

# Lesson Plans: Temperature of the Pacific Ocean

## Objective

The objective of this activity is to demonstrate how the earth's temperature has varied gradually in the past.

## Materials

Each student or group of students will need the following:

- Graph paper
- Ruler
- Pen and pencil

## Important Points to Understand

- Weather to most of us is rain, clouds, wind and temperature.
- Generally, climate is thought of as average weather with some information on extreme and unusual events. The climate statistics of an area depend on the time interval used to determine average weather and are not constant from year to year, decade to decade or even century to century.
- Climate has to be looked at globally because it depends on the joint behavior of the world's atmosphere and oceans. However, the starting point is to observe climate regionally.

## Preparation

Try to explain the information in the table which presents the temperature at the surface and bottom of the Pacific ocean for the last 140 million years (m.y.), as measured by a study of oxygen isotopes in microscopic fossil animals.

Although it is noticeable that some bottom temperatures are amazingly high, in order to not distort the authenticity of the original data set from the reference, they are expressed in the table with doubt.

| Time (m.y.) | High Temp<br>(degrees Celsius) | Low Temp<br>(degrees Celsius) |
|-------------|--------------------------------|-------------------------------|
| 0 (present) | 22.8                           | 1.9                           |
| 10          | 22.3                           | 2.8                           |
| 20          | 22.0                           | 6.2                           |
| 30          | 17.3                           | 5.1                           |
| 40          | 21.5                           | 10.4                          |
| 50          | 21.8                           | 12.7                          |
| 60          | 21.3                           | 11.3                          |
| 70          | 21.0                           | 11.6                          |
| 80          | 24.6                           | 14.8                          |
| 90          | 24.5                           | 16.0                          |
| 100         | 28.2                           | 17.9                          |
| 110         | 28.2                           | 15.9                          |
| 120         | 26.5                           | 15.2                          |
| 130         | 26.6                           | 15.1                          |
| 140         | 28.5                           | 16.5                          |

## Procedure

1. Plot on graph paper, time on the horizontal axis and temperature on the vertical axis.

2. Use different color for surface temperature and bottom temperature or draw a separate graph for the top and bottom temperature.
3. Analyze the fluctuation although the time step is 10 m.y.
4. Analyze the trend of temperature difference between top and bottom by plotting against time.

### Questions

1. What would you say the temperature of the Pacific Ocean is now compared with past geologic time?
2. What can you say about the temperature changes at the bottom and at the surface?
3. Do you have any reason to support your answer in question (2)?
4. What can you say about the trend of temperature differences between top and bottom of the Pacific Ocean?