4th-5th Grade

SCIENTISTS ON THE GO

Ever Wonder What Is the Matter?

You are surrounded by matter! Matter is a substance that has weight and takes up space. It can be in the form of solids, liquids, and gases. How does the matter look, feel, or act? Matter has properties that can be measured:

Color – *What color is it?*

Hardness – *How difficult is it to scratch?*

Malleability – *How easily can it be shaped?*

Smell – *How does it smell?*

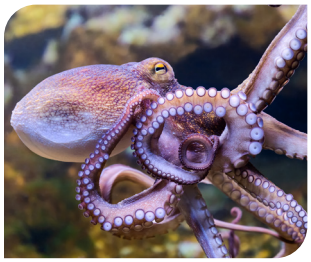
Reflectivity – *Will a light shine off it?*

Conductivity – *How well is heat or electricity transported?*

Magnetism – *Does it react with a magnet?*

Solubility – *Will it dissolve in water?*

Dive into a marine ecosystem to see what matter you can find! Answer yes or no if the image is an example of matter and write how you know. *Hint: Does it have weight and take up space?*



Octopus

Is it matter? _____

How do you know?

_____

_____

Air Bubbles

Are they matter? _____

How do you know?

_____

_____

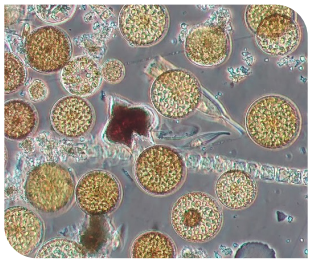
Heat

Is it matter? _____

How do you know?

_____

_____



Plankton

Is it matter? _____

How do you know?

_____

_____

Kelp

Is it matter? _____

How do you know?

_____

_____

Light

Is it matter? _____

How do you know?

_____

_____

Water

Is it matter? _____

How do you know?

_____

_____

Seastar

Is it matter? _____

How do you know?

_____

_____

A Fizzy Situation · Mixing Acids and Bases

All of the matter around us – whether solid, liquid, or gas – is made of molecules. Sometimes molecules or substances react with one another, causing a chemical reaction and forming new substances. While molecules may be too tiny to see, we can still observe when reactions take place. Think about the gas bubbles that form when baking soda (base) and vinegar (acid) mix.

When atmospheric carbon dioxide dissolves into the ocean, it reacts with seawater making the water more acidic. Marine scientists are studying how this change affects marine life with shells.

Follow along to see what happens when shells are placed in an acidic solution.

Experiment: What Happens to Shells in an Acidic Solution?

Write a Hypothesis

- What do you think will happen when shells are placed in water?

_____

_____

- What do you think will happen when shells are placed in diluted or pure vinegar (an acid)?

_____

_____

Experiment Directions

Materials	
3 clear cups	Measuring cup
Vinegar	3 egg or shellfish pieces
Water	
Tape	Pen

1. Gather your materials.
2. Label 3 cups like the image below with the words: Water, 50:50 Water:Vinegar, and Vinegar.
3. In jar 1 add ½ cup water. In jar 2 add ¼ cup water + ¼ cup vinegar. In jar 3 add ½ cup vinegar.
4. On the results page, trace each shell fragment and describe its properties. Then, place carefully into the correct jar.
5. Start observing the shell. Record observations at the start, after 5 minutes, and after 24 hours.
6. After 24 hours, remove the shell from jar 1. Gently dry it with a towel. Place shell on top of its previous outline and re-trace. Press down on the shell to see if the properties changed. Record your results. Repeat for shell 2 and shell 3.

Data Collection and Results

Record your data at the start, after 5 minutes, and after 24 hours. Follow the observation instructions below to see how the shells change over time in the different solutions.

Jar 1: Water

Trace the shell

Observations

Before: Describe the shell's properties of hardness and color.

After 5 minutes: What do you notice?

After 24 hours: What do you notice?

After 24 hours: How have the shell's properties changed? Does it bend, crumble, or feel the same?

Jar 2: Water & Vinegar

Trace the shell

Observations

Before: Describe the shell's properties of hardness and color.

After 5 minutes: What do you notice?

After 24 hours: What do you notice?

After 24 hours: How have the shell's properties changed? Does it bend, crumble, or feel the same?

Jar 3: Vinegar

Trace the shell

Observations

Before: Describe the shell's properties of hardness and color.

After 5 minutes: What do you notice?

After 24 hours: What do you notice?

After 24 hours: How have the shell's properties changed? Does it bend, crumble, or feel the same?

Discussion questions on next page.

Observe the chemical reaction

Draw a picture of the shell after placing into vinegar.

Label the 3 forms of matter: Solid, Liquid, Gas.

What are the gas bubbles made of?

_____

What is happening?

Shells are made of calcium carbonate. When the shells sit in the acidic solution, vinegar, there is a chemical reaction! The shells dissolve and carbon dioxide gas (the bubbles) is produced. In the process, the shells change size and texture as the calcium carbonate reacts with the vinegar.

Experiment Discussion Questions

Now that you've gathered your results about how the shells changed in the three liquids, answer the following discussion questions.

1. What did you observe soon after adding the shell to the vinegar solutions?

   _____

   _____

2. What did you observe after 24 hours?

   _____

   _____

3. What are three shelled animals that live in the ocean and could be affected by acidic water?

   a. _____ b. _____ c. _____

4. What do you think might happen to some shelled animals if the ocean absorbs more carbon dioxide and becomes more acidic? *Hint: Think about what happen to your shell in vinegar.*

   _____

   _____

5. The vinegar water was more acidic than ocean water. Do you think the chemical reaction in your experiment went slower, the same, or faster than what happens to shells in the ocean? Explain your answer.

