

Climate and Specific Heat

Keep this activity as part of your notes for class

Introduction:

The sun heats substances on our planet. However, different substances have different heat capacities and therefore respond differently to heating. This activity allows you to compare the specific heat capacities of various substances.

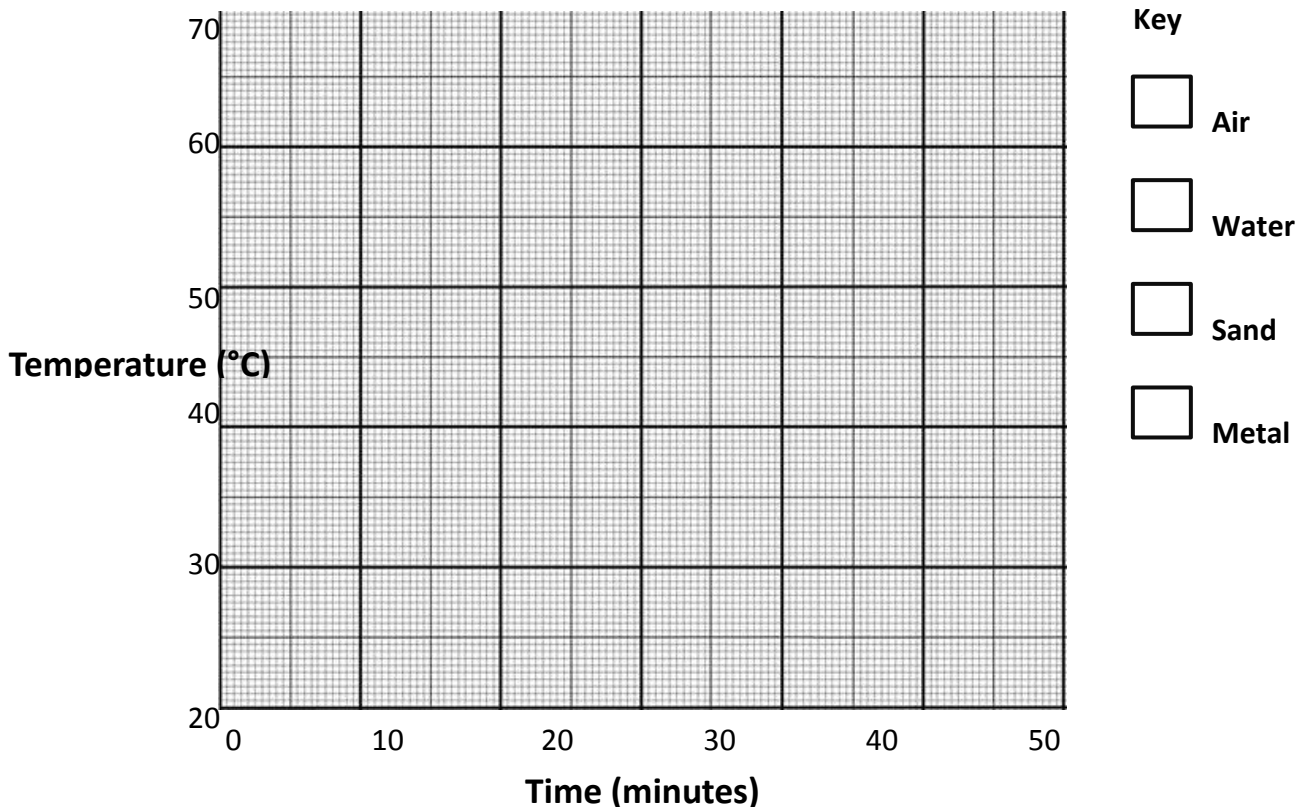
Heating Substances in the Sun:

The following table shows the temperature after 10.0 grams of four different substances have been in direct sunlight for up to 60 minutes.

Time (min)	Air (°C)	Water (°C)	Sand (°C)	Metal (°C)
0 (initial)	25	25	25	25
15.0	28.9	26.2	30	35
30.0	32.5	27.5	35	45
45.0	36.2	28.8	40	55
60.0	40	30	45	65

Graph the data from the table using four different colors to differentiate between substances:

Heating of Four Different Substances (10.0 grams each)



Group Discussion Questions on Back of Page

Group Discussion Questions:

1. Put the four substances in order of the time required to heat them from slowest to fastest.
2. Which do you think will cool the fastest? Explain your reasoning.
3. When you boil water in a pot on the stove, which heats faster, the metal pot or the water?

Specific Heat is the amount of heat energy required to raise the temperature of 1 gram of a substance by 1° C.



4. Which substance has the highest specific heat capacity?

Hint: Think about which one requires more energy to heat up!

5. Which substance has the lowest specific heat capacity?

Hint: Think about which one was easy to heat up!

6. Here are the heat capacities of the four substances: 0.10 cal/g°C, 0.25 cal/g°C, 1.0 cal/g°C, and 0.2 cal/g°C. Match each substance with its specific heat capacity.

7. Which will heat faster, a swimming pool or the ocean? Explain your thinking.

8. How do you think specific heat affects the weather?

9. In the late afternoon after the sun has been shining, what do you think happens to the temperature of the air as it moves from the ocean to the land? Explain.

Hint: Think what happens to water when the sun shines and heats it up!

10. Use specific heat capacity to explain why some regions have very mild climates and other regions have severe climates with a wide range of temperatures.

Challenge Question!

*The winds blow from west to east across the USA. Use this fact to explain why the west coast city of San Francisco is warmer in the winter and cooler in the summer than the East Coast city of Washington, DC. Both are at the same latitude.