Ontario Agri-Food Education Inc.

Nature's Sweet Mystery

An Integrated Curriculum Resource for Grades 4–6

An exploration of food energy through a series of four missions

carbon dioxide + water + sunlight = sucrose + oxygen

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About this Resource

Nature's Sweet Mystery is an exciting learning adventure for students in grades four to six. This integrated curriculum resource is designed to guide students in an exploration of food energy through a series of four Missions:

Mission 1: *Exploring Food Chains*
Mission 2: *Exploring Food from Field to Table*
Mission 3: *Exploring the Human Body*
Mission 4: *Exploring Energy Balance*

Each Mission includes:
✓ Curriculum connections, teacher background information, and teacher planning notes
✓ Reproducible evaluation rubrics and suggestions for assessing student achievement
✓ Glossaries for defining key words and suggestions of additional resources
✓ Reproducible student activity sheets and overhead masters

Although this resource is designed as a teaching unit, the individual Missions and activities may be used separately.

The teacher background information and student activities in each Mission have been developed primarily to support the achievement of curriculum expectations and learning outcomes for students across Canada in the areas of Science, Health, and Physical Education. The cross-curricular nature of the activities also provides opportunities for students to develop knowledge and skills in English Language Arts, Mathematics, and Social Studies.

The activities and experiments in *Nature's Sweet Mystery* encourage students to investigate, question, plan, observe, record and draw conclusions.

Evaluation
This resource has been classroom tested by Canadian teachers and their ideas and suggestions have been incorporated into the final kit. In order to continually improve this resource, we would like to hear from you! By visiting the catalogue link on the Ontario Agri-Food Education Inc. (OAFE) website, at www.oafe.org, you can rate and write a review of *Nature's Sweet Mystery*. Feedback can also be provided directly to the Canadian Sugar Institute at info@sugar.ca. Your feedback is greatly appreciated.

We hope you and your students enjoy this teaching resource as much as we enjoyed developing this program for you!

From the Nutrition Professionals of the Canadian Sugar Institute,
Nutrition Information Service
Visit our website at: www.sugar.ca

Testimonials

"Great ideas! They covered science, social studies, and health expectations."
Grade 3/4 teacher, Ontario

"It has elements that reach many grade levels in Ontario, and the units are well capsulated."
Grade 3/4 teacher, Ontario

"Very good resource for nutrition segment in health curriculum."
Grade 4 teacher, Manitoba

"There are lots of neat activities to do with your class."
Grade 4 teacher, Saskatchewan

Acknowledgements

Nature's Sweet Mystery was created in 1994, with an extensive revision in 2001 through collaboration with a variety of talented partners including, Valerie Steele, Nutrition-Wise Communications, Toronto, Ontario; Susan E. Morgan, Nutrition Consultant, Brooklin, Ontario; Ontario Agri-Food Education Inc.; and a team of teacher advisors from across Canada. The Canadian Sugar Institute is grateful to the following individuals of Ontario Agri-Food Education Inc. (OAFE) for their contribution to the 2009 revision of *Nature's Sweet Mystery*:

Jan Robertson	Marketing & Communications Manager
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Seal of Approval

The Ontario Agri-Food Education Inc. Seal of Approval ensures that this resource has met eight critical criteria. Resources are reviewed by an independent panel represented by both the agri-food and education sectors to ensure the following:

1. Factual information is current.
2. Information is accurate and authentic.
3. Learning expectations are clear and concise.
4. A balanced perspective is presented.
5. Assessment and evaluation of student achievement must be addressed.
6. The presentation of information is bias-free.
7. A copyright clearance statement is included.
8. Inclusive language is used wherever applicable.

Table of Contents

Exploring Food Chains

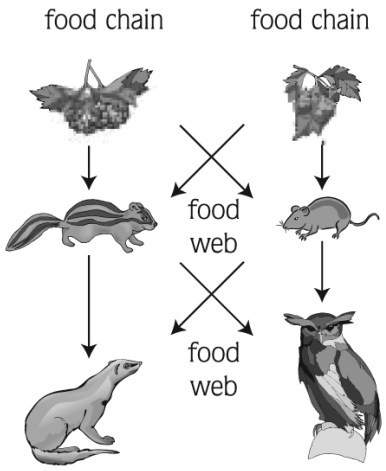
MISSION 1

Exploring Food Chains provides information and activities designed to lead students in exploring the natural sequence of feeding relationships between organisms in a variety of ecosystems.

Curriculum Connections for Grades 4 - 6

Students will:

1. Demonstrate an understanding of a food chain as a system in which energy from the sun is eventually transferred to animals.
2. Investigate the dependency of plants and animals on their habitat and the interrelationships of the plants and animals living in a specific habitat.
3. Recognize the sun as the principle source of energy for life.
4. Investigate the process of photosynthesis as the first step in all food chains.
5. Understand that plants make their own food in the form of sugar.
6. Construct food chains of different plant and animal species.
7. Classify organisms according to their role in a food chain (primary producer, secondary consumer, etc.).
8. Classify animals as omnivore, carnivore, and herbivore.
9. Identify various factors that affect plants and animals in a specific habitat.
10. Communicate the procedures and results of their food chain investigations.



Teaching Background Information

FOOD FOR LIFE

All living organisms, both plants and animals, need food to live. Food provides the nutrients plants and animals need to build and repair their body parts. Food also provides plants and animals with the energy they need to grow. Animals, including humans, also need energy for their hearts to beat, their brains to think, their lungs to breathe and their muscles to move.

FOOD CHAINS

Plant and animal needs are all interrelated and dependent on each other. Food chains are sequences of feeding relationships through which plants and animals depend on each other for food. There are countless food chains involving different plant and animal species in different habitats all around the world. Every plant and animal belongs to at least one food chain. Food chains can be very simple or very complex. When an animal from one food chain eats a member of another food chain, two food chains connect, creating food webs.

ENERGY FROM THE SUN

The sun is the primary source of energy for all life. Even living organisms that seem to flourish in darkness feed on plants, insects, animals or microorganisms that depend on sunlight for their survival. The sun provides energy that plants can use to make their own food. This is the first step in every food chain.

NATURAL FOOD FACTORIES

All green plants can do something truly amazing and unique that no other living thing on earth can do. They can make their own food energy using sunlight, air and water. The process by which plants produce food energy in this way is called *photosynthesis*. The word photosynthesis comes from two Greek words. *Photo* means light and *synthesis* means putting things together to make something new. Overhead 1:1 (page 6) illustrates the process of photosynthesis.

PHOTOSYNTHESIS IN ACTION

Green plants have a special chemical in their leaves called chlorophyll - the substance that makes leaves green. The chlorophyll found in the chloroplasts of green leaves allows the leaves to act like miniature solar panels capturing and storing the sun's energy far more efficiently than anything ever devised by humans. Green plants use energy from sunlight, carbon dioxide gas from the air, and water from the soil to produce their own food.

NATURAL FOOD ENERGY

Plants use the process of photosynthesis to make sugars, called glucose and fructose. The glucose and fructose is combined to produce sucrose: a sugar found naturally in all plants - the exact same sugar you find in your sugar bowl. These sugars are the basis for all food energy. The sugars that plants produce are stored in the root, leaf, seed, or fruit of the plant. Plants can turn these sugars into other sources of food energy, including other sugars, starches, proteins, and fats; all the different kinds of food energy that plants and animals need for life.

PRODUCERS AND CONSUMERS

Green plants are called primary producers because they are the first link in the food chain and they produce food. Plants provide animals and humans with food, both directly and indirectly. For example, humans eat many plants directly in the form of vegetables and fruit. Indirectly, humans receive plant food through animals called primary consumers. An example of a primary consumer is a cow that feeds on grass. Humans then get energy from drinking the milk that cows produce using the energy from the grass they ate. In this food chain, humans can be called secondary consumers. Food energy from sugar is transferred through this natural sequence in food chains starting with its formation in plants and ultimately providing energy for the human body.

HERBIVORES, CARNIVORES AND OMNIVORES

Animals can be further classified as herbivores, carnivores, and omnivores depending on the foods they eat. Herbivores are animals, like rabbits, that eat only plants. Carnivores are animals, like foxes, that only eat other animals. Herbivores are usually near the bottom of a food chain and carnivores near the top (e.g. the fox eats the rabbit). Omnivores are animals, like humans, that eat both plants and animals.

Teacher Planning for Student Activities

Activity 1:1 FIND OUT ABOUT PHOTOSYNTHESIS

PURPOSE: To help students recognize the key ingredients necessary for photosynthesis, the process by which plants produce their own food to sustain their growth.

CURRICULUM CONNECTIONS:
4, 5

KNOWLEDGE AND SKILL DEVELOPMENT:
Science, English Language Arts, Art

TEACHER NOTES:
This activity is designed to help students understand and illustrate the process of photosynthesis, the first step in every food chain. Overhead 1:1 (page 6) can be duplicated onto a transparency to illustrate the process and generate class discussions. This activity helps students learn the language associated with photosynthesis. The research and illustrations will help students discover how plants naturally produce food energy in the form of sugar, a basic element of every food chain, essential to the growth and life of all living organisms.

ASSESSMENT AND EVALUATION:
Students should be able to describe the process of photosynthesis in their own words.

Activity 1:2 PHOTOSYNTHESIS IN ACTION

PURPOSE: To help students recognize the key ingredients necessary for photosynthesis, the process by which plants produce their own food to sustain their growth.

CURRICULUM CONNECTIONS:
3, 4, 9, 10

KNOWLEDGE AND SKILL DEVELOPMENT:
Science, English Language Arts

TEACHER NOTES:
This activity provides students with an opportunity to conduct an experiment in which they create different environments where plants will either grow well, grow poorly, or won't grow at all. They will observe and record the effects of depriving plants of sunlight, water or air, the key ingredients for the process of photosynthesis, which is essential for plant growth. When students have finished planting their four containers, ask each team to predict what will happen and share their "hypothesis" with the rest of the class.

NOTE Bean seeds sold for food in grocery stores have often been heat-treated and will not grow. It is important to use bean seeds intended for planting for this activity. Check with a local nursery or garden centre. Bean seeds are an ideal choice for this activity because they grow more quickly than many other types of seeds.

ASSESSMENT AND EVALUATION: The following information should be used as criteria to evaluate the students' reflections on photosynthesis in their responses to questions 3 and 4 on the student activity page (page 15).

Students will observe that the seedlings in:

CONTAINER #1 - carry out photosynthesis most successfully because they have all the elements they need to produce their own food through the process of photosynthesis. The plants in the container with sunlight, water and air grow the best and are the healthiest.
CONTAINER #2 - grow tall and quickly but are not healthy; without light for photosynthesis they appear white, thin and weak looking. These plants use the energy reserves in the seed to grow and search for light, but because photosynthesis cannot occur without light, they cannot produce energy to sustain their ongoing growth and will die.
CONTAINER #3 - cannot grow without water.
CONTAINER #4 - will grow and be healthy for some time, because there is some air trapped in the bag. But without fresh air, the plant will use up all the carbon dioxide in the bag over time. Since the carbon dioxide in the air is essential for the process of photosynthesis, the plant will eventually die. Photosynthesis cannot occur and plants cannot grow properly without light, water or air.

Activity 1:3 CREATE A FOOD CHAIN

PURPOSE: To help students understand the basic elements of a food chain; how plant, animal and human needs are all interrelated; and the classification of organisms according to their role.

CURRICULUM CONNECTIONS:
1, 2, 3, 6, 7, 8, 9, 10

KNOWLEDGE AND SKILL DEVELOPMENT:
Science, Art, English Language Arts

TEACHER NOTES:
This activity provides students with an opportunity to investigate and illustrate a food chain of their own choice. Their findings can be used as the basis for a class discussion on conservation and environmental issues, and the impact these have on food chains. Once students have presented their food chain posters, you may wish to post them in the classroom.

ASSESSMENT AND EVALUATION:
The rubric included with this Mission (page 7) may be used to assess students' posters.

Activity 1:4 MAKE YOUR OWN MINI FOOD CHAIN

PURPOSE: To show students how they participate in food chains every day.

CURRICULUM CONNECTIONS:
1, 2, 5, 6, 10

KNOWLEDGE AND SKILL DEVELOPMENT:
Science, English Language Arts, Health and Physical Education

TEACHER NOTES:
We are involved in a food chain every time we eat a meal or a snack. In this activity, students will become actively involved in the making of bread, which is part of a food chain they enjoy regularly. In bread making, the action of yeast converts sugar and some starches into carbon dioxide gas and alcohol. The alcohol is lost during baking. The production of carbon dioxide is necessary in causing the dough to rise.

Read over the directions for this activity and ensure that you have all equipment and supplies.

NOTE Food safety is a primary concern when cooking in a classroom with children. Prior to this activity a discussion on safe food practices and handling must take place. All surfaces and equipment used for this experiment must be clean and sanitary. Dough should be properly stored to ensure food safety.

Organize students into groups of 4 or 5 in order to ensure success for all students. In their groups students will follow the instructions on the handout provided in order to make bread. Each member of the group will have one of the following jobs to do during the activity (note more than one student may be assigned to a job):

- **Equipment Manager** - collects all utensils, equipment and ingredients needed for the activity
- **Director** - reads the recipe/instructions and helps all members of the group to complete their task successfully
- **Cook** - mixes the dough and kneads, teaches other members of the group to knead as well
- **Sanitation Manager** - ensures that all members of the group use sanitary work habits, cleans up work area and equipment

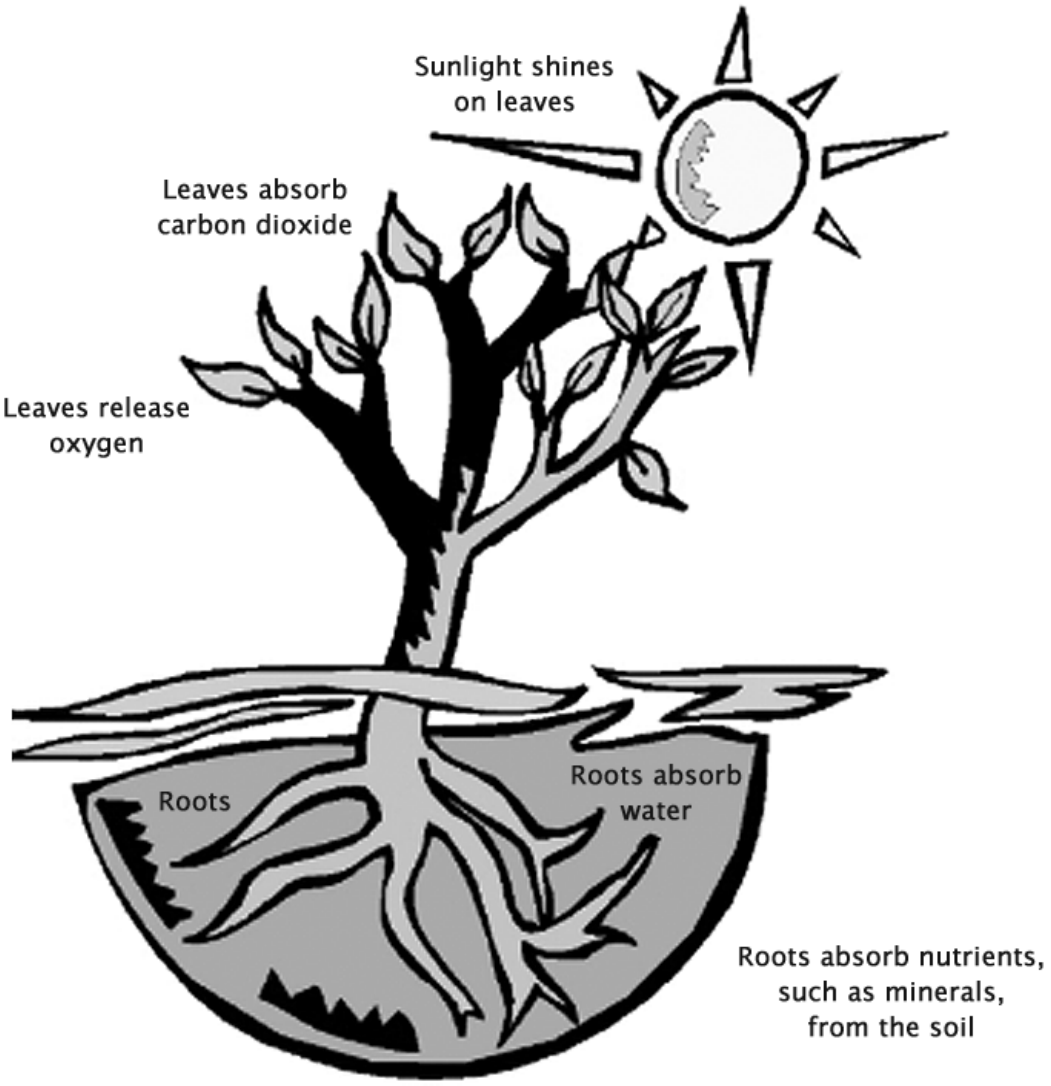
The Student Directions provide specific instructions for students to work through the activity.

