Science Eight

Module one

Mix & Flow Matter

Name:

Date Received:

Date In:

Grade:

Science Eight

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Mix & Flow Master

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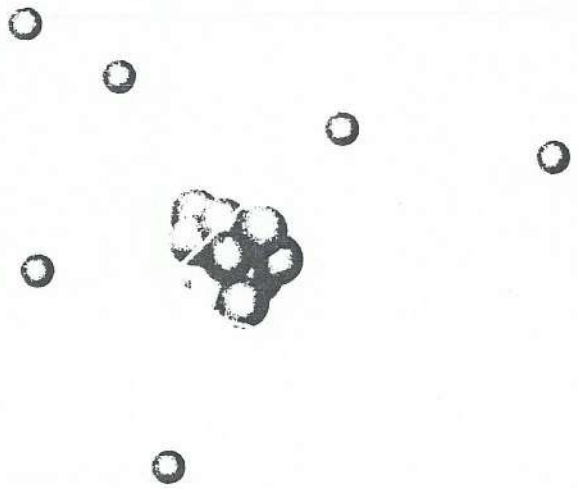
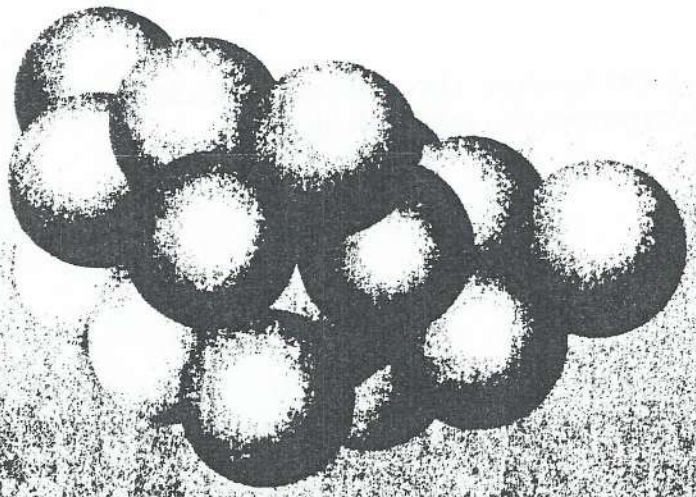
MIX AND FLOW OF MATTER





GRADE 8
TOPIC ONE

NAME

Science 8

Read through pages 8-10 of your text book and answer the following questions:

1) What are the 5 main ideas of The Particle Model of Matter?

a)

b)

c)

d)

e)

2) Describe the particles in solids. Give an example of a solid. Draw a diagram showing what the particles of a solid look like.

Part A: What is a fluid?

Many people think the word "**fluid**" means the same as "liquid." Actually, fluids can be **liquid** or **gas**. Fluids have the following characteristics:

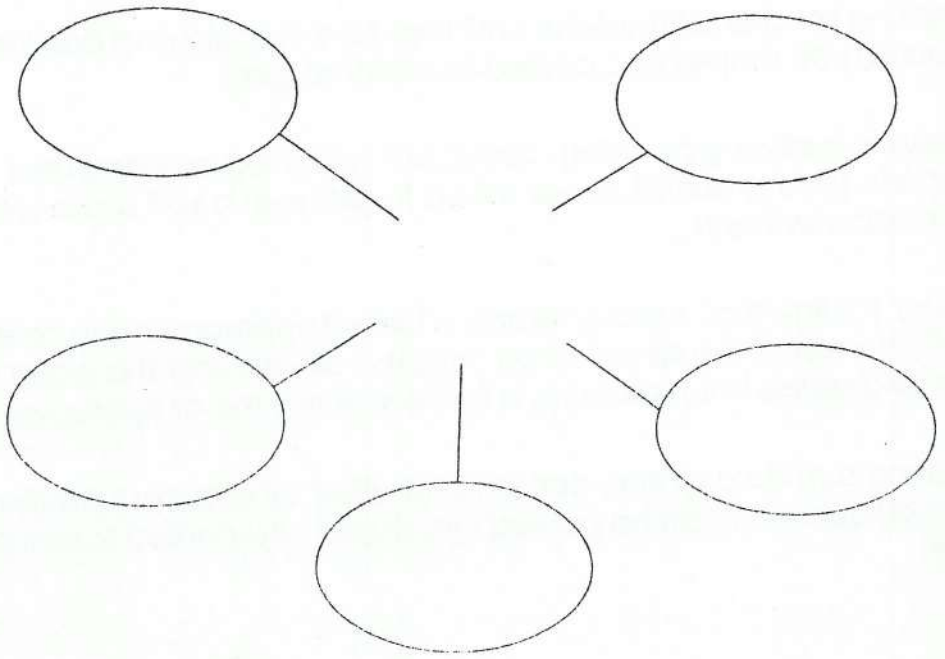
- they don't have a definite **shape**—they take the shape of whatever space or container they are in
- they are able to **flow** (move like they are being poured)
- you can easily poke your finger **into** or **through** a fluid

