“Deep calls to deep
in the roar of your waterfalls;
all your waves and breakers
have swept over me.” Psalm 42:7

(Psalm 42:7, NIV)
Welcome!

Welcome to the fascinating world of fluids and dynamics! In grade 8 students are beginning to gain a deeper understanding of the various ways scientific concepts are broken down by topic. This unit focuses on many of the essential principles needed to gain a deeper understanding of physical science. This unit is unique in that it is primarily video based and does not make use of resources from the digital library. Each day, students will view a video from Learn 360, a fantastic subscription based website that offers HCOS families access to thousands of educational videos. Students will use the video as a launching point for discussion, experiments, activities, note taking, and science journaling. The unit also includes links to websites, additional videos, and support materials to ensure a complete understanding of this complex topic. One of the best parts of a video-based unit is that it is similar to having an expert teacher who you can pause, rewind, and fast-forward as necessary! Many hands-on science experiments are included in this unit in order to increase student understanding, and develop a knowledge of the scientific method and proper scientific procedures. This unit is scheduled to be completed over five weeks thereby allowing students enough time to delve deeply into the concepts presented.

In the pages below you will find a list of learning outcomes met by completing this unit, a vocabulary list, a grid-style daily schedule, and detailed day plans. Many of the assignments and experiment instructions in this unit are written to the student, however, I encourage you to be involved in the exploration of this topic with your child to facilitate discussion, and enhance their understanding of the material. Experiments should always be conducted with parental support.
Provincial Learning Outcomes Met

British Columbia: In eighth grade it is expected that students will:

- demonstrate safe procedures
- perform experiments using the scientific method
- represent and interpret information in graphic form
- use models to explain how systems operate
- demonstrate scientific literacy
- demonstrate ethical, responsible, cooperative behaviour
- describe the relationship between scientific principles and technology
- demonstrate competence in the use of technologies specific to investigative procedures and research
- explain the concept of force
- describe the relationship between solids, liquids, and gases, using the kinetic molecular theory
- determine the density of various substances
- explain the relationship between pressure, temperature, area, and force in fluids
- recognize similarities between natural and constructed fluid systems (e.g., hydraulic, pneumatic)

Alberta: In eighth grade it is expected that students will (See Note Page 24):

- describe and interpret technologies based on flow rate and viscosity
- describe and interpret technologies for moving fluids from one place to another
- construct a device that uses the transfer of fluids to apply a force or to control motion
- investigate and compare fluids, based on their viscosity and flow rate, and describe the effects of temperature change on liquid flow
- compare densities of materials; and explain differences in the density of solids, liquids and gases, using the particle model of matter
- describe methods of altering the density of a fluid, and identify and interpret related practical applications
Physical Science: Fluids and Dynamics

Digital Resources for Use With This Kit:
To learn more about the different types of digital PDF resources, and how to download them the help page has excellent instructions.

Learn 360

Discovery Education

BrainPop

Bible Gateway

Additional Information:

Learn 360, Discovery Education, and BrainPop all require usernames and passwords to gain access to the content. You will need to contact your teacher to receive the latest HCOS passwords to these sites.

Many day’s activities require additional materials in order to conduct experiments. Materials needed are listed beside each experiment. I highly recommend looking ahead one or two weeks at a time in order to gather the necessary materials.

Throughout the unit your child will be taking notes and answering questions in a science journal. Scientific journaling is a great way to study, discuss, and retain information. Students will be using their science journals to record answers, questions, notes, images, and other important information they gain over the course of the unit. A science journal may take many different forms, your child may wish to record and present their information in a variety of formats including:

● a handwritten notebook
● typed pages
● video logs
● audio logs
● mind-maps
● a glog

I encourage you to allow your child to choose the method that works best for them. Students generally retain information better when they interact with it in a way that engages their learning style.
**Vocabulary Bank**

Throughout the unit you will be hearing important vocabulary words, you should save these words and their meaning in your science journal. Learning the meaning of these words will enhance your study of fluids and dynamics and ensure that you grasp the “lingo” of physical science. You can find the meaning of words by opening Google, typing “define” followed by the word you wish to learn about. This is a good trick to use with other subjects when you encounter a word you are unsure of. Remember, some words have more than one meaning. You are looking for the definition that relates to science or mathematics.

