RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

SECOND YEAR

B.A./B.SC. THIRD SEMESTER (July – December) 2014

Mid-Semester Examination, September 2014

Date : 15/09/2014 **INDUSTRIAL CHEMISTRY (Honours)**

Time : 2 pm – 4 pm Paper : III Full Marks : 50

[Use a separate answer book for each group]

Group – A

1. Define/explain the following terms (**any five**) : [5×1]
   a) What is china clay?
   b) What is chemical compositions of clay?
   c) What is 'glass'?
   d) What is the function of a 'glaze'?
   e) How do 'earthenware' differ from 'stoneware'?
   f) What is refractoriness?
   g) What is a softening temperature?

2. Answer **any four** : [4×5]
   a) What is meant by plasticity of clays? Explain the terms—
      i) Plastic limit of clay
      ii) Plasticity index and liquid limit. Explain the effect of plasticity of clay on moulding. What is a secondary clay? [1½+½+½+2+½]
   b) How is porcelain manufactured? What are the methods used in the manufacture of porcelain? Write down the steps involved in the manufacture of porcelain by wet process. [1+1½+2½]
   c) What are refractories? Explain the classification of refractories with one example of each type. Name two refractories whose refractoriness is about 2500°C. [1+3+1]
   d) What is polysilazane? Give the method of manufacture of 'polysilazane' which is used as precursor to advanced ceramics (TDC). Mention its properties and uses. [1+3+1]
   e) What is silica brick? Explain the different steps involved in the manufacture of silica bricks. Mention is properties and uses. Give a block diagram for the manufacture of refractories. [1+2+1+1]
   f) Explain the following terms—
      i) Thermal spalling
      ii) Dimensional stability
      iii) Pyrometric cone test
      iv) Porosity
      v) High-duty refractory brick [1+1+1+1+1]

3. Answer **any one** : [1×5]
   a) What is the composition of ordinary glass? Briefly narrate the operation of a pot furnace in making optical glass. What is annealing process during shaping of glass articles? [1+3+1]
   b) Name three important raw materials of glass manufacture with their chemical symbols. Distinguish between FORCAULT and COLBURN Process in shaping of sheet. Write composition of window glass. [1½+2½+1]
   c) What is material science? What types of materials are produced by applying this technology? Give brief description about these materials. [5]

Group – B

(*Answer **any two** questions*) [2× 5]

4. a) Equal weights of pure glucose ($C_6H_{12}O_6$) and acetaldehyde (C_6H_4O) are burnt in a combustion boat with pre oxygen to ensure complete combustion
   Calculate and show which of the two compounds has higher calorific value (Heat of combustion of C and H are 8137 and 34500 Cal/g respectively)
   b) Imported Australian coal was analysed at custom laboratory with following results:

	%
Moisture	3·5
Volatile matter	30·0
Ash	12·0

   Calculate F.C% on drybasis, dry Ash free (daf) basis, and dry mineral matter free (dmmf) basis.[2½×2]

5. a) Write short notes on : "Peat" and "Brown coal" mentioning place of occurrence calorific value, and industrial application.
   b) Write how proximate analysis of coal is carried out in Laboratory. [2½+2½]

6. a) Enumerate the important fractions of HTC tar distillate with composition and boiling range.
   What is coal tar pitch? State its use.
   b) What is metallurgical coke? Briefly describe its production process in coke oven plant. [2½+2½]

Group – C

Answer **any one** : [1×10]

7. Write short notes on : Calcination , Roasting, Smelting, Gibbs Phase Rule [4×2½]

8. Draw Fe – Fe_3C phase diagram. Show all the phases in it and explain briefly. Show eutectic and eutectoid. [8+2]

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