1. Put a check mark beside the four examples of fluids:

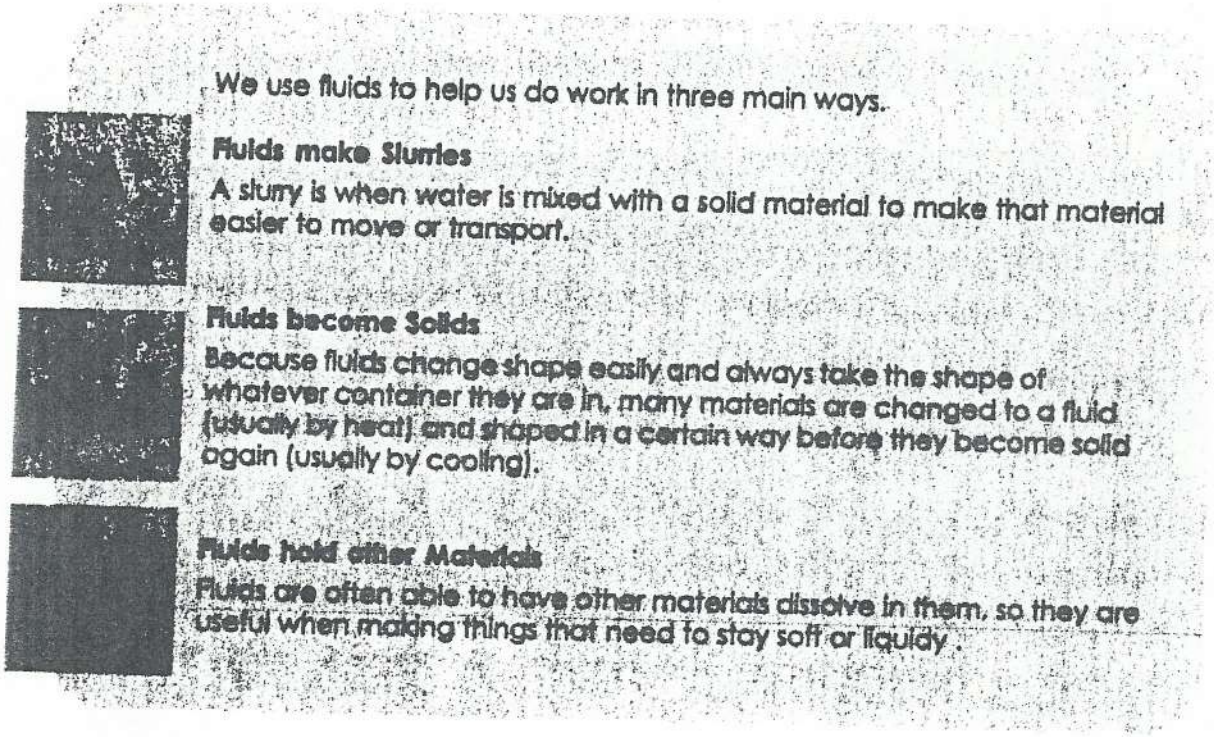
_____ water	_____ fog
_____ rock	_____ hairspray
_____ olive oil	_____ wood

Brainstorm!

2. How many other examples of fluids can you think of?



Part C: How do we use fluids to help us work?



Use the information above to help you identify how fluids are used in each of the following examples. Mark each example as A, B or C.

1. _____ using a garden hose to wash dirt and sand off the driveway

2. _____ heating sand and limestone until they form a liquid and can be poured into shapes and cooled to become glass

3. _____ bauxite (polishing powder), detergent (cleaning powder) and fluoride (strengthener) are all mixed together in a soft paste we use to clean our teeth

4. _____ water (as liquid or vapour/steam) is forced underground to "clean out" the rest of the oil out of an "empty" oil well and the water with the oil droplets in it is piped to a factory where the oil is removed

5. _____ heating a mixture of iron, carbon and other substances until they form a liquid and can be poured into shape and cooled to become steel

Use pages 13-21 of your text book to define the following terms:

Properties:

Mixture:

PureSubstance:

Homogeneous:

Solution:

Heterogeneous:

Suspension:

Emulsion:

MechanicalMixture:

Phases:

Dissolving:

Solute:

Solvent:

Soluble:

Solubility:

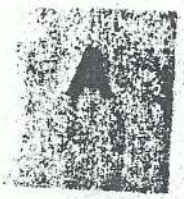
SaturatedSolution:

UnsaturatedSolution:

SupersaturatedSolution:

Part D: What is a substance?