   _____

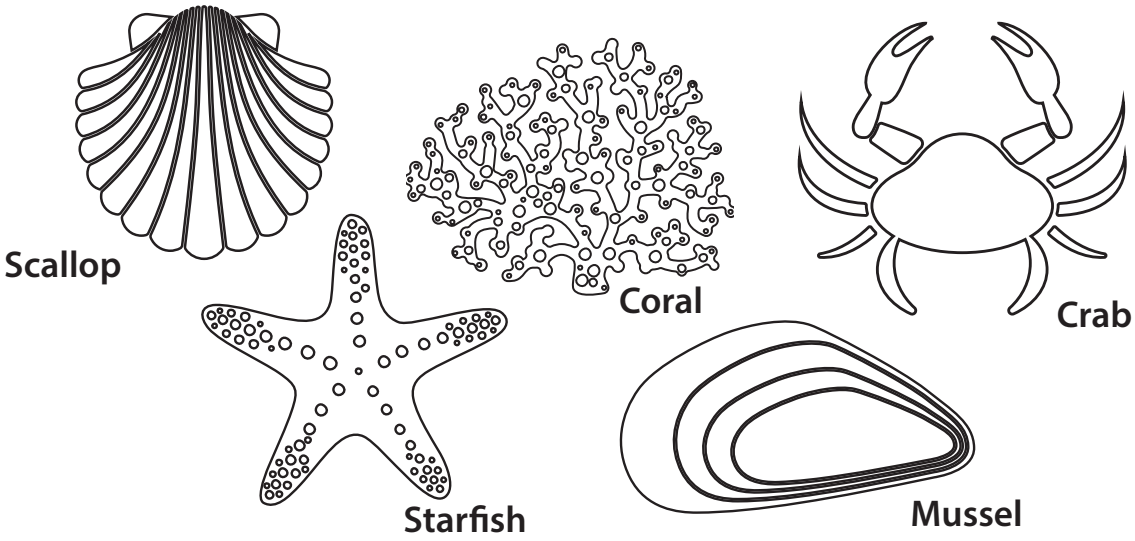
   _____

Animal Word Search

Search for animals with calcium carbonate shells or exoskeletons. The words are forwards, backwards, and up and down.

C T E N D H W P E L I L F M M
K O J L H E T A E T V Y O X W
C J C Z C E E S A I Z T R W C
O U Y C R A S H S I F R A T S
R H R O O U N E T S E Q M D P
A M P C M L Q R Y G G G I J O
L O E E H A I M A L C E N X L
D Q S V Z I T T P B S X I N L
W J Y T N R N D H U R P F P A
Z S W Y C Y E A E O G K E Y C
P O Y R G E Q S F W P Y R S S
U S A F Z Y L M S H D H A I N
X B M H H H O K W X B M O I M
G B K F T Y X L D X W F A R Q
N W J Y U T O Y S T E R X F E

COCCOLITHOPHORE
CRAB
PTEROPOD
MUSSEL
OYSTER
URCHIN
STARFISH
SCALLOP
CORAL
BARNACLE
FORAMINIFERA
CLAM



What Tools Do Scientists Use?

Scientists create hypotheses, conduct research, gather data, and share their findings. Every day you are a scientist as you ask questions and figure out the answers. Scientists study everything from the stars, how water moves, plants, to tiny matter we can't see with our eyes. Each type of scientist uses different tools for their work.

Scientists that study water quality measure the cleanliness and health of water. They use tools to study matter too tiny to see with our eyes, like plankton in the ocean and microbes in wastewater.

Read the tool description. If the tool is used by a water quality scientist, draw a line from the tool to the scientist.

Microscope Allows a close-up look at things we cannot see with our eyes alone.

Pipette
Use to measure small amounts of liquids.

Filtration Apparatus
Filters out small particles in liquids.

Water Quality Scientist

Stethoscope Listen to sounds like a heart beating and lungs breathing.

Petri Dish
A small container used to grow microbes like bacteria and germs.

Compass Helps to draw a perfect circle.

Which tool do you think is the most interesting and why?

_____

_____

_____

Take a Pledge

You too can help protect our oceans! Marine life in the ocean including plankton, salmon, sea otters, orcas, and many more depend on clean water. Water travels from where we live through storm drains on our streets into other waterways like rivers and streams. It eventually flows into Puget Sound and the ocean. The oceans are big and need each one of us to take action!

Draw a picture and write what you'll do to protect the ocean.

Actions you can take:

Pick up pet waste: Pet waste is full of harmful bacteria that can run off into our waterways.

Organize a trash cleanup: Pick up trash to prevent it from blowing or flowing into storm drains, rivers, and the ocean.

Bike or walk: These forms of transportation do not produce carbon dioxide. Plus you get exercise!

Reduce plastic use: Even if properly disposed of, plastics can end up in the oceans, becoming microplastics. Use reusable containers, carry your own straw and utensils, and select foods with the least amount of packaging.

Use less harmful soaps and cleaning products: Your wastewater goes to a treatment plant or a septic tank. Not all of the chemicals can be removed during the treatment process.

I pledge to help protect the oceans by _____

_____

_____

_____