



SCUBA Science



Grade Level: 3-8

Class Size: 30-40

Class Length: 45min-1hr

Class Summary

Students will understand the definition of SCUBA, explore buoyancy, and investigate SCUBA equipment and its functions.

Objectives:

Students will:

- Define SCUBA
- Identify positive, negative and neutral buoyancy
- Explore SCUBA equipment and its functions

Concepts:

- SCUBA
- Animal buoyancy control
- Diver buoyancy control



Background:

Humans have been diving into the water ever since the beginning. As terrestrial animals, however, humans are not adapted for life in the water. When we want to enter the underwater world, we need special equipment that allows us to see, breathe, and swim.

SCUBA commonly refers to two things: the activity of diving under water with the aid of a breathing apparatus and swimming gear; and the equipment used in swimming underwater.

SCUBA stands for **Self-Contained Underwater Breathing Apparatus**, an apparatus allowing the diver to breathe air compressed into a tank.

Buoyancy is the force that causes objects to float. Aquatic animals may be neutrally buoyant (neither sinks nor floats), positively buoyant (floats), or negatively buoyant (sinks). Animals control their buoyancy using different methods: swim bladders, oil-filled livers or lung volume.

Divers must use special equipment to control their buoyancy while underwater.

The WAVE Foundation is an independent, educational foundation at the Newport Aquarium created to further the Newport Aquarium's efforts in educating communities and students about marine life and the conservation of natural resources and habitats. The WAVE Foundation is designated as a 501(c)(3) organization and encompasses and embraces conservation, education, and volunteerism.



SCUBA SCIENCE PRE-LESSON ASSESSMENT

1. What is buoyancy?
2. Name an animal that floats in water.
3. Name an animal that sinks in water.
4. What part of your body do you use to control your buoyancy?
5. Which of the following objects will sink or float?
(Circle your answer.)
 - a. Ocean liner - 50,000 tons
 - b. Penny - 2.5 grams
 - c. Aluminum cylinder (filled with air) - 40 pounds
(Scuba tank)
 - d. Aluminum cylinder (empty) - 35 pounds
(Scuba tank)
6. What is one thing you would like to learn about SCUBA diving?





SCUBA SCIENCE VOCABULARY

Archimedes Principle - Any object wholly or partly immersed in a fluid is buoyed up by a force equal to the weight of the fluid displaced by the object.

BCD - Buoyancy Control Device

Buoyancy - the force that causes objects to float.

Displace - to move physically out of position (as a floating object displaces water)

Displacement - the volume or weight of a fluid (such as water) displaced by a floating body (such as a ship) of equal weight

Positively buoyant - when an object displaces an amount of water weighing more than its own weight; it floats

Negatively buoyant - when an object displaces an amount of water weighing less than its own weight; it sinks

Neutrally buoyant - when an object displaces an amount of water weighing equal to its own weight; it neither floats nor sinks.

Regulator - Reduces the scuba tank's high pressure air to match the surrounding water pressure, regulates the air flow.

S.C.U.B.A. - Self Contained Underwater Breathing Apparatus; invented

Snorkel - An alternate breathing apparatus used when floating on the surface



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SCUBA SCIENCE POST-LESSON ASSESSMENT

1. What is buoyancy?
2. Name an animal that floats in water.
3. Name an animal that sinks in water.
4. What part of your body do you use to control your buoyancy?
5. Which of the following objects will sink or float?
(Circle your answer.)
 - a. Ocean liner - 50,000 tons
 - b. Penny - 2.5 grams
 - c. Aluminum cylinder (filled with air) - 40 pounds
(Scuba tank)
 - d. Aluminum cylinder (empty) - 35 pounds
(Scuba tank)
6. What is one new thing you learned about SCUBA diving?





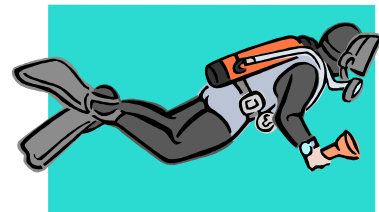
SCUBA SCIENCE

POST-LESSON ASSESSMENT

ANSWER KEY

1. What is buoyancy? Buoyancy is the force that causes objects to float.

2. Name an animal that floats in water.
Penguins, etc



3. Name an animal that sinks in water.
Sting rays, etc

4. What part of your body do you use to control your buoyancy?
Lungs

5. Which of the following objects will sink or float?
(Circle your answer.)

e. Ocean liner - 50,000 tons

SINK FLOAT

f. Penny - 2.5 grams

SINK FLOAT

g. Aluminum cylinder (filled with air) - 40 pounds
(Scuba tank)

SINK FLOAT

h. Aluminum cylinder (empty) - 35 pounds
(Scuba tank)