The bread will need to be baked for 15 to 20 minutes in an oven at 190°C / 375°F. If there is an oven in the school it can be baked at school, if not it will have to be sent home to bake. If you are sending it home, advise parents ahead of time that the dough will be coming home.

ASSESSMENT AND EVALUATION:
Students will be evaluated on their completion of their job in the activity. Use the Evaluation tool provided (page 8).

KNEADING INSTRUCTIONS:
1. Place the dough on a clean work surface that has been dusted with flour.
2. To begin kneading, fold the dough over toward you.
3. Then press it away from you with the floured heel of the hand, give it a quarter turn and press away again. The pressure exerted on the dough should be neither heavy nor rough.
4. Use more flour as necessary on your hands and work surface to overcome stickiness.
5. Repeat the process until the dough becomes smooth and elastic.
6. Air blisters will appear just under the surface coating, try not to break the coating.
7. The dough should no longer stick to the work surface when it is ready to be set aside to rise.

OVERHEAD 1:1


Sunlight shines on leaves
Leaves absorb carbon dioxide
Leaves release oxygen
Roots
Roots absorb water
Roots absorb nutrients, such as minerals, from the soil

Evaluation Page

ACTIVITY 1:3

Poster Evaluation Rubric

Criteria	Level 4	Level 3	Level 2	Level 1
Understanding concepts	Demonstrates a high degree of understanding of the connections in the food chain	Demonstrates considerable understanding of the connections in the food chain	Demonstrates some understanding of the connections in the food chain	Demonstrates limited understanding of the connections in the food chain
	Demonstrates a high degree of skill in making real life connections	Demonstrates considerable skill in making real life connections	Demonstrates some skill in making real life connections	Demonstrates limited skill in making real life connections
	Demonstrates a high degree of understanding of the supports for food chains	Demonstrates considerable understanding of the supports for food chains	Demonstrates some understanding of the supports for food chains	Demonstrates limited understanding of the supports for food chains
Communication of Results/Visual Presentation	Communicates results of their inquiries in a detailed, sequenced and organized manner with a high degree of skill	Communicates results of their inquiries in a detailed, sequenced and organized manner with considerable skill	Communicates results of their inquiries in a detailed, sequenced and organized manner with some skill	Communicates results of their inquiries in a detailed, sequenced and organized manner with limited skill
	Communicates the results of their inquiry by identifying titles, labelling key components and using learned vocabulary with a high degree of accuracy	Communicates the results of their inquiry by identifying titles, labelling key components and using learned vocabulary with considerable accuracy	Communicates the results of their inquiry by identifying titles, labelling key components and using learned vocabulary with some accuracy	Communicates the results of their inquiry by identifying titles, labelling key components and using learned vocabulary with limited accuracy

Evaluation Page

ACTIVITY 1:4

Evaluation Checklist for Group Activity – Make Your Own Mini Food Chain

Group member's name: _____

Group member's job: _____

Criteria	Level 4	Level 3	Level 2	Level 1
Understood job and completed tasks effectively				
Supported other members of the group in the performance of their tasks				

Glossary

MISSION 1

CARBON DIOXIDE - gas that is absorbed from the air by plants to make their own food using photosynthesis; a gas produced naturally by humans and other animals and released when breathing out.

CARNIVORES - animals, like foxes, that eat only other animals.

CHLOROPHYLL - the green pigment inside chloroplasts in the leaves and stems of plants that captures light energy for photosynthesis.

CHLOROPLASTS - structures found in the leaves of green plants that allow them to capture and store energy from the sun.

FOOD CHAINS - the sequence of feeding relationships through which plants and animals depend on each other for food.

FOOD WEBS - the connection of two or more food chains.

FRUCTOSE - a sugar produced naturally by plants as a source of energy through the process of photosynthesis.

GLUCOSE - a sugar that is the primary source of energy for humans, produced naturally by green plants through the process of photosynthesis.

HERBIVORES - animals, like rabbits, that eat only plants.

OMNIVORES - animals, like humans, that can eat both plants and animals.

PHOTOSYNTHESIS - the process by which green plants use the sun's energy to turn carbon dioxide gas and water into sugars (plant food) and oxygen.

PRIMARY CONSUMERS - animals that eat (consume) only green plants (primary producers) for food energy.

PRIMARY PRODUCERS - the first link in the food chain; green plants that naturally produce their own food using energy from the sun.

SECONDARY CONSUMERS - animals that rely on food energy from other animals that are primary consumers.

SUCROSE - a sugar made of glucose and fructose, naturally produced by plants as a source of energy through the process of photosynthesis.

Additional Resources

MISSION 1

BOOKS

I am a Living Thing
By Bobbie Kalman
Series: Science of Living Things
Crabtree Publishing Company
24 Pages (2007)
ISBN 0778732290
This new book explains in a simple way why people are living things. We need sunshine, air, water, and food. We grow and change. We need places to live. Young children will be amazed to learn that, as living things, they share many similarities with plants and animals.

What are Food Chains and Webs?
By Bobbie Kalman
Series: Science of Living Things
Crabtree Publishing Company
32 Pages (1998)
ISBN 0865058768
A simple introduction to food chains and webs, featuring both herbivores and carnivores, and discussing energy, food production, and decomposition in various ecosystems.

A Teacher's Guide To Nature's Food Chain: Lesson Plans To Teach Nature's Food Chains
By Carol Malnor
Dawn Publications; Teacher edition
48 Pages (2000)
ISBN 1584690070
Different types of food chains, habitats, and animal relationships are explored using approaches that incorporate multiple intelligences including movement, art, music, writing, and math activity centers for both individual and group work.

Photosynthesis and Respiration
By William G. Hopkins
Chelsea House Publications
168 Pages (February 2006)
ISBN 0791085619
Presenting plants as photosynthetic machines, this book follows the flow of energy and carbon through the natural processes of photosynthesis and respiration, spotlighting the role plants play in balancing the global carbon budget.

ELECTRONIC RESOURCES

ECOKIDS
www.ecokids.ca/pub/index.cfm
An environmental website for kids, teachers and parents with interactive activities based on Ontario Curriculum.

NATIONAL GEOGRAPHIC XPEDITIONS
www.nationalgeographic.com/xpeditions/
Interactive geography activities and lesson plans for all grades.

PARKS CANADA
www.pc.gc.ca/apprendre-learn/prof/itm2-crp-trc/crp-trc1_e.asp
Canadian educational resources categorized by curriculum, province and grade.

EARTH GUIDE at Scripps Institution of Oceanography
earthguide.ucsd.edu/earthguide/diagrams/photosynthesis/

That Beet is Sweet!
By Sarah Morrison, Statistics Canada
Approximately one third of the world's production of refined sugar comes from sugar beets! Learn more about the history, production, and processing of sugar beets.
http://www.sugar.ca/english/pdf/That_Beet_is_Sweet_Stats_Canada_08.pdf

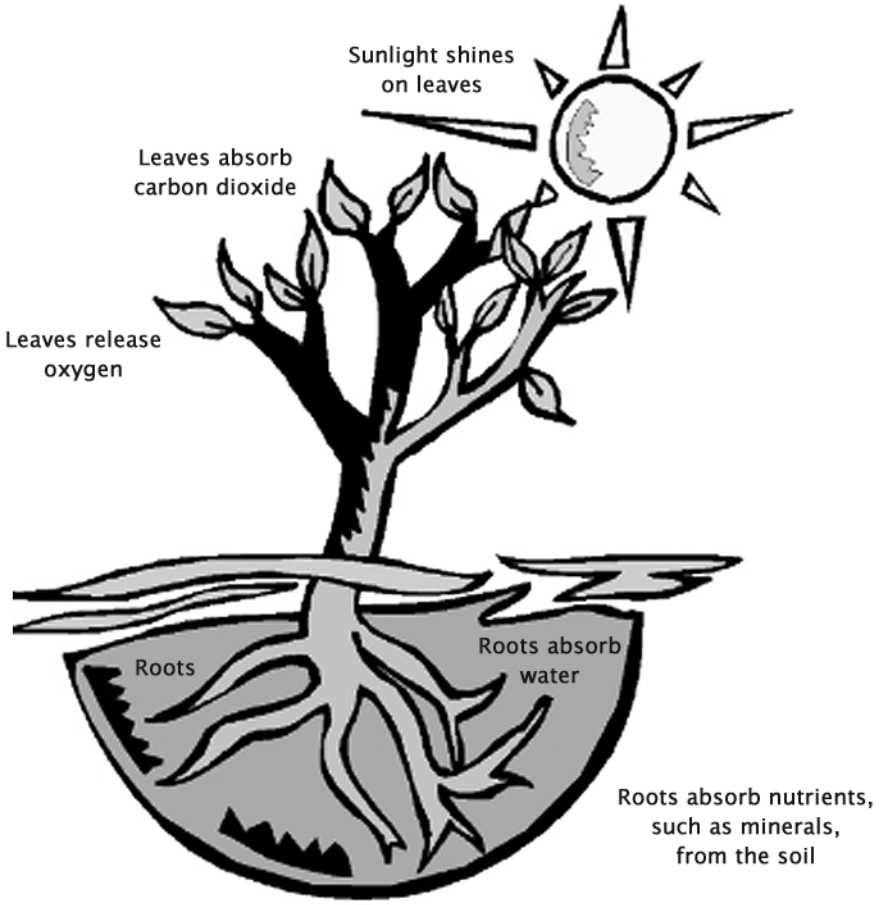
Exploring Food Chains

ACTIVITY 1:1

Find Out About Photosynthesis

Plants can do something truly amazing. They can make their own food using the energy from the sun. This process is called photosynthesis. The leaves and stems of green plants act like solar panels. They contain a green chemical called chlorophyll that can capture the sun's energy. They use this energy to combine water from the environment and carbon dioxide from the air to make food.

The foods that plants make using photosynthesis are sugars. Plants store the sugars they make in the root, leaf, seed or fruit. They also use these sugars to make other sugars, starches, fats and proteins - all the different kinds of food energy needed by plants and animals. The natural production of sugar by plants using photosynthesis is the first step in making food energy for all life on earth.



Student Directions

1. Use a dictionary or an encyclopedia to look up definitions of the following words that are used to describe how plants produce energy using sunlight, water, and carbon dioxide from the air.

Student Responses

PHOTOSYNTHESIS: _____

_____

CHLOROPHYLL: _____

_____

CARBON DIOXIDE: _____

_____

SUGAR: _____

_____

ENERGY: _____

_____

2. Draw your own picture to show how photosynthesis works, below or on a separate piece of paper. Be sure to use the new words you have learned to label your picture.

ACTIVITY 1:2

Photosynthesis in Action

Seeds contain stored plant food (nutrients and energy) that the plant needs to begin growing under the soil. This stored plant food lasts until the seedlings are able to trap energy from the sun to make their own food, in the form of sugars, through photosynthesis.

Plants use energy from the sun to make their own food through a process called photosynthesis. They use water from the environment and carbon dioxide gas from the air to make two types of sugars - glucose and fructose. Plants also combine glucose and fructose to make another sugar called sucrose. Sucrose is exactly the same kind of sugar that you find in your sugar bowl at home. The sugars that plants make during photosynthesis supply the energy that they need to grow strong and healthy.

Student Directions

Try this experiment to see how well plants can live with and without sunlight, water, and air.

1. Work in the group/team assigned by your teacher.

2. With your teammates, collect:
- ✓ 3 coffee cans (empty and clean with lids removed)
- ✓ 1 self-watering pot (a pot with a saucer attached at bottom for watering)
- ✓ 20 bean seeds (the kind used for planting)
- ✓ 1 clear plastic bag (large enough to cover the self-watering pot)
- ✓ potting soil
- ✓ 1 measuring cup (250 mL)
- ✓ masking tape
- ✓ 1 marker
- ✓ 1 rubber band

3. Soak the bean seeds in a bowl of cool water overnight. This softens the seed case so the new plant can break it more easily and sprout more quickly.

4. Fill the three coffee cans and the self-watering pot with soil to about 1.5 cm from the top.

5. Place five seeds in each container and push them down so they are just covered with soil.

6. Label the three cans:
#1 GOOD GROWING CONDITIONS
#2 NO SUNLIGHT
#3 NO WATER

7. Label the self-watering pot: #4 NO AIR

8. Prepare each can as directed:

#1 **GOOD GROWING CONDITIONS** - Add water until soil is just moist (about 50 mL) and place on a sunny windowsill. Do not cover the can and do not over-water.
#2 **NO SUNLIGHT** - Add water until soil is just moist (about 50 mL) and place in a dark closet. Close the closet door. Do not cover the can and do not over-water.
#3 **NO WATER** - Place on a sunny windowsill; do not add water and do not cover.

9. Prepare the self-watering pot as directed:

#4 **NO AIR** - Place the plastic bag over the top half of the pot and secure it with the rubber band so that the bottom half of the pot is not covered. Pour as much water as possible into the container at the bottom of the pot and place the pot on a sunny windowsill.

10. Rotate the plants on the windowsill daily. Water all plants, except for #3, when the soil is dry (about every 2 to 3 days). Be careful not to over-water the plants.

Student Responses

1. Note how many days it takes for the first plant to break through the soil in each container.

	CONTAINER #1 Good Growing Conditions	**CONTAINER #2** No Sunlight	**CONTAINER #3** No Water	**CONTAINER #4** No Air
Days to first Sprout				

2. Use the table below to note your observations on the plant growth over a period of 4 weeks after you plant the seeds. Record the height and describe the appearance of the plants in each container every week. After 2 weeks you should see some noticeable differences.