<table>
<thead>
<tr>
<th>Area</th>
<th>Compression</th>
<th>Condensation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convection</td>
<td>Density</td>
<td>Evaporation</td>
</tr>
<tr>
<td>Expansion</td>
<td>Fluid</td>
<td>Force</td>
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<tr>
<td>Friction</td>
<td>Gravitation</td>
<td>Hydraulic</td>
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<tr>
<td>Magnetic</td>
<td>Mass</td>
<td>Melting</td>
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<tr>
<td>Pneumatic</td>
<td>Pressure</td>
<td>Solidification</td>
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<tr>
<td>Sublimation</td>
<td>Viscosity</td>
<td>Volume</td>
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<td>Weight</td>
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<tr>
<td>Day</td>
<td>Learn 360</td>
<td>Activities</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Day 1*</td>
<td><strong>Fluid Power: Technology at Work</strong></td>
<td>Watch Launchpad: Fluid Dynamics from NASA to learn about fluid dynamics from NASA engineers! Water-Gun Pressure Experiment (See Page #9)</td>
</tr>
</tbody>
</table>
| Day 2* | **Fluid Power Technology-Pumps, Lines, Filters** | Fluid pressure experiment (See page #10)  
Read about water pressure and conduct an experiment (See Page #10) |
| Day 3* | **Fluid Power Technology: Control Mechanisms** | What is a fluid anyway? Catalyst for science explains what a fluid is in this document. After reading, you will conduct the Squeeze It Experiment from page 2. (See Page #10) |
| Day 4* | **Fluid Power Technology-Actuators**          | Cartesian Diver Experiment (See Page #11)                                    |
| Day 5* | **Hydraulics**                                | Watch Hydraulics from BrainPop.  
How Stuff Works breaks down how Hydraulic systems work in an easy to understand way.  
Hydraulic Lifter Experiment (See Page #12)  
If you are feeling particularly ambitious. Try making your own Hydraulic Elevator! (See Page #12) |
| Day 6* | **States of Matter: Solid, Liquid and Gas**   | Watch Introduction to Physical Science from Discovery Education.  
Experiment with the Viscosity Explorer. (Does Temperature affect the viscosity of liquids?) (See Page #13) |
| Day 7* | **Chemistry: The Properties of Matter**       | Watch Heat and the Changing States of Matter from Discovery Education.  
Fluid Flow Experiment (See Page #13) |
<p>| Day 8* | <strong>Chemistry: The Properties of Matter</strong>       | Watch Physical Science: Phases of Matter from Discovery Education.           |</p>
<table>
<thead>
<tr>
<th>Day</th>
<th>Learn 360</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 9*</td>
<td><strong>Density and Pressure</strong></td>
<td>Experiment with density using <a href="#">this fun interactive application</a> from Discovery Education.</td>
</tr>
<tr>
<td></td>
<td><strong>Density Definition</strong></td>
<td>Density Column Experiment (See Page #15)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pressure Experiment (See Page #15)</td>
</tr>
<tr>
<td>Day 10*</td>
<td><strong>Chemical Properties: Density</strong></td>
<td>Floating Crayons Experiment (See Page #15/16)</td>
</tr>
<tr>
<td>Day 11</td>
<td></td>
<td>Watch <a href="#">TEAMS: Chemistry: Part 07: Density</a> from Discovery Education.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amazing Floating/Sinking Pop Can Experiment (See Page #16)</td>
</tr>
<tr>
<td>Day 12</td>
<td><strong>Gravity, Force and Work</strong></td>
<td>Centripetal Force Experiment (See Page #18)</td>
</tr>
<tr>
<td>Day 13</td>
