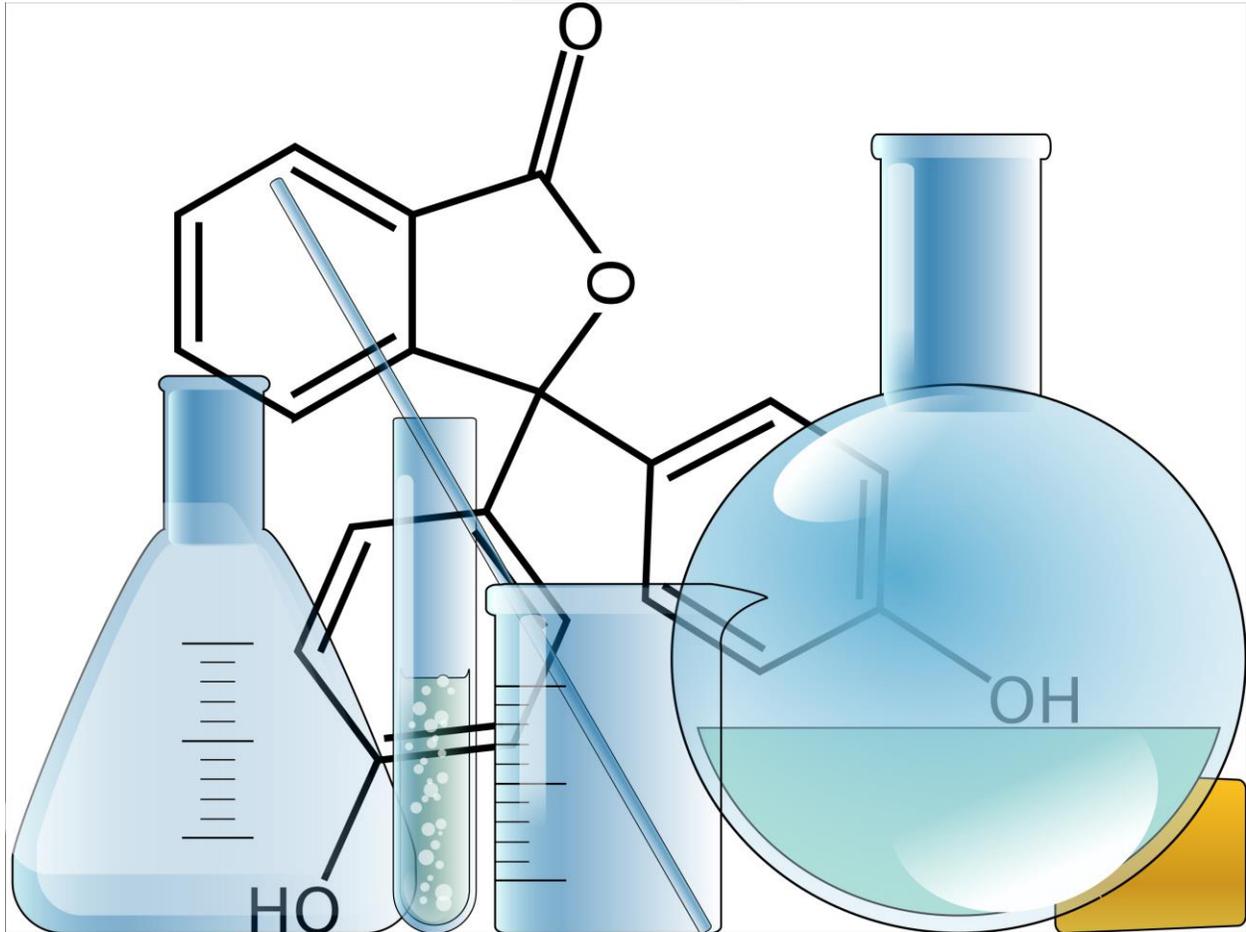


# Grade 6 Mixtures and Solutions Digital Unit Study Kit Guide

Written By Rachael Freed



“Therefore, if anyone is in Christ, the new creation has come: The old has gone, the new is here!”  
(2 Corinthians 5:17, Niv)

# Goals of the British Columbia Education Plan

Our curriculum team is excited to bring you a summarized version of the new BCEd plan core goals (competencies), strategies and content. As we develop the kits we will be personalizing the content to suit your students' need and interests. Big ideas and concepts will be the focus as well as curricular threads, inquiry learning (discovering how to ask the right questions based on who, how and why things occur, as opposed to what things occur), technology integration, and collaboration. First Peoples content will include the natural history/culture of our province and encourage our God given diversity. The kits are designed to help you gain a greater understanding of the following:



## **Biblical Worldview:**

We believe that every child in our school needs to hear the voice of God interwoven into all of their curriculum. Therefore we will be striving to make sure that this goal is an overarching strategy.



## **Communication Competency:**

Involves imparting and exchanging information, experiences and ideas, to explore the world around them, and to understand and effectively engage in the use of digital media.



## **Thinking Competency:**

Encompasses the knowledge, skills and processes we associate with intellectual development. It is through their competency as thinkers that students take subject-specific concepts (ideas that interest them) and content, (topics that need to be covered to increase knowledge, and transform them into a new understanding to increase knowledge), and transform them into a new understanding. This includes specific thinking skills as well as how students are allowed to learn, make mistakes and grow from failure. Encompassed in this thinking is the ability to feel safe and comfortable so that students can explore their surroundings.



### **Creative Thinking Competency:**

Involves the ability to generate new ideas and concepts that have value to the individual or others, and then develop these ideas and concepts from thought to reality. It requires a curiosity and a wondering reflection about God's creation, with a desire to make something new and different from what they have read, seen or observed.



### **Critical Thinking Competency:**

Encompasses a set of abilities that students use to examine their own thinking and that of others, and process information they receive through observation, experience, and various forms of communication.



### **Social Responsibility:**

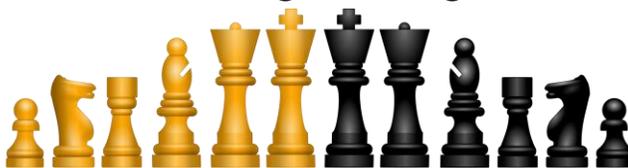
Involves the ability and disposition to consider the interdependence of people with each other and the natural environment; to contribute positively to one's family, community, society, and the environment; to resolve problems peacefully; to empathize with others and appreciate their perspectives; and to create and maintain healthy relationships.