SINK FLOAT

6. What is one new thing you learned about SCUBA diving?



SCUBA SCIENCE CROSSWORD PUZZLE

Use your vocabulary list to fill in the crossword puzzle

Across

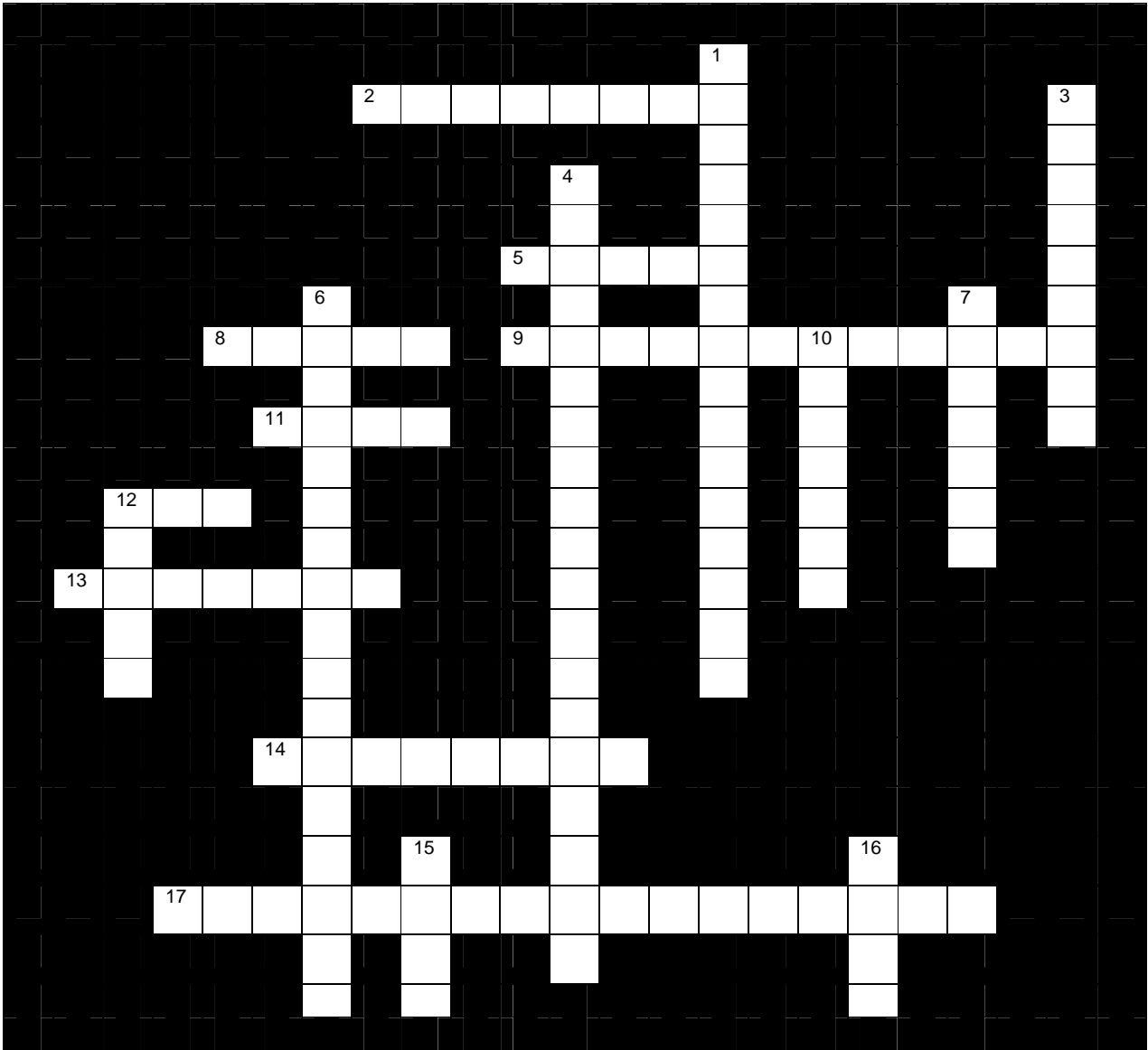
2. To move physically out of position.
5. Self contained underwater breathing apparatus
8. An item that is positively buoyant will _____
9. The volume or weight of a fluid displaced by a floating body of equal weight.
11. An item that is negatively buoyant will _____
12. A vest-like device used to help control buoyancy when scuba diving.
13. An alternate breathing apparatus used when floating on the surface.
14. The force that causes objects to float.
17. An object that sinks is _____

Down

1. An object that neither sinks nor floats is said to be _____
3. Regulates air flow
4. Any object, wholly or partly immersed in a fluid is buoyed up by a force equal to the weight of the fluid displaced by the object.
6. An object that floats is said to be _____
7. Helps keep you warm
10. Keeps you going in the right direction
12. What you get if you surface too quickly.
15. Provides a large surface area to help you swim.
16. Light behaves differently in water than in air, so scuba divers must wear a _____ to help them see underwater.