<td><strong>Motion</strong> (Click on “Resources” to access student activities.)</td>
<td><a href="#">Experiment along with Galileo at the Tower of Pisa</a> and discover information about force and motion.</td>
</tr>
<tr>
<td>Day 14</td>
<td><strong>New Braking System</strong></td>
<td>Learn more about <a href="#">George Westinghouse</a>, inventor of the railway air brake.</td>
</tr>
<tr>
<td>Day 15*</td>
<td><strong>Flying Whale</strong></td>
<td>Begin research project (See Page #19)</td>
</tr>
<tr>
<td>Day 16</td>
<td></td>
<td>Watch <a href="#">The Physics of Motion</a> from Discovery Education.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continue work on research project.</td>
</tr>
<tr>
<td>Day 17</td>
<td><strong>Physics: Gravity and Forces</strong></td>
<td>Watch the <a href="#">Force &amp; Motion Study Jam</a> from Scholastic.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continue work on research project.</td>
</tr>
<tr>
<td>Day 18</td>
<td><strong>Roller Coasters: Search for Ultimate Thrill</strong></td>
<td>Design a roller coaster with <a href="#">Amusement Park Physics</a> from Annenberg Learner.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continue work on research project.</td>
</tr>
<tr>
<td>Day</td>
<td>Learn 360</td>
<td>Activities</td>
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</tr>
<tr>
<td>Day 19</td>
<td><strong>Motion and Forces</strong></td>
<td>Experiment with <a href="#">forces and motion</a> in this interactive game from PHET.</td>
</tr>
<tr>
<td></td>
<td><strong>Newton’s Laws of Motion</strong></td>
<td>Make the <a href="#">Laws of Motion Mini-Book</a> to help you remember Newton’s three</td>
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<tr>
<td></td>
<td></td>
<td>laws. Begin science journal project about Sir Isaac Newton.</td>
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<td></td>
<td></td>
<td>Continue work on research project.</td>
</tr>
<tr>
<td>Day 20</td>
<td><a href="#">Real World Science: Forces</a></td>
<td>Continue work on research project.</td>
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<td></td>
<td>(Click on “Resources,” download the</td>
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<tr>
<td></td>
<td>document, print a copy, and complete</td>
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<tr>
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<td>the activity.)</td>
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<tr>
<td>Day 21</td>
<td><a href="#">Forces</a></td>
<td>Take an egg bungee jumping! (See Page #22)</td>
</tr>
<tr>
<td></td>
<td>(Click on “Resources,” download the</td>
<td>Continue work on research project.</td>
</tr>
<tr>
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<td>document, print a copy, and complete</td>
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<td></td>
<td>the activities.)</td>
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</tr>
<tr>
<td>Day 22</td>
<td><a href="#">Friction</a></td>
<td>Watch <a href="#">Force</a> from BrainPop.</td>
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<tr>
<td></td>
<td></td>
<td>Pressure Experiment (See Page #22)</td>
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<tr>
<td></td>
<td></td>
<td>Continue work on research project.</td>
</tr>
<tr>
<td>Day 23</td>
<td><a href="#">Friction</a></td>
<td>Continue work on research project.</td>
</tr>
<tr>
<td>Day 24</td>
<td></td>
<td>Continue work on research project.</td>
</tr>
<tr>
<td>Day 25</td>
<td></td>
<td>Finish your research project and present it to family members.</td>
</tr>
</tbody>
</table>

