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Effect of Temperature on Chemical Weathering

Problem:

How does temperature effect the rate of chemical weathering?

Materials:

* Earth science textbook
* 250ml beaker
* Hot water
* Ice
* 7 antacid tablets
* iPad with stopwatch
* iCelsius probe
* Graph paper

Procedures:

1. Using an iCelsius probe, fill a 250ml beaker with about 200ml of 60°C tap water. Record the exact temperature in your data chart.
2. Drop an antacid tablet into the beaker and start the stopwatch immediately. When the tablet has completely dissolved and you cannot hear fizzing, record the amount of time in your data table.
3. Using an iCelsius probe record the temperature of the water in the beaker after the antacid has dissolved and record the final temperature in your data table.
4. Calculate the average temperature by adding the starting and final temperature values and dividing that by 2 and record in your data table.
5. Repeat steps 1-4 6 more times for each of the following temperature values: 0°C, 10°C, 20°C, 30°C, 40°C, and 50°C. Note that for the colder temperatures you may need to add ice to your mixture to get the right temperature.
6. Make a graph with average temperature on the x-axis and dissolving time on the y-axis. Plot your data and connect the points.

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| --- | --- | --- | --- |
| Starting temp (°C) | Dissolving time (s) | Final temp (°C) | Average temp (°C) |
| 57.1° | 33.11s | 55.2° | 56.15° |
| 50.2° | 36.05s | 49.0° | 49.6° |
| 40.9° | 40.33s | 40.3° | 40.6° |
| 30.3° | 52.40s | 30.0° | 50.15° |
| 19.9° | 76.69s | 19.5° | 19.7° |
| 10.3° | 84.93s | 10.2° | 10.25° |
| 0.9° | 188.27s | 0.5° | 0.7° |

Data table:

Conclusions:

The antacid dissolved fastest in the hottest (57.1°C) water. The antacid dissolved the slowest in the coldest (0.9°C) water. Clearly the warmer the water is, the faster the tablet will react and dissolve. If this is true, then we would expect minerals to also dissolve more quickly in warmer water. Tropical areas will see faster weathering than colder climates. You could test this by setting up an experiment in two different climates and see which object dissolved first. I think if you had a limestone building in Homer, AK and a similar one in Honolulu, HI, even with the same amount of rain, you would see the Hawaiian one dissolve more rapidly because of the higher average temperature in HI. If you ground up your tablet into a powder, if would have dissolved even faster because of the larger surface area.