

## *DESCRIBING AND MEASURING THE OCEANS*

### OVERVIEW

Students will establish miniature simulated “oceans” by using various sized empty boxes located inside and outside the classroom. Students will measure and record (in metric units) the temperature and depth of the different oceans. They will discuss some of the *physical factors* by which oceans are described (temperature and depth), and the way in which physical factors influence living communities.

### CONCEPTS

- Oceans are described by a series of physical measurements that include, among other things, *temperature* and depth.
- Each animal has a range of physical factors for which it is adapted.

### MATERIALS

- 3 to 5 different sized boxes with lids (shoe box to TV size), or (optional) 3 to 5 boxes of the same size and enough sand to change the depth of the boxes
- 3 to 5 lengths of string
- 3 to 5 small weights (washers or nuts work well)
- 3 to 5 thermometers
- One worksheet per group
- Measuring tape or rulers
- Black plastic, foil, styrofoam (optional)

### PREPARATION

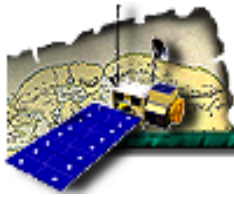
This activity works best with younger students.

Note that in this activity, the “ocean” boxes do not actually contain any water. This is because they will heat and cool more quickly with only air, and because the activity will be easier and less messy.

Cut the string into lengths that are longer than the tallest box. Tie a small weight to one end of each. The students will use this as a lead line to measure the depth of the “ocean” box. Number each box and cut a hole just large enough to insert the string and the thermometers. An hour before conducting the activity students should distribute the closed boxes in different areas in and around the classroom. Find areas that vary in temperature: in the sun, near a heater, outside, and near the door. Divide the class into as many groups as you have boxes and distribute one worksheet, one thermometer, and one string to each group.

Optional: Fill the same-sized boxes with varying amounts of sand to change the depth of each “ocean.” Then rearrange such that the depth is not known by looking at the outside of the box.

Another option: Wrap some of the boxes in black plastic, foil, or styrofoam. Then keep all the boxes near a window. The internal temperatures should differ because of each box’s outer “coating.”



## PROCEDURE

### Engagement

Scientists can compare different places in the ocean by measuring the physical parameters that define the study areas. The physical, or *abiotic*, factors that are measured can include temperature, depth, *salinity*, *pH*, clarity, dissolved oxygen, and currents. These factors are important because animals are adapted to live in certain areas. In this activity, you will measure two physical factors of an “ocean” box (temperature and depth) and then use that data to determine where an animal will live.

### Activity

1. To measure depth, lower the weighted string through the hole in the box until it hits the bottom. With the string taut, use your finger to mark the spot on the string that is even with the lid (the surface of the “ocean”). Pull the string out and measure the string from this point to the weight and record the depth on the data sheet.
2. To measure temperature, insert the thermometer through the hole in the top of the box. Hold the thermometer there for at least one minute. Record the temperature in Celsius on the data sheet. If you use a Fahrenheit thermometer, use the conversion diagram to convert to Celsius.
3. Start at one of the boxes and measure the temperature and depth and record the information on the data sheet. Rotate to the next box and record the temperature and depth measurements. Continue until you have collected data on all of the boxes.
4. When you have collected all of your data, compare the measurements from all of the boxes. How do the oceans differ? Why do they differ? Use your data to decide if the sample fish [Fig. 1] could live in your ocean.
5. Discuss how this activity relates to the ocean. What other abiotic factors in the ocean influence life? What would happen to the plants and animals that live within a specific set of conditions if any or all of these conditions change?

### Explanation

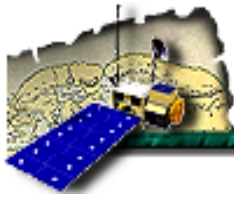
Oceans are different all around the world. Scientists use a variety of physical measurements to describe how one ocean differs from another (or even how areas within an ocean are different). Some of the parameters that are used to describe the ocean include: temperature, depth, salinity, pH, clarity, dissolved oxygen, and currents. By measuring these different physical factors (abiotic factors), we can begin to compare different areas in the ocean and quantify changes.

Different animals are adapted to survive within a specific range of physical factors. Some fish, for example, are adapted to live within a temperature range of 23° - 27°C. Measuring and describing the abiotic environment help us to understand the *biotic* (living) communities.