### **Personal and Social Competency:**

Is the set of abilities that relate to students' identity in the world, both as individuals and as members of their community and society.

# Learning Strategies



In response to the goals set out by the BC Ministry of Education, HCOS has made it a priority to make use of the following learning strategies throughout our unit studies and courses.

**Biblical Worldview:** Biblical worldview refers to the framework of ideas and beliefs through which a Christian individual, group or culture interprets the world and interacts with it. Individuals with a biblical worldview believe their primary reason for existence is to love and serve God. A Biblical worldview is based on the infallible Word of God. When you believe the Bible is true, then you allow it to be the foundation of your life. We believe that every student at HCOS needs to develop a worldview based on their Biblical thinking and beliefs.

**Inquiry-Based Learning/Mindset:** Students with an inquiry mindset have a God-given curiosity; a desire to dream big, constantly challenge themselves, and a desire to research more for increased understanding and clarity. Students who actively inquire will scan their environments, generate good questions, try new approaches, observe and collect evidence, synthesize the information, draw conclusions, and generate new questions from their research.

**Maker Education:** The Maker Education Initiative’s mission is to create more opportunities for all young people to develop confidence, creativity, and interest in science, technology, engineering, math, art, and learning as a whole through making. This may be through STEAM – science, technology, engineering, art and mathematics. The “maker mindset” includes learning to use your imagination to make connections, use intuition, persist through difficult circumstances in learning, collaborate with other team members and community, and become disciplined learners. Maker education often involves an interdisciplinary approach, teaching science, math and art together. Here is an [example](#). To learn more go to this [page](#).

**First Peoples Content:** First Peoples content has been interwoven into every grade in the new BCEd plan. Aboriginal content is for all learners of all ages, and includes a healthy diversity of approaches. From learning about cultural traditions and schooling injustice, creative ways of storytelling, and good stewardship of land and resources, we can gather rich learning from the traditions of the people groups indigenous to BC. As Christians we can draw many similarities from their holistic thinking, and share how our beliefs and traditions might be similar or different.

# HCOS Subscriptions

HCOS families have access to a wide variety of wonderful subscriptions which can be used to enhance student learning. Several of these subscriptions are used throughout the unit. Each year, a document containing the usernames and passwords for each subscription is sent to families. If you have not received this document please contact your child's teacher.



## Big Ideas

“Big ideas are statements that are central to one’s understanding in an area of learning. A big idea is broad and abstract.” (CT) Big ideas represent the overarching theme of each unit. They contain references to the content and key questions students will be investigating throughout the unit. Big ideas are often cross-curricular in nature. Similar themes can be found in many different subject areas within each grade-level.



### Science

Everyday materials are often mixtures.

# Curricular Competencies

“Competency represents the combined skills, processes, behaviours and habits of mind that learners use to make sense of the world.” (CT)



## Science

- Demonstrate a sustained curiosity about a scientific topic or problem of personal interest
  - Make observations in familiar or unfamiliar contexts
- Identify questions to answer or problems to solve through scientific inquiry
  - Make predictions about the findings of their inquiry
- With support, plan appropriate investigations to answer their questions or solve problems they have identified
  - Decide which variable should be changed and measured for a fair test
    - Choose appropriate data to collect to answer their questions
- Observe, measure, and record data, using appropriate tools, including digital technologies
  - Use equipment and materials safely, identifying potential risks
  - Experience and interpret the local environment
- Identify First Peoples perspectives and knowledge as sources of information
- Construct and use a variety of methods, including tables, graphs, and digital technologies, as appropriate, to represent patterns or relationships in data
  - Identify patterns and connections in data
- Compare data with predictions and develop explanations for results
- Demonstrate an openness to new ideas and consideration of alternatives
  - Evaluate whether their investigations were fair tests
    - Identify possible sources of error
    - Suggest improvements to their investigation methods
  - Identify some of the assumptions in secondary sources
- Demonstrate an understanding and appreciation of evidence
- Identify some of the social, ethical, and environmental implications of the findings from their own and others' investigations
- Contribute to care for self, others, and community through personal or collaborative approaches
  - Cooperatively design projects
    - Transfer and apply learning to new situations
    - Generate and introduce new or refined ideas when problem solving
    - Communicate ideas, explanations, and processes in a variety of ways
    - Express and reflect on personal, shared, or others' experiences of place

## Content and Key Questions

Content refers to the topics that will be investigated throughout the unit. The key questions serve as a guide as you and your child explore the content. Throughout this unit the key questions will be the starting point for learning.



### Social Studies

**Content: Mixtures are separated using a difference in component properties**

**Elaborations:** Density (eg: centrifuge or settling, silt deposits in a river delta, tailings pods)

**Elaborations:** particle size (eg: sieves and filters)

**Content: Local First People's knowledge of separating and extraction methods**

**Elaborations:** historical and current First Peoples use of separation and extraction methods (eg. eulachon oil, extraction of medicine from plants, pigments etc.)

# How to Use This Kit



The [Ministry of Education](#) is in the final stages of overhauling curriculum, learning strategies, and learning goals for students in the Province of British Columbia. This kit is designed with those goals in mind. On the next several pages you will discover the content that serves as the “bulk” of this kit. Rather than being divided by day, the unit plan uses the key questions detailed on page 8 to breakdown content, activities, and experiences.

Each key question will have books to read from the [HCS Overdrive E-Library](#), (if you do not have your client code & pin, please contact Shandra Wiebe at [swiebe@onlineschool.ca](mailto:swiebe@onlineschool.ca)), videos to watch, and activities to share with your child. You will not be required to complete all activities listed under each key question, instead, you will be able to choose activities which most appeal to you and your child. Each key question featured in the unit will include recommendations on how many activities to complete in order to fully address the curriculum content and competencies. Finally, each activity will have icons (shown on pages 2 and 3) showing which goals of the BCEd Plan the activity addresses.

**\*\*\*You are encouraged to choose varied activities to ensure all goals are being addressed. In order to fully meet the goals of this kit, it is important to read the recommended books.\*\*\***

Here is a **planning sheet** for you to use: [Unit planner](#)

Reading and discussing/watching and discussing the books and videos listed in this unit will consistently address the following goals of the BCEd Plan:



It is our hope that our redesigned format will allow for flexibility, individual preference, and student-centered learning. When selecting activities to complete with your child we recommend selecting a variety of activities to ensure that you touch on each BCEd Plan goal throughout the unit. Most activities are designed to address multiple goals.

