322102

Time : 3 Hours]   [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*

2. *Answer any four questions from Part-B in detail.*

3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Why X-rays are used in crystallography?   (1.5)

(b) State and explain law of constancy of interfacial angles, law of rational indices.   (1.5)

(c) Find out the Miller indices for the plane that cuts on crystallographic axis at 3, 2 unit distances along x, y and parallel to z axis directions.   (1.5)

(d) Define surface tensions and write mathematical expression for it.   (1.5)

(e) What do you mean by hydrogen bonding? Also discuss essential requirements for hydrogen bonding.

(1.5)

(f) Define pH and pOH mathematically. (1.5)

(g) Discuss mathematical relationship that holds good for variation of surface tension of a liquid and its temperature. (1.5)

(h) How pH and pK_a are related for a weak acid? (1.5)

(i) If a solution has pH 10.0, determine concentration of $[H^+]$. (1.5)

(j) A solution of HCl has pH 4.0. Find out amount of HCl present in one litre of the solution. (1.5)

PART-B

2. (a) Why gases deviate from ideal gas behavior? Discuss volume correction and pressure correction, compressibility factor Z. (10)

(b) Discuss various symmetry elements in solids. (5)

3. (a) Derive Henderson equation and discuss its applications. (5)

(b) What do you mean by coefficient of viscosity? Discuss determination of viscosity by Ostwald Viscometer method in details. (10)

4. Discuss Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation in details. (15)

5. (a) State and explain common ion effect. (5)

(b) Derive an expression for Bragg's law i.e. $2d \sin \theta = n\lambda$. Also discuss indexing of X-ray diffraction pattern in XRD. (10)

6. (a) What do you mean by critical state, derive relation between critical constants and van der Waals constants? (10)

(b) State and explain law of corresponding states. (5)

7. Discuss acid-base indicators theory and selection of indicators and their limitations in details. (15)

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