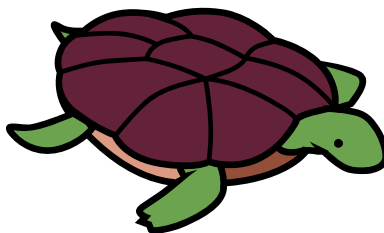


Title: Where is its shell?



Subject: Earth Science, Biology

Grade Level: 9th – 12th

Rational or Purpose: This activity aims to show difference of exerting pressure on hard and soft shell of sea or marine turtles. This would help students understand how leatherback turtles adapt to their environment.

Materials needed:

- Chicken eggs (1 per group)
- Storage bags (1 per group)
- Gloves
- Water

Lesson Duration: 20 minutes

TEKS Objectives:

6.1(C), 6.2(A), 6.2(B), 6.2(C), 6.2(D), 6.2(E), 6.4(A), 6.4(B), 6.6(B), 6.10(A), 6.10(C), 6.12(A)

7.1(A), 7.2(A), 7.2(B), 7.2(C), 7.2(D), 7.2(E), 7.4(A), 7.11(B)

8.2(A), 8.2(B), 8.2(C), 8.2(D), 8.2(E), 8.4(A), 8.11(A)

CONNECTIONS TO AP

AP Biology

III. Organisms and Populations: B. Structure and Function of Plants and Animals
1. Reproduction, growth, and development 2. Structural, physiological, and behavioral adaptations 3. Response to the environment

AP Environmental Science:

I Scientific Analysis, II ; II Interdependence of Earth's Systems: Fundamental Principles and Concepts, D. The Biosphere

Background Information

Leatherback sea turtles differ from other sea turtles because they do not have a scaled shell for protection. The skin is so soft that it may bleed when we scratch with our finger nails. The soft skin is a biological adaptation to their living environment. Since they may

deep in an ocean where water pressure is huge, having a shell would disfavor them from survival.

Activity

This activity will be divided into two parts. The first part of the activity will expose students to the concept of pressure. Students will feel how water exerts pressure onto their hands with a plastic bag that acts as a glove. They will share and discuss their own experiences in class. The second part of the activity is to compare tolerance of pressure between soft and hard materials, in this case a plastic bag with water and an egg shell. Students will visually experience the egg shell's susceptibility to pressure. This will help explain why leatherback turtles do not have a hard shell. This physiological adaptation has a lot to do with their living environment and habits.

Procedure

See attached teacher-version worksheet.

Where is its shell?

Name: _____

Date: _____

Class Section: _____

What is the major physiological difference between *Leatherback* turtles and other sea turtles?

For this activity, we focus on the shell of turtles. It will be useful to prepare images of a leatherback turtle and other sea turtles for students to compare.

Every physiological feature of a living organism is used to adapt to its living environment. Before going into details on the leatherback turtle's physiological features, we should understand its living environment and characteristics first.

Date	Day/Night	Total Dive Duration (min)	Total Surface Duration (min)
May 4	D	628.00	92.00
May 4	N	645.43	74.57
May 5	D	640.00	80.00
May 5	N	620.80	99.20
May 6	N	615.60	104.40
May 7	D	566.10	153.90
May 7	N	629.33	90.67
May 8	D	644.40	75.60
May 8	N	648.00	72.00
May 9	D	619.40	100.60
May 9	N	646.00	74.00
May 10	D	614.17	105.83
May 10	N	646.00	74.00
Average		627.94	92.06

Does leatherback turtle spend most of the time under or above water?

Under water

What is the percentage of time that leatherback turtle spends under water *on average* in 12 hours?

$$\begin{aligned} \text{\% of time spend under water} &= [(\text{time spend under water}) / (\text{total time})] * 100\% \\ &= [627.94 \text{ min} / (627.94 \text{ min} + 92.06 \text{ min})] * 100\% \\ &= 0.8721 * 100\% \\ &= 87.21\% \end{aligned}$$

Where is its shell?

Activity 1

Direction:

1. You will put a plastic bag on one hand to act as a glove and use a rubber band to tighten the opening.¹
2. On the other hand, prepare a bucket of water.
3. The student with the “glove” on will immerse his/her hand into the bucket *right below the surface*. Try to memorize how the water feels. You will do a comparison with this feeling later on.
4. Then, the student will immerse his/her hand to the bottom of the bucket.

