This question paper contains **3** printed pages]

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any *five* questions.

Question No. **1** is compulsory.

All questions carry equal marks.

1. Answer as asked :

    (*a*) State whether true *or* false :

    (*i*) A mineral in an oil grain mount will show high relief only if it has a higher index of refraction than the oil.

    (*ii*) Quartz shows one set of cleavage.

    (*iii*) Ionic radii of cations decrease with increasing coordination number.

    (*iv*) For biaxial positive minerals α is the 2V angle bisector.

    (*b*) What ratio determines the coordination number of anions surrounding a cation ?

    (*c*) Some minerals continue to be present even outside their stability fields and are called ....

(d) Biotite shows .... of cleavage.

(e) The relief of muscovite is ....

(f) Microclines are characterized by .... twinning.

(g) Length fast means that ....

(h) The mathematical difference between the largest and smallest refractive index for an anisotropic mineral is called ....

(i) A mineral with the seme refractive index regardless of vibration direction. Its indicatrix is a sphere is called ....

(j) A mineral with two principal refractive indices and one optic axis. Its indicatrix is called ....

(k) A mineral is usually formed by .... processes.

(l) Optic sign of quartz is .... and that of calcite is ....

2. What is a solid solution ? Discuss the *three* main types of soild solution mentioned below and provide mineral examples for each :

(i) Substitutional

(ii) Omission (or defect)

(iii) Interstitial.

3. Discuss the concepts of electrostatic (ionic) bonding. With reference to the concept, explain why some minerals have strong cleavage in particular directions ?

4. What are Hermann-Mauguin symbols ? Discuss its relationship to coordinate axes of the six crystal systems with *one* example each.

5. State the Braggs law for X-ray diffraction (XRD). Discuss with the help of suitable figures how it enables determination of *d*-spacing within mineral structures.

6. Write short notes on any *three* :

   (a) Bravais lattices

   (b) Point group

   (c) Miller indices

   (d) Polymorph.

7. 'Classification of the silicates is based on different ways in which SiO_4 group occurs'. Justify the statement with an example of mineral from each group.

8. Discuss the substitution of important ions in any of the *three* mineral groups :

   (a) Feldspars

   (b) Mica

   (c) Garnet

   (d) Pyroxene.