**A note about science journaling**

On day one you will begin by watching videos. As a part of this unit you will be learning to take notes about the videos you view and record these in the type of science journal you choose to create. Some people enjoy taking notes and are already very good at it, others don’t know where to start—they worry that they need to write down everything that is said which takes a very long time and is not very effective. A good place to start with taking notes is to record things that are new to you or unfamiliar, you may also choose to note anything that is said that sparks your interest or imagination. If word or sentence is repeated often, it is probably important for you to take note of it. Remember, if you miss something, or are not sure you understand, try replaying that section of the video. Good note-takers will also ask questions about things they are unsure of, or things they would like to learn more about in their science journals.
Day Plans

Day One:

Watch: Fluid Power: Technology at Work
Answer the following questions in your science journal:
- What is meant by “fluid power?”
- What are three ways to transmit power?
- What are some of the advantages of hydraulics?
- What is the definition of the term “pneumatics?”
- What are the components of a simple hydraulic system?
- How is fluid power used in modern-day industry?

Activities:

Watch Launchpad: Fluid Dynamics from NASA to learn about fluid dynamics from NASA engineers!

Water-Gun Pressure Experiment: (Supplies: 2 different water guns with a pumping mechanism, stable place to rest the water gun such as an outdoor table, water, duct tape, a 35+ foot tape measure, chalk or tape, a pen, Take Your Best Shot Worksheet, Evaluation & Enhancement Worksheet)

1. Gather your materials and print off the worksheets and instruction sheet.
2. Follow the instructions in this document to conduct the experiment.
3. Be sure to make predictions about what you think your results will be prior to beginning the experiment. Do you think the size of the water gun you used had an effect on the results? Why or why not? How could you test this?

Day Two:

Fluid Power Technology-Pumps, Lines, Filters
Answer the following questions in your science journal:
- What is the primary function of a pump in a fluid power system?
- Define the term “positive displacement pump.”
- Describe the operation and application of “gear pumps.”
- What are the basic purpose of lines, hoses, fittings, and filters in a fluid power system?

Pumps
Activities:

Fluid Pressure Experiment: (Supplies: 2 empty plastic pop bottles with caps, hot glue, string, a ping-pong ball, a plastic funnel, a metal spoon)

1. Science World has produced an excellent document providing information about fluids. Read the information in the document and conduct the experiments found on page 3.
2. What are some other places where fluid speed effects fluid pressure?
3. Answer 3 of the 5 questions (your choice) on page 5 of the document. Record your information in your science journal.

Read about water pressure and conduct an experiment. Supplies: three sizes of plastic bottles (1 litre, 2 litre, and 4 litre), water, masking tape, a ruler, a drill (you will need adult assistance to drill the same size hole in each bottle).

1. Read through the document.
2. Organize your experiment materials.
3. Make a prediction about what you think will happen. Out of which bottle will the water travel the furthest horizontally?
4. Follow the instructions to conduct the experiment.

Day Three:

Fluid Power Technology: Control Mechanisms

Answer the following questions in your science journal:

- What are some of the ways a flow control valves can be used in a fluid power circuit?
- Name some of the functions of an “accumulator” in a hydraulic system.
- What are some of the most common types of directional valve actuators?
- How do you construct a fluid power manifold?
- How can the use of electricity and electronics improve the efficiency of a fluid power system?

Activities:

What is a fluid anyway? Catalyst for science explains what a fluid is in this document. After reading, you will conduct the Squeeze It Experiment from page 2. Supplies: 2 litre pop bottle, small test tube, water). After conducting the experiment, answer the following questions for your science journal:

- “How many fluids are there inside the plastic bottle?”
- “What happens to the size of the air bubble inside the test tube when you apply pressure to the outside of the plastic pop bottle?”
“Why do you think the air bubble responds the way it does when pressure is applied to the bottle?”

Day Four:

Fluid Power Technology - Actuators

Answer the following questions in your science journal:

- What are the functions of a hydraulic and pneumatic actuator?
- List three types of fluid power actuators.
- What are the applications of hydraulic cylinders?
- What are the major parts of a fluid power cylinder?
- What are the applications of pneumatic cylinders?
- What are some of the differences between a hydraulic motor and a pneumatic motor?

Activities:

Cartesian Diver Experiment: (Supplies: 2 litre pop bottle, plastic pipette or ballpoint pen cover, metal nuts or modeling clay).

1. “Method” (Page 33): Using a pipette: Cut off the stem of the pipette, about 2 cm under the bulb. Slip at least one nut onto the end of the pipette – depending on the size of the nuts, it might be necessary to use a glue gun to keep the nut in place. Place the pipette into a glass of water, and squeeze some of the air out so that it just barely floats. Ideally, this should happen when the water level inside the bulb is approximately ¼ to ½ of the bulb – the diver is now ready to be used. If it takes too much water to make it sink, or it will not sink at all, add an additional nut to the end of the pipette. Alternative to pipette: Place some modeling clay on the ballpoint pen cover. The cover must not have holes in it. Then: Completely fill the pop bottle with water, and then add the diver to the bottle. Screw on the lid of the bottle, and squeeze the sides of the bottle. Record observations.

