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Understanding Life Systems

Students will explore the components, structures, and functions of cells in plants and animals. They will learn about the postulates of the cell theory and understand the role of microscopes in the study of cells. Students will also examine the roles of diffusion and osmosis and their processes within a cell. Furthermore, students will identify unicellular and multicellular organisms and investigate how they satisfy their basic life needs. They will study the organization of cells in multicellular organisms.

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Section
2

Understanding Structures and Mechanisms

Students will identify different kinds of systems and recognize smaller systems within large systems. They will discover that all systems have purposes, inputs, and outputs. Moreover, they will learn the scientific definitions of the words: energy, force, work, and efficiency, and learn to calculate how much work some simple machines do and their mechanical advantages. Students will also study the causes of heat and ways to minimize heat in mechanical systems. Furthermore, they will investigate how systems evolved in our society and how systems improved the productivity in industries.

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Section 3

Understanding Matter and Energy

Students will examine the properties of fluids including viscosity, and the relationship between buoyancy and density. They will learn to explain, using the particle theory of matter, how different states of matter vary in density. They will also calculate the density of a fluid with its mass and volume. In addition, students will study the difference between the compressibility of liquids and gases, as well as how their compressibility works in hydraulic and pneumatic systems. They will also explore the use and control of fluids in society.

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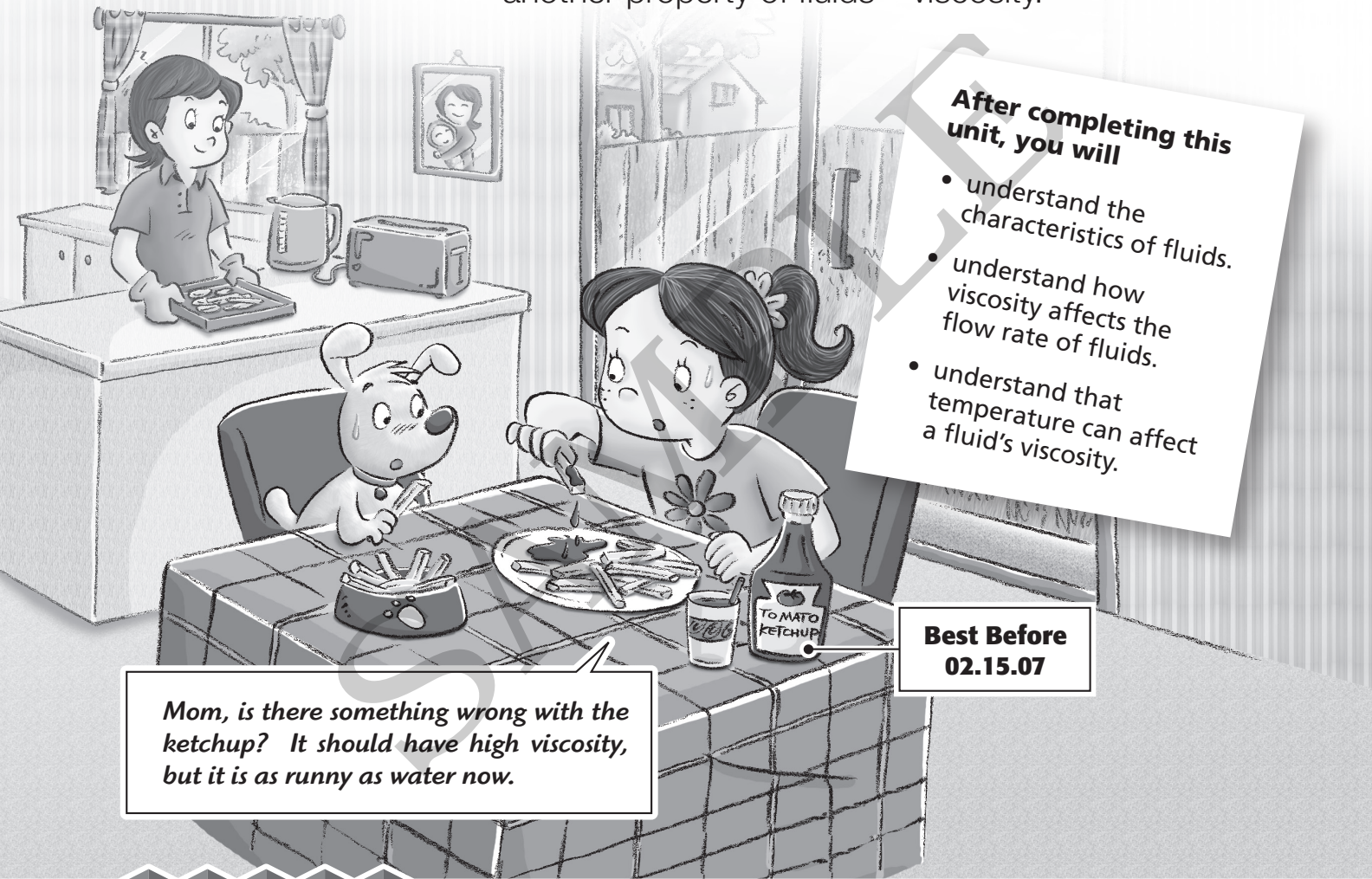
Understanding Earth and Space Systems