### EXTENSION

Watch the movies of biologists measuring other physical factors in the ocean. Besides temperature and depth, what abiotic factors influence life?

Discuss the impacts that two dramatic events--one natural and one human-related--might have on abiotic conditions: for example, El Niño (natural) and an oil spill (human-related). How might associated changes in abiotic factors affect animals in the area? Of your two chosen events, which has the greater potential to change abiotic conditions? In general, which is harder to control: natural or human-related events?



# Visit to an Ocean Planet



## LINKS TO RELATED CD ACTIVITIES, IMAGES, AND MOVIES

- Movie of *Taking thermometer/temperature measurements in the ocean.*
- Movie of *Taking dissolved oxygen measurements in the ocean.*
- Movie of *Taking pH measurements in the ocean.*
- Movie of *Taking Secchi disk/clarity measurements in the ocean.*

## VOCABULARY

*abiotic*

*biotic*

*pH*

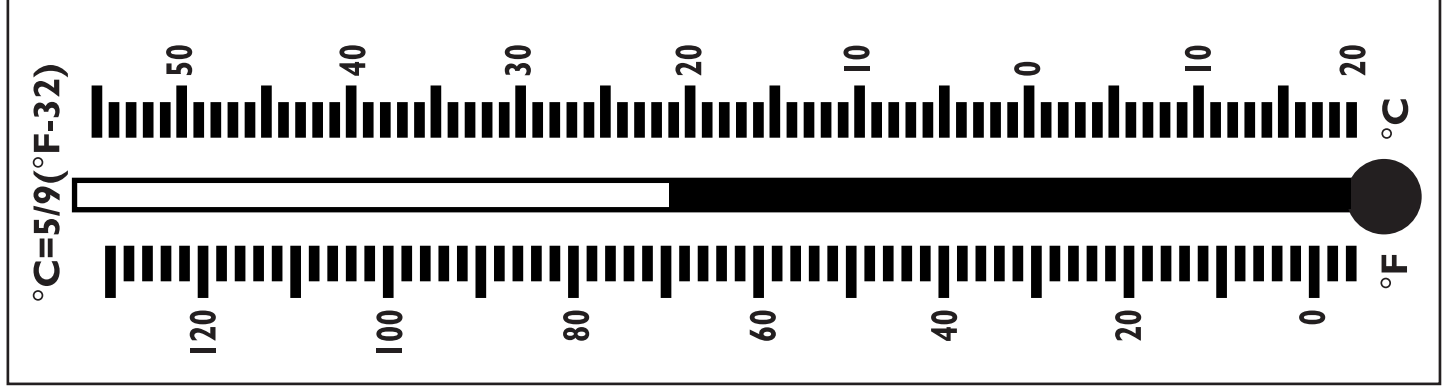
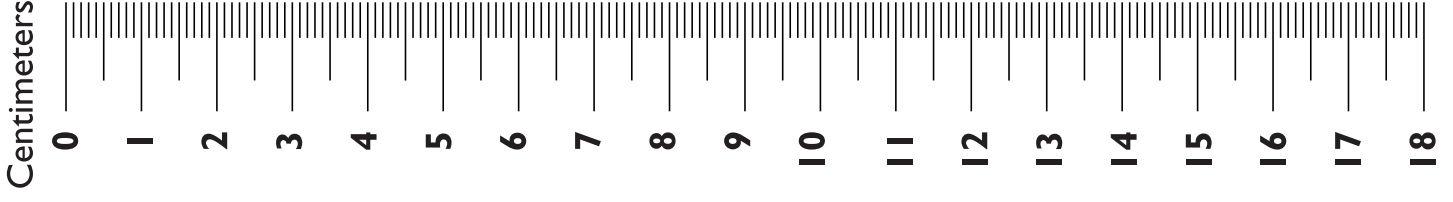
*physical factors*

*salinity*

*temperature*

## SOURCE

Adapted from Blanchard, Linda and Harry Helling. Orange County Marine Institute Curriculum Series. Orange County Marine Institute. Dana Point, CA. 1993.



**DATA SHEET FOR "CLASSROOM" OCEANS**

OCEAN BOX #	LOCATION	°F	°C	DEPTH (CM)
1				
2				
3				
4				
5				

CUT OUT AND GIVE TO EACH GROUP

## Fish CARD

**PHYSICAL FACTORS**  
 Temperature 18° – 24°C  
 Depth 23 – 27 cm



"CARDBOARD BOX FISH"