## Unit Guide

**What are mixtures? How are mixtures separated? What does it mean to use a difference in component properties to separate mixtures?**



**Please Note:** The recommended number of activities per section is meant to serve as a guide. Families are encouraged to make the kit their own and complete the number of activities that they, and their support teacher, feel are necessary. Each kit is designed to be completed over four to six weeks. This kit is smaller than many of our social studies kits. As such, it is designed to be completed over three weeks with an average of 2-3 activities per week.

**(The following books are from the HCS Overdrive e-library, if the link does not open, login and type of the name of the book in the search bar):**

### **Books to Read and Talk About**

[Mixtures and Solutions](#) by Molly Aloian

**Things to think about:** What is a mixture? What is a solution? What are mixtures? How are mixtures separated? What does it mean to use a difference in component properties to separate mixtures? What is a heterogeneous solution/mixture? What is a homogeneous solution/mixture? How can you tell if something is a homogeneous mixture or solution? How can you tell if something is a heterogeneous mixture or solution? How can heterogeneous mixtures be changed or separated? How can homogeneous mixtures be changed or separated? What are some homogeneous mixtures you interact with on a daily basis? What are some heterogeneous mixtures you interact with on a daily basis? Why do you think having knowledge of mixtures and solutions is helpful in learning about God's creation? What are some examples of how chemistry is useful to humans? What are improvements that have been made through the study and understanding of chemistry?

[Simple Chemistry](#) by Evan-Moor Educational Publishers

**How to use this book:** This unit provides a good overview of basic chemistry concepts. Information, activity suggestions, and worksheets are included throughout. Consider using some of the worksheets and printables from within this book to enhance your study of solutions and mixtures.

[Amazing Kitchen Chemistry Projects](#) by Cynthia Light Brown

**How to use this book:** This fun resource contains many different experiments that are easy to conduct in your own kitchen. Learn all about the kinds of chemistry we use every single day. Use the experiments and activities in this book to enhance your study of solutions and mixtures.

[Science Tutor: Chemistry](#) by Gary Raham

**How to use this book:** This book contains a variety of worksheets, projects, and activities which can be used alongside this unit to enhance your study of solutions and mixtures. Pick and choose activities as needed to reinforce concepts.

#### **Videos to Watch and Talk About:**

[Physical Science Series: Mixtures and Solutions](#) (Discovery Education)

[Show Me Science: Chemistry & Physics Series](#) (Learn 360)

[Essential Chemistry Series](#) (Learn 360)

[Compounds in Chemistry](#) (Learn 360)

[Chemistry Elements, Compounds and Mixtures](#) (Learn 360)

[The Properties of Fuels and Gases](#) (Learn 360)

[Chemistry: Acids, Bases and Salts](#) (Learn 360)

[Chemistry: Solutions-Ionic and Molecular](#) (Learn 360)

[Chemistry: Chemical Bonding and Atomic Structure](#) (Learn 360)

[Compounds](#) (Learn 360)

[Reactions](#) (Learn 360)

[Solutions at Work](#) (Learn 360)

[Elements, Compounds and Mixtures](#) (Learn 360)

[Investigating Chemical Reactions](#) (Learn 360)

[TEAMS Chemistry Part 1: Observing Matter and Changes](#) (Discovery Education)

[TEAMS Chemistry Part 2: Properties of Matter](#) (Discovery Education)

[Real World Science Matter: Solids, Liquids, and Gases](#) (Discovery Education)

[Changes in the Properties of Matter: Physical and Chemical](#) (Discovery Education)

[Properties of Matter Part 1](#) (Discovery Education)

[Common Properties of Matter: Atoms, Elements, and States](#) (Discovery Education)

[Matter: Building Blocks of the Universe](#) (Discovery Education)

[Chemistry: Solutions Ionic and Molecular](#) (Discovery Education)

[Chemistry: Making Modern Miracles: Show Me Science: Chemistry & Physics Series](#)  
(Learn 360)

[Atoms And Elements: Show Me Science: Chemistry & Physics Series](#) (Learn 360)

[Chemistry: Acids, Bases, and Salts](#) (Learn 360)

[States Of Matter: Solid, Liquid And Gas: Show Me Science: Chemistry & Physics Series](#)  
(Learn 360)

[Solutions at Work](#) (Learn 360)

[Solids, Liquids and Gases](#) (Learn 360)

## Activities (Select 10-14):



**Science Safety:** When completing chemistry experiments, and all other science experiments, it is extremely important to be safe. Science is an amazing discipline, fun, intriguing, exciting, but it can also be dangerous. Following safety guidelines, having a plan before beginning an experiment, and ensuring that you have an adult present at all times can help to keep you safe when conducting experiments. Brainstorm a list of what you think some important science safety rules are. Then, watch [this fun video](#) from I Think School to learn more about lab safety.



**Chemistry Vocabulary:** Use [Advanced Google](#) to research the following chemistry terms and record their meaning in a table similar to the one below, this will help you as you move through the unit. Separation, Mixture, Solution, Chemical, Filter, Sieve, Particles, Evaporation, Saturated Solution, Density, Dissolve, Soluble, Insoluble, Magnetic, Compound, Physical Change, Chemical Change, Vaporization, Condensation.

Word	Meaning
Separation	"A separation is a method that converts a mixture of chemical substance into two or more distinct product mixtures."
Mixture	



**Separating Mixtures:** The different substances in mixtures are oftentimes easily separated from one another. The method you use depends upon the type of mixture you have. There are many different methods for separating substances and mixtures, some are more complex than others. These methods include: chromatography, filtration, evaporation, simple distillation, and fractional distillation. Visit BBC Bitesize to learn about the [different methods for separating chemicals](#). You will be conducting experiments featuring some of these methods in this unit.



**Technology Time:** Separation of mixtures can occur naturally in nature. Rivers, for example, often have features, such as deltas and settling areas, where silt separates from the water. Read about [silt and river deltas from The Geological Society](#).



