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1 (Sem-3) GLG

2024

## GEOLOGY

Paper : GLG0300104

**(Minerology and Thermodynamics in  
Geological Systems)**

Full Marks : 45

Time : 2 hours

***The figures in the margin indicate  
full marks for the questions.***

1. Answer the following questions :  $1 \times 5 = 5$ 
  - (a) Which of the following crystal forms crystallizes in the tetragonal system ?
    - (i) Tetragonal trisoctahedron
    - (ii) Ditetragonal dipyramidal
    - (iii) Trapezohedron
    - (iv) Rhombohedron
  - (b) Uniaxial mineral have number of optic axes is
    - (i) One
    - (ii) Two

Contd.

- (iii) Three
- (iv) Infinite
- (c) Optic axial angle is denoted by
  - (i)  $2V$
  - (ii)  $4V$
  - (iii)  $1V$
  - (iv)  $3V$
- (d) In the Powder Camera, the diffracted x-ray beam at  $2\theta = 90^\circ$  forms which of the following in the photographic film?
  - (i) Curves of high radius near the slits
  - (ii) Straight lines
  - (iii) Dots
  - (iv) Curves of low radius
- (e) Temperature (T) is an intensive thermodynamic variable.  
(Write true or false)

2. Write short notes of the following questions :  
(any five)  $2 \times 5 = 10$

- (a) Extinction
- (b) Polarisation
- (c) Double refraction
- (d) Gibbs free energy

- (e) Enthalpy
- (f) Component and phase
- (g) Ionic and Covalent bonds
- (h) Crystal defect
- (i) Solid solution with examples
- (j) Chemical potential

3. Answer the following questions : (any four)  
 $5 \times 4 = 20$

- (a) What is co-ordination polyhedra ? Describe the cubic and octahedral types of co-ordination shown by crystals.  
 $2+3=5$
- (b) State Pauling's Rules.
- (c) Outline the characteristic differences between isomorphism and polymorphism. Give suitable examples of minerals showing both the phenomena.  $2+3=5$
- (d) What do you mean by optic axis, uniaxial and biaxial mineral.  
 $1+2+2=5$
- (e) Define extinction. What are the types of extinction ? Explain with schematic diagrams.  $2+3=5$

- (f) Describe open, closed and isolated thermodynamic systems.
- (g) Explain extensive and intensive variables with suitable examples.
- (h) Write a note on Geothermobarometry.

4. Answer the following questions : (**any one**)

10×1=10

- (a) What is co-ordination number ? How it is related to radius ratio ? Describe the various types of co-ordination polyhedron shown by different minerals.

1+1+8=10

- (b) What is interference figure ? Write about the different types of interference figures with sketches.

2+8=10

- (c) Explain the first law of thermodynamics. State the relationship between Gibbs free energy and enthalpy. Write the equation of state which relates Gibbs free energy with entropy and enthalpy.

3+3+4=10

- (d) Describe the physical and optical properties of either feldspar group or pyroxene group.