RELATIVE AND ABSOLUTE DATING – BUILD YOUR OWN STRATA + HALF-LIFE OF BUBBLES

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Key Learning Objectives:

1. Understand that a relative geological time scale can be constructed using stratigraphic principles including superposition, cross cutting relationships, inclusions and correlation (ACSES016)
2. Understand that precise dates can be assigned to points on the relative geological time scale using data derived from the decay of radioisotopes in rocks and minerals; this establishes an absolute time scale and places the age of the Earth at 4.5 billion years (ACSES017)
3. Represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error, and uncertainty and limitations in data; and select, synthesise and use evidence to make and justify conclusions (ACSES004)

*SEQ Figure * ARABIC 1: Evidence for Extinctions and Expansions*

https://bit.ly/meriSTEMextinctions

Part 1: Relative Dating

the most significant pieces of evidence that geologists have for mass extinctions and expansions. By identifying fossils in the strata of sedimentary rocks we can determine what organisms were present at different times in geological dating. By analysing these fossils we can also learn what the environment these fossils lived in looked like and what they might have eaten! In order to date these fossils, geologists use both **relative and absolute dating**. Relative dating describes the age of one fossil in relation to another geological object (e.g. a brachiopod fossil is younger than the layer of sand beneat g gives the fossil a specific age, usually b e decay of isotopes found in a fossil (e.g. a

520 million years old).

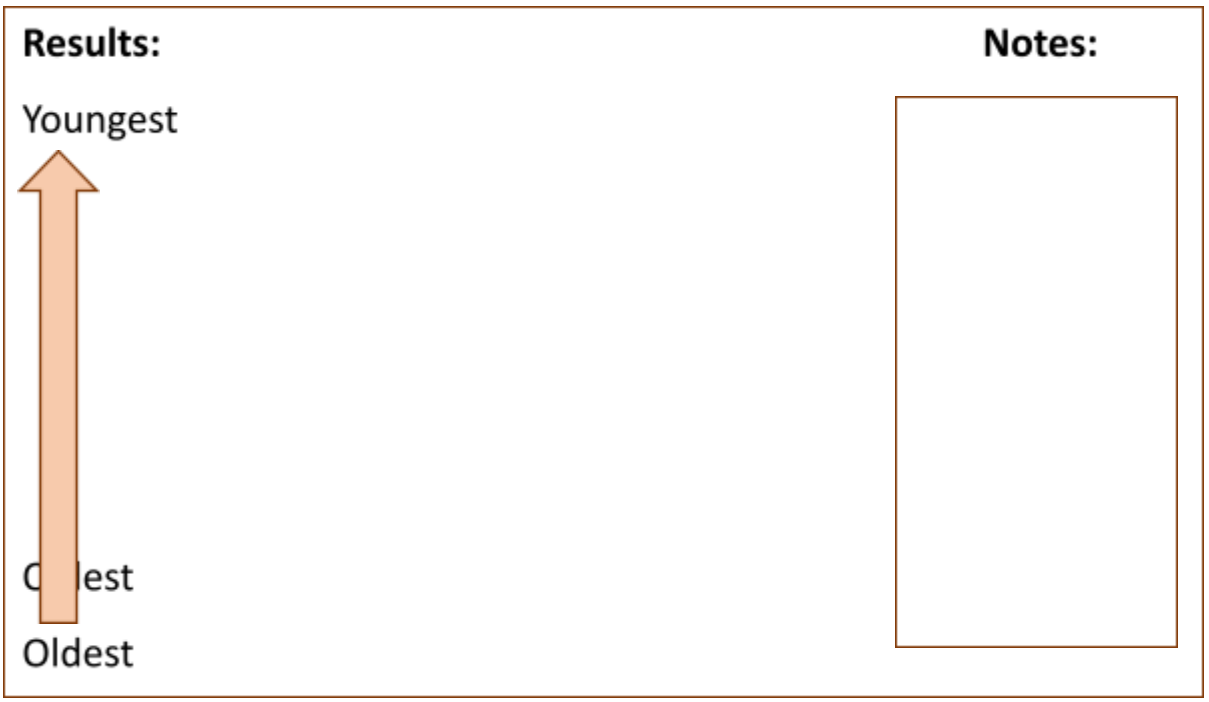
In this experiment you will be modelling relative and absolute dating.

Materials:

- Clear plastic container
- A variety of sediment types (e.g. sand, dirt, flour, sugar, pebbles)
- Model fossils

Method:

1. Choose a number of sediments and begin layering them in your container. Make sure the layers you create are reasonably flat and evenly spread.
2. Between different layers add model fossils.
3. Take note of the order in which you placed your sediments into the container.
4. Consider adding another geological feature. E.g. an igneous intrusion, or a fold. If you do, make a note of how you did this and at what step in your process.
5. Once you have finished creating your strata, trade containers with another student and create a relative timeline describing the age of each layer and fossil. Make notes of any geological events you think might have taken place.



Part 2: Absolute Dating

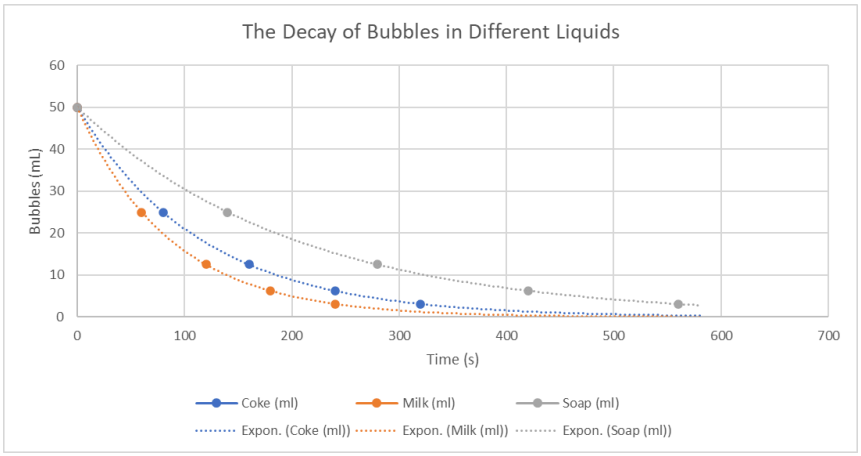
Materials:

- Dish soap
- Soft drink
- Milk
- 3x straws
- 3x 100ml measuring cylinders
- Stopwatch

Method:

1. Pour 50ml of milk into a 100ml measuring cylinder.
2. Carefully blow into the milk with a straw, creating bubbles, until the bubbles reach the level of the 100mL line.
3. Start your stopwatch.
4. Every 20 seconds, note down the time and the level of the bubbles. Do this until all bubbles are gone.
5. Repeat this process use a soft drink and then repeat again using 40mL of water combined with 10mL of dish soap.
6. Using a graphing tool, create a graph showing the decay bubbles from milk, soft drink, and soapy water. Include trend lines, a graph heading, and axis headings.

Example graph:



Results:

Record your results in a table below. Use this data to create your graph.

What was the half-life of the bubbles in each liquid?

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Compare the graph you generated to the graph below. How well does your model of half-life compare to what is seen in radioactive decay? What limitations do bubbles have on representing radioactive decay?

SEQ Figure * ARABIC 2: "Figure 1. Decay kinetics of the 232Th, 238U, 40K and 235U isotopes since the origin of Earth." Ershov B (2022) 'Natural Radioactivity and Chemical Evolution on the Early Earth: Prebiotic Chemistry and Oxygenation', Molecules, 27(23):8584.