2. What happens? Why do you think this happens? What force is acting on the diver?

3. When something sinks, the force of gravity acting on the item is greater than the force of buoyancy. When something floats, the reverse is true.

4. Draw a diagram showing the forces acting on the diver.
Day Five:

Hydraulics

Activities:

Watch Hydraulics from BrainPop.

How Stuff Works breaks down how Hydraulic systems work in an easy to understand way.

Hydraulic Lifter Experiment: (Supplies: short length of tubing, balloon, empty can, tape, empty plastic bottle, funnel, heavy book, water, scissors).

1. Stretch the balloon by blowing it up and letting the air out again.
2. Attach the tubing to the empty balloon and seal the join with tape. Check the join is water-tight by attaching the funnel to the other end of the tube and filling with water. Remove the funnel and drain out the water.
3. Cut the empty bottle so that it is just a little taller than the can. (We should have cut a bit more off ours.) Use a pencil to make a small hole near the bottom of the bottle.
4. Feed the free end of the pipe through the hole in the bottle, leaving the balloon inside.
5. Put the heavy book on top of the bottle.
6. Attach the funnel to the pipe and fill with water. (Hold the funnel up high to quickly release any air bubbles.)
7. What happens? Why do you think this happened? (The weight of the water in the funnel creates enough pressure to force water into the balloon. This force is in turn transmitted through the balloon to lift the book. Fluids transmit forces more effectively than gases because they cannot be compressed, even under pressure.)
8. Record the results of your experiment in your science journal. Consider creating a diagram showing what happened.

If you are feeling particularly ambitious. Try making your own Hydraulic Elevator!

The instructables has wonderful instructions for building your own easy hydraulic machines. Considering using some of your time to create one, or more, of these simple machines and ‘wow’ your friends!
Day Six:

Activities:

Watch Introduction to Physical Science from Discovery Education.

Experiment with the Viscosity Explorer. (Does Temperature affect the viscosity of liquids?)

- choose the same liquid for each beaker
- choose a different temperature for each beaker
- compare the rate at which the steel balls fall to the bottom of each beaker
- repeat the experiment several times using a variety of temperatures.
- Repeat experiment to compare the effect of temperature on the viscosity of a number of different liquids.
- record their thoughts and ideas on how temperature differences could affect the performance of the motor oil in protecting a car’s engine from excessive heating.
- create a chart that lists the results of the investigation.

Day Seven:

States of Matter: Solid, Liquid and Gas

Activities:

Watch Heat and the Changing States of Matter from Discovery Education.

Fluid Flow Experiment: (Supplies: a sheet of plastic (a plastic cutting board would work well), cooking oil, liquid hand-soap).

1. Gather your supplies.
2. Find a washable, flat surface on which to conduct your experiment.
3. Use supports to balance your plastic cutting board at a slight angle so that it forms a ramp.
4. Predict which liquid you think will make it to the bottom of the ramp first. Why?
5. Pour both liquids down onto the top of the piece of plastic that has been set up on a slant.
6. Which liquid won?
7. Do your results change if the liquids are chilled or heated?

Volume changes as temperature and/or phase changes. Try placing water in a pop bottle to a certain level (mark this with a Sharpie), then, freeze the bottle. What
happens? What happens when you leave a glass of water sitting outside on a hot day? Try placing a balloon outside in cold weather and see what happens. Can you think of other examples of a change in volume taking place? Describe what you see, and any other examples, in your science journal. You can learn more about the states of matter here.

Day Eight:

Chemistry: The Properties of Matter

Activities:

Watch Physical Science: Phases of Matter from Discovery Education.

Try this:

- You will need the lid from a small yogurt container, the lid from a larger container, a large bowl or container, and marbles (or small rocks). First, place as many marbles as you can in the lid so that they do not move. This shows a solid. Next, place the same number of marbles in the larger lid so that they move around. This shows a liquid. Finally, place the same number of marbles in the large bowl or container, this shows a gas.
- Read about the make-up of molecules from NASA.
- Draw a diagram showing a solid, liquid, and gas molecule.