**Design a Water Filter:** For this project you will be using materials you gather to design and build your own water filter, you will then test your design to see how it works. Before you begin, consider the job of a water filter? Is it to filter out rocks, dirt and other debris? Smaller particles? Bacteria? How complex do you want your water filter to be? What materials will you need to build your water filter? Consider using some combination of the following: a 2 litre plastic bottle, rocks, charcoal, cheesecloth, a sieve, coffee filters, wet fabric, sand etc. Learn more about the [filtration process from BBC Bitesize](#), then use [this sheet](#) to design and test your water filter. When you are ready to test your filter, mix water with small rocks, dirt, debris, and other particles together to pour through the filter. How does your water look after running through the filter? Compare the filtered water to the original water mixture.

What particles, other than water, also made it through your filter? Why do you think this happened? How could you improve on the design for your water filter? Do you think your filter would have been able to withstand water running through it for an hour? Why or why not? If you could have used a material or materials that were not provided to you, what would you have wanted? Why do you think this additional material might have helped you with the challenge of building your water filter? What was your favorite part of the challenge? Design Phase? Building Phase? Testing phase? Why? Do you think it is easy to separate particles from water? What if a particle in your water had completely dissolved (sugar, salt etc.) would it have been easy to separate? How did different component properties help the different layers of your filter to separate the water? (Remember, no matter how clear your filtered water is, it is not suitable for drinking).

There are many countries around the world where clean water is not readily available. The water that is available can also not be easily fixed by simple filters. Did you know that clean water can change the world? Take a peek at the [infographic here](#) to learn more about the impact clean water can have on struggling communities. Then, try designing a water filter to create clean water in a developing country. You can draw/sketch your design, and or build a model. Consider submitting your model to PBS

Design Squad. Use this [excellent documentation sheet](#) to record information about your experiment. You can also begin creating a science journal using [this page](#). Consider reflecting on your project using this [helpful document from BIE](#).



**Separating Solids:** “Oops! Fred has mixed up all these solids, which belong to some of the teachers. He will be in BIG trouble unless you can help him out. What will you use to separate these mixtures? Will Fred be happy or sad?” Try your hand at this fun separating solids activity. Use [this worksheet and chart](#) to separate the mixtures. For this experiment you will need gold balls, sand, small stones, paper clips, large pebbles, dried peas, rice, and bulb holders (optional). What are some other mixtures that might be more difficult to separate? How did different component properties (materials your solution is made up of) help you to separate the mixture? Use this [excellent documentation sheet](#) to record information about your experiment. You can also begin creating a science journal using [this page](#).



**Bubble Solution Designer:** Try this fun activity from [Science Buddies](#) to create different bubble solutions. “Making your own bubble solution is fun, but sometimes the bubbles don't seem to work as well as the solutions you buy in the store. In this experiment you can test if adding corn syrup or glycerin to your bubble solution will make it just as good as the stuff you can buy.”

- **Step One:** Make your bubble solutions and then store them in clearly labeled jars. Use a different jar for each solution. Try the following solution mixtures below.

Ingredient	Solution #1 detergent only	Solution #2 detergent + glycerin	Solution #3 detergent + corn syrup
Water	1 cup (240 mL) + 1 Tbsp (15 mL)	1 cup (240 mL)	1 cup (240 mL)
Detergent	2 Tbsp (30 mL)	2 Tbsp (30 mL)	2 Tbsp (30 mL)
Glycerin	None	1 Tbsp (15 mL)	None
Corn Syrup	None	None	1 Tbsp (15 mL)

- **Step Two:** Make a pipe cleaner wand for each of your solutions, or, if you have plastic bubble wands, you can use a different wand for each solution.
- **Step Three:** Take your bubble solution outside and test it using your wands. Use a cellphone timer or a stopwatch to time how long each of your bubbles last for.
- **Step Four:** Repeat the experiment multiple times for each solution. Use a table to record your data.

	<b>Solution #1 detergent only</b>	<b>Solution #2 detergent + glycerin</b>	<b>Solution #3 detergent + corn syrup</b>
Test One			
Test Two			
Test Three			
Test Four			
Test Five			
Test Six			
Total/Average Bubble Time in Seconds			

Which formula worked the best? Why do you think this is? Do you think you could separate out the individual ingredients in your bubble solution? Why or why not? What would you need to separate your formulas? Why do you think God designed a world with complex substances, mixtures, and materials for human beings to experiment with and explore? How did God provide for human's needs when he created the earth? What are the natural resources we need to survive? How are human bodies created to survive and function on earth? Consider reflecting on your project using this [helpful document from BIE](#).



**Separation of a Complex Mixture:** Chemists, and other scientists, work with mixtures. Some mixtures have one or two parts, other mixtures have many parts. It can be helpful for scientists to be able to break down mixtures into their original parts. This can sometime result in the creation of something new! A complex mixture is a mixture made

up of many different parts. For this project you will be creating a complex mixture and then building a tool to separate the various parts of the complex mixture. Make your complex mixture out of 5-10 of the following: cork, white sand, stone, sugar or salt, styrofoam, marbles, beans, thread, clay, nails, buttons, powdered gelatin, or feathers. Once you have created your complex mixture, build a tool designed to separate the components of the complex mixture. Build your sorting tool out of any of the following materials: pipe cleaners, nylon stockings, magnets, paper clips, cardboard, twist ties, coffee filters, tape, brass fasteners, plastic straws, screen/mesh, plastic spoons, comb, hanger, cotton balls, plastic wrap, string, boxes, nails, rubber bands, paper plates etc. How did your sorting tool work? Were you able to separate out all of the parts of your complex mixture? When you were faced with the challenge what did you do first?

Did you try anything that didn't work very well? How did different component properties (materials your solution is made up of) help you to separate the mixture? Were you able to improve on your design? What are some situations in life where it might be important or necessary to separate mixtures? Why do you think God designed a world with complex substances, mixtures, and materials for human beings to experiment with and explore? What evidence do you see of God providing for our needs through the different materials available on earth? Use this [excellent documentation sheet](#) to record information about your experiment. You can also begin creating a science journal using [this page](#). Consider reflecting on your project using this [helpful document from BIE](#).



**Making Mixtures:** Try this [exciting experiment from Science Buddies](#) to experiment with making mixtures. *“Have you ever wondered why some things disappear when they are put in water but other things do not? For example, you may have seen that salt disappears, or dissolves, when it is mixed in a glass of water. But when you throw a rock in a stream it will not usually dissolve, and instead it will just sink to the bottom. And then there are some things that do not act like the salt or the rock. These are called colloids. If you have made [Oobleck](#) out of cornstarch and water, then you have seen that when a colloid (the cornstarch) is mixed with water it acts like a solid and a liquid at the same time! For this science project get ready to make some different types of fascinating mixtures and identify each type of mixture based on its appearance and behavior.”*

- Before beginning the experiment, read the [background information](#) provided by Science Buddies. Next, create a data table similar to the one below. Tables are a wonderful way to record information neatly.