Fluids usually fit into three categories, depending on what they are made of.

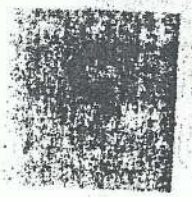


Pure Substance

A pure substance is made up of one type of matter (material), behaves in a unique way (nothing else is exactly the same) and can't be separated into different substances.

Solution

A solution is made up of two or more different materials but the particles are so small and they are mixed together so well that it is impossible to see the different particles, but they could be separated through heating or evaporation.



Mechanical Mixture

A mechanical mixture is made up of two or more different materials that can easily be separated. Depending on the size of the particles, you may or may not be able to see the different particles in the mixture.

Use the information above to help you identify whether each of the following examples is pure, solution or mechanical mixture. Mark each example as A, B or C.

1. _____ orange juice made by mixing frozen concentrate with water
2. _____ distilled water created by treating water to make sure there are no other substances in it
3. _____ iced tea made by mixing crystals of tea flavouring and sugar into water
4. _____ mouthwash contains a mixture of alcohol and flavouring
5. _____ olive oil is the natural "juice" of the fruit of an olive tree
6. _____ salad dressing made by mixing oil, vinegar and other substances has to be shaken before it is used because it separates into layers when left to stand for a while
7. _____ ketchup is made with vinegar, tomato paste, salt, sugar and other ingredients. When you "pinch" ketchup you can feel the tiny lumps and crystals in it.

Read through pages 40-68 of your text book, and answer the following questions:

1) Define the following terms:

Viscosity

Viscous

Flow Rate

2) Use the particle model to explain why some fluids can have different flow rates.

3) How do gas particles flow differently than liquid particles?

4) What happens when gas particles have low energy? What happens to viscosity?

5) What happens when gas particles gain energy? What happens to viscosity?

6) Is the viscosity of gasses effected the same way as liquids?

7) Define DENSITY

8) Explain why you cannot walk on water or air particles.

9) Why is it harder to separate particles in a solid than particles in a liquid?

10) What happens to particles when they are heated?

11) Define the following terms:

Mass

Volume

Weight

Force

Gravity

12) Write the formula used to determine the density of an object

13) Using the formula from above, determine the density of a solid that has a mass of 12g and a volume of $3g/cm^3$.

14) Define the following terms:

Buoyancy

Buoyant force

Floating

15) How do objects float?

16) Define average density, and use the term to help you explain how and why large objects (such as ships) are able to float.

17) Define Neutral buoyancy.

18) What is Archimedes' principle?

Part E: How do fluids behave?

Before you continue, it's important to learn some of the key words that will be used in the rest of this section. Read these definitions carefully and then complete the activity on the next page.

Viscosity

Viscosity is a word used to describe how "**thick**" a fluid is. A fluid that is thick is very **viscous** and a fluid that is thin is not very viscous. The viscosity of a fluid affects its **flow rate** (how fast it moves when it is poured).

Density

Density is a word used to describe how **close together**, or tightly-packed, the **particles** (tiny pieces) in a fluid (or other material) are. The **more particles** there are in a small amount of fluid, the **more dense** it is. Fluids with **fewer particles** in the same amount of space (so they are less tightly-packed) are **less dense**.

Buoyancy

Buoyancy is a word used to explain whether things will **float** or **sink** in a fluid. The fluid's **buoyant force** is how much it **pushes "up"** at objects (floating) to fight against gravity that pull them down (sinking). Even though buoyancy really describes the fluid, we often use it to describe how the objects behave. Things that are buoyant **float** and things that are not buoyant **sink**.

Compressibility

Compressibility is a word used to describe whether a fluid can be **"squeezed"** into a **smaller space**. Liquid fluids **cannot** be compressed—only **gases** can be compressed (squeezed into a smaller space).

Part F: How can we use math to help us in science?

