

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. THIRD SEMESTER EXAMINATION, DECEMBER 2012

SECOND YEAR

Industrial Chemistry (Honours)

Date : 14/12/2012

Time : 11am – 2pm

Paper : III

Full Marks : 75

[Use separate answer book for each group]

Group – A

1. Answer **any three** questions of the following: [3×2]
 - a) Distinguish between amorphous, single and polycrystalline structures.
 - b) What are the various glass forming methods?
 - c) What are nanocrystalline materials?
 - d) Define alloys with at least two examples.
2. Answer **any two** questions of the following : [2×2]
 - a) Correlate lattice, basis and crystal structure.
 - b) Why little gypsum is used in Portland cement.
 - c) Why is glass called 'Super cooled liquid'?
3. Answer **any six** questions of the following : [6×5]
 - a) Calculate the atomic packing factors for simple cubic and FCC unit cell.
 - b) Write a note on manufacturing of Portland cement.
 - c) Calculate the weight % of CaO and SiO₂ in the Portland cement. Given weight % of : C₃S=45, C₂S=27, C₃A=11, C₄AF=8, Others=9 & atomic weights of Ca=40.08, Al=26.98, Si=28.09, O=16.00, Fe=55.85.
 - d) What is clinker? Illustrate the roles of C₃S and C₃A in formation of the cement.
 - e) Write a note on structure of glass.
 - f) Write a note on various types of glass material.
 - g) Classify refractory material according to the nature of their chemical reactions. Describe Various types of clay.
 - h) Write the characteristics of white ware products. What are the raw materials for white ware industries?
 - i) Name the primary and secondary crusher. Give a brief account of Ball-mill.

Group – B

4. Answer **any four** questions of the following : [4×5]
 - a) Briefly explain the concept of phase rule and its application for refining process.
 - b) Write short note on Lever rule.
 - c) Briefly explain TTT diagram.
 - d) Write the major reactions that occur in a blast furnace.
 - e) Explain the following terms : Pulverization, Calcination, Smelting.
 - f) Briefly explain the production of pure aluminium by electrolysis process.

Group – C

5. Answer **any three** questions of the following :

[3×5]

- a) Distinguish between Liquified Petroleum Gas (LPG) and Natural Gas (NG), as regards their composition, physical property and calorific value.
- b) Distinguish between Fuel fired and Electrical Furnace.
Mention types of furnace, operation and major input raw materials for the following commodities with reference to Indian practice.
- i) Calcium Carbide.
- ii) Synthetic Graphite.
- c) Write a note on solid fuels and state how they compare to liquid and gaseous fuels. Compare HTC with LTC.
- d) Give a brief outline of H.T.C process for production of Metallurgical Coke. A sample of Coal from Ney Valey (TN) gave the following data :

Prox. Analysis	ultimate analysis
percent, air dried	percent, dmmf.

Moisture - 2.2

Ash - 16.5

Volatile Matter - 31.7

H - 6.2

Gross C.V as determined is 6720 KCal/kg. Compute the Net C.V on air-dried basis.

$$(2\frac{1}{2} + 2\frac{1}{2})$$

- e) i) Equal weights of glucose ($C_6H_{12}O_6$) and acetaldehyde (C_4H_2O) were individually burnt in combustion Tube with pure oxygen .
combustion Tube with pure oxygen.
Calculate which is of higher Heating unit (HU).

ii) A biodiesel ($C_{18}H_{35}COOCH_3$) is used as Fuel in an I.C. Engine in place of Diesel ($C_{16}H_{34}$) .
Prove that the heating Value of biodiesel is less than the Hydrocarbon.

(Heating Value of C and H are 8137 and 34500 Cal/g respectively).

$$(2\frac{1}{2} + 2\frac{1}{2})$$