SCUBA SCIENCE CROSSWORD PUZZLE





SCUBA SCIENCE CROSSWORD PUZZLE (Answer Key)

Across

2. To move physically out of position. **Displace**
5. Self contained underwater breathing apparatus **SCUBA**
8. An item that is positively buoyant will **float**.
9. The volume or weight of a fluid displaced by a floating body of equal weight.
displacement
11. An item that is negatively buoyant will **sink**.
12. A vest-like device used to help control buoyancy when scuba diving. **BCD**
13. An alternate breathing apparatus used when floating on the surface.
snorkel
14. The force that causes objects to float. **buoyancy**
17. An object that sinks is **negatively buoyant**

Down

1. An object that neither sinks nor floats is said to be **neutrally buoyant**
3. Regulates air flow **regulator**
4. Any object, wholly or partly immersed in a fluid is buoyed up by a force equal to the weight of the fluid displaced by the object. **Archimedes' Principle**
6. An object that floats is said to be **positively buoyant**
7. Helps keep you warm **wetsuit**
10. Keeps you going in the right direction **compass**
12. What you get if you surface too quickly. **bends**
14. Provides a large surface area to help you swim. **fins**
16. Light behaves differently in water than in air, so scuba divers must wear a **mask** to help them see underwater.



SCUBA SCIENCE QUESTIONS FOR THE DIVER

During your visit, you may have the opportunity to speak with one of our SCUBA divers using an underwater communication device. As a group, come up with a total of five questions to ask the diver during the dive presentation.

1.)

2.)

3.)

4.)

5.)



SCUBA SCIENCE SCAVENGER HUNT

Find animals in each gallery that are positively, neutrally, or negatively buoyant.

Negative

Positive

Neutral

World Rivers

Shore Gallery

Bizarre & Beautiful

Dangerous & Deadly

River Bank

Frog Bog



Negative

Positive

Neutral

Rainforest

Amazon Tunnel

Coral Reef Tunnel

Surrounded By Sharks

Shark Central

Kingdom of Penguins



SCUBA SCIENCE BUOYANCY LAB

Objectives: Students will understand Archimedes' principle of buoyancy which states that "any object wholly or partly immersed in a fluid is buoyed up by a force equal to the weight of the fluid displaced by the object".

Materials:

- large transparent container (approx. 4 qt.) per group
- water
- 4 - 2"x2" sheets of aluminum foil
- pennies

Procedure:

1. Split students into four groups.
2. Fill the containers just over halfway with water.

Hypothesis: Will one penny sink or float?

3. Place one penny in the water

Did it sink or float? Why?

The penny sank because it did not displace enough water to support its weight on the surface.

Hypothesis: Will a flat piece of aluminum foil sink or float?

4. Place the piece of aluminum foil on the surface of the water.

Did it sink or float? Why?

The aluminum foil floated because its weight was evenly dispersed along the surface displacing enough water to support it.

Hypothesis: Will one penny sink or float when placed on top of the aluminum foil?

5. Gently place one penny in the center of the aluminum foil.

Did it sink or float? Why?



It floated because the weight of the aluminum foil was still supported by the amount of water it displaced.

6. Continue gently placing pennies on the foil until it sinks.
How many pennies did the aluminum foil sheet support before it sank?
7. Remove foil and pennies from water.

Hypothesis: Will a piece of aluminum foil sink or float when wrapped around 10 pennies?

8. Now take a new piece of aluminum foil and wrap it tightly around 10 pennies.
9. Place the foil wrapped pennies in the water.

Did it sink or float? Why?

It sank because it was not able to displace enough water to support its weight on the surface.

Discussion:

What was learned from this experiment?

In order for an object to float, it must displace an amount of water weighing more than itself. This explains why a 50,000-ton ocean liner can float, and why a 1-ounce penny will sink.



SCUBA Science

National Science Standards (Grades 3-8)

Below is a list of National Science Standards discussed during the teaching of **SCUBA Science**.

Science as Inquiry K-4

Content Standard A: As a result of activities in grades K-4, all students should develop:

- Abilities necessary to do scientific inquiry
- Understanding of scientific inquiry

History and Nature of Science K-4

Content Standard G: As a result of activities in grades K-4, all students should develop understanding of:

- Science as a human endeavor

Science as Inquiry 5-8

Content Standard A: As a result of activities in grades 5-8, all students should develop:

- Abilities necessary to do scientific inquiry
- Understanding of scientific inquiry

History and Nature of Science 5-8

Content Standard G: As a result of activities in grades 5-8, all students should develop understanding of:

- Science as a human endeavor
- Nature of science
- History of science

The NSES publication (ISBN 0-309-05326-9) can be viewed at

<http://books.nap.edu/html/nses/html/index.html>.

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