WEEK	**CONTAINER #1** Good Growing Conditions	**CONTAINER #2** No Sunlight	**CONTAINER #3** No Water	**CONTAINER #4** No Air
1				
2				
3				
4				

3. Which seedlings carried out photosynthesis most successfully? Why? _____

_____

_____

_____

4. Can photosynthesis occur, allowing healthy plant growth, without: Light? Water? Air? Why?

_____

_____

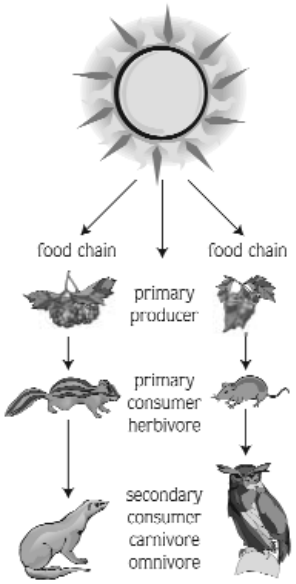
_____

_____

Exploring Food Chains

ACTIVITY 1:3

Create a Food Chain



All living plants and animals depend on food energy for life. The transfer of food energy from one living organism to another is called a food chain. Every plant and animal belongs to at least one food chain. There are many food chains taking place every day all around you - in nearby parks or fields, in far away jungles, in little ponds, and in the great oceans.

Food chains all start with energy from the sun. Green plants are called primary producers because they are the first link in the food chain and they produce food using energy from the sun. Herbivores, or animals that feed on plants, are the next link in the food chain - they are primary consumers. Animals called carnivores feed on other animals. Animals that eat both plants and animals are called omnivores. Carnivores and omnivores are called secondary consumers. Food chains allow for energy from the sun to be transferred from one living organism to another.

Student Directions

1. Choose a food chain to investigate using an encyclopedia, a book, or the internet. Start with the sun and work your way up to a secondary consumer.

2. Based on your research, create a poster that illustrates a food chain. Your poster should include real life examples of all of the following:

   - primary producers
   - herbivores
   - primary consumers
   - carnivores
   - omnivores
   - secondary consumers

   Your poster should also show what is provided in the environment (air, water, soil) to support the food chain.

3. Label your food chain with the words listed above to describe the different roles of the plants and animals in the food chain.

Student Responses

1. Make a list of things that affect the plants and animals in your food chain like the availability of water, food sources, light, soil conditions, weather.

2. Brainstorm a list of things that may cause "breaks" in your food chain (e.g. pollution). What do these breaks do to your food chain?

3. Present your food chain and your findings to your group or class. Explain:

- the roles of the plants and animals
- other things in the environment that can affect your food chain in a good or bad way

ACTIVITY 1:4

Make Your Own Mini Food Chain

Every meal and snack that you eat each day connects you to different food chains. Food chains allow for the energy from the sun to be transferred from one living organism to another, and another, without being lost. For example, when you eat chicken, you use the energy that the chicken stored from the grain that it ate. The grain stored the energy from the sun while it was growing in the field.

Student Directions

This bread baking activity recreates a mini food chain that you probably participate in every day.

1. Your teacher will assign students to a group and each member of the group to a different job:

a. **Equipment Manager** - collects all utensils, equipment and ingredients needed for the activity
b. **Director** - reads the recipe/instructions and helps all members of the group to complete their task successfully
c. **Cook** - mixes the dough and kneads, teaches other members of the group to knead as well
d. **Sanitation Manager** - ensures that all members of the group use sanitary work habits, cleans up work area and equipment

2. Equipment manager - gather the following items:

- ✓ 1 sponge, soap and hot water
- ✓ several sheets of paper towel
- ✓ 1 large mixing bowl
- ✓ 1 medium size mixing bowl
- ✓ 1 soup bowl
- ✓ 1 measuring cup for liquids
- ✓ 1 set of measures for dry ingredients
- ✓ 1 tablespoon (15 mL) measuring spoon
- ✓ 1 mixing spoon
- ✓ 15 mL (1 tbsp) yeast (fast acting)
- ✓ 45 mL (3 tbsp) sugar
- ✓ 15 mL (1 tbsp) salt
- ✓ 30 mL (2 tbsp) cooking oil
- ✓ 750 mL (3 cups) flour
- ✓ plastic wrap

3. Sanitation Manager - clean the surface of a work table well using the sponge, soap and hot water. Dry the surface with the paper towel.

4. **All group members** - wash your hands.

5. **Equipment Manager** - fill the measuring cup with 250 mL (1 cup) of lukewarm tap water, and add it to the large bowl.

6. **Cook** - empty the yeast into the large mixing bowl. Put the sugar and salt into the large bowl and mix gently with the mixing spoon.

7. **Equipment manager** - measure 30 mL (2 tbsp) of cooking oil using the tablespoon and place in the soup bowl.

8. **Cook** - measure 15 mL (1 tbsp) of this oil and add it to the large mixing bowl.

9. **Cook** - measure 750 mL (3 cups) of flour using your dry ingredient measures, into your medium size mixing bowl. Then put 500 mL (2 cups) of this flour into the large mixing bowl. Leave the remaining 250 mL (1 cup) of flour in the medium bowl to use later (in step 11).

10. **Cook** - mix all the ingredients in the large bowl with the mixing spoon.

11. **Cook** - three times in a row, measure 50 mL (1/4 cup) of flour (from the medium bowl) and add to the large bowl, mixing it in each time until a ball of dough is formed.

12. **Cook** - powder the work table with a bit of the leftover flour (in the medium bowl) and place the ball of dough on this surface.

13. AFTER WATCHING YOUR TEACHER SHOW YOU HOW, take turns kneading the dough 5 or 6 times each. Knead the dough about 25 times altogether.

14. **Cook** - cover the ball of dough with a bit of the leftover cooking oil (from the soup bowl) and place the dough back into the large bowl. Cover the bowl with plastic wrap.

15. **Leave the bowl to sit for one hour in a warm area** - in the sun or near a radiator for example. This warmth will allow the yeast to live and do its work. BE CAREFUL NOT TO PUT THE BOWL TOO CLOSE TO VERY HIGH HEAT OR THE YEAST WILL DIE.

16. **Each Group Member** - record observations on the rising of the dough on the worksheet provided.

17. **Cook** - punch the ball of dough to release the carbon dioxide. Divide the dough into pieces, one for each member of the team.

18. **Each Group Member** - take your ball of dough and knead it 5 more times, then shape it. Oil the dough and wrap it loosely in plastic wrap to allow for it to swell again.

19. Once the dough is ready, bake the bread for 15 to 20 minutes in an oven at 190°C / 375°F.

Student Responses

1. Leave the dough to rise and record your observations for the following time intervals:

a. 15 minutes _____

_____

b. 30 minutes _____

_____

c. 45 minutes _____

_____

d. 1 hour _____

_____

2. In the bread dough, the yeast has everything it needs to live and reproduce: a humid area with an ideal temperature and food.

What is that food? _____

_____

3. The yeast eats and breathes in the dough. Like us, the yeast breathes out carbon dioxide.

a. What happens to this carbon dioxide?

_____

_____

_____

b. What happens to the bread dough?

_____

_____

4. When you eat the bread, you are participating in a food chain. Draw this mini food chain below.

Exploring Food from Field to Table

MISSION 2

Exploring Food from Field to Table provides information and activities designed to lead students in exploring how the food they eat is grown, transported, processed, and preserved.

Curriculum Connections for Grades 4 - 6

Students will:

1. Understand that different plants rely on different climates to grow.
2. Identify countries, oceans, and the equator on a world map.
3. Use a world map to identify regions where specific foods are grown.
4. Explore the agri-food chain from production to consumer, using natural sugar as an example.
5. Conduct a scientific experiment that involves preparing, observing, and comparing the results of four different test solutions over a period of days.
6. Discover how effectively different solutions work to preserve foods.
7. Observe the process of crystallization by which sugar is purified.

Teaching Background Information

THE EVOLUTION OF FOOD

Primitive people relied on foods that they could pick, hunt, and fish for their survival. As ancient populations began to depend on planted crops for food, they were faced with the challenge of finding ways to preserve their harvest between seasons. As time went on, they also looked for ways to transport food from one part of the world to another without having it spoil. Today, many foods travel a long way from the field in which they were grown to your table.

FOOD AROUND THE WORLD

Over the centuries, extensive trade of foods developed between different regions of the world. Methods of food production, preservation, and distribution have evolved over time. Today, the most exotic foods travel from one continent to another, much to the delight of our taste buds!

CLIMATE AND FOOD PRODUCTION

When ancient populations first began to grow their own food, they relied on a limited selection of crops that would grow in the local climate and soil conditions. Today, the local climate still influences the types of plants and animals that will live in different areas throughout the world. Sugar cane and sugar beet, the two most practical sources of sugar, are examples of plants that require different climatic conditions. Sugar cane resembles bamboo and grows well in tropical regions. Sugar beets are root vegetables that are cultivated in North America and Europe.

HIGH ENERGY PLANTS

All green plants produce and store sugars. However, long ago, people observed that certain plants contained more sugars than others. Thus, they tried to extract these sugars to use them along with other foods in their daily menus. Two plants, sugar cane and sugar beet, proved to be most practical for this purpose. Today, the majority of sugar used in food is derived from these two plants.

THE JOURNEY OF SUGAR

Many foods that we eat every day come from other parts of the world, and they are involved in a series of steps during their journey to our table. This is called the agri-food chain and involves the production, processing, and distribution of food to consumers. Sugar is a good example of the agri-food chain.

Production:

Sugar cane is grown in tropical climates as it requires plenty of water, sunlight and constant high temperatures to grow. When mature, the cane is stripped of its leaves, and the stalk is cut into lengths. These lengths are transported immediately to a local cane mill, so that the sugar in the cane is not broken down as the cane dies. Canada grows sugar beets primarily in Alberta and processes them in Taber, Alberta. They stay fresh because they are protected by the cold Canadian winter. The beets are then transported by truck to the sugar beet processing plant.

Processing:

At the cane mill, the sugar cane is shredded and pressed to extract the cane juice. The juice is then processed and boiled, and crystals begin to form. These crystals are dried to produce what is called "raw sugar", consisting of sugar crystals with impurities and a coating of molasses. The raw sugar is then transported on a cargo ship to sugar refineries in Canada. Refining is a process of purification that removes bits of plant material, soil, and colour compounds to produce the clean, pure white sugar we use at home. In this process, the raw sugar is first blended with a solution of molasses and water, and washed in a centrifuge. The clean, raw sugar is then boiled, filtered, and concentrated to a clear, colourless liquid. This liquid is then re-crystallized to make pure sugar crystals, which are dried and sold to consumers and food processors for use in other food products. Some liquid sugar is also sold directly to the food industry consumers for use in beverages and other food products.

At the sugar beet processing plant, the beets are washed, sliced, and soaked in hot water to remove the juice, which is full of sugar (sucrose). The juice is purified, filtered, concentrated, and dried in a series of steps similar to sugar cane processing. There is very little waste in the production of sugar from sugar cane or sugar beets. The crushed cane stalks are used as fuel to provide power for machinery. The by-products from sugar beets are made into animal feed.

Distribution:

Depending on their needs, sugar is packaged in different ways to be distributed to consumers and food manufacturers in Canada. Within Canada, sugar is generally transported by truck or train. Liquid sugar is delivered to food companies in tankers. Other sugars are packaged in bags which contain anywhere from 500 g to 1000 kg of different types of sugars. Refined sugar syrups may be sold to grocery store customers in small bottles.

Consumers:

The consumers of sugar may be:

- Shoppers at a grocery store who buy sugar for use at home;
- Food companies that buy sugar in bulk for the many food products they make;
- Companies that use sugar in unusual ways, including cement making and textile finishing;
- Restaurants that buy sugar to use in their recipes, or in small packages for use at the tables.

PRESERVING FOODS

Over time, several methods of preserving foods have been discovered, including purification. Sugar is an example of a purified substance. The purification process removes undesirable residues to produce a high quality product with a long shelf life that is easy to keep and transport. Sugar can in turn be used to preserve foods because of its ability to absorb and 'tie up' water and, thus, reduce the growth of micro-organisms. Sugar also naturally enhances the flavour of foods while helping to preserve colour and texture. Other common means of preserving foods include the use of temperature (both hot and cold), spices, salt, and acidic substances like vinegar.

Activity 2:1 FOOD AROUND THE WORLD

PURPOSE: To help students understand how the different plants that they rely on for food energy are grown in different regions around the world according to the climate that they require.

CURRICULUM CONNECTIONS:
1, 2, 3

KNOWLEDGE AND SKILL DEVELOPMENT:
Social Studies, Art, English Language Arts

TEACHER NOTES:
Using the map on page 33, students locate countries and shade in the regions where sugar cane and sugar beets are grown. They can label these countries and the equator. Students can then research the climates in the regions where sugar is grown. Ask students to identify where the foods they ate for breakfast came from on their map.

ASSESSMENT AND EVALUATION:
The Student Self-Evaluation Checklist (page 28) will allow individual students to self check their work.

Activity 2:2 FROM FIELD TO TABLE

PURPOSE: To help students understand the journey that foods take from field to table.

CURRICULUM CONNECTIONS:
4, 5

KNOWLEDGE AND SKILL DEVELOPMENT:
Social Studies, Science, Art, English Language Arts

TEACHER NOTES:
This activity provides students with an opportunity to create a report, poster or class mural to illustrate the journey that food takes from field to table, addressing the following: production, processing, distribution, and consumers. As an example, use the journey that sugar cane or sugar beets take from crop production through the purification process to end up with sugar as an ingredient in a food product. Ask students to choose a plant or animal food product for their project. Encourage students to work individually or in small groups to research, illustrate, and present their findings to the class.

ASSESSMENT AND EVALUATION:
Provide students with the list of criteria to include in the creation of their report, poster or mural. It can then also be used to evaluate the final product by involving students in developing a rubric for evaluation. The following words can help students establish the four levels of achievement: **level 1** - limited, somewhat, beginning to show clarity; **level 2** - some, usually, some clarity; **level 3** - considerable, consistently, considerable clarity, **level 4** - high degree of, exceptional, high degree of clarity.

CRITERIA LIST FOR CREATING A POSTER OR MURAL

- ❑ Important features are included (facts, pictures or diagrams, headings).
- ❑ The title is legible and states what the poster/mural is about.
- ❑ Information is accurate and important to the topic.
- ❑ Information is organized, has a logical sequence and is easy to follow.
- ❑ Language is clear and concise; no extra words.
- ❑ Words are correctly spelled.
- ❑ Poster/mural is neat and eye-catching.

Activity 2:3 PRESERVING FOOD ENERGY

PURPOSE: To help students develop their skill in conducting scientific experiments, by following instructions, observing and comparing the changes in different samples over time, and recording their results.

CURRICULUM CONNECTIONS:
6, 7

KNOWLEDGE AND SKILL DEVELOPMENT:
Science, English Language Arts

TEACHER NOTES:
Following the directions on page 37, students conduct an experiment to identify the best method for preserving fruit. The results of this experiment will vary according to the type of fruit selected (an apple, pear, or peach work best). The rate of decay and appearance will depend on the individual conditions and on the ripeness of the fruit. Sugar works best as a preservative because it has the ability to "tie-up" water and inhibit the growth of micro-organisms that can spoil food. Because of this quality, sugar is used in making jams, jellies, dairy products, candies, and in preserving fruit. (Tip: Use home canning labels to label the samples for this experiment if possible because they soak off during washing).