Students will examine the conditions under which each state of water exists and the relative amount of each state. They will learn about watersheds and water tables, their importance in water management and planning, and the impacts of nature and humans on them. In addition, students will study the characteristics of glaciers and polar ice caps, and the factors that affect their sizes. They will also learn how large bodies of water affect climate and weather patterns. The uses of our water supply and the treatments that it goes through will also be discussed.

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1 Fluids and Viscosity

You should have known fluids by certain characteristics – their ability to flow and their lack of a fixed shape. In this unit, you will identify different fluids by these characteristics, and examine another property of fluids – viscosity.

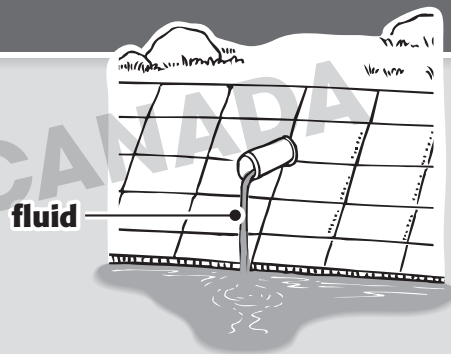


Vocabulary

fluid: any substance that flows

viscosity: thickness of a fluid

friction: resistance of movement when an object is in contact with another



Extension

You are surely familiar with these everyday words: *thick, sticky, runny, goey, stiff, and watery*, which you use to describe the thickness of drinks, soup, and other fluids. Some fluids flow fast, but some do not. Do you know what makes fluids flow at different speeds? Do fluids that flow slowly have anything in common?



Check the ones that flow slowly. Do you think they have high viscosity? Which one do you think has the highest viscosity?

Fluids

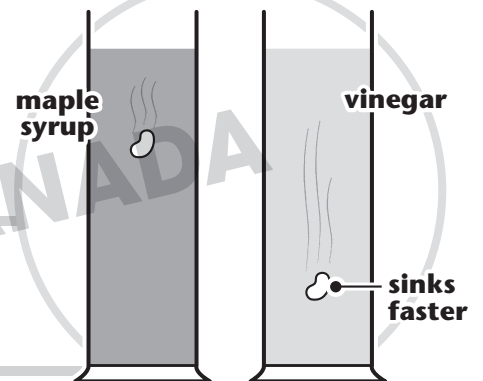
- air melted butter oil juice liquid soap
 lava honey helium egg condensed soup

A. Fill in the blanks to complete the paragraph about fluids. Then circle the correct word.

The Viscosity of Fluids

Fluids 1. _____ and do not have a fixed 2. _____. Each fluid has its own viscosity that affects its 3. _____ of flow. Viscosity is not only a measure of a fluid's 4. _____ or thinness, but also a measure of its inner 5. _____, that is, its 6. _____ to flow, and how other substances 7. _____ through it.

The inner friction of maple syrup is **greater / smaller** than that of vinegar.