Boil water in a pot on the stove with the lid on. What happens when the water reaches a boil? Why do you think this happens? Having observed this, why do you think it is better that tires be under-inflated in the summer, and overinflated in the winter?

Day Nine:

Density and Pressure

Density Definition

Activities:

Experiment with density using this fun interactive application from Discovery Education. Record the definition of Density in your science journal.

Density Column: (Supplies: corn syrup, water, vegetable oil, dawn dish soap (preferably blue), rubbing alcohol, lamp oil, honey, cylinder (tall glass or other tall, clear container will work), food colouring, food baster, cups.)
1. Follow the fantastic instructions from Steve Spangler Science to create your own density column.

2. Prior to conducting the experiment, predict what you think the order of the liquids will be (1-7). Why?

3. After completing the experiment write another list showing the actual order of the liquids. How many did you get right? Did any surprise you? Why?

4. Continue experimenting with density by taking the following small items and dropping them one by one into your density column to see where they settle! (Ping pong ball, bottle cap, plastic bead, grape tomato, die from a board game, popcorn kernel, metal nut or bolt).

Pressure Experiment: (Supplies: balloon, water).

1. Fill a balloon half full with water. Tie the top.

2. Predict what you think will happen when you squeeze the balloon.

3. Try squeezing the balloon. What happens? Why does this occur?

4. What happens when force is exerted against a solid, a liquid, or a gas? Consider what happens when you blow on your soup, squeeze a ball, or wave your hand through steam.

5. Record the definitions for Compression and Expansion in your science journal.

Day Ten:

Chemical Properties: Density

Activities:

Floating Crayons: (Supplies: measuring spoons, a beaker or class with a wide-mouth, old crayons, spoon, salt).

1) Fill a beaker or glass with 300ml of water and add a piece of crayon, or several pieces of crayon, to the water. Test both large and small pieces of crayon in various colours.

2) Which crayons do you predict will float first? What is your reasoning?

3) Do you think any particular colour will float best? Why? Do you think that all of the crayons have the exact same composition?

4) Add 1 tsp. of salt to the water and stir it with a spoon. Observe the crayons and record your results.

5) Continue to add salt 1 tsp. at a time and record your observations. Be sure to stir the water long enough to dissolve the salt each each time. Continue until all the crayons are floating, or the salt will no longer dissolve.

Consider recording your results in a chart like this:
<table>
<thead>
<tr>
<th>Crayon Colour:</th>
<th>Red</th>
<th>Blue</th>
<th>Orange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank prediction (how many scoops of salt do I think it will take to make the crayon float)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scoops of salt:</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rank:</td>
<td>3rd</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Day Eleven:

Activities:

Watch [TEAMS: Chemistry: Part 07: Density](#) from Discovery Education.

Exciting Pop Can Experiment: (Supplies: kitchen sink or laundry room sink, an assortment of standard size pop cans (full), be sure to have a mix of diet and regular, salt from the dollar store).

1. This exciting experiment from Steve Spangler Science uses your favourite varieties of pop to demonstrate the principles of density!
2. Prior to beginning the experiments, create a chart like the one shown below listing the types of pop you will be experimenting with.

<table>
<thead>
<tr>
<th>Brand</th>
<th>Sink/Float</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular Coke</td>
<td></td>
</tr>
<tr>
<td>Regular Pepsi</td>
<td></td>
</tr>
<tr>
<td>Diet Coke</td>
<td></td>
</tr>
<tr>
<td>Diet Pepsi</td>
<td></td>
</tr>
<tr>
<td>Mountain Dew</td>
<td></td>
</tr>
<tr>
<td>Root Beer</td>
<td></td>
</tr>
</tbody>
</table>

3. Place the pop cans in the water one at a time.
4. As you conduct your experiment, record which cans sink and which float. Why do you think this is?
5. What is true about all of the cans that float? What is true about all of the cans that sink?
6. What happens if you add salt to the water? How much salt do you need to add in order to change your results?

