

3rd Semester Examination, 2020

Time : 3 hours

Full Marks : 60

Answer any **one** Group as per your syllabus

Answer from **all** the Sections as per direction

The figures in the right-hand margin indicate marks

*Candidates are required to answer in their own words
as far as practicable*

GROUP — A

(MODEL SYLLABUS)

(PHYSICAL CHEMISTRY - III)

SECTION — A

1. Answer *all* the following questions : 1 × 8

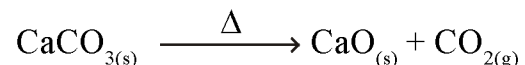
(a) The phase rule equation is

$$F = C - P + \underline{\hspace{2cm}}$$

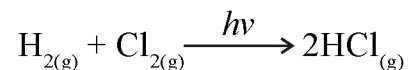
(Turn Over)

(2)

- (b) How many phases are there in Sulphur system ?
- (c) Give an example of a three components system.
- (d) What is the number of components of following system ?



- (e) What is the order of following reaction ?



- (f) Write the unit of second order reaction rate constant.
- (g) The substance which adsorbs is called _____ and the substance which is adsorbed is called _____ .
- (h) What is the relation between catalyst and surface area ?

SECTION – B

2. Answer any *eight* of the following : $1\frac{1}{2} \times 8$

SH CHE–07

(Continued)

(3)

- (a) What is triple point of water ? What are the values of pressure and temperature ?
- (b) Define degree of freedom of a system.
- (c) What is eutectic point ?
- (d) What informations are obtained from the curves and areas of phase diagram ?
- (e) What is metastable equilibrium ?
- (f) What are azeotropes ?
- (g) What are parallel reactions ? Give one example.
- (h) What are consecutive reactions ? Give one example.
- (i) Write any three important characteristics of a catalyst.
- (j) What is autocatalysis ? Give one example.

SECTION – C

3. Answer any *eight* of the following : 2×8

SH CHE–07

(Turn Over)

(4)

- (a) Find number of phases for following system :
- (i) Water-ethylalcohol
 - (ii) Water- benzene.
- (b) What do you understand by congruent and incongruent melting points ?
- (c) Why is Sulphur system considered to be one component system ?
- (d) In the phase diagram of water system the fusion curve and sublimation curve of ice have respectively negative and positive slopes. Why ?
- (e) What are the phases present in Pb – Ag system ?
- (f) What is the half - life period of a first order reaction having rate constant 0.0023 Sec^{-1} ?
- (g) Define activation energy and write Arrhenius equation.
- (h) Explain Temperature coefficient of a reaction.

(5)

- (i) Which factors affect extent of adsorption and how ?
- (j) What do you understand by chemisorption ? What is the effect of temperature on it ?

SECTION – D

Answer *all* the questions as directed : 6×4

4. (a) Draw and explain phase diagram of water system. 6

Or

- (b) Derive Clapeyron - Clausius equation for solid vapour equilibrium. 6

5. (a) State and explain Nernst Distribution Law. 1 + 5

Or

- (b) Derive Gibbs-Duhem-Margules equation. 6

6. (a) Derive the rate expression for a second order reaction of the type $2A \longrightarrow$ products. 6

(6)

Or

(b) Discuss the salient features of Collision theory of reaction rates. 6

7. (a) Write notes on : 3 + 3

(i) Acid-Base catalysis

(ii) Enzyme catalysis.

Or

(b) What is adsorption isotherm? Explain Freundlich adsorption isotherm. 1 + 5

GROUP – B

(OLD SYLLABUS)

(PHYSICAL CHEMISTRY - III)

SECTION – A

1. Answer *all* questions : 2 × 6

(a) Explain the activity of a catalyst increases on decrease in particle size.

(7)

(b) What are catalytic inhibitors ? Give one specific example.

(c) Write two difference between molecularity and order of reaction.

(d) Differentiate between triple-point of water and melting-point of Ice.

(e) What are congruent and in congruent melting point ?

(f) Define and distinguish between absorption and adsorption.

SECTION – B

Answer **all** questions : 12 × 4

2. Explain with the help of Clausius-Clapeyorn equation : 4 × 3

(i) Effect of pressure on melting-point of ice.

(ii) Effect of pressure on melting-point of sulphur.

(iii) Effect of pressure on the transition-temperature of SR.

(8)

Or

Discuss phase-diagram for two component systems the two components form. 6 + 6

- (i) An eutectic mixture
- (ii) A stable compound with congruent melting-point.

3. Draw and discuss the phase diagram for a three-component system consisting two solids *A* and *B* and water. 12

Or

Write notes on : 4 × 3

- (i) Azeotrope mixtures
- (ii) Cooling curves for a two component systems in which two components are not miscible in solid state and form an eutectic mixture.
- (iii) Steam distillation.

4. State and explain the term "Temperature coefficient of a reaction." What is energy of

(9)

activation ? How is it determined by Arrhenius equation. 12

Or

Write notes on : 8 + 4

- (i) Lindemann theory of unimolecular reaction
- (ii) Consecutive reactions.

5. Write notes on : 4 × 3

- (i) Specificity of a catalyst
- (ii) Selectivity of a catalyst
- (iii) Auto catalysis.

Or

Write notes on : 4 × 3

- (i) Physical adsorption and chemical adsorption
- (ii) Freundlich's adsorption isotherm
- (iii) Nature of adsorbed state.