Khaled bin Sultan Living Oceans Foundation

STANDARDS

- **CCSS**: RST.9-10.1, 2, 3, 4, 5, 7, 8, 10; RST.11-12.1, 2, 3, 4, 8, 10; SL.9-10.1, 6; SL.11-12.1, 6; HSN.Q.A.1; HSA.CED.A.1, 4
- **NGSS**: ESS 2.A, ESS 2.C, ESS 2.D, HS-LS2-2, HS-LS2-6
- **OLP**: 1.B.1, 1.C.1, 1.C.7, 1.C.8, 1.C.9, 1.C.11

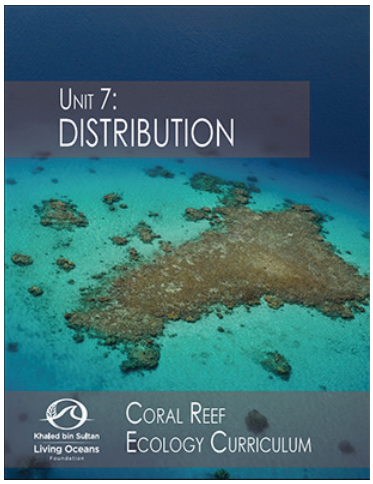
ONLINE CONTENTS

- Distribution Quiz
- *Where Are Coral Reefs Found?* Video Although corals are found throughout the planet, most reef-building corals are found in the tropics and subtropics where thousands of animals make these reefs their home.

DISTRIBUTION

This lesson is a part of the *Distribution* unit, which explains the two major drivers of coral distribution: salinity and temperature. Below is a summary of what is included in the entire unit.

UNIT CONTENTS



A. Background Information
   - Where are Corals Found?
   - What is a Current?
   - What is Density?
   - Salinity, Temperature, and Ocean Circulation

B. Lessons

Watch it! Where are Corals Found?
- A worksheet to accompany the *Where are Corals Found?* video

Density 101
- A lab to calculate and compare densities of liquids

Inquiring about Density 1
- A lab to create a procedure to determine relative densities

Inquiring about Density 2
- A lab to create a procedure to determine actual densities

Go With the Flow
- A worksheet to accompany a teacher demonstration on how salinity and temperature affect water density

Read it! Galapagos Ocean Currents
- A worksheet to accompany the *Galapagos Ocean Currents* field blog

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LESSON 1 DENSITY 101

OBJECTIVE:
Find the density of the unknown liquids.

MATERIALS:
- 5 unknown liquids
- 100 mL graduated cylinder
- Scale
- Safety goggles

PROCEDURE:
1. There are 5 stations. Each station has a different unknown liquid labeled #1-5. Follow the same procedure for each of the liquids. Record all data in *Table 1*.
2. Measure and record the mass of the empty graduated cylinder in grams.
3. Put 10 mL of the liquid in the graduated cylinder. Record the exact volume of the liquid.
4. Measure and record the mass of the graduated cylinder and liquid together.
5. Subtract the mass of the empty graduated cylinder from the mass of the graduated cylinder and liquid. This will give you the mass of the liquid.
6. In order to find the density, use the equation D = m/V.

   REMEMBER: All measurements need to be recorded in the units listed below.

TABLE 1:

	Unknown #1 Fresh Water	Unknown #2 Apple Juice	Unknown #3 Diet Soda	Unknown #4 Salt Water	Unknown #5 Soapy Water
Volume of liquid (mL)					
Mass of the empty graduated cylinder (g)					
Mass of the graduated cylinder and liquid (g)					
Mass of the liquid (g)					
Show density calculation (include units)					
Density of the liquid (g/mL)					

PART A:

INSTRUCTIONS: Answer each of the following questions based on your results.

1. Which liquid has the greatest density?

2. Which liquid has the least density?

3. Do the graduated cylinders contain the same liquids? Why?

4. Based on your results, draw a diagram that represents each of the different densities of the liquids. Use figure 7-3 in the *Background Information* as an example. The diagram does not need to be an exact representation.

UNKNOWN #1:

UNKNOWN #2:

UNKNOWN #3:

UNKNOWN #4:

UNKNOWN #5:

PART B:

INSTRUCTIONS: Solve each of the density word problems below. Show all work and remember to include units of measurement.

1. Calculate the density of a liquid if 50.00 mL of the liquid has a mass of 78.26 g.

2. What is the volume of 50.00 g of honey, if honey has a density of 1.36 g/mL?

3. Calculate the mass of vinegar if it has a density of 1.01 g/mL and a volume of 111 mL.

4. 30.0 mL of methanol has a mass of 23.7 g and 30.0 mL of benzene has a mass of 26.29 g. Which liquid is more dense? Is there a relationship between density and mass when there is a fixed volume?