

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, JUNE 2022

SECOND YEAR [BATCH 2020-23]

INDUSTRIAL CHEMISTRY (HONOURS)

Paper : X [CC10]

Date : 25/06/2022

Time : 11 am – 1 pm

Full Marks : 50

Answer **any five** questions of the following:

[5×10]

1. a) Define the terms 'glass and glass ceramics'.
b) Write the Zachariasen's structural model of glass.
c) Explain why SiO_2 is a good network former with the help of the Zachariasen's structural model.
d) Determine the final batch composition for the production of glass composition:
 $15\text{Na}_2\text{O}-5\text{Al}_2\text{O}_3-80\text{SiO}_2$. [2+2+3+3]
2. a) What is of vitreous silica? Describe the structure of vitreous silica.
b) Why alkali addition increases the coefficient of expansion and density of soda lime silica glass.
c) A soda-lime-Silica glass is made as under: Glass Sand (SiO_2) = 6000 Kg, Lime Stone (CaCO_3) = 8000 Kg, Soda Ash (Na_2CO_3) = 12000 Kg Calculate the oxide % composition of the finished glass. viz, $\text{Na}_2\text{O} : \text{SiO}_2 : \text{CaO}$. [$\text{SiO}_2 = 60 \text{ g/mol}$, $\text{CaO} = 56 \text{ g/mol}$, $\text{Na}_2\text{O} = 62 \text{ g/mol}$] [3+2+5]
3. a) Write short notes on : Flint glass, Optical glass, Safety glass and Bioglass.
b) Which is the best nucleating oxide for the ceramization of glass and why?
c) Why glass is called a 'Super cooled liquid'? [6+2+2]
4. a) Draw and explain the T-T-T diagram of glassy melt. Define the critical cooling rate (CCR) from this diagram.
b) Determine the ratio of O : Si ions when 12 weight % of B_2O_3 is added to SiO_2 . Mol. mass of $\text{SiO}_2 = 60 \text{ g/mol}$ and $\text{B}_2\text{O}_3 = 69.6 \text{ g/mol}$. [5+5]
5. a) Describe the composition of PSC (Portland Slag Cement) and PPC (Portland Pozzolona Cement). State advantage of uses of blended cement over OPC.
b) What effect does additional fineness of grinding have upon the strength of concrete and on the rate of development of strength?
c) Why little amount of gypsum is added in Portland cement? [5+3+2]
6. a) Write short notes on the clinker?
b) Mention the name of mineralogical phases of Portland cement clinker.
c) Illustrate the roles of CS_3 and CA_3 in formation of the cement. [4+3+3]
7. a) Discuss the chemistry of Hydration of cement in brief to form set cement viz, Calcium Silicate Hydrate CSH gel.
b) Write a short note on the manufacturing process of Portland cement. [5+5]

_____ × _____