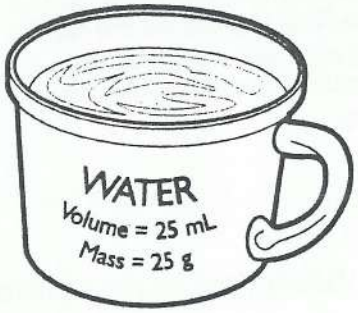
As with many things in science, we can use math to figure out the density of a fluid. The following mathematical formula (problem) can be solved to find density.

$$D = \frac{M}{V}$$

Density equals Mass divided by Volume

As long as we know the mass (how heavy it is) and the volume (how much space it takes up), we can figure out the density (how tightly packed the particles are).

Use the density formula to help you calculate (figure out) the density of each of the following fluids and then answer the question below.



Calculation:

Answer:

Statement:

The density of water is ____ g/mL

Calculation:

Answer:

Statement:

The density of water is ____ g/mL

1. How does the density of water compare to the density of syrup?

_____

_____

2. What does that tell you about the buoyancy (ability to float) of objects in syrup compared to the buoyancy of those same objects in water?

_____

_____

Part G: How are gases different than other fluids?

Like liquid fluids, gases have the following characteristics:

- they don't have a definite **shape**—they take the shape of whatever space or container they are in
- they are able to **flow** (move like they are being poured)
- you can easily poke your finger **into** or **through** a fluid

Unlike liquid fluids, however, gases can also have the following characteristics:

- they can be invisible
- they can be compressed (particles squeezed into a smaller space)

As the bike travels along and the tires roll over bumps and rocks in the path, the gas absorbs the shock (hard bounce) by compressing (gets squeezed) to fit in the rest of the tire and then spreads out again once bump or rock isn't pushing into the tire anymore.

Apply What You Have Learned!

1. How does having air-filled tires help us to have a smoother (less bumpy) ride in cars?

_____

_____

_____

2. What would happen if tires were filled with liquid fluid (remember, liquid can't be compressed)?

_____

_____

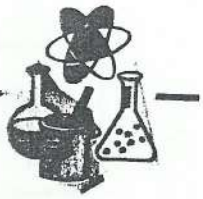
_____

3. Why do you think vehicles that are made for rough terrain (really bumpy roads) are recommended to not fill their tires up all the way?

_____

_____

Grade 8 Unit A: Mix and Flow of Matter



Substances and Mixtures

1. In groups, discuss the differences between pure substances and mixtures and come up with simple definitions for both. Write your group's definitions below and list examples of pure substances and mixtures.

pure substance

Examples:

salt

mixture

Examples:

sea water

Concentration: The amount of solute dissolved in the solvent, measured in g/mL or kg/L.

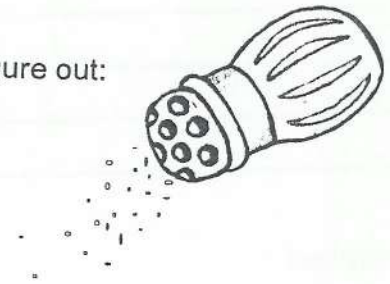
Calculating Concentration

Remember:

Concentration is usually written as grams per millilitre (g/mL) or kilograms per litre (kg/L).

To calculate concentration, you need to know or figure out:

- the mass of solute (in grams or kilograms)
- the volume of solvent (in millilitres or litres)



The formula:

Solute ÷ Solvent = Concentration

Example:

5 grams of salt ÷ 100 millilitres of water = 0.05 g/mL

For a further explanation of solutions and concentrations, **go to** http://www.chem4kids.com/files/matter_solution.html

Saturation point: The point at which a solvent will no longer dissolve a solute and the solute begins to collect on the bottom.

Dilution: A weak solution; a solution with a low amount of solute.

Grade 8 Unit A: Mix and Flow of Matter

Properties of Fluids

Viscosity

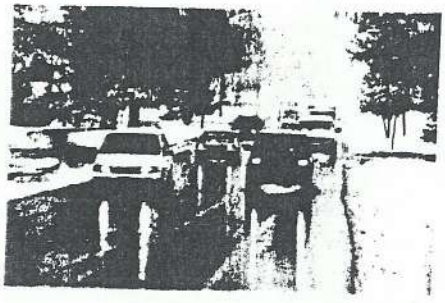
Did You Know? Different grades of motor oil (thick and thin) are used in Alberta at different times of the year.

Viscosity: The thickness of a fluid. This is determined by how close the particles are that make up the fluid.

Flow rate: Rate of flow of a fluid. This is calculated using the following formula:

$$\text{Flow rate} = \frac{\text{volume of fluid}}{\text{time}}$$

1. Discuss how viscosity may affect how, where and when fluids are used in the community, e.g., fluids that Albertans change in their cars as seasons change.



