

Department of Geology and Geophysics
Mid semester examination: Spring 2010
Subject: Geochemistry and Planetary Sciences
Subject code: GG44004 Number of students: 12

Total marks: 60

Time: 2 hours

Q1. What are the nucleosynthetic processes and their astrophysical settings where elements heavier than Fe are synthesized? [6]

Q2. Describe briefly the standard and triggered-collapse model of star formation. Why is the triggered collapse model necessary? [6 + 2]

Q3. How is the volatility of an element measured? Describe the volatility-related equilibrium condensation sequence of elements/compounds from a gas of solar composition. [6+2]

Q4. What are undifferentiated and differentiated meteorites? Which meteorite group most closely resembles the composition of the solar photosphere? [6+2]

Q5. You are given a specimen of biotite picked from a granite sample whose age is to be determined from $^{87}\text{Rb} \rightarrow ^{87}\text{Sr}$ decay. You measured content of Rb = 500 ppm and of Sr = 0.6 ppm. Given that that Rb is composed of ^{87}Rb and ^{85}Rb in the proportions $^{85}\text{Rb}/^{87}\text{Rb} = 2.5$, that the Sr is "pure" radiogenic ^{87}Sr , and that the decay constant is $\lambda = 1.42 \times 10^{-11} \text{ yr}^{-1}$, calculate the age of the biotite. [10]

Q6. Discuss advantages of using trace element data over major element data in studying various igneous and metamorphic processes. [6]

Q7. Explain, using equations and diagram, the "isochron" method of dating. What are the essential criteria that must be fulfilled to date rocks by isochron method? How will you distinguish a valid isochron from an apparent isochron? [7+4+3]