Day Twelve:

Gravity, Force and Work

1. What is force? Look up the word force and record the definition in your science journal. There are many different types of force that can be exerted on objects, this includes magnetic, friction, gravitational, and electrical. Conduct the following experiments and determine the type of force at work. Consider recording the information in a chart like the one below. You will probably know the answer to many of these without needing to try them out.

2. Can you think of other examples in addition to the ones below?
3. What do magnetic, friction, gravitational, and electrical forces do? What are some of the effects of force on objects?

<table>
<thead>
<tr>
<th>Action</th>
<th>Type of Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushing a book</td>
<td></td>
</tr>
<tr>
<td>Dropping a ball</td>
<td></td>
</tr>
<tr>
<td>Bouncing a ball</td>
<td></td>
</tr>
<tr>
<td>Holding a magnet by a nail</td>
<td></td>
</tr>
<tr>
<td>Rubbing a balloon against yourself and then holding it above scraps of paper</td>
<td></td>
</tr>
<tr>
<td>Squeezing a ball</td>
<td></td>
</tr>
<tr>
<td>Rolling a ball back and forth</td>
<td></td>
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</tbody>
</table>

Activities:

Centripetal Force Experiment: (Supplies: wire hanger, penny).

1. This simple experiment from Steve Spangler Science demonstrates the relationship between motion and force.
2. Follow the instructions to complete the experiment. Record your results.
3. Centripetal force is what keeps you in your seat on a roller coaster!

Friction is a force that opposes motion (this includes air resistance). Try this (you will need an assistant):

- Let a ball fall vertically, then toss a ball from the same height (stay away from anything breakable). What paths do they take? Use a stopwatch or cellphone to measure the time it takes the ball to fall to the floor each time (gravity).
- Slide a book across a table. Then, slide a ball across a table, a block of wood, followed by ice (be sure to push each item with the same amount of force). What happens? Which items slide the furthest? Why do you think this is so? (Friction)
- Drop a sheet of paper while standing on a chair. Measure how long it takes to land on the ground. Now, crumple the same sheet of paper and drop it from the same chair. How long does it take this time? What causes the difference?

Day Thirteen:

Motion (Click on “Resources” to access student activities.)

Activities:

Experiment along with Galileo at the Tower of Pisa and discover information about force and motion.

Have you ever wondered how David was able to kill Goliath using a slingshot? According to the author Malcolm Gladwell, “Eitan Hirsch, a ballistics expert with the Israeli Defense Forces, recently did a series of calculations showing that a typical-size stone hurled by an expert slinger at a distance of 35 meters would have hit Goliath’s head with a velocity of 34 meters per second [~75 mph or ~120 km/h] – more than enough to penetrate his skull and render him unconscious or dead. In terms of stopping power, that is equivalent to a fair-size modern handgun.” Physics is amazing!

Day Fourteen:

New Braking System

Activities:

Learn more about George Westinghouse, inventor of the railway air brake.
Day Fifteen:

Flying Whale

Activities:

Research Project: As a major project for this unit you will be researching examples of natural and human-made fluid systems, where they occur, and their uses. Your project will include examples of the following: examples of natural fluid systems and constructed fluid systems; information about the scientific principles involved in the systems, and any possible problems in the natural or constructed fluid system. Your presentation should also feature the following:

- An explanation of expansion, compression, fluid flow, explain expansion, compression, and fluid flow.
- A model or demonstration of how a system works.

Decide how you want to present the information you gather. You may wish to choose a unique way to do this, for example:

- a poster board presentation including written information, and pictures
- a digital poster (Glogster)
- a Prezi
- a videotaped or podcast (Audacity) of oral report.
- a diorama, scene or model
- A video or machinima (WindowsMedia iMovie or WeVideo)
- Use of software to incorporate learning such as Powerpoint, Popplet, or Digital Storytelling tools to be found here.

Note: It is, however, important that the project includes a written element. You should make a plan for your project before beginning. Consider re-watching videos, and returning to your notes for ideas. Use Student Research Centre from EBSCOhost to find articles and information. Remember to use specific search terms. Student Research Centre is a fantastic tool that will enable your child to conduct age-appropriate research.