ASSESSMENT AND EVALUATION:
Students evaluate themselves on how well they worked in a group using the student rubric (page 29) provided. As well, to complete a personal self-reflection on their learning, students can complete the self reflection questions on page 39.

Activity 2:4 MAKING SUGAR CRYSTALS

PURPOSE: To help students understand the process of purifying sugar by crystallization through exercising their scientific observation skills.

CURRICULUM CONNECTIONS:
8

KNOWLEDGE AND SKILL DEVELOPMENT:
Science

TEACHER NOTES:
This activity provides students with an opportunity to observe the last step involved in the process of extracting and purifying sugar. The sugar dissolves in the hot water. The amount of sugar the water can hold depends on its temperature. Hot water can hold more than cold water. When the solution cools, there is more sugar than can remain dissolved in the solution. Some of the sugar will start to come out of the solution and will form sugar crystals on the paper clip. The sugar molecules that were dissolved in the water participate in the formation of the crystal. This process is called re-crystallization. Other substances are left behind in the syrup.

ASSESSMENT AND EVALUATION:
Use the student response page (page 41) provided with this activity for assessment.

Evaluation Page

ACTIVITY 2:1

Student Self-Evaluation Checklist - Food Around the World

Student Name:_____

✓ Check off

Yes or **No**

Yes	No	
☐	☐	I have written the name of different continents and oceans on my map.
☐	☐	I have labelled the Equator, the Tropic of Cancer and the Tropic of Capricorn.
☐	☐	I have marked my home location on the map.
☐	☐	I have labelled the following countries and regions on my map: Africa, Argentina, Australia, Brazil, Canada, China, Columbia, Cuba, France, Germany, India, Italy, Philippines, Poland, Thailand and United States.
☐	☐	I have shaded in these regions of the world where sugar cane and sugar beets are grown on my map (regions are listed above).
☐	☐	I have marked the places of origin of the breakfast foods I ate today on my map.
☐	☐	I have given my map an appropriate title.
☐	☐	My map is legible and neatly completed.

Evaluation Page

ACTIVITY 2:3

My Group Work Assessment

Each time we work in a group we need to think about how well the group worked and our role in the successes of the group. Use the following chart to share your success and the places where you can improve with your teacher.

Give yourself a rating of Level 1, 2, 3 or 4 in the first column; provide a statement to support your rating in the second column; in the final column, suggest a way you could improve for the next time you work in groups.

Quality	Level	Support for My Choice	Ways I Can Improve for Next Time
Participates actively in the assigned task.			
Demonstrates appropriate behaviour during activity.			
Demonstrates persistence.			
Demonstrates cooperation.			

Glossary

MISSION 2

AGRIFOOD CHAIN - the journey that food takes from production, to processing, to distribution, to the consumer.

BY-PRODUCTS - other products produced during the processing of a food.

CENTRIFUGE - a machine that separates solids from liquids, or solid materials of different weights by spinning at very high speeds.

CLIMATE - the temperature, wind, and rainfall conditions typically found in an area.

CONSUMERS - people that use a product.

DISTRIBUTION - the transportation of food to its consumers.

FOOD PRODUCTION - the growing of crops and raising of livestock for food.

PRESERVATION - the processing of foods to prevent them from spoiling.

PROCESSING - the changing of foods into different products.

PURIFICATION - a process to remove undesirable material from a raw product to produce a clean, pure product.

RE-CRYSTALLIZATION - the process by which solid particles that are dispersed in a liquid are linked together to form crystals.

REFINING - a process that removes impurities to produce a high quality product.

Additional Resources

MISSION 2

Canadian Sugar Institute
www.sugar.ca
Visit the Canadian Sugar Institute Web site to learn more about the history of sugar production in Canada and about Canadian sugar today.

A Taste of Sugar - Recipe Collection from the Canadian Sugar Institute
www.sugar.ca/english/consumers/cookingwithsugar.cfm#4
A Taste of Sugar is a series of recipe fact sheets which includes some sugar and health information and provides concrete examples about the role and function of sugar in recipes.

Redpath Sugar Museum Tours
www.redpathsugars.com/museum_index.htm
Redpath Sugar has established a public museum facility in Toronto at which school classes can receive educational programming related to sugar.

Agriculture in the Classroom
www.aitc.ca/
Agriculture in the Classroom programs across Canada build awareness and an understanding of sustainable agriculture and food systems by providing educational programs and resources to students and teachers.

ACTIVITY 2:1

Food Around the World

Different plants grow in different climates. Sugar cane plants need plenty of water, a lot of sunlight, and constant high temperatures. They are thought to have originated in the South Pacific. Now sugar cane is grown in tropical or sub-tropical climates in the rich, moist soil in countries like Mexico, Australia, Africa, Brazil, Argentina, Colombia, India, Thailand, Philippines, Guatemala, and China. Sugar beets thrive in regions that have moderate temperatures with sunny days and cool nights. They originally grew wild around the coasts of the Mediterranean. Countries where sugar beets are grown today include Canada, United States, Germany, France and Russia.

Student Directions

Use coloured pencils and an atlas or encyclopedia to help you label the following important features on the world map on page 33.

1. Write the name of different continents and oceans on the world map.

2. Label the Equator, the Tropic of Cancer and the Tropic of Capricorn.

3. Identify and mark where you live on the map.

4. Shade in all the regions of the world where sugar cane and sugar beets are grown. Label your world map with the countries listed in the information above.

5. Make a list of all the foods that you ate for breakfast this morning. Then mark these foods on the map according to where they come from.

_____

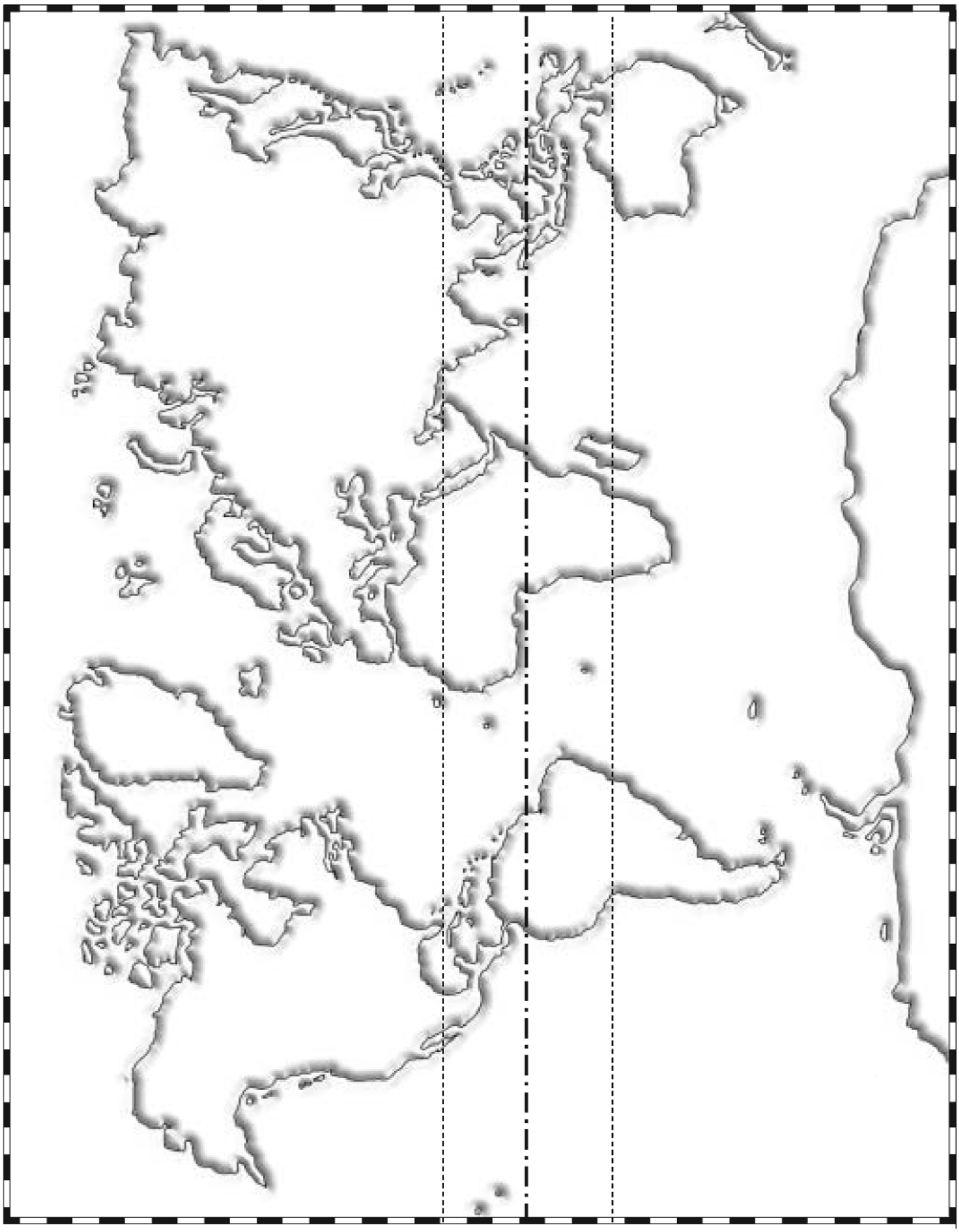
_____

_____

_____

6. Give your map an appropriate title.

7. Complete the Student Self-Evaluation Check-list provided by your teacher.



Exploring Food from Field to Table

ACTIVITY 2:2

From Field to Table

Most foods that you eat travel a long way from the field in which they were grown to your table. Many foods come from different parts of the world and are involved in a series of different steps during their journey to you. For example, sugar cane and sugar beets grow in fields in countries around the world. Sugar cane is harvested and used to make raw sugar in the countries where it is grown. The raw sugar is transported to refineries in Canada where it is purified so that we can enjoy it in our food. Sugar beets are processed into sugar near the fields where they are grown.

Student Directions

Choose a plant or animal food. Prepare a report, poster or a class mural of the journey the food takes from the field to your table. Show the following steps: production, processing, distribution, consumers.

Student Responses

Make some notes under the following headings to help you get started.

1. Name of the food:

_____

_____

2. Production (producing crops and raising livestock):

Is the food an animal or plant product?

_____

_____

_____

Where is it produced?

Describe the climate needed by the animal or plant.

3. Processing (changing the food into different products):

Describe how the food is processed.

What form is it in when it is sold to the consumer?

4. Distribution (transporting the food to consumers):

How is the food transported to the consumer?

_____

_____

_____

Is it available all year round?

_____

Can it be stored?

_____

_____

_____

5. Consumers (food is ready to buy and eat or use in cooking):

Who buys this food?

_____

_____

_____

How do they use it?

_____

_____

_____

_____

ACTIVITY 2:3

Preserving Food Energy

Over the centuries, people discovered several ways to preserve food by trying different methods. Some of the things they tried were very successful, while others did not work so well. A good way to find the best method for preserving foods is to compare different methods.

Student Directions

Try this experiment to see how well fresh fruit can be preserved with different solutions.

1. Team up with a few classmates and collect the following items for your experiment:

- ✓ 4 large glasses or glass jars (1 cup / 250 mL)
- ✓ 4 labels
- ✓ 1 measuring cup (1 cup / 250 mL)
- ✓ 1 plastic knife
- ✓ 10 mL (2 tsp) of sugar
- ✓ 30 mL (2 tbsp) of concentrated lemon juice
- ✓ 1 fruit, such as an apple, pear or peach
- ✓ 2 wooden stir sticks
- ✓ 4 small pieces of plastic wrap to cover the glasses or jars
- ✓ 600 mL (2.5 cups) of water

2. Label the four glasses as follows:
- Sample #1 - sugar solution
- Sample #2 - lemon solution
- Sample #3 - water
- Sample #4 - air

3. Using the measuring cup, measure and pour 200 mL (3/4 cup) of water into each of the glasses except the glass labelled Sample #4. Leave the glass marked Sample #4 empty.

4. Add the sugar to the glass labelled Sample #1 and stir well with the stir stick until the sugar is dissolved in the water.

5. Add the lemon juice to the glass labelled Sample #2 and stir well with another stir stick.

6. Using the plastic knife, cut the fruit into 4 pieces, and cut each of these pieces in to 4 again.

7. Put 4 little pieces of fruit in each of the glasses. Observe and record their colour and texture in the table provided.

8. Cover the glasses with plastic wrap and put in a warm place (e.g. in the sun, next to a window) for three days. Once you have prepared all of your samples, wash your hands, your work table and the measuring cup carefully.

Student Responses

1. Using the table below, record the colour and texture (using words like firm, soft, mushy) of the fruit at the beginning and after 4, 24, and 72 hours.

CHARACTERISTIC		SAMPLE #1 Sugar Solution	SAMPLE #2 Lemon Solution	SAMPLE #3 Water	SAMPLE #4 Air
At Start	Colour				
	Texture				
After 4 Hours	Colour				
	Texture				
After 24 Hours	Colour				
	Texture				
After 72 Hours (3 Days)	Colour				
	Texture				

2. What can you conclude from this experiment?

_____

_____

_____

_____

When you have finished your experiment, discard your samples in an appropriate place.
(Recycle the fruit by adding it to a composting pile if you can).

STUDENT SELF REFLECTION QUESTIONS:

1. What did I learn to do in conducting this experiment?

2. What did I learn well enough to teach a friend?

3. What I am curious about and/or what I am confused about?

ACTIVITY 2:4

Making Sugar Crystals

As ancient populations began to depend on planted crops for food, they had to find ways to preserve their harvest between seasons and to transport food from one part of the world to another without it spoiling. Over time, several methods for preserving foods were discovered. One of these methods involves purifying and drying a substance, such as sugar, so that it is easy to keep and transport.

Student Directions

Discover the last step in the long process used to extract and purify sugar. See how sugar crystals are made by following these instructions:

1. Assemble into groups assigned by your teacher and collect the following on your work table:

- ✓ 1 large glass or bottle (at least 750 ml or 3 cups)
- ✓ 1 piece of string 30 cm long
- ✓ 1 paper clip
- ✓ 1 pencil
- ✓ 1 measuring cup
- ✓ 250 mL (1 cup) of sugar
- ✓ 1 teaspoon or a small wooden stick
- ✓ water

2. Pour the sugar into the glass.

3. With adult assistance from your teacher, collect 250 mL (1 cup) of boiling water in your measuring cup.

4. Place the teaspoon or wooden stick into the sugar.

5. Carefully and slowly, pour a little of the boiling water along the teaspoon or wooden stick, allowing it to run right to the bottom. Gently stir the spoon or stick to dissolve the sugar in the boiling water. Add very small amounts of water, stirring gently each time, until all the sugar is dissolved, using the least water possible. You will have a very thick syrup.

6. Tie one end of the string to the paper clip, and the other end around the pencil.

7. Balance the pencil on the edges of the glass, plunging the paper clip and string into the syrup.

8. Turn the pencil, winding the string around it so that the tip of the paper clip just touches the bottom of the glass.

9. Set the glass aside for at least 10 days in a well-ventilated area where it will stay cool and be undisturbed. To allow the water to evaporate even better, remove the crust that forms on the syrup every day.