<b>Mixture</b>	<b>Did particles dissolve? (Yes/No)</b>	<b>Would it be easy to separate the particles from the water? (Yes/No)</b>	<b>When you mixed it, did it ever become a solid, and then turn back into a liquid when you stopped mixing? (Yes/No)</b>	<b>Do you think it is a <i>true solution</i>, a <i>colloidal solution</i>, or a <i>suspension</i>?</b>
Water and cornstarch				
Water and sand				
Water and sugar				

- Now, fill an empty container with water. Add 1 tablespoon of cornstarch to a small bowl. Use a medicine dropper to the water from the cup to the small bowl with the cornstarch. Add the water one drop at a time, make sure to count each drop as you go (you will be adding 20 drops to begin with), try to sprinkle the water evenly across the cornstarch. After you have added your 20 drops of water, stir the cornstarch with a fork. Break up any clumps that remain.
- Repeat the above procedure until you have added 100 drops of water. Once you have added the 100 drops of water, repeat the procedure until you have added 200 drops of water. However, this time you will need to stir the mixture after every 10 drops of water.
- Once you have added the 200 drops look at your mixture and answer the following questions:

-Have the particles dissolved in the water? Are fewer particles visible than there were in the beginning? Can you still see individual particles in the water? Do you think the mixture you created is a true solution, a colloidal solution, or a suspension?

- Now, add one tablespoon of sugar to a second small bowl. Repeat the same procedure you followed with the cornstarch. Once you have completed the procedure, answer the questions in your data table.
- Then, repeat the experiment by adding one tablespoon of sand to a small bowl, and follow the same steps you completed with the cornstarch and the sugar.

Once you have completed all three mixtures, compare them. Which mixture do you think is the true solution? Which mixture is the colloidal solution? Which one is the

suspension? Why do you think this is? What do you think this tells you about the size of cornstarch, sand, and sugar particles? Do you think it would be easy to separate the different mixtures? Why or why not? What procedure could you use to separate them? Why do you think God designed a world with complex substances, mixtures, and materials for human beings to experiment with and explore? What evidence do you see of God providing for our needs through the different materials available on earth? Consider reflecting on your project using this [helpful document from BIE](#).



**Separating Mixtures: Can You Design a Device to Do It?:** Try this [exciting experiment from Science Buddies](#) to design a device to separate small particles. *“Have you ever looked in the kitchen cupboard and found a container of tiny white grains, but you were not sure if they were sugar or salt? They look very similar. How could you tell them apart? Well, you know that sugar and salt taste very different. Taste is actually called a property, and properties are used to describe and identify different materials. Properties can also be used to physically separate things. In this science project, you will use different properties to create a way to separate a mixture of three different materials: salt, sand, and iron filings.”*

Begin by reading through the [Science Buddies Background Information](#). Be certain to [check the supplies needed](#), some materials may need to be purchased ahead of time in order for your experiment to be a success. This experiment requires Neodymium magnet discs which can be purchased through Amazon or at school supply stores (and some office supply stores). These magnets are not particularly expensive, and can be used in many different science experiments. They are a wonderful component to a science toolkit. Before using Neodymium magnets it is important to read the [safety information](#).

Once you have gathered your resources and materials, follow the [detailed instructions here](#) to complete this fascinating experiment. Be sure to create the tables and charts recommended by Science Buddies to document your experiment. Consider reflecting on your project using this [helpful document from BIE](#).

- Was it difficult to design a separating device? Did you need to make modifications to your device? Was this process similar to when you designed other sorting devices for other experiments? Was separating these substances more difficult? Why? How did different component properties (materials your solution is made up of) help you to separate the mixture?
- Why do you think God designed a world with complex substances, mixtures, and materials for human beings to experiment with and explore? What evidence do you see of God providing for our needs through the different materials available on earth?



**Soluble Separation Solution:** Conduct another [fun experiment from Science Buddies](#) to learn more about separating solutions! *“Have you ever mixed together salt and sand? It is fun to see how all of those tiny grains of salt and sand mix together! But what if you had to separate them out again? Do you have nightmares of tiny tweezers, a magnifying glass, and hours spent picking grains of salt and sand apart? Do not be afraid, there is another way! In this chemistry science project you will use the differences in solubility between salt and sand to find out the simple “solution” to this problem.”*

Begin by reading through the [Science Buddies Background Information](#). Be certain to check the [supplies needed](#), some materials may need to be purchased ahead of time in order for your experiment to be a success. Once you have gathered your resources and materials, follow the [detailed instructions here](#) to complete this fascinating experiment. Be sure to create the tables and charts recommended by Science Buddies to document your experiment. Consider reflecting on your project using this [helpful document from BIE](#).

- What were your results? Was the experiment a success? Was it difficult to separate the components of your solution? How did different component properties (materials your solution is made up of) help you to separate the mixture?
- Why do you think God designed a world with complex substances, mixtures, and materials for human beings to experiment with and explore? What evidence do you see of God providing for our needs through the different materials available on earth?



**Glitter-Go-Round: Snow Globe Science with a Centrifuge:** Conduct another [fun experiment from Science Buddies](#) to create a snow globe with a centrifuge! *“It is fun to shake up a snow globe and watch the “snow” slowly fall. You can imagine that if the snow fell down very quickly it would be disappointing. But there are times when scientists in a laboratory want this to happen. Scientists use samples that have liquid mixed with small, solid pieces (like the inside of a snow globe), and they need all of the solid pieces in a clump, separated from the liquid. Instead of waiting for the pieces to slowly fall out of the liquid, scientists speed up the process by using a piece of equipment called a centrifuge. In this science project you will build your own version of a centrifuge from a salad spinner and investigate how well it can separate pieces in a homemade snow globe (glitter mixed with water and corn syrup).”*

Begin by reading through the [Science Buddies Background Information](#). Be certain to check the [supplies needed](#), some materials may need to be purchased ahead of time in order for your experiment to be a success. Once you have gathered your resources and materials, follow the [detailed instructions here](#) to complete this fascinating experiment. Be sure to create the tables and charts recommended by Science Buddies to document your experiment. Use this [excellent documentation sheet](#) to record additional information about your experiment. You can also begin creating a science journal using [this page](#). Consider reflecting on your project using this [helpful document from BIE](#).

