

Changing Planet: Rising Ocean Temperatures – Rising Sea Levels

Background

Scientists have not only detected rising temperatures on land surfaces, but they have detected rising temperatures in our oceans as well. Given that over 70% of the Earth is covered by water, there is concern that warming oceans can lead to sea level rise and impact low lying land surfaces such as the small islands found in our equatorial region. In this lab activity you will explore the phenomenon of thermal expansion and apply it to an understanding of sea level rise.

Materials

Conical flask
Two-hole cork for flask
Thin, glass tube
Long thermometer
Portable lamp
100 - 150 Watt light bulb
Food coloring
Water
Salt
Ethyl Alcohol
Marker
Small ruler
Stopwatch

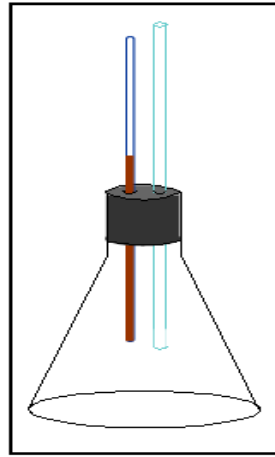


Figure 1: Lab set up

Part 1

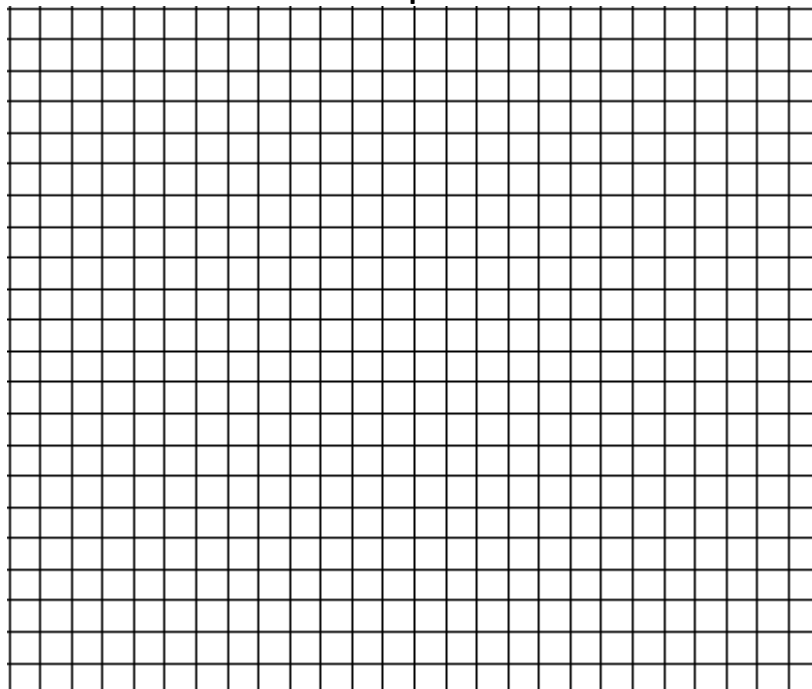
1. Look at figure 1 and assume the flask has been filled completely with water. Use the space below to hypothesize about what will happen to the volume of water as heat is applied to the flask of water.
2. Gather all your lab equipment.
3. Completely fill the flask with very cold water (to improve visibility, food coloring can be added).
4. Place the thermometer and glass tube into the cork as shown in Figure 1 above.

5. Place the cork (with tube and thermometer) into the mouth of the flask. The water should rise a short way up the glass tube. Be sure there is not a gap between the surface of the water and the bottom of the cork. Mark this level.
6. Place the lamp so that it is facing the flask. Do not shine the lamp on the thermometer above the flask.
7. Record the initial temperature in the table below at time "0."
8. Turn on the heat lamp and record the temperature and water level at one minute intervals.
9. Graph your results with time on the horizontal axis, and temperature and water level on separate vertical axes. Use different colors for each line.

Data Table 1

Time (min)	0	2	4	6	8	10	12	14	16	18	20
Temperature(°C)											
Water Level (mm)											

Graph 1



10. Results: Use the space below to describe the trend in the graph. What is the relationship between temperature and water volume?

11. Conclusion & Application: How does this lab model sea level rise with warming temperatures?

How can we change the model to make it a better fit for what we are observing in sea levels? Explain your answer.

Part 2

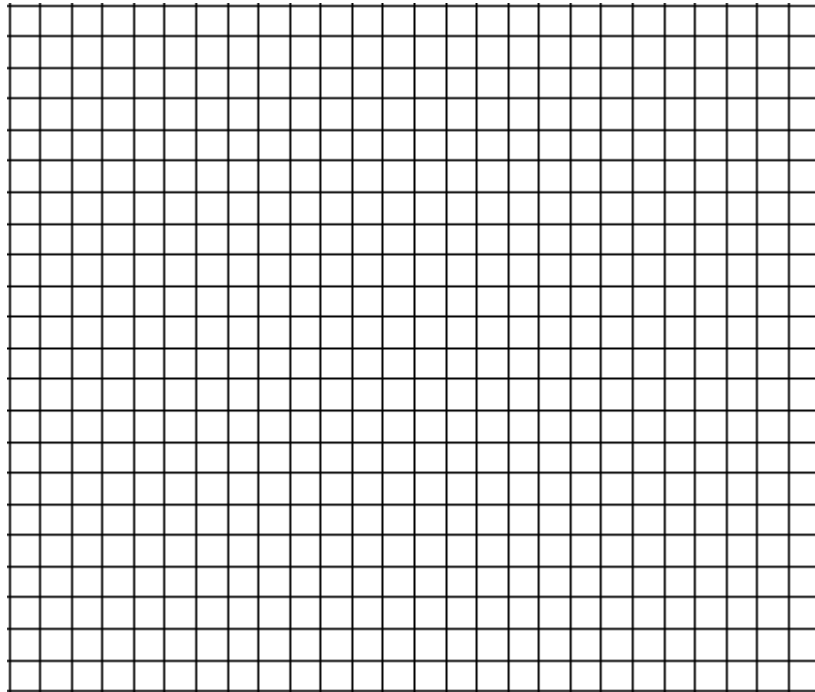
1. Your teacher will assign you another material to use instead of water. Use the space below to hypothesize about what will happen to the volume of the new liquid as heat is apply to the flask of water.

2. Repeat the above steps 2-9 for the new liquid. Gather your data in Data table 2, and plot your data on Graph 2.

Table 2

Time (min)	0	1	2	3	4	5	6	7	8	9	10
Temperature(°C)											
Water Level (mm)											

Graph 2



3. Results: Use the space below to describe the trend in the graph. What is the relationship between temperature and the volume of the new liquid?

4. Use the space below to compare the results from Part 1 with the results from Part 2.
5. If your classmates used a different liquid, compare your results with theirs. Use the space below for the comparison.
6. Conclusion & Application: Which part of the lab was a better model for thermal expansion and sea level rise? Explain your answer.

Application:

1. Why does water volume increase with increasing temperatures?
2. How will the change in ocean volume change coastal areas? Use references for examples to support your answer.
3. Are there other causes of sea level rise? If so, what are they, describe them, and how they are influencing sea level.