Student Responses

1. Record your observations on days 1, 3, 6 and 10 in the chart below using diagrams or pictures.

Day 1	Day 3
Day 6	**Day 10**

2. Describe what happened.

Exploring the Human Body

MISSION 3

Exploring the Human Body provides information and activities designed to explore how our bodies digest food to produce energy for all our body systems.

Curriculum Connections for Grades 4 - 6

Students will:

1. Explore ways in which humans use their senses to meet their needs.
2. Describe the basic structure and function of the major organs in the digestive system.
3. Understand how the digestive system works to digest food.
4. Describe the types of nutrients in foods (e.g. carbohydrates, fats, proteins, vitamins and minerals) and their importance in maintaining a healthy body.
5. Identify starchy foods that supply carbohydrates.
6. Recognize carbohydrates as the body's primary source of food energy.

Teaching Background Information

TASTE BUDS

Primitive people relied on their taste buds as important danger detectors. If a leaf, berry or bush tasted bitter, it probably was bad or even poisonous, so they spit it out. Humans are born with a natural liking for sweet foods. It is believed that our taste preference for sweet was a protective mechanism to direct early humans toward safe (not poisonous, not spoiled) foods that provided food energy. Now, we use our taste buds to help us determine how good something tastes, more often than for safety.

INSIDE YOUR BODY

The human body is truly fascinating. Like a car, it is made up of thousands of parts that all work together. Each part is made up of tiny cells. Each cell has a job to do, and all cells work together to keep you alive and well. Groups of similar cells that do a special job form tissues such as skin, muscle, and bone. Different tissues working together form organs such as your heart, lungs, and stomach. A group of different organs that work together to do a particular job forms a system such as the circulatory, respiratory, or digestive system. Just like a car needs fuel to run, the body needs food to provide energy for all body parts to work.

AMAZING CELLS

All living organisms (both plants and animals) are made up of cells. Simple organisms have few cells compared to complex animals. The human body contains about 50 trillion cells (50,000,000,000,000). Most cells are too small to see without a microscope. In fact most cells are so tiny that over 200 of them could fit into a period at the end of a sentence. Cells come in different shapes and sizes, depending on their job. Muscle cells are long and can shorten or lengthen to allow you to move. Nerve cells have long fibres that send messages around your body. Red blood cells are disk shaped and can transport oxygen. Cells make copies of themselves by growing larger and then splitting in two. The body uses new cells to grow and heal itself.

THE DIGESTIVE SYSTEM

The digestive system turns food into fuel for the body, providing energy and nutrients for tissue growth and repair. The digestive system chops up the food and breaks it down, so that the nutrients can be absorbed and used by cells throughout the body. Overhead 3:1 (page 48) provides an overview of the digestive system.

The digestive system works like a giant food processor. This system is made up of a group of body parts that break down food both mechanically and chemically. Digestion begins in the mouth. Teeth grind up food, the enzymes in saliva begin to digest it, and the tongue helps roll it into a ball that can be swallowed. Food then travels down the esophagus into the stomach where it is churned up and mixed with very strong digestive juices. From the stomach, the food flows through the small intestine where nutrients from the food are absorbed into the blood.

The Circulatory System carries food energy throughout the body in the form of glucose, other nutrients, and oxygen. The blood also transports wastes from the cells so that the body can remove them. The heart works like a pump to push blood all around the body. The large intestine holds the food that cannot be digested and passes it out of the body. The whole digestion process takes about 24 hours.

FOOD ENERGY

Food is the fuel that gives the body energy. Food energy is measured in units called Calories. All of the body's activities use up energy. If a car travels very fast it uses more fuel than if it goes slowly. In much the same way, the body uses more Calories when exercising than when sleeping. The body still uses Calories even when asleep to maintain proper function of the heart, lungs, digestive system, and nervous system. When more food energy is consumed than needed for daily activities, excess energy is stored and used for energy at a later time.

KEY NUTRIENTS

The body needs five types of nutrients for life: carbohydrate, fat, protein, vitamins, and minerals, plus water. Carbohydrate (mainly sugars and starches) is the body's preferred source of food energy. Carbohydrate is broken down by the body into an important nutrient called glucose. Glucose circulates in the blood to provide energy for cells all over the body. Fat is another key source of food energy, but the requirement for fat is less than for carbohydrate. Protein provides the building blocks for cells, so they can help your body grow and repair itself. Proteins also provide energy. Vitamins and minerals work in cells throughout the body to help maintain health. For example, vitamin A aids in night vision, and the mineral calcium is important for bone health and development. The body needs a healthy balance of all of these nutrients plus plenty of water for peak performance.

Teacher Planning for Student Activities

Activity 3:1 TONGUE DETECTOR

PURPOSE: To provide students with an opportunity to explore the ways in which humans use their senses to meet their needs.

CURRICULUM CONNECTIONS:
1

KNOWLEDGE AND SKILL DEVELOPMENT:
Science

TEACHER NOTES:
Although all areas of the tongue can detect taste sensations (including sweet, sour, salty and bitter), the level of sensitivity to these tastes on different areas of the tongue varies among individuals. This experiment allows students to identify the areas of their tongues that are most sensitive to each of these tastes. The activity is divided into two separate parts which can be completed on different days. In part one, students will taste different solutions to determine which taste sensation each solution provides, and which parts of their tongue are most sensitive to these sensations. In part two, students will taste and describe solutions of water, lemon juice, and varying amounts of sugar.

ASSESSMENT AND EVALUATION:
Students should be able to identify four taste sensations by accurately completing the table in part 1A (page 53). In part 1B, the tongue diagram can be used for students to label the areas of their tongues that are most sensitive to these sensations. Because each individual is different, there are no right or wrong answers to this diagram. In part 2, students should be able to describe levels of sweetness of each solution and draw conclusions.

Activity 3:2 YOUR DIGESTIVE SYSTEM

PURPOSE: To help students explore the different organs that make up one of the body's main systems - the digestive system - and learn about the nutrients found in foods and their importance in maintaining a healthy body.

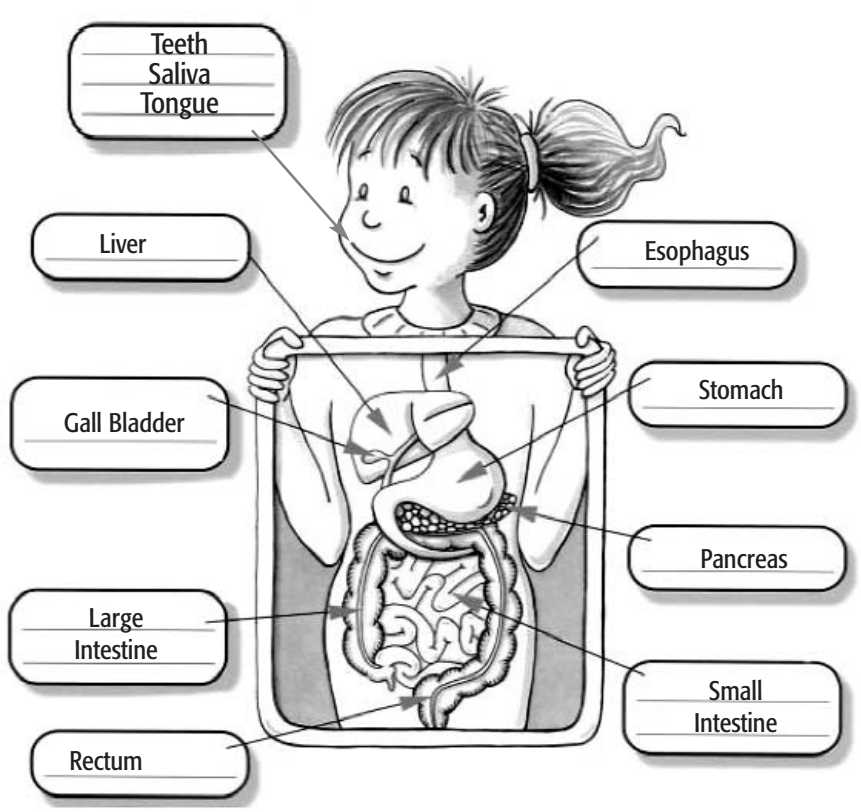
CURRICULUM CONNECTIONS:
2, 3, 4

KNOWLEDGE AND SKILL DEVELOPMENT:
Science, Health and Physical Education, English Language Arts

TEACHER NOTES:
This activity provides a framework for students to research and learn about the digestive system as well as the nutrients found in foods and their role in maintaining a healthy body. Encourage students to do their own research in the library, in an encyclopedia, or on the internet to explore the digestive system and key nutrients (carbohydrate, fat, protein, vitamins and minerals). Once they have explored this system, they can research other body systems as well.

ASSESSMENT AND EVALUATION:
Use the answer key on page 46 as well as the glossary to ensure that students have the correct answers. Overhead 3:1 (page 48) can be used for class discussion.

ANSWER KEY - Activity 3:2



Answer Key for Student Responses (page 56):

1. Esophagus
2. Liver
3. Teeth
4. Stomach
5. Saliva
6. Large Intestine
7. Rectum
8. Tongue
9. Small Intestine
10. Gall Bladder

Activity 3:3 FIND A STARCHY FOOD

PURPOSE: To identify foods that provide energy from carbohydrate in the form of starches, and help students understand that carbohydrate is digested into sugars for the body to use for energy.

CURRICULUM CONNECTIONS:
5

KNOWLEDGE AND SKILL DEVELOPMENT:
Science

TEACHER NOTES:
Foods derived from plants all contain carbohydrate in the form of sugars or starches. Plants can store sugars in a large chain called starches. The experiment in Activity 3:3 will help students identify starchy foods. Iodine can be used to detect the presence of starch because it turns a blackish purple colour when it reacts with starch. Potatoes and bread contain carbohydrate in the form of starches. Meat and cheese contain mainly protein and fat. This activity is best conducted in small groups. An ideal group size would be 5 to allow each member of the group to test one of the samples.
**Children should be instructed to use care when working with iodine because it is poisonous if ingested and can stain.

ASSESSMENT AND EVALUATION:
The evaluation rubric (page 49) may be used to assess students' responses.

Activity 3:4 YOUR FOOD PROCESSOR

PURPOSE: To help students discover the process of digestion and understand that high-carbohydrate foods are used most efficiently by the body.

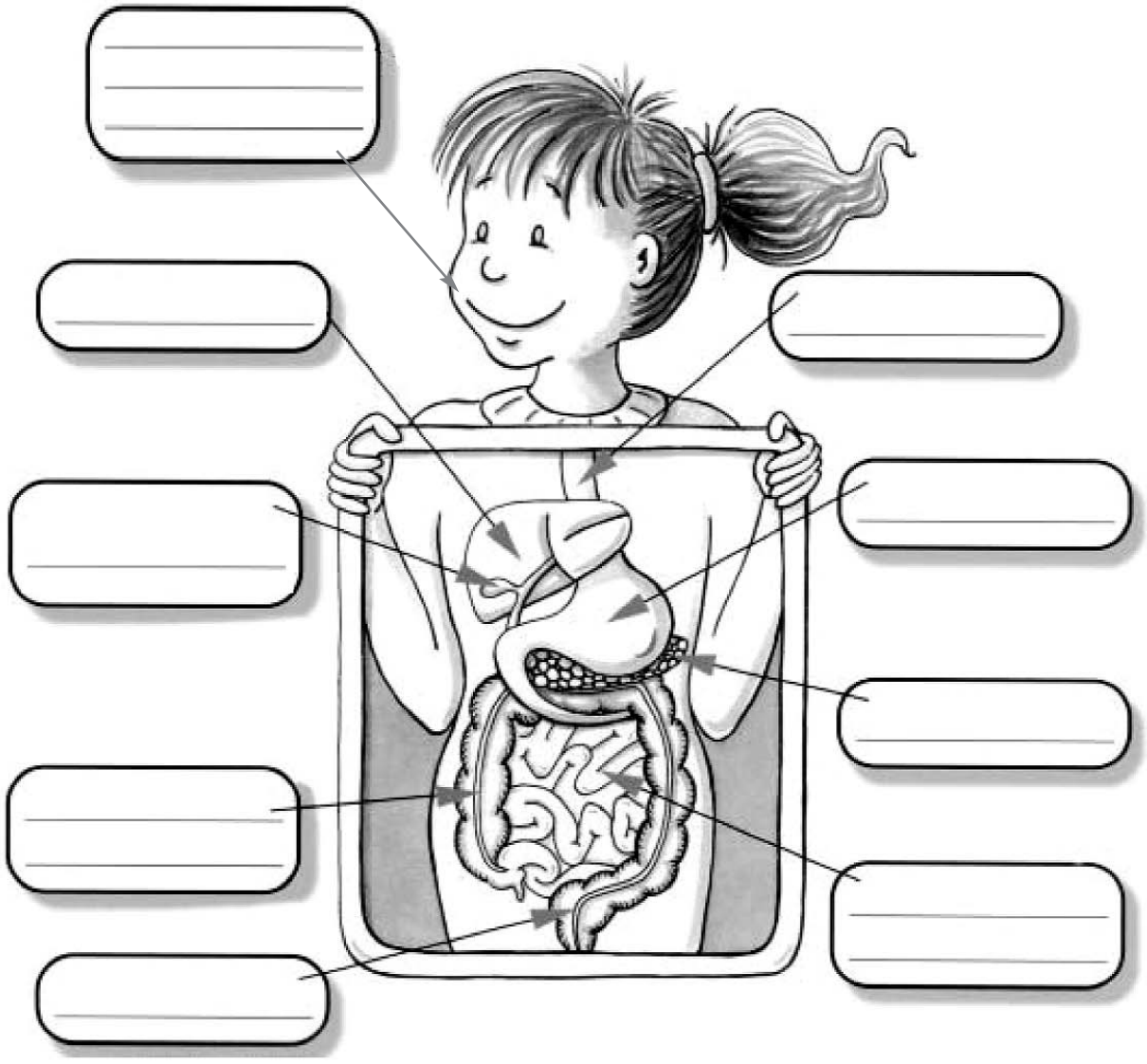
CURRICULUM CONNECTIONS:
3, 6

KNOWLEDGE AND SKILL DEVELOPMENT:
Science, Health and Physical Education

TEACHER NOTES:
By following the instructions on Activity Sheet 3:4, students create an "artificial stomach" and watch a simulation of how the stomach breaks down foods. Some foods take longer than others to break down, such as those that contain a lot of protein (meat, cheese) or fat (butter, margarine). High-carbohydrate foods containing sugars and starches, like bread, cereal, vegetables and fruit break down the quickest. Carbohydrates are broken down and converted into blood sugar called glucose. The glucose is released into the bloodstream to provide energy for the brain and body. The stomach is only part of the process of changing food into fuel. The small intestine completes digestion and sends nutrients from digested foods into the bloodstream. Place students into small groups to complete this activity.

ASSESSMENT AND EVALUATION:
The Student Self Reflection questions (page 65) included as part of the activity may be used for assessment purposes.