3. Make a chart of liquids and solutions used in the home, community or workplace. For each liquid, record the properties you have observed. Also, record how you would handle the liquid safely.

Flow rate of:

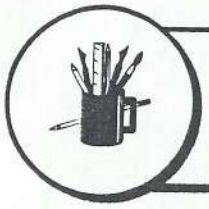
Liquid	Concentration	Viscosity	Solubility	Safety

Buoyancy

Buoyancy: The force with which a fluid pushes up an object to make it float.

4. Review Scientific Inquiry. With a partner or as a class, create an experiment to investigate one or both questions below.
   - How do fluids affect buoyancy?
   - How does the composition of a floating object affect buoyancy?

   Carry out your action plan.



Use Tools Planning an Experiment, Experiment/Investigation Template I and Analyzing and Interpreting Experiment Results.

5. Investigate which objects are more buoyant (float more easily) in salt water. Present your findings to the class.

Grade 8 Unit A: Mix and Flow of Matter

Properties of Fluids

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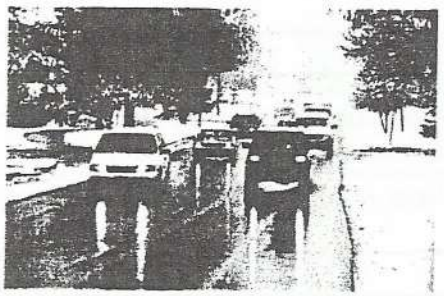
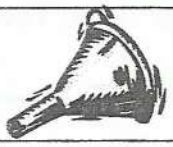


2. Complete the following experiment on viscosity and flow rates. Before you begin, make sure you understand the process of Scientific Inquiry and rules for Safety in Science.

Question
Why do Albertans use different car oils in different seasons? How does the viscosity of a fluid affect the speed at which objects move through it and the speed at which it flows?
Hypothesis/prediction
Materials
3 grades of motor oil table syrup olive oil shampoo  6 large graduated cylinders 6 large funnels 6 marbles stopwatch/timer 
Procedure
1. Fill the cylinders with the same volume of each of the six fluids. 2. Drop a marble into each cylinder and record how long it takes the marble to reach the bottom. 3. Pour each cylinder of fluid through a funnel and record how long it takes the fluid to run through. 4. Record your findings and draw conclusions.
Diagram/sketch
Results: List below or on a separate page. Use a chart and/or graph to show your results.
_____ _____ _____
Conclusion: Compare findings with prediction and classmates' results. Write a conclusion and/or inference statement.
Note: In your conclusion, connect what you learned about viscosity to everyday life. _____ _____ _____ _____ _____

3. Make a chart of liquids and solutions used in the home, community or workplace. For each liquid, record the properties you have observed. Also, record how you would handle the liquid safely.

Flow rate of:

Liquid	Concentration	Viscosity	Solubility	Safety

Buoyancy

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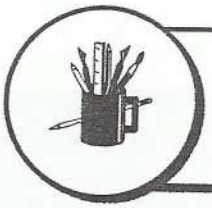
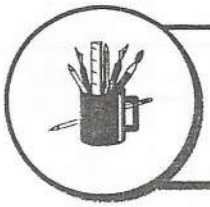


Use Tools Planning an Experiment, Experiment/Investigation Template I and Analyzing and Interpreting Experiment Results.

5. Investigate which objects are more buoyant (float more easily) in salt water. Present your findings to the class.

6. Review Scientific Inquiry. Create your own experiment to answer the following question.
    - How is buoyancy of an object affected when the concentration of salt in water is increased and decreased?



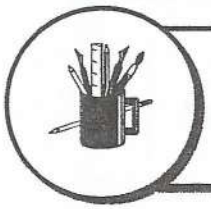
Use Tools Experiment/Investigation Template I and Analyzing and Interpreting Experiment Results.

Pressure

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

7. Discuss the above equation for pressure in groups and discuss how increasing either the force or area affects pressure. Share you ideas with another group.

8. Plan and conduct an experiment to investigate the effect of pressure change on a fluid. Before you begin, make sure you understand the process of Scientific Inquiry. You might also want to review ways of Processing and Displaying Data.



Use Tools Planning an Experiment, Experiment/Investigation Template I and Analyzing and Interpreting Experiment Results.

9. Identify ways that people use pressure on fluids in our everyday lives. Think about how and why we apply pressure to:
    - air
    - water
    - oil
    - hydraulic fluids in machinery.