What is the difference, in terms of *feeling*, between your hand right below the surface and at the bottom of bucket?

Students are expected to feel that water is pressing onto their hands when they immerse deeper into the bucket.

What is causing this difference? How do you know that?

Water. If students are not able to answer this question, you can compare two situations, one is the hand with plastic bag in the air, and the other is the hand with plastic bag in the water. This comparison (with the aid of drawing) should help students understand that it is water that exerts pressure on their hands.

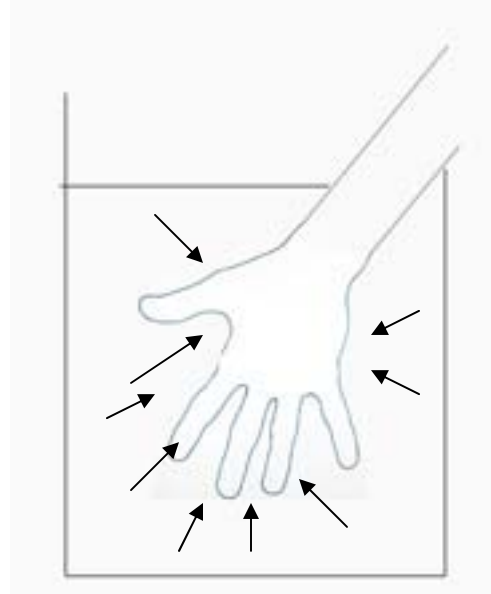
On the diagram, draw arrows to represent the direction of “pushing” in the water.

What is the “pushing” formally called?

Pressure

Does it become greater or smaller when the water is deeper?

The pressure becomes greater when the water is deeper.



¹ Any plastic bag from grocery store will work for this activity. Make sure the rubber band is tight enough to avoid water draining into the plastic bag.

Where is its shell?

Activity 2

Directions:

1. Half-fill a plastic food storage bag.
2. Leave some air in the plastic bag and tightly knit the opening of storage bag.
3. Put the bag on a tray.
4. Put your hand onto the bag and slowly press it down.

Do you think the bag will break at this time? If no, when do you think it will break?

5. Continue to press the bag.
6. If you press very hard and the bag does not break yet, you have performed the first half of activity very successfully.
7. Remove the plastic bag and put an egg on the tray.
8. Put your hand (with *thick gloves*) on top of the egg, but DO NOT press it.

Do you think the egg will break when you press it? If no, when do you think it will break?

9. Slowly press the egg.
10. When the shell begins to crack, you can stop the activity. You have completed the second-half of activity.

Which is easier to break, *plastic bag* or *egg*?

Egg

Which one can tolerate a greater pressure?

Plastic bag

Can you apply this activity to explain the physiological difference between leatherback turtles and other sea turtles?

Soft material tends to tolerate greater pressure than hard materials. One of the reasons that leatherback turtles do not have a hard shell because their soft skin can tolerate greater pressure when they dive deeply.

Where is its shell?

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Date: _____

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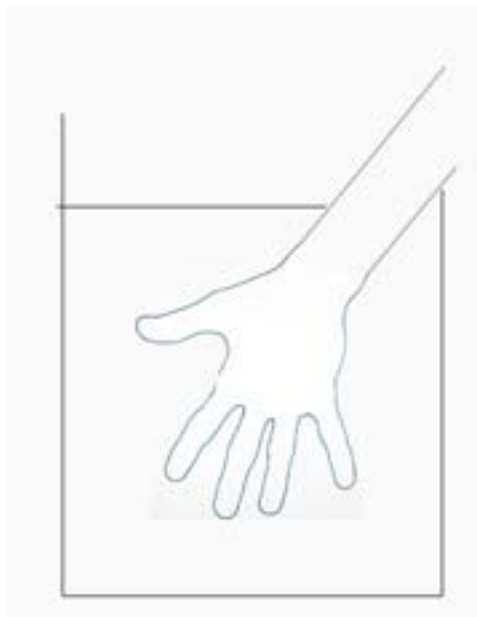
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