

[This question paper contains 7 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6562 HC

Unique Paper Code : 32191102

Name of the Paper : Mineral Science

Name of the Course : B.Sc. (H) Geology

Semester : I

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Answer any five questions.

1. Fill up the gaps :

(15×1=15)

- (i) Olivine is typically found in igneous rocks.
- (ii) Serpentine is generally an alteration product of
- (iii) Garnet is found in a wide variety of rocks and in somerocks.
- (iv) Pyroxenes have cleavage at an angle of

P.T.O.

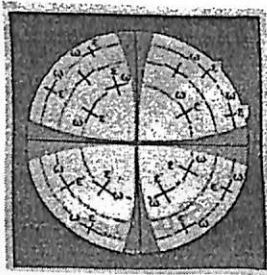
- (v) The mathematical difference between largest and smallest refractive index for an anisotropic mineral is called as
- (vi) A mineral with more than one principal refractive index is called as
- (vii) Albite crystallizes in system.
- (viii) The chemical formula for grossular is
- (ix) Interference colours are observed when the difference is
- (x) When the ordinary ray is slower in a uniaxial mineral the mineral is optically
- (xi) A section cut parallel to optic axis of a uniaxial mineral will show figure.
- (xii) A crystallographic face cutting a-axis and b-axis and parallel to c axis is represented by
- (xiii) Six-fold and three fold rotation axes are common in the system.
- (xiv) A radius ratio of 1 favours coordination.
- (xv) Isometric crystal system has crystallographic axes of length..

2. Answer the following : (5x3=15)
- (i) What do you understand by exsolution in minerals?
- (ii) How can we identify isotropic minerals under microscope?
- (iii) Why silica tetrahedra do not share edges or faces?
- (iv) What does an optical indicatrix portray in a mineral?
- (v) What do you understand by solid solution?
3. From the study of symmetry elements of symmetry of a given crystal, the hermann. Mauguin symbol is obtained as $32/m$ (3 fold axis of roto-inversion and 2 fold axis of rotation and perpendicular to it is a mirror plane). (5x3=15)
- (i) In what crystal system and crystal class does this fall? Give the name of a common non-silicate mix crystallizing in this class which in many instances forms stalactites.
- (ii) Does the mineral referred to above have a cleavage set? If yes, indicate it and draw a free hand sketch of the cleavage fragment.
- (iii) Give the name and crystal system of its polymorph.
- (iv) Would you expect either of these of these

polymorphs to be piezoelectric? Give reasons.

4. (a) For the given figure answer the following: (6)

- (i) What is this optic figure?
- (ii) What are the black bars called and why do they form?
- (iii) If this figure has a positive sign, in which quadrants will the colors go down when a gypsum plate is inserted? Draw a sketch to explain it.
- (iv) The color rings that encircle the cross are called?



(b) Illustrate through sketches and briefly describe the various ways in which SiO_4 tetrahedra can be combined to produce different silicates. (9)

5. Answer the following

(15×1=15)

- (i) Name three types of minerals that occur as metallic

native elements

- (ii) Name 4 metals for which sulfide minerals are the most common source of ore
- (iii) Name two copper bearing sulfide minerals.
- (iv) What is the main anionic component of hydroxide minerals? Name a type of hydroxide mineral.
- (v) What common features does a carbonate, sulfate and phosphate mineral share?
- (vi) Red corundum is ruby, blue corundum is sapphire. What attribute of corundum makes these minerals good gemstones?
- (vii) Name an element that is a common anion in halides. Name a type of halide mineral.
- (viii) Quartz is a common piezoelectric mineral. Name another piezoelectric mineral.
- (ix) Name a monoclinic carbonate
- (x) Name the mineral which is opaque shows magnetic property and has black streak.
- (xi) Name the uniaxial mineral which is highly pleochroic, shows staright extinction and belongs to point group 3m.

- (xii) What are the two subtypes of sulphates?
- (xiii) Name Li-bearing mica.
- (xiv) Name the common pyroxene found in basalt.
- (xv) Name the high pressure garnet found in the earth's interior.

6. Differentiate between following giving suitable example and sketches wherever necessary. (3×5=15)

- (i) Wave surface and Indicatrix
- (ii) Hardness and tenacity
- (iii) Colour and lusture
- (iv) Cleavage and parting
- (v) Uniaxial and biaxial minerals.

7. Define "Form" of a crystal. What do you understand by "general form" of a crystal class? Indicate which crystal system corresponds to each point group listed here and their general form: 422, 622, 4/m 2/m2/m, 2/m, 6mm, 432, 1.

(15)

8. Answer the following (5×3=15)

- (i) What is understood by a crystal zone?
- (ii) Describe briefly the method calculating Miller Indices of crystal faces.
- (iii) Tabulate important Nesosilicates and give their chemical compositions.
- (iv) What is Becke line? Give its use.
- (v) Discuss application of Pauling's co-ordination principles in study of minerals.