



‘समानो मन्त्रः समितिः समानी’

UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 2nd Semester Examination, 2023

CC3-GEOLOGY

ELEMENTS OF GEOCHEMISTRY

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

1. Write short notes on any **five** of the following: 1×5 = 5
 - (a) Which mineral is most suitable for the geochronology?
 - (b) Name the most abundant element and mineral of earth crust.
 - (c) Why zircon is commonly used in mineral geochronology?
 - (d) Why does the e-process stops at mass number 56?
 - (e) Compare the properties of solid with Ionic and Covalent bonding.
 - (f) What type of meteorite is important in resolving the CHUR age-model?
 - (g) Describe the compatible and incompatible element.
 - (h) What are achondrites?

2. Answer any **three** questions from the following: 5×3 = 15
 - (a) Write down the geochemical classification of elements with suitable examples.
 - (b) A granitic rock sample has $^{143}\text{Nd}/^{144}\text{Nd}$ and $^{147}\text{Sm}/^{144}\text{Nd}$ of 0.51215 and 0.1342, respectively. The present chondritic $^{143}\text{Nd}/^{144}\text{Nd}$ and $^{147}\text{Sm}/^{144}\text{Nd}$ are 0.512638 and 0.1967, respectively. The decay constant of ^{147}Sm is $6.54 \times 10^{-12} \text{ Ga}^{-1}$. Calculate the τ_{CHUR} , i.e., crustal residence time relative to a chondritic mantle.
 - (c) Classify magma with respect to SiO_2 percentage. Which type of magma is least viscous?
 - (d) Write down a short note on Chondrite and stony-iron meteorite.
 - (e) Differentiate between the Enriched Mantle and Depleted Mantle.

3. Answer any **two** questions from the following: 10×2 = 20
 - (a) State Pauling's principles for ionic substitution. What is the role of Gibbs free energy (G) in determining the stability of mineralogical assemblages? Express G from the laws of thermodynamics. 4+6
 - (b) What is fractionation factor in stable isotope notation? Why Isotopic fractionation is more pronounced in lower temperature? Write down a short note on Isochron method. 5+5
 - (c) With the help of Harker Diagram explain the general trends of Major and Minor oxides in an evolving Magma. Give suitable diagrams to illustrate your answer.
 - (d) Describe the differences in the analytical methods used in EPMA and XRF and the specific purposes for these methodologies.

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