Q.P. Code : 12156

[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) For exothermic reaction enthalpy change is _____
a) negative b) positive c) zero

ii) The normality of 1M H_2SO_4 is _____
a) 0.5 b) 2.0 c) 1.0

iii) State functions are _____
a) path dependent b) inexact differentials c) path independent

iv) Enthalpy is _____
a) extensive property b) intensive property c) colligative property

v) The azimuthal quantum number of 3P electron is _____
a) 0 b) 1 c) 2

vi) The number of radial nodes for 3S orbital is _____
a) 1 b) 2 c) 3

vii) Ionisation enthalpy of elements _____ across the period.
a) remains same b) increases c) decreases

viii) De Broglie wavelength of an electron is given by equation _____
a) $\lambda = \frac{h}{2\pi}$ b) $\lambda = \frac{h}{mv}$ c) $\lambda = \frac{c}{v}$

ix) The group _____ exhibits +I effect
a) $-C_2H_5$ b) –CN c) -Cl

x) Benzyl Carbocation is _____
a) primary b) secondary c) tertiary

xi) Carbon-Carbon bond length is maximum in _____ bond
a) triple b) double c) single

xii) _____ are electron deficient species.
a) electrophiles b) nucleophiles c) bases

B) State whether the following statements are True or False: 03

i) Number of millimoles is equal to volume in cm^3 multiplied by molarity.
ii) No two electrons can have all four quantumn number same in a given atom.
iii) Helerolytic fission results in formation of free radicals.

C) Match the following columns: 05

Column A	Column B
i. 20 ppm	a. R-OH
ii. Isobaric process	b. 32
iii. Groups in the periodic table	c. $\Delta p = 0$
iv. Number of elements in VIth period	d. 18
v. Alcohol	e. 20mg per dm^3
	f. 0.2mg per dm^3

Q.2 A) i) Explain the terms 05
a) Enthalpy of Formation
b) Enthalpy of Combustion

ii) Define heat capacity at constant volume. Calculate the value of ΔE on heating 3 moles of oxygen from 0°C to 100°C. Given Cv = 20.92 J.K^{-1} mo1^{-1}. 03

OR

A) i) What is standard state? 05
The heat of a certain reaction
$A_2+3B_2 \rightarrow 2AB_3$
Is -92000 J at 300 K. What will be its value at 333 K? Given ΔCp = -39.4 J

ii) State the first law of thermodynamics. State its any one limitation. 03

B) i) Calculate the amount of heat necessary to raise the temperature of 180 g water from 20°C to 110°C. 05
Molar heat capacity of water is 75.3 J K^{-1} mo1^{-1}
At.Wt. of H = 1, O = 16.

ii) Calculate the weight of the following substances that will be required to prepare 03
a) 500cm^3 of 0.1N $H_2C_2O_4.2H_2O$ solution
b) 600cm^3 of 0.15N Na_2CO_3 solution
c) 700cm^3 of 0.1N $KHCO_3$ solution
Equivalent weight $H_2C_2O_4.2H_2O$ = 63
Equivalent weight Na_2CO_3 = 53
Equivalent weight $KHCO_3$ = 100

OR

B) i) Define work. 05
Calculate q, w and ΔE when two moles of monoatomic gas expand adiabatically against constant external pressure of 2 atm from a volume of 2dm^3 to 14dm^3 at 303 K.
Given: 1dm^3.atm = 101.325 Joules

ii) 14g of KOH is dissolved in 1dm^3 of solution. Calculate molarity of solution K = 39, O = 16, H = 1 03

C) i) Define 02
a) open system b) heat.

ii) Define the terms 02
a) milliequivalent b) Molality

OR

C) i) Define 02
a) closed system b) Isolated system
ii) Differentiate between ppm & ppb 02

Q.3 A) i) Explain Rutherford's model of atom based on alpha particle scattering experiment. 05
ii) What are hydrogenic species? Give two examples. Explain their significance in developing quatum models. 03

OR

A) i) Plot and explain radial probability distribution curve of 2S electron. 05
ii) Explain any two drawbacks of Bohr's atomic model. 03

B) i) What is Pauling's definition of electronegativity? Explain variation in electronegativity of elements across the period and down the group. 05
ii) Calculate the effective nuclear charge felt by 2P electron in oxygen atom (Atomic number 8) 03

OR

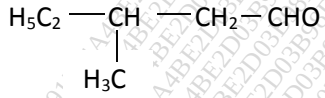
B) i) What is meant by atomic radius? Explain its variation across the period and down the group. 05
ii) State modern periodic law. What are the types of elements in the long form of periodic table? 03

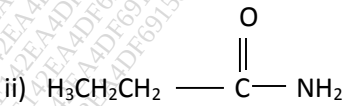
C) Distinguish between Ψ and Ψ^2 04

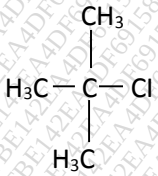
OR

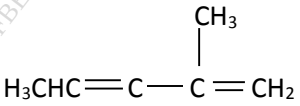
C) Explain Lyman and Balmer series of spectral lines observed in atomic spectrum of hydrogen. In which spectral regions are the lines observed? 04

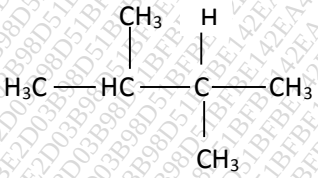
Q.4 A) i) Give IUPAC names of the following compounds:- 05

i) 

ii) 

iii) 

iv) 

v) 

ii) Explain orbital structure of ethane. 03

OR

A) i) Write the structures of the following:- 05
   a) Ethoxy ethane
   b) Butan-2-one
   c) Nitroethane
   d) Propyne
   e) Petanoic acid

   ii) Indicate the type of hybridization of C, N, O atoms in CH_3CONH_2 03

B) i) Explain lewis concept of acids and bases with a suitable example for each. 05

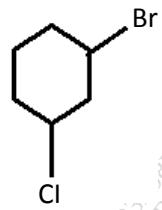
   ii) Name three types of organic reactions and give one example for each. 03

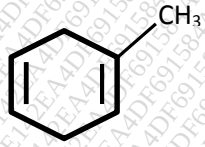
OR

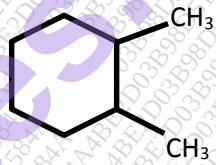
B) i) Give structure with geometry, bond angle and hybridization of carbocation. 05

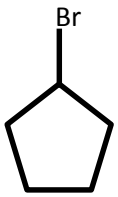
   ii) Explain the terms-electrophile and nucleophile with a suitable example for each. 03

C) Give IUPAC names of the following compounds:- 04

i) 

ii) 

iii) 

iv) 

OR

C) Draw structures for the following compounds:- 04
   i. 1,3-cyclopentadiene
   ii. Cyclopentanamine
   iii. Cyclohexane carboxylic acid
   iv. 3-methyl cycloheptanone

Q.5 Attempt any four of the following:

A) Explain the terms: 05
   i. Bond dissociation energy
   ii. Resonance energy.

B) A solution containing 13.0g of oxalic acid per 500cm^3 of solution has a density of 1.07g/cm^3. Calculate the mole fraction of oxalic acid. Molecular weight of oxalic acid = 126. Molecular weight of water = 18. 05

C) Draw and explain shapes of S and p orbitals. 05

D) Explain Heisenberg uncertainty principle, using its mathematical expression. 05

E) Explain inductive effect 05

F) What is sp^3 hybridisation? Explain sp^3 hybridization of carbon in methane. 05

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