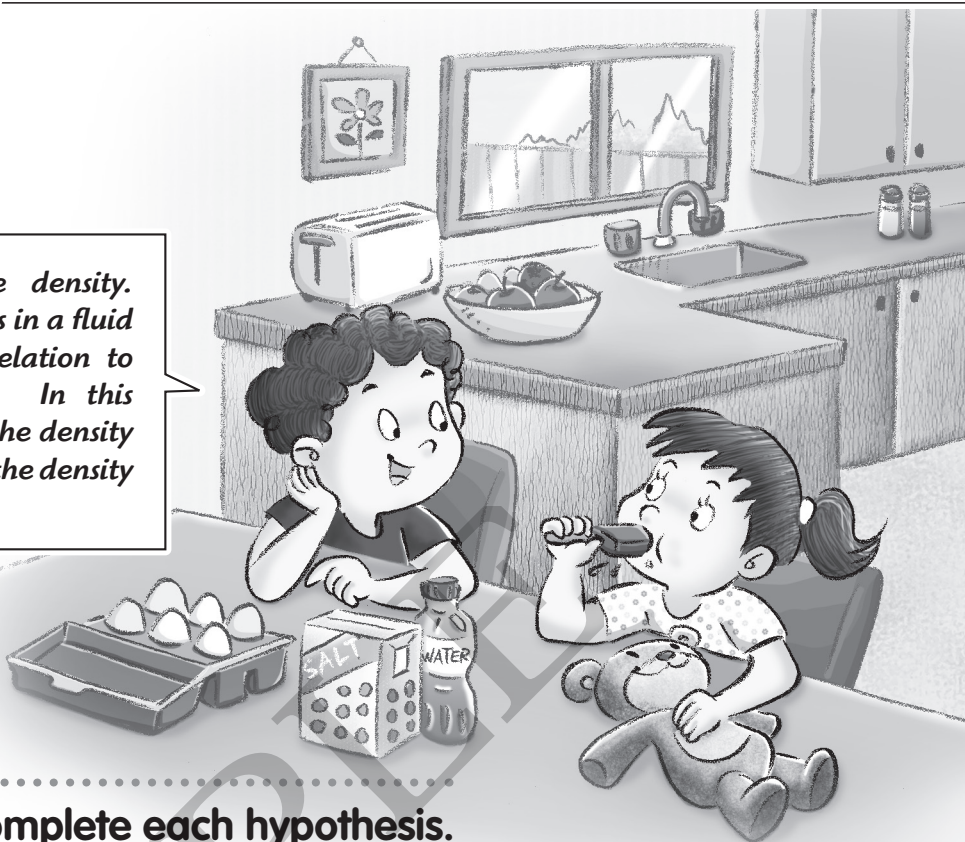




Experiment

Introduction

All solids and fluids have density. Whether a solid floats or sinks in a fluid depends on its density in relation to that of the fluid it is in. In this experiment, you'll compare the density of an egg and tap water, and the density of tap water and salt water.



Hypothesis

Circle the words to complete each hypothesis.

Experiment A A raw egg **sinks / floats** in warm tap water. Tap water is **more / less** dense than a raw egg.

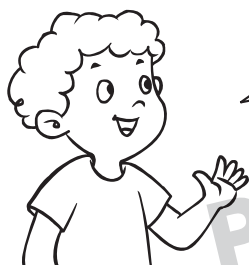
Experiment B A raw egg **sinks / floats** in salt water. Salt water is **more / less** dense than tap water.

Steps For Experiment A

1. Put the raw egg in the cup of warm tap water.
2. Record your observation.

Materials

- a raw egg
- a cup of warm tap water
- salt
- a teaspoon



Which has greater density – a raw egg or tap water?

Steps For Experiment B



1. Put the raw egg in the cup of warm water.
2. Add $\frac{1}{4}$ teaspoon of salt into the cup and observe the egg's movement.
3. Repeat step 2 until the egg moves significantly.
4. Record how much salt you added and what you observed.

Amount of salt added: _____

Observation: _____



Which has greater density – tap water or salt water? How do you know?

Result

Compare the density of a raw egg, tap water, and salt water. Which one has the highest density? Which one has the lowest?

Conclusion

Experiment A

The hypothesis was: _____

My experiment _____ the hypothesis.
supported/did not support

Experiment B

The hypothesis was: _____

My experiment _____ the hypothesis.
supported/did not support