rich species which donates electrons to electron deficient species.
a) Electrophile b) Acid c) Nucleophile

B) State whether following statements are True or False. **03**

i) Mole fraction is a volume basis method of expressing concentration.

ii) Hydrogenic species have only one electron.

iii) Pi - bond is formed by overlapping of P-P orbitals.

C) Match the following columns **05**

Column P	Column Q
a) 1 mg L^{-1}	i) State function
b) Primary amines	ii) low enthalpy of ionization
c) Atomic number	iii) ppm
d) Internal energy	iv) ppb
e) Alkali metals	v) R-NH_2
	vi) Modern periodic law

Q.2 A) I) Explain the terms **05**

a) Bond Dissociation Energy

b) Resonance Energy

II) Define enthalpy. **03**

Calculate ΔH for the reaction

$H_2F_2(g) \rightarrow H_2(g) + F_2(g)$

Given $\Delta E = -59.4$ K. J mol^{-1} at 298 K

$R = 8.314$ J. K^{-1} mol^{-1}

OR

I) What is standard enthalpy of formation? Calculate standard enthalpy of formation of benzene **05**

$C_6H_6(l) + \frac{15}{2} O_2(g) \rightarrow 6CO_2(g) + 3 H_2O(g)$

Given $\Delta H° = -3267$ KJ

$\Delta H_f^{\circ}(CO_2) = -393.5$ KJ mol^{-1}

$\Delta H_f^{\circ}(H_2O) = -285.8$ KJ mol^{-1}

II) State and explain zeroth law of thermodynamics. Explain why is it called so ? **03**

B) I) Calculate the value of ΔH and ΔE for the reversible isothermal evaporation of 198 g of water vapour at $100°$ C. Assume water behaves as an ideal gas. **05**

Given: Latent heat of evaporation of water =2258.1 J.g^{-1}

R= 8.314. JK^{-1} mol^{-1}.

II) 40 g of glucose is dissolved in 300 g of water. Calculate mole fraction of glucose in the solution molar mass of glucose $= 180$ **03**

OR

i) Calculate the amount of heat necessary to raise the temperature of 216g of water from 24°C to 100°C **05**

Molar heat capacity of water = 75.3 J k $mole^{-1}$ At. Wt. of H=1, 0=16.

ii) Calculate the weight of the substances that will be required to prepare 400 cm^3 of 0.3 N solution of each of the following **03**

1) $Ni\ Cl_2\ .6H_20$
2) KNO_3
3) $NaNO_3$

Molar mass – $NiCl_2.6H_2O = 237.69\ g\ mol^{-1}$
$KNO_3 = 101.1\ g\ mol^{-1}$
$NaNO_3 = 84.99\ g\ mol^{-1}$

C) i) Define a) Isothermal process **02**
b)Isochoric process

ii) With respect to concentrations of solutions explain the terms **02**
a) Weight / Volume (w/v)
b) Volume / volume (v/v)

OR

i)Define a) Adiabatic process **02**
b) Extensive property

ii)Explain the term 'millimoles' **02**

Q.3 A) i) Explain postulates of Bohr's theory of atomic structure **05**

ii) Plot and explain radial probability distribution curve of 1s electron. Calculate radial node for 1s electron. **03**

OR

i) What are the conditions a wave function Ψ should satisfy in order to be acceptable? **05**

ii) An atom of an element contains 20 electrons and 20 neutrons.
Deduce a) the number of protons b) atomic mass and c) the electronic configuration of the element. **03**

B) i) What is Pauling's definition of electronegativity? Calculate electronegativity of Pb based on Allred Rochow method. (Given – Atomic number of Pb = 82
Shielding constant of Pb = 76.35
Covalent radius of Pb = 1.53 A°. **05**

ii) Why are cations smaller and anions larger in size as compared to their parent atoms? **03**

OR

i) What are main group and inner transition elements? Explain with suitable examples. **05**

ii) Why do halogens show higher electron gain enthalpy values? **03**

C) Explain main drawbacks of Rutherford's atomic model. **04**

OR

What is meant by dual nature of an electron ? Calculate wave length of an electron of mass 9.1×10^{-31} kg moving with velocity 800 $m.s^{-1}$ (Given h=6.26×10^{-34} Js) **04**

Q.4 A) i) Write IUPAC names to following **05**

a) $CH_3-\underset{\displaystyle NO_2}{\underset{|}{CH}}-CH_3$

b) $CH_3-COOCH_3$

c) CH_3-COOH

d) $CH_3-CH_2-\underset{\displaystyle O}{\underset{||}{C}}-CH_2-CH_3$

e) $CH_3-CH_2-CH_2-CH_2-CH_2-OH$

ii) Explain why ammonia has pyramidal shape with a bond angle of 107^0? **03**

OR

A) i) Draw the structures for following **05**

a) Pentane - 2,3 - diene
b) Ethanol
c) 1,2 - Dichloro Ethane
d) Pentanoic acid
e) Methyl Methanoate

ii) Indicate types of hybridization in 'O' atom of following compounds. **03**

a) CH_3-OH

b) CH_3-O-CH_3

c) $CH_3-\underset{\displaystyle O}{\underset{||}{C}}-CH_3$

B) i) Explain the effect of hybridization on following bond properties of molecules considering example of ethane, ethene and ethyne. **05**

a) Shape of molecule
b) Bond angle
c) Bond multiplicity
d) Bond Length
e) Bond Energy

ii)Give an example of each of following reaction **03**

a) Addition Reaction
b) Elimination Reaction
c) Substitution Reaction

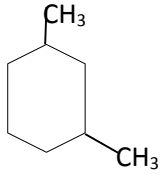
OR

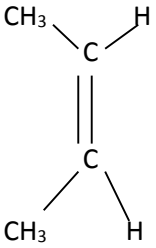
i) Draw resonance structures for **04**

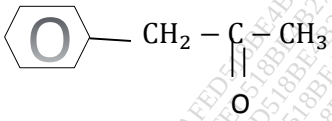
a) Vinyl Chloride
b) Acetamide

ii) Distinguish between resonance and hyper conjugation. **04**

C) Give IUPAC names for the following. **04**

i) 

ii) 

iii) 

iv) $H\text{-}COOC_2H_5$

OR

C) Draw the structures for following **04**

i) 2-amino butane
ii) Ethoxy ethane
iii) Ethane dioic acid
iv) Ethanamide

Q.5 Attempt any four of the following **05**

A) Explain the terms
a) Standard states
b) Enthalpy of combustion

B) Calculate the normality & molarity of the solution containing 20.2 g of succinic acid dissolved in one dm^3 of the solution. Molar mass of succinic acid = 118.09. **05**

C) Explain the terms shell, subshell and orbital. Write the values of shell, subshell and orbitals for a 3d electron. **05**

D) Explain in brief recording of hydrogen spectrum. Name different series of spectral lines observed in different spectral region. **05**

E) What is carbocation? Explain its shape with suitable example. **05**

F) Why monochloro acetic acid is stronger acid than acetic acid. Explain with structures. **05**

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