2021

Time : 3 hours

Full Marks : 75

Pass Marks : 24

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

*Answer any **five** questions selecting at least **one** from each Group in which Q. No. 1 is compulsory.*

1. Choose the correct answer of the following : $1\frac{1}{2} \times 10 = 15$

(a) The value of $\left(\frac{P_C V_C}{RT_C}\right)$ is :

(i) 8.314

(ii) 0.082

(iii) 0.375

(iv) 1.987

(b) Bragg's law is represented by the equation :

(i) $n\lambda = 2\theta \sin\theta$

(ii) $n\lambda = 2d \sin\theta$

(iii) $2n\lambda = d \sin\theta$

(iv) $n\lambda = d \sin\theta$

(c) Which of the following is an intensive property ?

(i) Volume

(ii) Mass

(iii) Enthalpy

(iv) Temperature

(d) The phase rule is expressed as :

(i) $C = F - P + 2$

(ii) $P = C - F + 2$

(iii) $F = C - P + 2$

(iv) None of these

(e) The half life period of 2nd order reaction is :

(i) Proportional to initial concentration

(ii) Inversely proportional to initial concentration

(iii) Independent of initial concentration

(iv) None of these

(f) Which of the following has the maximum number of unpaired electrons ?

(i) Zn^{2+}

(ii) Fe^{2+}

(iii) Ni^{3+}

(iv) Cu^{+}

(g) Which crystalline form of carbon has a two dimensional sheet like structure ?

(i) Coal

(ii) Coke

(iii) Diamond

(iv) Graphite

(h) Carboxylic acids and esters with same number of carbon atoms are :

(i) Functional isomers

(ii) Tautomers

(iii) Metamers

(iv) Homologous

(i) d and ℓ tartaric acids are :

(i) Diastereo isomers

(ii) Enantiomers

(iii) Achiral molecules

(iv) Tautomers

(j) The enzyme that can catalyse the conversion of glucose to ethanal is :

(i) Zymase

(ii) Invertase

(iii) Diastase

(iv) Maltase

Group – A

2. (a) Derive van der Walls equation of state for n moles of real gases. 7

(b) Write units and significances of van der Walls constants 'a' and 'b'. 8

3. (a) What is Lattice energy ? Describe Born-Haber Cycle for determination of lattice energy of an ionic compound. 4+6 = 10

(d) Discuss different types of unit cells. 5

4. (a) What do you mean by second order reaction ? Derive an expression for rate constant of a second order reaction when both the reactants are same. 4+6 = 10

(b) Discuss the effect of temperature on reaction rate. 5

Group – B

5. Discuss the chemistry of 3d block element with respect to their : 5×3 = 15

(a) Complex formation

(b) Magnetic behaviour

(c) Variable oxidation states

6. Write short notes on any **three** of the following : 5×3 = 15

(a) Heisenberg Uncertanty principle

(b) Schrödinger wave equation

(c) van der Walls forces

(d) Metallic bond

7. (a) What do you mean by double and complex salts ? Explain with examples. 5

(b) Write Werner's postulates. 5

(c) Write IUPAC names of the following : 1×5 = 5

(i) $[Ag(NH_3)_2]Cl$

(ii) $K_3[Cr(C_2O_4)_3]$

(iii) $K_4[Fe(CN)_6]$

(iv) $[Co(NH_3)_6]Cl_3$

(v) $Ni(CO)_4$

Group – C

8. (a) Discuss the mechanism of nitration and sulphonation of benzene. 10

(b) Explain Keto-enol tautomerism with suitable examples. 5

9. (a) What are carbohydrates ? How are they classified ? 5

(b) Discuss the open chain structure of glucose. 10

10. Write notes on any **three** of the following :

5×3 = 15

(a) Bakelite

(b) Resins

(c) Sulfa drugs

(d) Optical Isomerism in Lactic acid