Also of note: you will need to contact your teacher in order to get the login information for EBSCOhost. Once you have logged in you will be able to choose from a range of search options including Student Research Centre.
Day Sixteen:

Activities:

Watch *The Physics of Motion* from Discovery Education.

Continue work on research project.

Day Seventeen:

Physics: Gravity and Forces

Activities:

Watch the *Force & Motion Study Jam* from Scholastic.

Continue work on research project.

Day Eighteen:

Roller Coasters: Search for Ultimate Thrill

Answer the following questions in your science journal:

- Roller coasters today are marvels of modern technology. How have the advances in technology improved the rollercoaster in the 20th century?
- Roller coasters provide the means to satisfy the thrill seeker. Why do people seek thrills? What is it about being frightened, in a controlled environment that appeals to people? What other ways do people seek thrills?
- How are amusement parks a product of the Industrial Revolution?
- Discuss why we could name the 20th century the "century of motion?" What events and inventions took place that make this true?

Activities:

Design a roller coaster with *Amusement Park Physics* from Annenberg Learner.

Continue work on research project.
Day Nineteen:

**Motion and Forces**

**Activities:**

Experiment with forces and motion in this interactive game from PHET.

Continue work on research project.

Isaac Newton is considered to be the father of physics. He also strongly believed in a Creator. Many people today believe that Christianity (and all religions) are in conflict with science. Newton disagreed with this. He believe that by studying science we can learn more about God and the universe he created. For this assignment you will be conducting some research to learn about Isaac Newton and what he believed, and considering the scientific implications of believing in a Creator. You can use Google or Canadian Research Centre to conduct your research. Some of the questions you will be answering will be opinion-based. For certain questions you may wish to consider other readings you have done or conversations you have had with your family. Try and support your opinion statements with evidence, particularly, Biblical evidence.

- Who was Isaac Newton? What was his life like? Why is he important?
- What did Newton believe?
- Do Newton’s beliefs reflect a Christian worldview? Why or why not?
- Do you believe that science and a Christian worldview are compatible with one another? Why or why not?
- Do you believe that Bible supports science? Why or why not?

Day Twenty:

**Real World Science: Forces** (Click on “Resources,” download the document, print a copy, and complete the activity.)

**Activities:**

Continue work on research project.
Day Twenty-One:

Activities:

Bungee Jumping Egg Experiment: (Supplies: Ruler, 6 eggs (although 1 should be enough), Supply of pennies, Pair of pantyhose, Strong tape, Newspaper)

1. Follow the instructions from Education.com to demonstrate the relationship between mass, acceleration, and force.
2. What happened to the egg?
3. Why do you think this happened?
4. What happens if you use a longer length of panty hose, or bungee the egg from a higher point?
5. Record your observations in your science journal.

Continue work on research project.

Day Twenty-Two:

Forces (Click on “Resources,” download the document, print a copy, and complete the activity.)

Activities:

Watch Force from BrainPop.

Conduct the pressure experiment found on page 1 of this document. Supplies: 2 litre milk carton, water, freezer, iron wire (thin--available at craft stores), a weight.

1. Prior to beginning the experiment make a prediction as to what you think will happen.
2. Were you correct?
3. Record your observations in your science journal.

Continue work on research project.

Day Twenty-Three:

Friction

Activities:

Continue work on research project.
Day Twenty-Four:

Activities:

Continue work on research project.

Day Twenty-Five:

Activities:

Present your research project to family members.
Note for Alberta Parents & Students

There are many similarities between the curriculum used in Alberta and the curriculum used in British Columbia. Both Alberta and BC students study fluids in grade eight. However, some of the content and skills that are focused on in these units are different. In Alberta the focus is on fluids and the states of matter, whereas, in British Columbia, the focus is on fluids and dynamics (force and motion). While this unit will cover some of the outcomes for Alberta, it will not cover all of them. Additionally, some of the content covered in this particular unit is not necessary to meet Alberta learning outcomes. This means that it is not necessary for Alberta students to complete all of the lessons in this unit in order to meet the learning outcomes listed on page 3. Alberta students only need to complete lessons 1-10 in this unit and the research project described in lessons 15 (indicated by the asterisk in the day plan chart).

Bibliography


