

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1783

GC-3

Your Roll No.....

Unique Paper Code : 32191102

Name of the Paper : Mineral Science

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

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. Out of **eight**, attempt any **FIVE** questions.
3. Question No. 1 is compulsory.

1. Fill in the blanks : (2+2+2+2+2+2+3)
- (a) The coordination number for octahedral coordination is _____ .
 - (b) Piezoelectricity occurs in only those crystalline substances, which have no _____ .
 - (c) Gypsum has higher hardness than _____ and lower than _____ .
 - (d) A mineral that can be hammered out into thin sheets is called _____ .
 - (e) In stereographic projection the polar angle p is with reference to _____ crystallographic axis and the horizontal angle ϕ is with reference to _____ axis.
 - (f) Interference colour of augite is _____ .

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- (g) Interference colour in a mineral is produced when the phase difference between ordinary and extraordinary rays is _____ and the maximum interference colour is seen at _____ position with reference to extinction position.

2. Answer the following questions :

- (a) Explain any two continuous vectorial properties of minerals.
- (b) Define substitutional solid solution and interstitial solid solution in minerals.
- (c) What is the difference between fluorescence and phosphorescence ?
- (d) Write the definition of crystal forms called prism and pyramid.
- (e) Explain the difference between parting and fracture of a mineral. (5×3)

3. Justify the following statements :

- (a) A five-fold rotation is not possible in ordered crystalline structure.
- (b) Uniaxial have one optic axis and biaxial minerals have two optic axis.
- (b) The geometric derivation shows that the maximum radius ratio for tetrahedral arrangement of atoms in tetrahedral coordination is 0.225. (3×5)

4. Write notes on the following : (3×5)

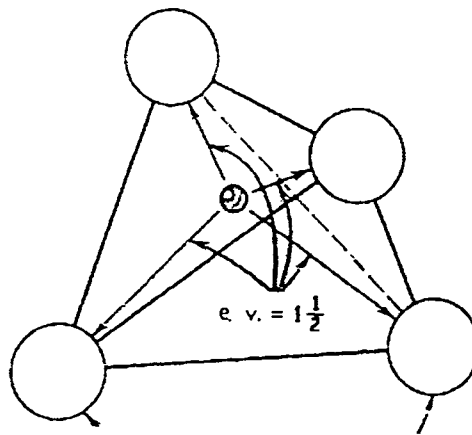
- (a) Different types of chemical bonding in minerals.
- (b) Critical angle and total internal reflection in a mineral.
- (c) Inosilicates.

5. (a) Distinguish between : (3×3+6)

- (i) Polymorphism and polytypism.
- (ii) Extinction angle and optic axial angle.
- (iii) Fluorescence and phosphorescence.

(b) What are Spinel? Why are they rarely found in the earth's crust? Give two examples.

6. (a) Below is an illustration of an SiO_4 anionic complex. Explain : (7+8)



- (i) What is the net valence charge of this anionic complex?
- (ii) How much charge is available for each oxygen ion to contribute to another bond?

(b) Match the element pairs that are likely to substitute for each other in solid solution sites

- | | |
|--------|----------------------|
| (a) Na | (i) Fe^{3+} |
| (b) Al | (ii) Mn |
| (c) Ca | (iii) K |
| (d) Fe | (iv) Sr |

7. Answer the following : (5+4+6)
- (a) What are chromophores ? Is colour of a mineral an identifying feature ? Why ? Distinguish between colour and streak.
 - (b) What are special properties in minerals ? Give examples.
 - (c) Explain the mechanical properties of minerals.
8. Explain the principles of stereographic projection in crystallography. Support your answers with suitable sketches. (15)