

Introduction to Isotope Geochemistry

SIO 144/252A

Winter 2022

Location: VH300

Time: Wednesday-Friday: 09:30 – 10:50

Instructors: James Day (jmdday@ucsd.edu)

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References*: See notes of individual instructors and book suggestions on this syllabus.

Grading (Letter grade):

40% Homework

25% Midterm

35% Final Exam

Tentative class schedule:

05 Jan	JD	Introduction, nucleosynthesis, radioactive decay and growth
07 Jan	JD	Trace element geochemistry and mass spectrometry
12 Jan	JD	Radiogenic isotope geochemistry, Rb-Sr isotope systematics
14 Jan	JD	Samarium-Nd isotope systematics; two-component mixtures (HW1 assigned)
19 Jan	JD	Lead isotope systematics
21 Jan	JD	Lu-Hf and Re-Os isotope systematics (HW1 Due/HW2 assigned)
26 Jan	JD	Mantle geodynamics, isotopes and paradoxes
28 Jan	JD	Potassium-Ar, ^{40}Ar - ^{39}Ar dating methods and extinct radionuclides
2 Feb	JD	Mass dependent versus mass independent fractionation
4 Feb	JD	'Novel' stable isotopes (Si to U)
9 Feb	JD	Mid-term (HW2 Due)
11 Feb	JS	Noble gases as tracers in the solid earth, ocean, and atmosphere
16 Feb	JS	Cosmogenic isotopes I – Surface exposure dating, ^{10}Be and ^{36}Cl

18 Feb	JS	Cosmogenic isotopes II – Carbon-14 as tracer and clock (HW3 assigned)
23 Feb	JS	Principles of isotope fractionation and water isotopes
25 Feb	JS	Oxygen isotopic composition of carbonate shells/ paleothermometry (HW3 Due/HW4 assigned)
2 Mar	JS	Carbon isotopes; photosynthetic fractionation; major reservoirs
4 Mar	JS	Carbon isotopes; applications
9 Mar	JS	Nitrogen isotopes
11 Mar	JS	Sulfur isotopes (HW4 Due)
Final:	JS	Wednesday, 08:00 – 11:00, 16 March 2022

*** Recommended Reading – We will upload relevant papers to read during class. Text from these books will not be uploaded, but they are excellent references.**

Faure, Gunter. Principles of isotope geology, Wiley, c1986 QE501.4.N9 F38 2005

Allègre, Claude J., Isotope geology, Cambridge University Press, 2008 QE501.4.N9 A45 2008

Dickin, Alan P., Radiogenic isotope geology, Cambridge University Press, 2005 QE501.4.N9 D53 2005

H.-G. Attendorn and R.N.C. Bowen, Radioactive and Stable Isotope Geology, Chapman & Hall QE501.4.N9 A895 1997

Robert Bowen, Isotopes in the earth sciences QE501.4.N9 B69 1988

Zach Sharp, Principles of Stable Isotope Geochemistry, 2nd Edition.

Available as free download at http://digitalrepository.unm.edu/unm_oer/1/