Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hour \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**When Polar Ice Caps Melt!**

**Background**

In this activity we will see the effects of melting ice on a simulated surface like a continent. Polar ice caps hold 2% of all the available fresh water in the world. Water locked up in the Antarctic ice cap alone equals approximately 17, 900, 000km. The area of the Earth covered by water equals approximately 358,000,000 km. If the Antarctic ice cap melted, the rise in sea level around the world could be computed by the following formula.

Vol H O in Antarctic Ice = 17,900,000 km

Area covered with H O = 358,000,000 km

The same formula as above can be used in this investigation by substituting:

Vol H O in Antarctic Ice = Vol H O in ice block – rise in sea level

Area Earth covered with Area of pan covered

H O with H O

This activity will take part of two class periods.

**Materials**

-Student activity sheets 1&2 -Large flat pan -Sand and pebbles

-Block of ice -Ruler (mm) -Calculator

**Directions:**

We are going to simulate polar ice caps melting in this activity. You will be working in groups of 3 at your table. (Yellow, purple, orange and blue, green, red). One group will add a lamp to their simulation.

The lamp should be hovering over the ice cap.

What does the lamp represent?

Why do we have one simulation without a lamp and one with a lamp?

*You may be sharing a simulation with another group in another hour. This will not only save time and materials it will also give us better results in the end.*

**Student Activity Sheet #1 (Day 1): When Polar Ice Caps Melt**

**Part 1: Observations/Calculation**

1. Measure the depth of the water in the pan at its deepest point.

Depth at deepest point = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mm

2. Measure and compute the volume of the block of ice.

(Volume = Length x width x height)

Length = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mm

Width = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mm

Height = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mm

VOLUME = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mm

3. Measure and compute the area of the water surface.

(Area = Length x width)

Length = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mm

Width = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mm

SURFACE AREA OF WATER = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mm

4. Predict the rise in water level after the ice melts.

(Divide the volume of the ice block by the area of the water surface.)

volume of ice block = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mm \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_rise in water level

Area of water surface mm

5. Observe what is happening to your ice cap; observe what is happening to the model. Answer the following questions using complete sentences with a restate.

A. What is happening to the block of ice? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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B. What is happening to the sand under the block of ice?

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**At the end of the hour observe again..**

A. What is happening to the block of ice?

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B. What is happening to the sand under the block of ice?

**Student Activity Sheet # 2 (Day 2): When Polar Ice Caps Melt**

C. What happened to your simulation? Describe the ice block, sand and water level.

Ice block-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Sand- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Water level- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

D. What is the difference between the sand under the ice block and the sand not under the ice block?

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E. Measure the depth of the water now at the deepest point\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mm

What was the depth of the water yesterday? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mm

Calculate the rise in water level\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mm

How close was your prediction to the actual rise in water level? (You predicted the rise in water level yesterday on student activity sheet 1)

**Observations and Questions:** *Answer the following using complete sentences with a restate.*

1. What does the block of ice represent?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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2. Refer to step D on day 2. What would happen to the surrounding environment when the water level rises due to glaciers melting?

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3. Using your text book describe the salinity of seawater. How does the melting of sea ice affect the salinity of seawater in Polar Regions? (g. 413-414) (2 points)

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4. If global warming continues and Earth’s temperature continues to rise, what factors most likely would be the cause?

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