OVERHEAD 3:1



Evaluation Page

ACTIVITY 3:3

Evaluation Rubric - Find a Starchy Food

Criteria	Level 4	Level 3	Level 2	Level 1
Safety Skills	Practices safety skills with exceptional care	Practices safety skills with considerable care	Practices safety skills with some care	Practices safety skills with limited care
Understanding of Concepts	Responses to questions indicate exceptional understanding of the concepts	Responses to questions indicate considerable understanding of the concepts	Responses to questions indicate some understanding of the concepts	Responses to questions indicate limited understanding of concepts
Follows directions and applies concepts	Follows directions for experiment and applies concepts with exceptional accuracy	Follows directions for experiment and applies concepts with considerable accuracy	Follows directions for experiment and applies concepts with some accuracy	Follows directions for experiment and applies concepts with limited accuracy

Glossary

MISSION 3

CARBOHYDRATE - nutrient produced naturally by plants, consisting mainly of sugars and starches; the body's preferred source of energy.

CELLS - microscopic living units, each with a special job to do, that make up your body parts including your skin, blood, muscles, and brain.

DIGESTION - the process by which food is broken down by the body into smaller parts that it can use.

ENZYMES - proteins in the body that speed up or initiate chemical reactions, like breaking down (digesting) food.

FAT - nutrient that is a concentrated source of food energy and performs many important functions in the body.

GLUCOSE - the main form of carbohydrate that is absorbed by the body as a source of food energy for all cells; glucose is one of the sugars naturally produced by plants and is obtained by the complete digestion of other carbohydrates.

MINERALS - single nutrient elements (e.g. sodium, iron, calcium) needed in small amounts to perform specific body functions and for normal growth and good health.

NUTRIENTS - substances found in foods needed by the body for energy, healthy growth, and body functions.

ORGANS - different tissues working together such as the heart, lungs, and stomach.

PROTEIN - nutrient that provides building blocks for growth and repair of the body, as well as a source of energy.

SYSTEM - a group of different organs that work together to do a particular job form a system, such as your circulatory, respiratory, and digestive systems.

TISSUE - groups of similar cells that do a special job such as your skin, muscle, and bone tissue.

VITAMINS - nutrient compounds containing carbon, needed in tiny amounts to perform specific body functions and for normal growth and good health.

Additional Resources

MISSION 3

BOOKS

How the Body Works
By Steve Parker
Reader's Digest
192 Pages (1999)
ISBN: 0762102365
A great resource for teaching children in grades 4 to 7 about the human body with fun and easy experiments to do in the classroom or at home.

Head to Toe Science
By Jim Wiese
John Wiley & Sons
128 Pages (2000)
ISBN: 0471332038
Over 40 eye-popping, spine-tingling, heart pounding activities and answers to interesting questions to teach 9 to 12-year-olds about the human body.

The Incredible Human Body
By Esther Weiner
Scholastic
96 Pages (1999)
ISBN 0590599283
Engaging hands-on activities to help students explore the major body systems.

Uncover the Human Body
By Luann Colombo, Jennifer Fairman, Craig Zuckerman
Silver Dolphin
16 Pages (2003)
ISBN 1571457895
This book-model combination takes some of the mystery out of how the body works. It covers all the major systems and processes. Children get to look at each system on a different page, then by closing the book, combine them into a whole.

Human Body, Grades 4-6: Fun Activities, Experiments, Investigations, and Observations!
By Sue Carothers, Elizabeth Henke
Carson-Dellosa Publishing Company
128 Pages (2006)
ISBN 088724954X
Includes detailed diagrams of each body system!

Break It Down: The Digestive System
By Steve Parker
Raintree
48 Pages (2006)
ISBN 1410926583
Using interesting photos and facts, this book will really make you think about the body and the amazing things that go on inside you every second.

ELECTRONIC RESOURCES

Healthy Canadians - Your Source for a Healthier Lifestyle
www.healthycanadians.ca
This website provides information about healthy lifestyles including Eating Well with Canada's Food Guide and information about food and consumer safety.

Kids Health - How the Body Works
http://kidshealth.org/kid/htbw/
Kids Health is the most-visited site on the Web for information about health, behavior, and development from before birth through the teen years. Watch movies, take quizzes, read articles, solve word finds, and do activities - all about the parts of the body!

ACTIVITY 3:1

Tongue Detector

Your five senses connect you to the world around you. One of their primary jobs is to help you tell if your environment is safe or not. Taste, for example, can help you detect if a food is fresh and good to eat or spoiled and dangerous to your health.

We inherited a natural liking for foods rich in carbohydrates (starches and sugars) from our ancestors. Early humans relied on their taste buds as important danger detectors. If a leaf, berry or bush tasted bitter, it probably was bad or even poisonous, so they spit it out. Humans are born with a natural liking for sweet foods to direct us toward safe (not poisonous, not spoiled) foods that provide food energy.

Carbohydrate foods not only taste great, they're also full of energy. Primitive people needed a lot of energy to survive in cold weather, on long walks, and to get away from animals.

Whenever you put food in your mouth your taste buds get busy! Discovering different flavours in foods is part of what makes eating so much fun. Take a look at a classmate's tongue and you will see lots of bumps. Around the base of these bumps, there are taste buds. You have about 10,000 taste buds. Inside them are special cells that sense taste. There are different kinds of taste buds, each designed to help you taste different sensations. These taste sensations include sweet, salty, bitter, and sour. Some areas of your tongue may be better than other areas in detecting each of these tastes.

Student Directions

Try this taste test to see if you can identify four basic tastes while blindfolded. Then try to figure out which parts of your tongue can best detect each of these four tastes.

Part 1A

1. In groups assigned by your teacher, collect the following items for your experiment:

✓ 1 blindfold
✓ 4 small sampling cups
✓ 15 mL (1 tbsp) of sugar
✓ 5 mL (1 tsp) of salt
✓ 30 mL (2 tbsp) of lemon juice
✓ 30 mL (2 tbsp) of tonic water
✓ 1 measuring spoon (15 mL / 1 tbsp)
✓ 8 q-tips (per student)
✓ 1 glass of water (per student)

2. Label the 4 cups as sugar, salt, lemon juice and tonic water.

3. Put the sugar, salt, lemon juice, and tonic water in each of the four separate cups. Add 15 mL (1 tbsp) of water to the sugar sample and 30 mL (2 tbsp) of water to the salt sample. Mix both of these samples well using the measuring spoon, but be sure to rinse it off in between.

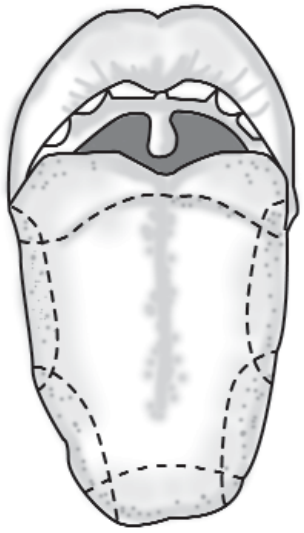
4. Taking turns with your classmates, blindfold each other and taste a little bit of each of your own samples using the clean end of a q-tip each time. Rinse your mouth by drinking a little water in between tasting each sample. Match each sample with the taste sensation it provides (salty, sour, bitter or sweet) and record your answers in the table below.

Remember to rinse your mouth by drinking a little water in between each sample.

SAMPLE	TASTE
Sugar	
Salt	
Lemon Juice	
Tonic Water	

Part 1B

Taste each of your four samples again **one at a time** to try to determine whether certain parts of your tongue are more sensitive to the taste sensations than others. Follow these instructions for each sample: dip the clean end of a q-tip in one of the samples, and then place it on the tip of your tongue, then the back of your tongue, then the sides near the tip of your tongue and finally the sides near the back of your tongue. Which parts of your tongue can best detect each of these tastes? Label the diagram of the tongue below to indicate the areas of your tongue that are most sensitive to each of the four tastes. After you have labelled your tongue diagram, compare your diagram to the diagrams of a few of your classmates.



Part 2 - Which taste do you like best?

1. In groups assigned by your teacher, collect the following items:

✓ 1 measuring cup (250 mL / 1 cup)
✓ 200 mL (3/4 cup) of water
✓ juice of two lemons or 30 mL (2 tbsp) of lemon juice
✓ 20 mL (1 tbsp + 1 tsp) of sugar
✓ 1 small cup (per student)

2. Add the juice of two lemons (or 30 mL / 2 tbsp of lemon juice) to the 200 mL (3/4 cup) of water in the measuring cup.

- Then add 5 mL (1 tsp) of sugar to the lemon solution, stir, and taste by pouring a little in each person's cup.
- Describe the taste in the chart below.
- Add the rest of the sugar to the lemon solution, 5 mL (1 tsp) at a time.
- Stir and taste each solution by pouring a little in each person's cup.
- Describe the taste of each solution in the table below.

	TASTE	DESCRIPTION
with 5 mL of sugar		
with 10 mL of sugar		
with 15 mL of sugar		
with 20 mL of sugar		

3. How much sugar would you add to make the Lemon Drink Solution taste right for you?

_____

_____

What can you conclude?

_____

_____

_____

_____

ACTIVITY 3:2

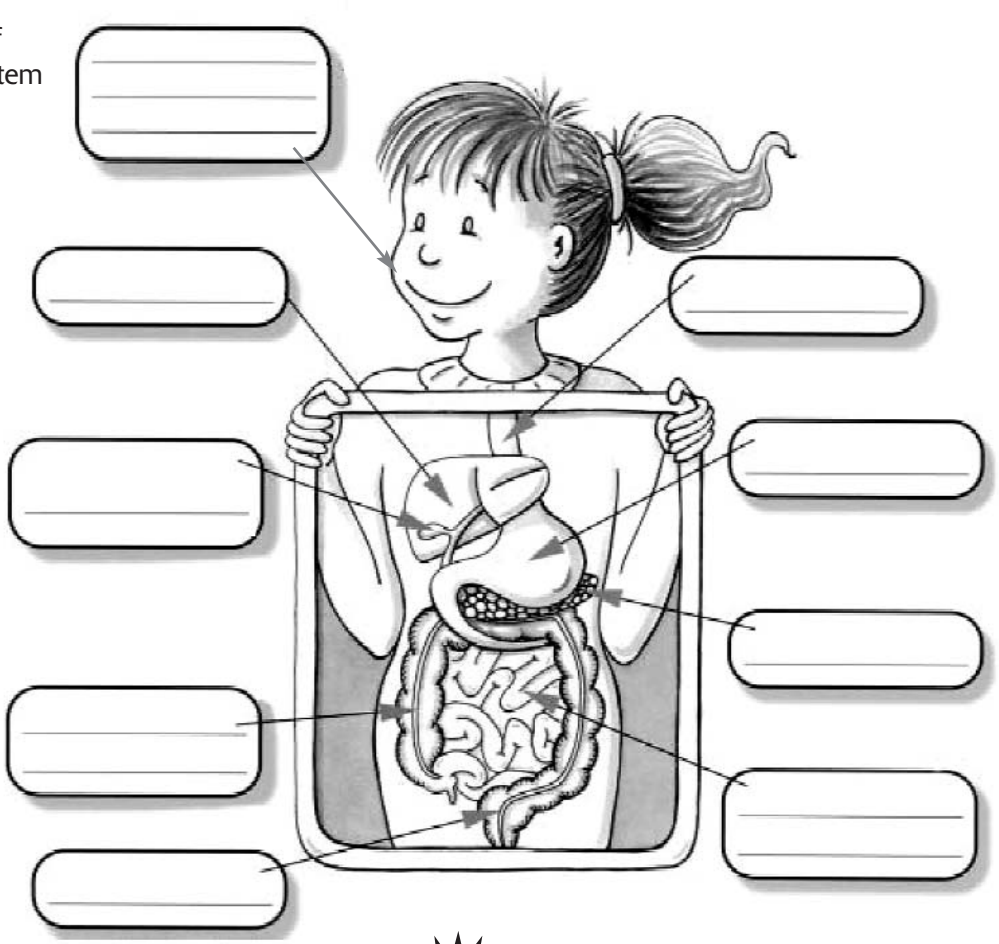
Your Digestive System

When you eat, the food you put in your mouth goes on a fascinating journey through your digestive system. Your digestive system is made up of many organs that all have a special job to do in digesting the food you eat. It takes about 24 hours for food to travel through your whole digestive system. The food that you eat is broken down into nutrients that your body can use for energy and to grow and repair itself.

Student Directions

The following diagram shows all the major organs in the digestive system. Try to name each organ that helps digest your food on its journey. Don't hesitate to use a dictionary, encyclopedia, the internet, or books about the human body to help you fill in the blanks. Answer the questions that follow and discover other fascinating details about how your body works.

Label the Parts of the Digestive System



Student Responses

Each organ in your digestive system does a specific job. Use each of the descriptions below as a clue to help you label the parts of the digestive system and the role each plays in your body.

1. A 25 cm long muscular tube that pushes food from your mouth to your stomach. _____

2. This is the body's biggest internal organ that performs many tasks, including storing energy and helping the body get rid of toxins. _____

3. These help break your food down into smaller bits you can swallow. _____

4. When empty, it has a volume of about 60 mL (about the size of a small yogurt cup), but it can hold up to about 2 litres (about the size of a large milk carton) of food after a big meal. _____

5. A liquid containing enzymes that begins to digest carbohydrates in your mouth. _____

6. Where undigested parts of food are held, and water is absorbed into your body. _____

7. The exit of the 9 meter long tube called your digestive system. _____

8. It helps mash your food up, mix it with saliva in your mouth and roll it into a ball that you can swallow. _____

9. A 6.5 meter long tube all coiled up inside you, from which nutrients are absorbed into your body. _____

10. A small pouch that stores bile made by the liver and then releases it to help with digestion of food leaving the stomach. _____

Enrichment Activity:

Research and describe the role of each of the following types of nutrients in maintaining a healthy body:

- Carbohydrate

_____

_____

_____

_____

- Fat

_____

_____

_____

_____

- Protein

_____

_____

_____

_____

- Vitamins

_____

_____

_____

_____

- Minerals

_____

_____

_____

_____

ACTIVITY 3:3

Find a Starchy Food

Plants store food energy in the form of carbohydrates for their growth and repair. Sugars are the foods that all plants produce naturally, using the sun's energy. In order to store large amounts of food energy, plants store sugars in large chains called starches. Sugars and starches are carbohydrates, your body's preferred source of energy.

Student Directions

In groups determined by your teacher follow the directions for this experiment. Iodine is used as a starch detector to find out which foods provide you with food energy from carbohydrates.

1. Cover your work surface with newspaper.

2. One person from your group collects:
- ✓ 1 paper plate
- ✓ 1 paper cup
- ✓ 1 eye dropper or 1 plastic straw
- ✓ 1 quarter slice of bread
- ✓ a few pieces of cooked macaroni
- ✓ 1 piece of cooked potato
- ✓ 1 slice of hardboiled egg
- ✓ 1 piece of cheese

3. Put each of the food items that you collected on your paper plate.

4. Fill the paper cup half full with water. Then ask your teacher to add a few drops of iodine and mix it in gently.

CAUTION	**Iodine is poisonous - do not taste it! Iodine can also stain your clothes, skin, or work surface - so take care not to spill it.**

5. Use an eye dropper to collect a small amount of the iodine solution, or dip one end of the straw into the solution in the paper cup and cover the other end with one of your fingers. This will trap a little of the iodine solution in the bottom of the straw. Keeping your finger on the end, you can now lift the straw up and the iodine will not drip out of the bottom of the straw.