- What is a centrifuge? What practical purposes to centrifuges serve? Where are centrifuges commonly used? What is centrifugal force? What is centripetal force? How does a centrifuge separate substances? How do hospitals and blood clinics make use of centrifuges? Research and write down what you have learned.
- Why do you think God designed a world with complex substances, mixtures, and materials for human beings to experiment with and explore? What evidence do you see of God providing for our needs through the different materials available on earth?



**Liquid Combinations:** In this project from [ACS: Inquiry for Life](#) you will be using colours to observe the characteristics of water, salt water, alcohol, and detergent solution. The liquids will be coloured yellow allowing you to observe the different ways they combine with water that has been coloured blue. For this project you will need tap water, isopropyl rubbing alcohol ([70% if possible](#)), detergent, salt, 5 droppers, 5 small paper cups, crayons or coloured pencils, toothpicks, paper towels, yellow food colouring, and blue food colouring. It is recommended that you wear gloves, and even goggles while conducting this experiment. Remember, safety is extremely important when working with chemicals.

- Prepare your solutions:
  - Water ( $\frac{1}{4}$  cup regular tap water)
  - Salt Water ( $\frac{1}{4}$  cup tap water mixed with 1 tablespoon salt)
  - Alcohol ( $\frac{1}{4}$  cup 70% isopropyl alcohol)
  - Detergent (Add 1 teaspoon clear, colorless, liquid hand soap or detergent to  $\frac{1}{4}$  cup tap water. Stir gently.)

Add 2 drops of yellow food coloring to each solution. Place about 1 teaspoon of each solution into its labeled cup. Add 4 drops of blue food coloring to  $\frac{1}{2}$  cup of tap water. Label one small cup water. Label one dropper W for the blue water. Then place about 2 teaspoons of this blue water into the newly labeled cups. Download and print the [student activity sheet](#), then, download [Chapter 3](#) and print page 146 laminate it or place it in a plastic sheath.

- Combine a small amount of each of the yellow liquids with blue water.
- It is important that you use each dropper for one liquid only. Use a clean toothpick each time you combine liquids. Pull the blue liquid to the yellow liquid each time.
- Use yellow, blue, and green pencils to record their observations on the activity sheet as each pair of liquids combines. Write a descriptive caption for each drawing that gives information not shown in your drawings.
- Add drops of each liquid to its labeled circle to completely fill each circle on the chart. Depending on your dropper, you may need to add about 5 drops or more.
- Then, use a toothpick to pull the blue water toward the yellow water. It may take a few tries to get them to join. Instead of holding the toothpick straight up and down, it is helpful to hold it more horizontally so more of the toothpick touches the blue water. As soon as the two drops meet, lift the toothpick away and discard it. Watch the two drops combine on their own. Do not stir.
- Record your observations.
- When the drawings and captions are complete for the first pair of liquids, combine the second pair and record your observations.
- Continue testing the remaining pairs in this manner.
- Describe what happened as each pair of liquids combined. Which liquids combined immediately? Which liquids took a long time to combine? Which liquids would not combine? Do you think you could identify four yellow liquids using a similar test?
- Use this [excellent documentation sheet](#) to record information about your experiment. You can also begin creating a science journal using [this page](#).



**Edible Science--Rock Candy (Evaporation):** Experience transforming matter by creating [rock candy](#)! Crystallization is one process through which homogeneous solutions can be altered. For this project you will need wooden skewers (cut in half), water, sugar, clothespins, and glass jars or drinking glasses. The amount of water and sugar required varies based on the number of jars you have available and how many pieces of rock candy you plan to make. 1 jar can generally accommodate two pieces of rock candy. Approximately 2 ¼ cups of sugar to 1 cup of water. Once you have decided how much rock candy you would like to make add your water and sugar into a pot or saucepan (large--it will expand). Consider starting with 4 cups of water and 4 cups of sugar. Mix the sugar together until it begins to dissolve. Then, place your pot on the stove, bring your ingredients to a low boil over a medium heat, continue to add sugar one cup at a time until you can no longer dissolve any more of it. Turn off the heat and

allow your rock candy mixture to cool for 15 minutes. Prepare your wooden skewers by soaking them in water and then rolling them in a coating sugar (this will help your sugar crystals to attach to the skewers). Allow them to dry completely. Carefully, slowly, pour your sugar solution into your glass jars, if you would like to add food colouring or flavouring to your rock candy, now is the time to do so. Gently insert your skewers into the solution. If you would like, use a clothespin to hold your skewers in place. Make sure that your sticks are not touching the sides or bottom of the glass or each other--the crystals need room to grow. Leave your jars in a sunny area and wait for a week (try not to disturb them). After your week is up you will be left with rock candy!

- What different states of matter do you see?
- What causes the sugar to dissolve?
- How much sugar did you put in the water?
- Why did the sugar stop dissolving at a certain point?
- What do the sugar crystals look like?
- Do the sugar crystals look exactly like the sugar you put in the water?
- What do you think your crystals would look like under a microscope?

Use this [excellent documentation sheet](#) to record information about your experiment. You can also begin creating a science journal using [this page](#).



**Egg Geodes (Evaporation):** Crystallization is one process through which homogeneous solutions can be altered. Have you ever heard the word geode before? What does it mean? “A geode is a round rock which contains a hollow cavity lined with crystals. Rocks which are completely filled with small compact crystal formations such as agate, jasper or chalcedony are called nodules.” While actual geodes take an extremely long time to form, you can make your own egg geode at home. For this project you will need eggs, rock salt, sea salt, Borax, sugar, Epsom salts, a mini-muffin pan, and food colouring. Tap a knife around the very top of an egg to remove a bit of the shell. Empty your egg into a container (to use for scrambled eggs later on). Repeat with 4 or 5 eggs. Gently clean the eggs using water, be sure that all of the membrane is removed. Heat a pot of water (not quite boiling) and pour  $\frac{1}{2}$  a cup of the water into a mug or measuring cup. Then, add  $\frac{1}{4}$  cup kosher salt into the mug and let it dissolve. Add  $\frac{1}{2}$  cup of hot water and  $\frac{1}{4}$  cup sea salt to the next mug. Mix until it is dissolved, add a little more and mix until dissolved. You are trying to get as much salt into the mug as you can, without making it visible. For your final mug, add  $\frac{1}{2}$  cup of hot water and  $\frac{1}{4}$  cup of Borax. Let it dissolve. If you wish, repeat the procedure using sugar, or Epsom salts. Add a couple drops of food colouring to each mug--use a different colour for each solution and write down which solution is which colour (to keep track). Finally, pour the

liquid into your eggs. Then wait! Allow your eggs to sit in a safe place for 6-7 days, this will give the water time to evaporate. What happens? Are all the crystals the same? How are they different? Which solution grew the best crystals? Which geode is your favourite? Why? Use this [excellent documentation sheet](#) to record information about your experiment. You can also begin creating a science journal using [this page](#).



