(iv) Discuss application of Becke Line.

(v) Discuss the process of optical extinction and how to measure the extinction angle.

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1043 **D**

Unique Paper Code : 2192011102

Name of the Paper : DSC-2 (4) Mineral Science

Name of the Course : **B.Sc. (Hons) Geology (NEP)**

Semester : I

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Answer any **five** questions.
3. Question number **1** is mandatory.

1. Fill up the gaps : (18×1=18)

(i) Amphiboles have ..... cleavage at an angle of .....

(ii) We observe interference colours in anisotropic minerals when the phase difference between the ordinary and extraordinary ray is .....

(iii) The chemical formula for Monticellite is .....

(iv) Ringwoodite is a ..... of olivine.

(v) Serpentine is generally an alteration product of .....

(vi) Garnet is found in a wide variety of ..... rocks and in some ..... rocks.

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

(viii) A mineral with more than one principal refractive index is called as .....

(ix) Augite crystallizes in ..... system

(ii) Hardness and tenacity.

(iii) Uniaxial and biaxial minerals.

7. (a) Define the "Form" of a crystal. What do you understand by the "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. (9)

(b) What is meant by crystal habit? Give a few examples. Illustrate your answer with neat sketches. (6)

8. Answer any **three** of the following : (3×6=18)

(i) Discuss the phenomenon of pleochroism.

(ii) Describe the method of calculating Miller Indices of crystal faces.

(iii) Tabulate important types of phyllosilicates and give their chemical compositions.

(i) Fayalite (ii) Spessartine

(iii) Albite (iv) Diposide

(v) Hornblende (vi) Muscovite

(b) Discuss compositional variations (e.g., between end members) and describe substitutions of the major cations in the following mineral groups: (9)

- feldspars
- pyroxenes
- amphiboles
- olivines
- garnets

6. Differentiate between the following giving suitable example and sketches wherever necessary : (3×6=18)

(i) Wave surface and Indicatrix.

(x) When the ordinary ray is faster in a uniaxial mineral the mineral is optically .....

(xi) A section cut perpendicular to optic axis of a uniaxial mineral will show ..... interference figure.

(xii) A crystallographic face cutting a-axis and parallel to b axis and c-axis is represented by .....

(xiii) Six-fold and three-fold rotation axes are common in the ..... system.

(xiv) A radius ratio of 0.228 favours ..... coordination.

(xv) Isometric crystal system has crystallographic axes of ..... length.

(xvi) A measure of the relative difference between the index of refraction of the mineral and that of the surrounding medium is called as .....

(xvii) Crystals in which all bonds are of equal strength are called .....

(xviii) When small, highly charged cations coordinate larger and less highly charged anions, compact, firmly bonded groups result termed as .....

2. Answer the following : (3×6=18)

(i) What do you understand by exsolution in minerals? Explain with suitable examples

(ii) Why do silica tetrahedra not share edges or faces? Discuss using a mineral example and its effect on the stability of crystal structure.

(iii) What does an optical indicatrix portray in a mineral?

3. (a) Give the definition of a mineral. (3)

(b) How many crystallographic axes are needed in order to define the directions of a crystal? (2)

(c) What is understood by a crystal zone? (3)

(d) Which crystal systems do sillimanite and beryl come from? Graphically explain these systems and clearly state the relationships between the lengths of the axes and the angles in between them. (10)

4. (a) Explain how light waves interfere and the importance of this phenomenon in the optical identification of minerals. (9)

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

5. (a) Indicate to which Family and Group each of the following minerals come from. Give the chemical formula and Si to O ratio of each mineral, and provide one example of a rock where the mineral commonly occurs. (9)