



'সমানো মন্ত্র: সমিতি: সমানী'

UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 2nd Semester Examination, 2022

CC3-GEOLOGY

ELEMENTS OF GEOCHEMISTRY

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

1. Answer any **five** questions from the following: 1×5 = 5
- (a) What is meant by PDB in stable isotope notation?
 - (b) Why zircon is commonly used in mineral geochronology?
 - (c) Which rock show europium anomaly?
 - (d) Is the upper mantle elementally depleted?
 - (e) Why is Helium used as a carrier gas in IRMS?
 - (f) 'Isotopic fractionation is more pronounced in higher temperature'— Justify the statement in short.
 - (g) What is ionic complexation?
 - (h) When did the H atoms came into existence?
2. Answer any **three** questions from the following: 5×3 = 15
- (a) What are the main assumption of geochronology?
 - (b) What is first ionization potential? Describe geochemical significance of electronegativity. 1+4
 - (c) Express Gibbs free energy (G) from the laws of thermodynamics. Do the composition of minerals and reaction equilibria play role in controlling the stability of certain mineralogical assemblage?
 - (d) What is geochemical cycle? Describe nitrogen cycle by explaining major processes.
 - (e) Describe the implications of EPMA and its advantages in relation to SEM.

3. Answer any *two* questions from the following: 10×2 = 20
- (a) What is Isochron method? A sample of granite 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, for this granite. 4+6
- (b) State the principal astrophysical settings for origin of elements. Why do we think that space is appear to began inside of the singularity? Write down a short note on CNO cycle. In which kind of stars this process happen? 2+2+4+2
- (c) Define compatible and incompatible elements with suitable examples. “Ni concentration of the melt decrease sharply in the initial phase during differentiation of basaltic magma”—Discuss the statement. What is Depleted mantle and Bulk Silicate Earth? Use isotopic systematic to discern the difference the depleted mantle from the bulk silicate earth. 2+3+2+3
- (d) Write down a short note on IRMS. State the differences in the analytical methods used in EPMA and XRF. 6+4

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