RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIFTH SEMESTER EXAMINATION, DECEMBER 2019

THIRD YEAR [BATCH 2017-20]

Date : 12/12/2019 **INDUSTRIAL CHEMISTRY (Honours)**

Time : 11 am – 1 pm **Paper : V [Gr. A]** Full Marks : 50

Answer **any one** question from question nos.**1 and 2**: [1×10]

1. Enumerate various ceramic white wares used in construction and in electrical appliances. Mention approximate body composition of triaxial hard porcelain stating the function of each ingradient. How does bone china body differ from porcelain body? Why bone china body exhibits unusually high translucency? (2+4+2+2)

2. State the forming –shaping and drying process followed for pottery bodies. Mention the drying defects encountered in triaxial body. Specify the quality control tests that are conducted on ceramic white wares. What are the criteria for selection of glaze over white ware body? How are the glazes classified? (4+1+2+1+2)

Answer **any four** questions from question nos. **3 to 8**: [4×10]

3. Choose the correct option of the following: (10×1)

   a) Fused quartz has high thermal shock resistance because of its

      i) Low thermal conductivity

      ii) Low coefficient of thermal expansion

      iii) High coefficient of thermal expansion

      iv) Crystallographic orientation

   b) In which ceramic system, Martensitic transformation is observed-

      i) Al_2O_3 ii) ZrO_2 iii) SiC iv) SiO_2

   c) Which of the following is used as a thermal barrier coating

      i) SiC ii) ZrO_2 iii) MgO iv) TiO_2

   d) What is the range of stability of crystobalite

      i) 573-867^{0}C ii) 867-1470^{0}C iii) 1470-1710^{0}C iv) None of these

   e) Not a characteristic property of ceramic material

      i) High temperature stability ii) High mechanical strength

      iii) Low elongation iv) Low hardness

   f) In the structure of SiO_2. The co-ordination number for Si is

      i) 2 ii) 3 iii) 4 iv) 6

   g) The degree of freedom at the melting point of pure SiO_2 of Al_2O_3-SiO_2 phase diagram (at constant pressure) is –

      i) 0 ii) 1 iii) 2 iv) 3

   h) Which one is the best nucleating oxide for glass ceramization

      i) Fe_2O_3 ii) P_2O_5 iii) TiO_2 iv) PbO

   i) The transformation of α – quartz to α - tridimite is

      i) Displacive ii) Reconstructive iii) Martensitic iv) None of these

j) Low cement castable contains –

i) Below 5% High alumina cement ii) 5% - 10% High alumina cement

iii) Above 10% High alumina cement iv) None of these

4. a) A day tank Furnace is charged with an intimately ground mixture of 1200 kg Quartz Powder, 880 kg Lime Stone Powder, 240 kg Potash Feldspar (K_2O. Al_2O_3.6SiO_2) and 420 kg soda Ash. Calculate the quantity of glass produced and its composition in % of oxides basis.

b) Write short notes on :

Glass ceramic and optical glass.

c) Why boro-silicate glasses have better thermal shock resistance and better chemical durability than soda-lime silica glass? (4+3+3)

5. a) Draw the viscosity versus temperature plot of the commercial soda-lime-silica glass and define annealing point, strain point and working point.

b) Write short notes on:

Tempered glass

c) Determine the ratio of O:Si ions when 12 weight % of B_2O_3 is added to SiO_2. Mol. Mass of SiO_2 = 60 and B_2O_3 = 69.6. (4+3+3)

6. a) Mention the advantages and disadvantages of magnesite refractories.

b) Why magnesia refractory has much lower thermomechanical properties compared to its PCE?

c) What are the main impurities present in different raw material sources for magnesia?

d) Write down the advantages and disadvantage of unshaped refractory, over the conventional shaped refractory. (3+2+2+3)

7. a) Discuss the merits and demerits of dry and wet processes to manufacture of ordinary portland cement.

b) What do you understand by false and flash set of ordinary portland cement.

c) Mention few important characteristics of slag cement.

d) Write a short note on quick setting cement. (2+4+2+2)

8. a) Why do we need classification of refractions.

b) Write in details about the classification of refractories based on chemical nature, Porosity and manufacturing methods.

c) Discuss the differences between Pyrometric cone equivalent (PCE) and refractoriness under load (RUL) properties of refractory brick.

d) What are the advantages of having multi-phase in high alumina refractories? (2+3+3+2)

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