**Inquiry Time:** What does the word inquiry mean? Take a minute to look it up, what did you learn? Inquiry involves the process of seeking out information. An inquiry project begins with a simple idea about a topic of interest. Your idea then becomes a question that you want to answer. Inquiry projects require strong questions. A strong question does not have a yes or no answer. A strong question cannot be answered with one or two words, or even a single sentence. A strong inquiry question doesn't have a right or a wrong answer. A strong question starts with "how," or "why." You will need to conduct research in order to investigate your question.

### The Inquiry Project

Step One	Step Two	Step Three	Step Four
Ask a Question 	Find Information and Resources 	Decide Which Information Helps to Answer Your Question 	Share What you have Learned 
-What do I want to learn?  -What do I already know?  -What do I need to know to answer my question?	-What resources might help?  -Where can I find information about my question?  -How can I make sure that the information I find is accurate?	-Does the information help to answer my question?  -What do I still need to know?  -What information best answer my question?	-What do I want to tell my audience?  -What are my important points?  -How will I make my presentation interesting?

A Good Question:

- has more than one answer
- has a very deep meaning
- gives you lots of information
- doesn't have a yes or no answer
- is hard to answer and takes a lot of thinking to understand the question

- contains exciting words that make you want to look for an answer
- is about something you can research
- takes a long time to figure out
- makes you think, know, and wonder

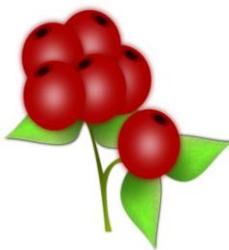
In this unit we are learning about the chemistry. Chemists work with mixtures and solutions to discover and explore the world around them. Chemistry is a fascinating and important scientific discipline. Everything we do is chemistry, from the way our bodies break down foods and distributes nutrients, to the reactions that occur when we breathe, to what happens when bleach interacts with the grime on our countertops. What would you like to discover about chemistry? Select a chemistry topic to complete an inquiry project on. Find a topic that peaks your interest, use your imagination, and have fun! Use [Popplet](#) to create a mind map. Write your BIG question in the centre of your mind map, and write your smaller questions around the outside. Now, use [Explora](#) and [World Book Kids](#) to conduct some research about your questions. You can use [this form](#) to organize your research. Once you have gathered the research you need to answer your question, decide how you would like to present the information you have worked so hard to gather. This might be a video using Windows Movie Maker or iMovie, a [Wix](#) or a [Weebly](#), a [Prezi](#), [Edubouncee](#), or PowerPoint, or another method of your choosing. Have fun conducting your investigation! Consider reflecting on your project using this [helpful document from BIE](#).



**Design an Experiment:** You have probably conducted many experiments throughout this unit. Experiments are a wonderful way to learn more about God’s creation. Scientists use a specific process when conducting an experiment known as [The Scientific Method](#). The Scientific Method must be used to achieve high-quality, accurate results. It is important not to start with a conclusion before conducting your experiment. Scientists begin with a question they would like to answer, they conduct research, and then they develop a hypothesis. This can be a long process! Watch [Using the Scientific Method](#) from Learn 360. Now, what is a question you have about matter? It is important that it is not a “yes” or “no” question, if you can answer your question with “yes” or “no,” that question won’t work for your experiment. Use [Popplet](#) to create a mind map. Write your BIG question in the centre of your mind map, and write your small questions around the outside. Now, use [Explora](#), [Science Power](#), and [World Book Kids](#) to conduct some research about your questions. You can use [this form](#) to organize your research. Use the information you gather to create your hypothesis (prediction about what will happen) and design your experiment. What will you do to find an answer to your

question? How many times will you repeat the experiment? Where will you conduct the experiment? What materials will you need? How will you document your experiment (paper, camera, video etc.)? For the most accurate results, conduct your experiment at least twice. Have fun! Parents and teachers can use [this handy rubric](#) for assessing the project. Consider reflecting on your project using this [helpful document from BIE](#).

## How do local First People's Local First People's use different methods to separate and extract mixtures?



### Activities (Select 3-4):



**Eulachon Oil:** Have you ever heard of eulachon oil? Do you know what eulachon are? Eulachon are a small ocean fish found along the Pacific coast. First Peoples from California to Alaska used eulachon as an important part of their diet. Eulachon played an important role in trade between different First Peoples groups. Harvest of eulachon continues today in places along the coast of British Columbia. Eulachon were also processed for their rich oil. You can use [Advanced Google Images](#) to find pictures of eulachon. Have you ever seen fish oil? Did you ever wonder how the fish oil was extracted and processed? Learn more about the process by which First People extracted and process eulachon oil in this interesting videos from Discovery Education: [Making Eulachon Oil](#) and [Processing the Eulachon Catch](#). Then, watch the process by which a [fish transforms into a candle](#). What are the steps in the process by which the fish is transformed? Document them using [this handy sheet](#). What are some of the physical changes that take place as the fish is transformed? What are some of the chemical changes that take places as the fish is transformed? Why is the eulachon sometimes referred to as the “saviour fish?” How do you think people around the world learn to extract the nutrients and materials they need from the resources available in their environment? Why do you think God designed a world with complex substances, mixtures, and materials for human beings to experiment with and explore? What

evidence do you see of God providing for our needs through the different materials available on earth?



