10% for each question

1. Give the definition of the following terms concerning the crystal structure: (a) interstices, (b) octahedral site interstice, (b) tetrahedral site interstice.

2. (a) Draw the picture of FCC structure and indicate the corresponding octahedral site interstice. (b) What is the coordination number of this site and explain how you count it from the figure you have drawn above in (a).

3. What will be the difference in the response of a metal and an ionic solid, when each material is struck with a blow from a hammer? Explain your answer from the basis of type of bond.

4. Calculate according to Bragg's law the spacing of planes responsible for an intensity peak at $30°$, assuming (a) first-order and (b) second order diffraction. The wavelength of the radiation is 1.54 A.

5. Explain how to determine the coordination number in an ionic compound.

6. What are the secondary bonds and their influence on physical properties of solids?

7. What is the glass transition temperature? Some physical properties show discontinuity and some others show slope change at glass transition temperature. Give the respective examples for each case and explain the physical meaning from molecular point of view.

8. Draw the stress-strain curves for ceramics, metals, brittle polymers, and ductile polymers. Give some comparison among them.

9. Give the definition of energy bands and band gap in a solid.

10. What is the sufficient condition for a solid to become electrically conductive from quantum mechanics viewpoint on energy band diagrams?