6. Take turns with your group members, placing a drop of iodine solution onto the foods on your plate. Each member of the group can deposit the iodine onto a different food.

Student Responses

1. Observe the colour of the iodine solution when it is added to each food and record your results in the table below.

SAMPLE	COLOUR OF THE IODINE
Bread	
Macaroni	
Potato	
Egg	
Cheese	

2. Iodine changes to a blackish-purple colour when it comes into contact with starches. Which foods made the iodine change colour?

3. What can you conclude from your observations?

When you have finished this experiment, dispose of all the food samples, as well as the iodine solution and the paper cup, plate and plastic straw that you used. Use your school's recycling containers as well as garbage containers.

Wash your hands thoroughly.

ACTIVITY 3:4

Your Food Processor

Food gives you energy for all your body parts to work. You need food energy for your heart to beat, your lungs to breathe, your brain to think, and for your favourite activities such as rollerblading, snowboarding, cycling, swimming, and soccer.

Your digestive system works like a giant food processor to break down the food you eat into nutrients that your body can use for energy and to grow and repair itself. Your stomach is an important organ in your digestive system. The digestive juices in your stomach contain strong acids and proteins called enzymes to digest foods.

Some foods are digested more quickly than others for the body to use as energy. Carbohydrate foods, including sugars and starches, are converted into energy the quickest. Foods that contain mostly protein and fat take longer to digest.

Student Directions

In a small group, follow the instructions below to make an artificial stomach to help you see how the stomach works to digest food and how the body digests some foods more quickly than others.

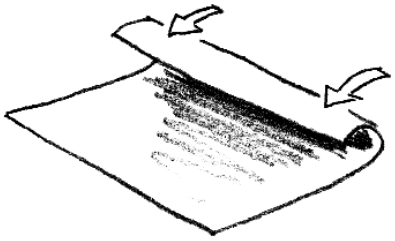
Each member of your group will take one of the following roles:

- a recorder
- a stomach holder
- a food giver

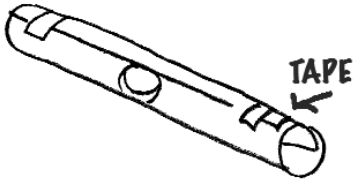
1. Collect the following items for your experiment with your group:

- ✓ half a page of acetate transparency or plastic page protector
- ✓ transparent tape (you can share a roll with other groups)
- ✓ scissors
- ✓1 large plastic self-sealing freezer bag
- ✓1 plastic knife
- ✓1 paper plate
- ✓ 1 measuring cup
- ✓ 200 mL (3/4 cup) of lemon juice concentrate
- ✓ 1 teaspoon of sugar (5 mL)
- ✓ 2 soda crackers
- ✓ 1/2 slice of bread
- ✓ 1 slice of cheese
- ✓ 1/2 slice of luncheon meat

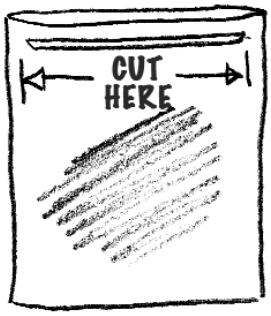
2. To make an artificial stomach, roll up the plastic page (from the short end) to form a tube about 2.5 cm in diameter. Tape the ends securely.



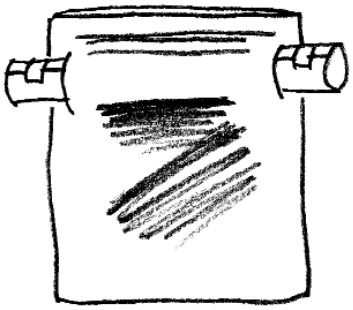
3. Use the scissors to cut a hole about the size of a quarter in the middle of the plastic tube.



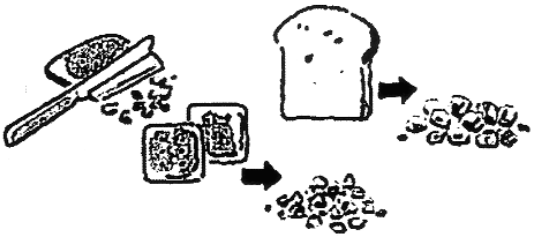
4. Use the scissors to cut two vertical slits, about 5 cm long each, in the plastic bag below the self-sealing line, one near each edge of the bag so the tube can slide in.



5. Slide the tube into the bag through the slits so that the hole in the tube is in the middle and facing down into the artificial stomach. Tape the tube in place, but don't worry about making the bag totally water tight around the tube. Keep the artificial stomach upright at all times to prevent spills.

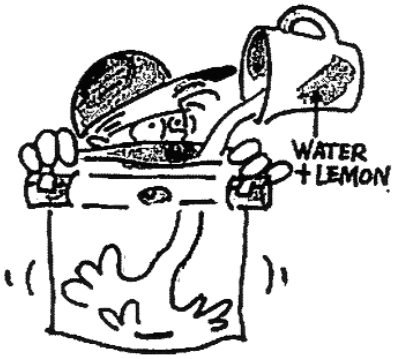


6. Prepare the food for the stomach, just like your teeth do by breaking it into small pieces so they are easier to digest. Break the crackers and bread into tiny bits using your hands and cut the meat and cheese into tiny bits using the plastic knife.



7. Adding acid to the artificial stomach.

- The stomach holder of the group should hold the artificial stomach by the tube while the food giver pours the 200 mL (3/4 cup) of lemon juice concentrate into the open bag.
- Using the measuring cup, the food giver measures 200 mL (3/4 cup) of lukewarm water and adds it to the bag. This mixture is acidic and can help to break down foods, kind of like your stomach juices (although your stomach juices have special enzymes and much stronger acid).
- The stomach holder seals the bag. Remember not to put your artificial stomach down once it has been filled with liquid!



8. Adding food to the artificial stomach

- While the stomach holder holds the artificial stomach, the food giver should push each food sample, one at a time, into the tube so that they fall through the hole and into the stomach.
- After adding each food, the food giver should use his/her hands on the outside of the bag to squish the contents of the bag for one minute. This is like the work your stomach muscles do to mix the food with the digestive juices.
- Let the food sit in the bag for another 3 minutes before adding the next food.
- Add the foods in the order they are listed in the table below (start with sugar, then add soda crackers, bread, cheese, and luncheon meat, in that order).

Student Responses

1. Observe the appearance of each food in the artificial stomach after one minute and three minutes. The recorder of the group should write your group's observations in the chart below.

SAMPLES	APPEARANCE	
	AFTER 1 MINUTE	AFTER 3 MINUTES
Sugar		
Soda Crackers		
Bread		
Cheese		
Luncheon Meat		

2. When you have added all the foods, continue mixing the foods by squeezing the bag with your hands, taking turns, for another five minutes. Then, based on all of your observations, answer the following questions:

Which type of food is digested the most quickly by the stomach?_____

_____

Which foods can you still see at the end of this activity? _____

_____

Which foods are made up of mostly carbohydrates? _____

_____

Which foods are made up of mostly proteins and fats? _____

_____

Are there any other observations or comments about your experiment you want to share?

_____

_____

STUDENT SELF REFLECTION

1. Did you enjoy doing this experiment? Explain your answer. _____

_____

_____

2. Did your group work well together? Explain your answer. _____

_____

_____

3. What did you find difficult to do? _____

_____

_____

4. How could you improve for next time? _____

_____

_____

5. What did you find most interesting about this experiment? _____

_____

_____

6. List any questions that you still have about the digestive process. _____

_____

_____

_____

_____

Exploring Energy Balance

MISSION 4

Exploring Energy Balance provides information and activities to guide students in exploring the importance of healthy eating, physical activity and self-esteem.

Curriculum Connections for Grades 4 - 6

Students will:

1. Understand how nutrition information is presented on food labels by identifying the Nutrition Facts table, ingredient list and nutrition claims on a food product.
2. Identify sources of food energy - fat, carbohydrate and protein.
3. Describe the benefits of healthy eating and physical activity.
4. Use a goal-setting process related to physical activity.
5. Observe body signals associated with eating and activity patterns.
6. Identify factors that influence food and activity choices.
7. Analyze different eating and activity patterns.
8. Recognize the importance of feeling good about oneself for health.
9. Identify personal qualities that contribute to self-esteem.

Teaching Background Information

EATING WELL WITH CANADA'S FOOD GUIDE

Eating Well with Canada's Food Guide defines a healthy eating pattern for Canadians two years of age and older. It highlights the importance of healthy eating and physical activity. Canada's Food Guide uses a rainbow to illustrate that just as different colours make a rainbow, different food groups are the basis of healthy eating. Contact your local public health unit to obtain copies of *Eating Well with Canada's Food Guide* for each student in your class. You can also order copies online through Health Canada's website: www.healthcanada.gc.ca.

Enjoy a Variety of Foods

Canada's Food Guide encourages Canadians to enjoy a variety of foods every day. Different foods provide the body with different nutrients (including carbohydrate, fat, protein, vitamins and minerals), therefore, eating a variety of foods helps to meet nutrient needs. A variety of foods also adds fun and enjoyment to eating. Encouraging children to try foods from other cultures is a great way to help them learn to enjoy a variety of foods while learning about their friends and the world around them.

FOOD ENERGY

Energy Requirements

Children require energy from food for healthy growth and development, to sustain body functions such as breathing and digestion, and to participate in physical activity. As physical activity increases, so do energy requirements. Carbohydrate, protein and fat are the nutrients in foods and beverages that provide energy. Energy is measured in the form of Calories.

The amount of food energy that children require each day from the four food groups depends on their age, gender, body size and activity level. Canada's Food Guide recommends a range of servings from each of the four food groups based on age and gender for all Canadians two years of age and older.

Energy Balance

Energy balance is achieved when energy intake (in the form of Calories from food) equals energy output (energy used for body functions and physical activity).

The two situations below highlight what happens when food intake and activity levels are out of balance:

- When energy intake is greater than energy output, weight gain results. If this equation is maintained over a long period of time it may lead to health problems such as obesity, diabetes or heart disease.

- When energy intake is less than energy output, weight loss results. If this equation is maintained over a long period of time (e.g., over several months or years) it may lead to a lack of energy and health problems such as inadequate growth and development (especially in children). It may also signal eating disorders such as anorexia nervosa in teens and young adults.

CARBOHYDRATE

Carbohydrate is the body's preferred source of energy, especially for the brain and muscles. One gram of carbohydrate provides 4 Calories of energy. Carbohydrate-rich foods can be found in each of the four food groups from Canada's Food Guide. It is a good idea to choose carbohydrate foods at every meal and snack. Health Canada recommends that Canadians consume 45-65% of daily Calories from carbohydrate.

Foods that provide carbohydrate include:

- Vegetables and fruit.
- Grain products such as breads, cereals, pasta, and rice.
- Milk products such as milk and yogurt (lactose, the sugar naturally found in milk products, is a carbohydrate).
- Meat alternatives such as peas, beans, lentils and nuts.
- Foods that are not part of the four food groups but contain carbohydrate include (but are not limited to): sugar, maple syrup, molasses, honey, corn syrup, fruit drinks, and candy.

Carbohydrate in foods come from three sources: starches, sugars and fibre.

Starches
Starches are a type of carbohydrate composed of many sugar units linked together to form long, complex chains. Starches are abundant in grain products and certain vegetables including rice, bread, breakfast cereals, pasta, crackers, corn, potatoes, squash, pumpkin and parsnips. The majority of carbohydrate consumed in North American diets comes from starches.

Sugars
Like most carbohydrates, sugars are a source of Calories that help fuel the brain and muscles. Sugars are naturally found in many foods such as fruit, vegetables and milk products. Sugars are also added to foods to provide sweetness and make them taste more appealing. In addition to sweetness, sugars play an important role in many foods by enhancing flavour, improving appearance and texture and helping to retain moisture and freshness.

Fibre
Fibre is found in many plant foods including whole grains, vegetables, fruit, beans, nuts and seeds. Fibre is an important part of the diet because it helps to keep the digestive system healthy and can also help reduce the risk of some health conditions. Health Canada recommends that children aged 4-13 years consume 25-30 grams of fibre per day. To help Canadians increase fibre intake, Canada's Food Guide emphasizes vegetables and fruit and recommends that half of grain product servings be whole grain (such as oats, brown rice, whole grain breads and whole grain pastas).

FAT

Fat represents the most concentrated form of food energy, providing 9 Calories per gram. It helps to insulate the body, protect the body's organs and line nerve cells. Fat in the diet also provides essential fatty acids and helps transport certain vitamins that are necessary for good health. Although fats are an important part of the diet, Canadians need to moderate their total fat intake. Health Canada recommends that children aged 4-18 years consume 25-35% of daily Calories from fat. There are four main types of fat in the diet: saturated fat, trans fat, monounsaturated fat and polyunsaturated fat (including omega-3 and omega-6 fats).

Foods that provide fat include:

- Oil, salad dressing, butter, margarine, mayonnaise, cream sauces, and snack foods such as potato chips and chocolate.
- Vegetables such as avocados.
- Grain products and baked goods made with fats such as cookies, crackers, cakes, pastries, pies, doughnuts and croissants.
- Milk products such as milk, cheese, yogurt and ice cream.
- Meat products such as beef, poultry, fish, eggs and meat alternatives such as nuts and seeds.
- Foods from any of the four food groups that are fried or prepared in oil.

PROTEIN

Protein in food is made of individual units called amino acids. Protein is essential for forming the structure of all body tissues including muscle, skin and hair. Protein is also a source of energy, containing 4 Calories per gram.

Foods that provide protein include:

- Milk products such as milk, cheese, yogurt and ice cream.
- Meat products such as beef, poultry, fish, eggs and meat alternatives such as beans, peas and lentils, soy products, nuts and seeds.
- Grain products such as cereals, breads, rice and pasta provide some protein, but to a lesser extent than milk products, meat products and meat alternatives.

VITAMINS AND MINERALS

In addition to carbohydrate, protein and fat, vitamins and minerals are also essential nutrients that perform many key functions within the body.

For example,
- Vitamin A is needed to maintain healthy skin, bones and vision.
- Vitamin C is needed for the formation of healthy teeth, gums and blood vessels.
- Calcium, vitamin D, phosphorus and magnesium work together in the development of strong and healthy bones.

Vitamins and minerals are found in many different foods from all four food groups of Canada's Food Guide. Unlike fat, carbohydrate and protein, vitamins and minerals do not provide energy.

BEVERAGES

Fluid is an essential part of a balanced diet. Water supports many body functions, cushions joints and organs, helps to transport important nutrients, and removes wastes. Canada's Food Guide encourages Canadians to satisfy their thirst with water, but all beverages count towards fluid intake, including juices, hot beverages and soft drinks.

Fluid needs vary by age. It is recommended that children aged 1 to 13 years consume 1.5 - 2 litres of fluid per day. It is important to drink additional fluid before, during and after physical activity to replenish fluid lost from sweating. In addition, fluid needs increase when it is hot outside. Keep in mind that total fluid intake includes fluids consumed from both food and beverages, although food is only a minor contributor.

