

Roll No.

Total Pages : 4

GSQ/M-21

1752

PHYSICAL CHEMISTRY (Theory)

Paper–XIX (CH-305)

Time Allowed : 3 Hours]

[Maximum Marks : 32

Note : Attempt **five** questions in all, selecting at least **two** questions from each Unit. Question No. 1 is compulsory.

Compulsory Question

1. (a) Define First law of Photochemistry. 1
- (b) What is Phosphorescence ? 1
- (c) What is Partition function ? Why is it so called ? 2
- (d) State 'Gibb's phase rule'. 1
- (e) Define the term 'Phase'. 1
- (f) Define Raoult's law for solutions containing non-volatile solute. 1
- (g) What are Isotonic solutions ? 1

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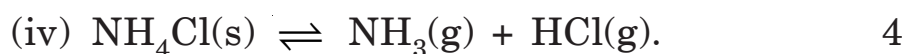
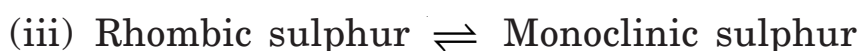
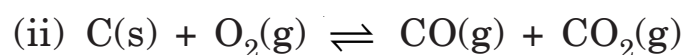
UNIT-I

2. (a) Give one example of a Photochemical reaction in which the quantum yield is very high. Briefly explain the reason for the same. 3
- (b) For the Photochemical reaction $A \rightarrow B$, 1.0×10^{-5} moles of B are formed on absorption of 6.0×10^7 ergs at 3600\AA . Calculate the quantum efficiency of the reaction. 3
3. (a) What are Photochemical reactions ? How these reactions differ from Thermochemical reactions ? 3
- (b) Calculate the value of an Einstein of energy for radiation of wavelength 4000 \AA . 2
- (c) What is 'Resonance fluorescence' ? Give one example. 1
4. (a) What is Photosensitizer ? How does it act ? Explain by giving two suitable examples. 3
- (b) What is Statistical mechanics ? What are the main points of difference between Classical Statistical mechanics and Quantum Statistical mechanics ? 3

5. (a) Discuss the following :
- (i) Thermodynamic probability.
 - (ii) Born-Oppenheimer approximation. 4
- (b) Write expression for Maxwell-Boltzmann distribution law taking degeneracy of states into consideration. What do different symbols signify ? 2

UNIT-II

6. (a) Give two examples each of two component systems in which :
- (i) the components do not react with each other.
 - (ii) the component react to form a compound with congruent melting point
 - (iii) the component react to form a compound with incongruent melting point. 3
- (b) What is meant by Triple point of Water ? Why is it different from the normal melting point of Ice ? 2
- (c) What is Condensed system ? 1
7. (a) Calculate the number of components and degrees of freedom for the following systems :
- (i) $\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$



(b) Draw a labelled phase diagram for lead-silver system. 2

8. (a) What are ideal and non-ideal solutions ? Give one example of each of them. 2

(b) Define the term Colligative properties. How can you justify that Osmotic pressure is a colligative property ? 2

(c) 1.20 g of a substance dissolved in 100 g of water lowered its freezing point by 0.37 °C. Calculate the molecular weight of the substance. Molal depression constant of water is 1.86 °C per molality. 2

9. (a) Define Molal elevation constant. Derive the relationship between elevation in boiling point and molality of the dissolved solute. 4

(b) Differentiate between Molarity and Molality of a solution. Which out of these is the preferred method of expressing Concentration and why ? 2