**Natural Plant Dyes:** How did First Nations people colour or decorate their clothes, baskets, masks, food? What do you think some natural sources of dye might be? How many can you think of? How would you process these sources so that nothing but dye is left behind? Try this fun activity from the Scientist in Residence Program. You will need to prepare your plant dyes two days before you intend to use them. For your plant dyes you can use powdered turmeric (yellow), cranberries (red), and purple cabbage (purple).

- *“Turmeric dye: Add 4 Tbsp of powdered turmeric to 2 cups of water. Place in glass jar, mix and then let sit for 1-2 days.”*
- *“Cranberry Dye: Squish 1 bag of cranberries in a non-reactive pot and add 2 cups of water. Bring to a boil and then let simmer on low heat for 30 minutes, adding water if needed. Let sit overnight and then sieve mixture and place liquid dye in glass jar and refrigerate until ready to use.”*
- *“Purple Cabbage Dye: Chop up half a head of purple cabbage and place in a non-reactive pot. Add 2 cups of water and bring to a boil, then simmer for 20-30 minutes on low heat. Add more water if necessary. Let cool, sieve and place liquid dye in glass jar and refrigerate until ready to use.”*

When you are ready to use your dyes, select 3 (or more) strips of unbleached cotton. Old sheets or pillowcases will work well for this purpose. Place a strip of cloth in each dye. You will then need to boil the cotton strips inside the prepared dye for approximately 20 minutes. Allow the strips and dye to cool, then spoon out the cloth strips. Rinse each strip with cold water, and allow to dry.

Now, try to prepare fresh dye using different materials (walnut shells and frozen blackberries)

- To create walnut shell dye crack open your walnuts and place the shell in the dye pot. Try to have 20-30 walnut shells. Add 2 cups of water and let your mixture soak for 24 hours. Then simmer the shells for one hour on low heat. Sieve and place the dye liquid in a jar. To use the dye, repeat the process listed above.
- To create dye from frozen blackberries (or blueberries) begin by thawing ½-1 pound of berries. Have fun squishing the berries using your hands. Simmer the mixture for 30-40 minutes on a low heat. To use the dye, repeat the process listed above.

Was it fun to create the different dyes? What are some of the ways you could use the dyes you created? Would they work as paint? Would any of the dyes you created be

safe to eat? Why do you think people created dye? Do you think that God gave us an appreciation for colour? Explain your thinking.



**Bannock Making (Flour from Wheat):** Many of the foods that you eat on a daily basis involve elements of extraction. How do you think First Peoples, and other people around the world, get bread? What is the process used to make bread? What materials are required? What is flour made from? How is flour made? First Peoples in Canada did not grow their own wheat, but they did trade for it with the Europeans. Try grinding your own flour to experience the process. Then, make your own bannock, a First Nations style bread! For this project you will need whole wheat grains and a mortar and pestle. Use the mortar and pestle to grind the wheat grains. Is this an easy process? How long does it take you to produce flour? How much flour can you produce in ten minutes? Fifteen minutes? Twenty minutes? An hour? Are your arms sore yet? Use the following recipe to make your own bannock: *“1 ½ c flour ½ Tbsp baking powder ½ tsp salt 1 ½ c water 1 ½ Tbsp oil or lard Mix dry ingredients together. Add wet ingredients and mix lightly. Do not overmix. Make patties and put on to greased pan. Bake at 425 degrees for 20 minutes. Eat with jam.”* If you are feeling particularly ambitious, try grinding enough flour to make a small batch of bannock. How did it turn out? What are the differences between today’s processed flour, and the flour you grind with your mortar and pestle?



**Jacques Cartier Case Study:** Read [this case study](#) about Jacques Cartier and his crew in December of 1535. What happened to the crew? Why do you think they become sick? What were some of their symptoms? Do you know of any disease that have those symptoms? Once you have finished thinking about the symptoms, click the red link to read about what happened to the sailors. How do you think Donnacona's people knew to boil the needles to make tea? Why don't people in Canada, generally speaking, not develop scurvy anymore? How does your body receive the vitamin C it needs to stay healthy? How does boiling the needles/leaves help to create the remedy for scurvy? Would chewing on the needles have the same effect? Do you think it would work as efficiently as the tea? Why or why not?

Write a series of journal entries from the perspective of Jacques Cartier, or one of his men, retelling the story of how they were saved from scurvy. Or, if you prefer, write a skit retelling the story to perform with siblings and friends and create a video recording. Read other Canadian [case studies featuring natural medicines here](#).



**First People's Medicine:** Before there was Shopper's Drug Mart, First Peoples were using plants to produce different medicines and remedies. Use [this website](#) to fill in the table below, be sure to write in some medicines/remedies that are a more modern equivalent. Once you have completed your chart, discover what [plants might be hiding in your own medicine cabinet!](#) You can also use [this interactive map](#) to discover plant species that are native to your local area.

Plant Name	How is it Administered?	What does it treat?	What is a modern equivalent?
<i>Acorus calamus</i> - Sweet Flag			
<i>Arctostaphylos uva-ursi</i> - Bearberry			
<i>Cypripedium reginae</i> - Showy Lady's-slipper			
<i>Gaultheria procumbens</i> - Teaberry			
<i>Heuchera richardsonii</i> - Alumroot			
<i>Hierochloe odorata</i> - Sweet Grass			
<i>Ledum groenlandicum</i> - Labrador Tea			
<i>Polygala senega</i> - Seneca Root			
<i>Sanguinaria canadense</i> - Bloodroot			



**Pemmican Cakes:** Make [pemmican cakes](#)! Pemmican is a high-energy food that was used by First People groups and, eventually, explorers and voyageurs when traveling. Ingredients: 1 package of beef jerky, 1 cup dried berries (blueberries, cranberries or cherries), 1 cup chopped nuts or sunflower seeds,  $\frac{1}{4}$  cup beef suet or vegetable shortening, honey to taste (1-3 teaspoons). You will also need a 12-cup muffin tin. Line muffin cups with paper liners (or grease cups extremely well). Grind or chop beef jerky into miniscule pieces to make about 1 cup. Melt suet or shortening in a saucepan. Remove from heat, stir in beef jerky, dried berries, and seeds. Stir in honey. Spoon about  $\frac{1}{4}$  cup of the pemmican mixture into each muffin cup. Press down firmly to make a cake, smoothing the top. Refrigerate until well set. What different elements make up the mixture that forms pemmican? Is this a complex mixture? Explain your thinking. Would it be easy to separate out the different parts of the pemmican mixture? Why or why not?

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