

Instructions to candidates

Duration: 01 hour

Number of questions: 03

Mark allocation: 80

Answer all questions

1.
 - a. Glass can be defined using three terms i.e. amorphous, solid, and glass transition. Briefly describe each case. (6 marks)
 - b. Draw a schematic diagram of the temperature dependence of the specific volume of a liquid as it forms a crystalline and a glass phase. Label the important features on it. (6 marks)
 - c. Write a brief introduction about glass structure. Include different atomic ordering in your answer. (6 marks)
 - d. Give a rough sketch of Radial distribution function, $J(r)$ of glass structure. What are the structural information you obtain from it? How do you obtain them? (7 marks)

2.
 - a. Why vitreous silica glass is used in optical devices? (4 marks)
 - b. Discuss briefly soda-lime-silica glasses using their structure and properties. (7 marks)
 - c. Pyrex is a brand based on borosilicate glass. Write the chemical composition of this glass. (3 marks)
 - d. In glass-ceramic production, a mixture of TiO_2 and ZrO is added to the batch. Why do you add them? (4 marks)
 - e. Explain briefly how viscosity of glass forming melts plays a major role in glass production using an appropriate viscosity vs temperature diagram. (7 marks)



3.

- a. What are the best glasses for the following products?
(i) Glass containers (ii) Electrical insulating tapes (iii) Telescope mirrors
(iv) High thermal resistance glass plate (v) Cooktops (5 marks)
- b. Briefly describe the following physical properties of glasses. (10 marks)
(i) Mechanical properties
(ii) Transport properties (5 marks)
- c. How do you add different colors into glasses? (10 marks)
- d. Write classical forming methods of the following commercial glass products. (5 marks)
(i) Glass containers (ii) Flat glasses (iii) Glass fibers (iv) Lamp glasses
(v) Glass spheres (10 marks)