Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(CT)/SEM-4/CT-401/2010

2010

CERAMIC RAW MATERIALS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) Which clay mineral shows exfoliation on heating ?

a) Halloysite b) Montmorillonite

c) Vermiculite d) Chlorite.

ii) The unit formula of gama alumina is

a) Al_8O_{12} b) Al_4O_6

c) Al_2O_3 d) none of these.

iii) Which is the microscopic view of materials ?

a) Particle b) Grain

c) Crystallite d) None of these.

iv) Which of the following transformation of ZrO_2 is volume expansive process ?

a) Monoclinic to tetragonal

b) Tetragonal to cubic

c) Tetragonal to monoclinic

d) None of these.

v) Which gives finer particle ?

a) Attrition milled b) Jet milled

c) Ball milled d) Crushed particle.

vi) Which of the following is measured by XRD-techniques ?

a) Particle size b) Grain size

c) Crystallite size d) Surface area.

vii) Which is the best fluxing agent for first firing technology ?

a) Albite b) Anorthite

c) Nephelene Syenite d) Wollastonite.

viii) Which raw material must be calcined before using as starting material for refractory brick manufacturing ?

a) Phlogopite b) Vermicullite

c) Montmorillonite d) Saponite.

ix) Bone ash is exclusively used in

a) hotel china body b) bone china body

c) stoneware body d) none of these.

x) Which material does not show CEC ?

a) Phlogopite b) Vermicullite

c) Montmorillonite d) Saponite.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Discuss the advantages and disadvantages of synthetic ceramic raw materials over natural ceramic raw materials. 5

3. How montmorillonite group of clay minerals differ from kaolinite group ? What is brittle mica and why is it so called ? 3 + 2

4. What is fluxing agent ? Why is potash feldspar preferred to soda feldspar in whiteware body ? How does caustic magnesia differ from dead burnt magnesia ? 1 + 2 + 2

5. Discuss the structural stability of $BaTiO_3$. How is nano-size $BaTiO_3$ manufactured by modified Pachini process ? 2 + 3

6. Give a flowchart for preparation of Y_2O_3 stabilized ZrO_2 powder by precipitation technique. How c/t phase ratio would be increased ? 4 + 1

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Discuss the basic principle of Sol-Gel process.

   b) What are the advantages and disadvantages of this process ?

   c) Show the descriptive flowchart for manufacture of silica glass fibre from TEOS by sol-gel process.

   d) Discuss the process variable of this synthesis.

   4 + 4 + 4 + 3

8. a) What are the precursors used for the preparation of MAH powder by solution precipitation techniques ?

   b) Discuss the effect of calcination temperature and seeding technique on spinelization ?

   c) How nano alumina is prepared from boehimite sol ?

   d) What are the different routes for preparation of mullite powder by solution route ? 4 + 4 + 4 + 3

9. a) What is cation exchange capacity of clay ?

   b) Mention the factors on which CEC depends.

   c) Explain the different causes of CEC in clay.

   d) Why is the CEC value of ball clay 15-40 meq/100 gms. whereas that of china clay is only 4-6 meq/100 gms although both belong to the same group (kaolinite) ?

   e) Describe the method of measurement of CEC of clay.

   2 + 2 + 6 + 3 + 2

10. a) Describe the displacive and reconstructive type of transformation in silica polymorphs.

   b) Why quartzite is preferred in silica brick production whereas glass sand / quartz powder is preferred in glass melting ?

   c) What is vitreous silica and how is it prepared ?

   d) Mention the important applications of silica.

   4 + 5 + 4 + 2

11. a) Name the different polymorphs of $Al_2O_3.SiO_2$.

   b) How do they differ from each other ?

   c) State their important applications.

   d) What is chromite ? Name the different types of chromite available in nature and their basic characteristics.

   e) How can friable chrome ore be used as substitute for massive variety ? 2 + 2 + 2 + 6 + 3