3 (Sem–1/CBCS) GLG HC 2

2022

GEOLOGY

(Honours)

Paper : GLG–HC–1026

(Mineral Science)

Full Marks : 60

Time : Three hours

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

1. Choose the correct answer : ***(any seven)*** 1×7=7

(a) Which of the following is NOT true with respect to crystals ?

(i) Homogeneous solid

(ii) Irregular interval arrangement of ions/atoms

(iii) Bounded by plane surfaces

(iv) Translational periodicity

Contd.

(b) The ratios of intercepts which a crystallographic face makes on the different axes is called

(i) index

(ii) notation

(iii) parameter

(iv) None of the above

(c) Which of the following crystal class does not belong to the isometric system ?

(i) Diploidal class

(ii) Tetartohedral class

(iii) Trapezohedral class

(iv) Hextetrahedral class

(d) Which of the following is not a factor which directly influences atomic substitution ?

(i) Density

(ii) Temperature

(iii) Ionic radii

(iv) Nature of structure

(e) When an entire sheet of ions in a crystal has an irregular crystalline environment, the defect is referred to as

(i) point defect

(ii) plane defect

(iii) line defect

(iv) None of the above

(f) The number of intersection points in a stereographic projection for a horizontal rotational axis is

(i) one

(ii) two

(iii) three

(iv) four

(g) Which of the following is best suited for minerals ?

(i) Inorganic substances

(ii) Have definite chemical composition

(iii) Have fixed atomic structure

(iv) Have all of the above characteristics

(h) How many cleavage sets are present in the mineral quartz ?

(i) One

(ii) Two

(iii) Three

(iv) None of the above

(i) Tectosilicates are three-dimensional framework of tetrahedra, with

(i) all four oxygen atoms shared

(ii) any three oxygen atoms shared

(iii) any two oxygen atoms shared

(iv) it is not certain

(j) The refractive index of Canada balsam is —

(i) 1.33

(ii) 1.43

(iii) 1.54

(iv) 1.77

(k) Double refraction phenomenon is shown by

(i) isotropic substances only

(ii) anisotropic substances only

(iii) Both isotropic and anisotropic substance

(iv) None of the above

(l) The order of interference colour is determined by

(i) Quartz plate

(ii) Gypsum plate

(iii) Mica plate

(iv) Calcite plate

2. Answer ***any four*** of the following questions : 2×4=8

(a) Differentiate between crystalline and amorphous substances.

(b) If the parameters of a crystal face is $|a : 2b : |c$, calculate the Miller index.

(c) Write the formula of *two* isomorphous compounds.

(d) Write down the symmetry elements present in the normal class of the Hexagonal system.

(e) Write short note on Mohs scale of hardness.

(f) Briefly describe the classification of minerals.

(g) Write a short account on Extinction of minerals.

(h) Explain shortly on accessory plates.

3. Answer ***any three*** of the following questions : 5×3=15

(a) Differentiate between parameters and indices. Write on the usage of commas in Miller's indices. Show that the values of indices and parameters are inversely proportional. 2+1+2=5

(b) Describe the various symmetry elements present in a crystal.

(c) What is a solid solution ? Differentiate between interstitial and omission solid solution. 2+3=5

(d) What is a point defect ? Describe the various types of point defects. 2+3=5

(e) Distinguish between CCP and HCP structures. Give suitable diagrams. 3+2=5

(f) Define mineral. What are the physical properties of minerals ? 2+3=5

(g) Describe briefly the interference figure of an uniaxial mineral. What do you mean by flash figure ? 4+1=5

(h) Define optical indicatrix. Describe with sketches positive and negative indicatrices. 1+4=5

4. Answer ***any three*** of the following questions : 10×3=30

(a) Describe the crystallographic axial orientation that are characteristic of the different crystal systems. Draw suitable sketches. 7+3=10

(b) Describe the various forms which are grouped under the hexoctahedral class of the isometric system. Mention the general indices of the different forms. 7+3=10

(c) Define coordination number. Describe the various types of coordination that are exhibited by crystal structures. 2+8=10

(d) Describe the crystal structure of halite ($NaCl$). Provide representative sketches. 8+2=10

(e) Give a brief account on the structures of silicate minerals. Illustrative with suitable sketches. 6+4=10

(f) Describe the physical, chemical and optical properties of *either* PYROXENE GROUP *or* AMPHIBOLE GROUP of minerals. 3+3+4=10

(g) Write a note on the process of determination of optic axial angle with suitable sketch.

(h) Define optic sign of a mineral. How can the optic sign of uniaxial minerals be determined ? 2+8=10
