

1. A. How are meteorites classified? (5%)
 B. What are the mineralogical the compositional characteristics of each groups? (5%)
 C. Which type is the best representative for the relative proportions of the condensable elements in the solar system? Why? (5%)
2. Please explain the following terms and name five elements for each group.
 - A. Siderophile elements (3%)
 - B. Chalcophile elements(3%)
 - C. Lithophile elements(3%)
 - D. Atmosphile elements(3%)
 - E. Large Ion Lithophile Elements(4%)
 - F. High Field Strength Elements(4%)
3. A. What is the definition for isotopes? Please explain with an example. (5%)
 B. Strontium has four isotopes. Please use the following table to calculate the abundance of isotopes (in %) and the atomic weight of strontium. (5%)

Isotopes	Mass (g/mole)	Isotopic Ratios
^{84}Sr	84.0	$^{87}\text{Sr}/^{86}\text{Sr} = 1.0000$
^{86}Sr	86.0	$^{86}\text{Sr}/^{88}\text{Sr} = 0.1194$
^{87}Sr	87.0	$^{84}\text{Sr}/^{88}\text{Sr} = 0.0068$
^{88}Sr	88.0	

- C. What is radioactive decay? What are half-life and decay constant? (5%)
 D. Calculate the half-life of ^{87}Rb given that its decay constant is $1.42 \times 10^{-11} \text{yr}^{-1}$. (5%)
4. Please describe the chemical characteristics of the following reservoirs in the Earth system.
 - A. Earth's core (5%)
 - B. Earth's mantle (5%)
 - C. Earth's continental crust (5%)
 - D. Earth's oceanic crust (5%)
5. What are the compositional differences between granite and andesite? What causes these differences? (15%)
6. If the fractionation factor for ^{18}O between liquid and vapor water at 10°C is $\alpha = 1.0101$, what is $\delta^{18}\text{O}$ of vapor in isotopic equilibrium with water having $\delta^{18}\text{O} = -0.8 \text{‰}$? (10%)