INFORMATION ON FOOD OR BEVERAGE PACKAGES

Ingredient List

Virtually all pre-packaged foods require an ingredient list. The ingredient list displays the ingredients in the food. Ingredients are listed by weight - from most to least. Ingredient lists are particularly useful for people with food allergies or people who have to avoid certain ingredients.

Nutrition Facts Table

Nutrition information on food labels can help Canadians make informed food choices. Nutrition information is provided on the packaging of food and beverages in the form of a Nutrition Facts table. A Nutrition Facts table has been mandatory on most pre-packaged food and beverages in Canada since December 2005. Some foods do not require a Nutrition Facts table such as fresh fruit and vegetables, raw meat and poultry, and foods sold at road-side stands, farmer's markets and flea markets.

Nutrition Facts

Per 125mL (87g)

Amount	% Daily Value
Calories 80	
Fat 0.5 g	1%
Saturated 0 g + Trans 0 g	0%
Cholesterol 0 mg	
Sodium 0 mg	0%
Carbohydrate 18 g	6%
Fibre 2 g	8%
Sugars 2 g	
Protein 3 g	

Vitamin A	2%	Vitamin C	10%
Calcium	0%	Iron	2%

The Nutrition Facts table provides information on serving size, Calories (energy value) and 13 different nutrients in a standardized table. The nutrient information in the Nutrition Facts table is based on a serving size. For example, the Nutrition Facts table on the right lists nutrition information for a serving size of 125 mL (87 g). The nutrients that must be listed in the Nutrition Facts table include fat, saturated fat, trans fat, cholesterol, sodium, carbohydrate, fibre, sugars, protein, vitamin A, vitamin C, calcium and iron. Manufacturers may also include other nutrients from a defined list.

Sugars and the Nutrition Facts Table

The 'sugars' value listed in the Nutrition Facts table is often a source of confusion among consumers. 'Sugars' in the Nutrition Facts table represents the total of both naturally occurring sugars in foods (such as in milk, fruit and vegetables) and sugars added to foods (such as table sugar, honey, glucose-fructose, molasses and maple syrup). For example, one cup of partly skimmed chocolate milk lists 28 grams of sugars in the Nutrition Facts table. This value is a combination of the sugar naturally occurring in milk (lactose) and the sugar added to the product for sweetness.

Using the Nutrition Facts Table

The Nutrition Facts table is useful for evaluating and comparing the nutritional value of packaged foods and beverages. Since serving sizes listed in the Nutrition Facts table vary, even among similar products, it is important to look at the serving size information when comparing different foods. If the serving sizes differ between two products, some basic math may be required to compare products.

The Nutrition Facts table lists a percent daily value for certain nutrients. The percent daily value can help determine whether a food or beverage contains a lot or a little of a nutrient compared to the amount recommended in one day. For example, one cup of milk has a percent daily value of 30% for calcium. This means that one cup of milk provides 30% of an adult's daily recommendation for calcium based on a 2000 Calorie diet. In general, nutrients with a daily value of 40% or more are considered “high”, and nutrients at 5% or less are considered “low”.

NUTRITION CLAIMS

Some food and beverage packages display **nutrition claims**, which describe important nutritional features of a food. Nutrition claims made on a food or beverage package consist of two types:

(1) Nutrient content claims: These are statements that may appear on the front of the package to highlight a specific nutrient in the food such as "low in fat" or "high source of fibre". A food must meet specific criteria from Health Canada in order to carry a nutrient content claim. For example, a food may only display the claim "high source of fibre" if it contains at least 4 grams of fibre per serving.

(2) Health claims: Some food products may display a claim about reducing the risk of certain health conditions including heart disease, cancer, osteoporosis, high blood pressure and dental caries. A food must also meet specific criteria from Health Canada to display a health claim.

HEALTHY ACTIVE LIVING

Healthy Active Living includes eating well, being active and feeling good about yourself.

- Eating well means choosing a variety of foods from Canada's Food Guide everyday, especially those that are higher in carbohydrate and lower in fat.
- Being active means doing some type of physical activity every day. Regular physical activity helps maintain a healthy weight and strengthen the heart, lungs and muscles.
- Feeling good about yourself means believing in yourself, being proud of your abilities, accepting who you are and how you look, and treating yourself well.

Active Living is "an approach to life that values and includes physical activity in everyday living." Children should be encouraged to participate regularly in a variety of activities that they enjoy. This means engaging in simple movement that is comfortable, convenient and fun with family and friends every day. Regular physical activity helps keep the heart and lungs in shape, build muscle strength and endurance, and can improve flexibility. Contact your local Public Health unit to obtain copies of Canada's Physical Activity Guides for Children and Youth. You can also order copies online by visiting the Public Health Agency of Canada website at: www.phac-aspc.gc.ca/pau-uap/fitness/order.html.

LEARNING TO LISTEN TO YOUR BODY

Humans have built-in cues to help them decide when and what to eat. These sensory cues include hunger, satiety (fullness), thirst and taste. Sensory cues are the body's way of telling the brain what it needs; that is, when and how much to eat or drink. A sense of taste helps to identify foods and plays a big part in the pleasure of eating. Learning to listen to these cues and eat accordingly is an important part of the development of healthy eating habits.

Activity 4:1 LEARNING ABOUT NUTRITION INFORMATION ON FOOD LABELS

PURPOSE: to explore and identify nutrition information found on food labels and to identify sources of food energy.

CURRICULUM CONNECTIONS:
1, 2

KNOWLEDGE AND SKILL DEVELOPMENT:

Health and Physical Education, Science, English Language Arts.

TEACHER NOTES:

Bring in two or more food packages that display the Nutrition Facts table and nutrition claims. Students should be asked ahead of time to bring in their own empty food or beverage package. Introduce this activity by brainstorming the benefits of healthy eating with students.

Ask students to consider the following questions before distributing Student Activity 4:1:

- What does healthy eating mean?
- What do foods give us?
- Why is it important to eat a variety of foods?
- What three nutrients give our bodies energy?
- What is our body's preferred source of energy?
- How do we know what is in a food?

Before students work on the activity sheets, complete the blank Nutrition Facts table on Overhead 4:1 (page 76) so that students are able to see an example of how to fill in the information. Students can then use their food or beverage package to answer the questions in the activity.

ASSESSMENT AND EVALUATION:

Students should be able to accurately answer the questions about their food packages. To evaluate student responses, teachers can ask students to submit their activity sheets and food labels for marking or teachers can ask students to give their answers through class discussion. The Answer Key below provides examples of acceptable answers to question #11 of Activity 4:1.

ANSWER KEY for Question #11 of Activity 4:1

What are the benefits of looking at the Nutrition Facts table on food products?

- Determine whether a food has a lot or a little of a nutrient
- Compare the amount of Calories (energy) that different foods provide
- Identify products that are good sources of nutrients such as fibre, calcium and iron
- Help to increase or decrease intake of a particular nutrient (e.g. increase fibre, decrease fat)
- Assist in managing special diets (e.g. diabetic diet, low fat diet)

Essentially, any positive answer towards food labels or being able to read food labels can be deemed correct, as long as students are thinking and reflecting about how food labels can help them and their families make informed food choices.

Activity 4:2 INTERPRETING NUTRITION FACTS TABLES

PURPOSE: To help students utilize and interpret nutrition information found on food labels and increase understanding of the nutrients present in different foods.

CURRICULUM CONNECTIONS:
1, 2

KNOWLEDGE AND SKILL DEVELOPMENT:
Health and Physical Education, Science, English Language Arts.

TEACHER NOTES:
Place students in small groups for this activity. With a list of four food products and four Nutrition Facts tables, the objective of the activity is for students to match each food product with its corresponding Nutrition Facts table. Students should use the activity sheet provided on page 84 to complete the matching.

ASSESSMENT AND EVALUATION:
Teachers should discuss the correct answers to this activity through class discussion and by incorporating the key discussion points for each food product found in the Answer Key below.

ANSWER KEY for Activity 4:2 - Interpreting Nutrition Facts Tables

Once students have worked in groups of four or five to complete the activity, discuss the correct answers with the class. In addition to providing correct answers, the following answer key provides important discussion points about the nutritional composition of each product. These discussion points will give students a better understanding of different nutrients present in different types of foods.

Table 1
Correct Answer: Bran Cereal with Raisins
Key Discussion Points:
- Breakfast cereals are part of the Grain Products group from Canada's Food Guide. Grain products are high in carbohydrate as demonstrated by this cereal which contains 44 g per cup.
- This cereal contains fibre (6 g) which is important for healthy digestion. The fibre comes from the bran part of the cereal (a component of wheat).
- The sugars in this cereal (16 g) represent both the sugar naturally occurring in the raisins and sugar to sweeten the bitter taste of the bran.
- Cereal boxes typically show the serving size as a cup measure (i.e., 1/2, 3/4, or 1 cup) and a gram amount.
- Most breakfast cereals are fortified with iron as well as other vitamins and minerals. This cereal contains 50% of the daily value for iron.

Table 2
Correct Answer: Canned Peaches
Key Discussion Points:
- Canned peaches belong to the Vegetables and Fruit group of Canada's Food Guide.
- These peaches are canned in fruit juice. All of the sugars listed in the Nutrition Facts table (17 g) are sugars that occur naturally in the peaches and the fruit juice.
- Most fruit, including peaches, contains fibre. These peaches contain 2 g of fibre per 2/3 cup serving (150 g).
- As with other fruit, peaches do not contain protein or fat.
- Peaches naturally contain vitamin C. Vitamin C is required for the growth and repair of tissues in all parts of the body.

Table 3

Correct Answer: Fruit Yogurt

Key Discussion Points:

- Yogurt belongs to the Milk and Alternatives group of Canada's Food Guide.
- In general, yogurts contain carbohydrate, protein and fat. However, the fat content of yogurts vary depending on the percentage of milk fat present in the product. This yogurt contains 2% milk fat (M.F.).
- The sugars in this product (16 g) are a combination of naturally-occurring sugars (from milk and fruit) and added sugar.
- Since yogurt is made from milk, it contains calcium.

Table 4

Correct Answer: Breaded Chicken Breast Strips

Key Discussion Points:

- Chicken belongs to the Meat and Alternatives group of Canada's Food Guide.
- Meat and fish contain significant amounts of protein and varying amounts of fat (depending on the type of meat or fish). Chicken is a lean meat but this product contains added fat from the breading which has been browned in canola oil.
- Meat and fish are naturally low in carbohydrate, but this product is made with a bread crumb coating which contributes carbohydrate (21 g).
- Meat and Meat Alternatives are good sources of iron. Iron is important in the formation of red blood cells.

Activity 4:3 EXERCISING FOR ENERGY

PURPOSE: To help students understand the benefits of physical activity, their need for food energy to fuel activity, and how to set physical activity-related goals.

CURRICULUM CONNECTIONS:
1, 2, 4.

KNOWLEDGE AND SKILL DEVELOPMENT:

Health and Physical Activity, Science

TEACHER NOTES:

This activity requires students to participate in a step test to determine their body's reaction to exercise (e.g. tired, thirsty, faster breathing rate, faster heart rate, hotter). If students find it difficult to find their pulse on their wrist, they can place their fingers on the side of their neck to take their pulse. The student response page on page 86 provides a framework for exploring the benefits of physical activity and the need for food energy to fuel the body. Students will identify activities they enjoy and set a physical activity goal.

ASSESSMENT AND EVALUATION:

Students should recognize the benefits of physical activity for endurance, strength and flexibility and the importance of carbohydrate-rich foods for providing energy for activity.

Activity 4:4 TUNE INTO YOUR BODY

PURPOSE: To observe body signals associated with eating and activity patterns.

CURRICULUM CONNECTIONS:
5.

TEACHER NOTES:
This activity is designed to help students tune into their body's cues for hunger and satiety (fullness) as well as feelings related to physical activity. It provides an opportunity for students to identify and explore the signals that help them decide when and what to eat as well as how physical activity can help them to feel good about themselves. Learning to be aware of body signals is an important part of developing healthy eating and activity habits.

Once students have completed their three-day journals and worked with a partner to answer the questions on the activity sheet, ask them to compare their findings in a class discussion about appetite and activity. Note: while a three-day journal allows students to observe eating and activity patterns, students can also complete this activity based on a one-day journal.

ASSESSMENT AND EVALUATION:
Use the student response page (page 89) as well as oral discussion and sharing for evaluation.

OVERHEAD 4:1

Nutrition Facts

Per

Amount	% Daily Value
Calories	
Fat g	%
Saturated g + Trans g	%
Cholesterol mg	
Sodium mg	%
Carbohydrate g	%
Fibre g	%
Sugars g	
Protein g	

Vitamin A	%	Vitamin C	%
Calcium	%	Iron	%

Glossary

MISSION 4

% DAILY VALUE - benchmark for evaluating the nutrient content of foods quickly by indicating whether there is a little or a lot of a nutrient in one serving of a packaged food or beverage.

ACTIVE LIVING - a way of life in which physical activity is valued and integrated into daily living.

BEING ACTIVE - participating in some type of physical activity every day to keep fit, feel good and be healthy.

BODY SIGNALS - feelings or sensory cues that help you decide when and what to eat, including hunger, satiety (fullness), taste and thirst.

CARBOHYDRATE - nutrient produced naturally by plants, consisting mainly of sugars and starches; the body's preferred source of energy.

EATING HABITS - your total pattern of eating including the sum of all your food choices over time.

EATING WELL - choosing a variety of foods from *Eating Well with Canada's Food Guide* every day, especially those that are higher in carbohydrate.

ENERGY BALANCE - a balance of the energy you get from the foods you eat and the energy your body needs for healthy growth, body functions and daily activities.

FAT - nutrient that is a concentrated source of food energy and performs many important functions in the body.

FEELING GOOD ABOUT YOURSELF - believing in yourself; being proud of your abilities; accepting who you are; and treating yourself well.

FOOD ENERGY - the energy that your body requires in the form of carbohydrate, fat and protein.

HEALTHY ACTIVE LIVING - making positive choices that enhance your personal physical, mental and spiritual health.

INGREDIENT LIST - a listing of the ingredients in a packaged food by weight, from most to least.

NUTRITION CLAIMS - nutrient or health claims made on a food or beverage package.

NUTRITION FACTS TABLE - a table on most pre-packaged foods that reports the serving size, calories, 13 nutrients by weight and % Daily Value of certain nutrients.

PHYSICAL ACTIVITY - activities that involve moving your body to keep it healthy, improve your strength and flexibility and help you feel energetic and fit.

PROTEIN - nutrient that provides building blocks for growth and repair of the body, as well as a source of energy.

SATIETY - the feelings of fullness you experience when your body is satisfied with the amount of food you have eaten.

Additional Resources

MISSION 4

NUTRITION AND HEALTHY EATING

Eating Well with Canada's Food Guide
http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/index_e.html
Visit the Health Canada website to view the food guide online, or contact your local public health unit for copies of the food guide or additional publications:
- Eating Well with Canada's Food Guide - A Resource for Educators and Communicators
- Eating Well with Canada's Food Guide - First Nations, Inuit and Métis

Dietitians of Canada
www.dietitians.ca
Visit the site of the national professional association of Registered Dietitians for information on healthy eating, or to find a dietitian in your area.

Nutrition Labelling
http://www.hc-sc.gc.ca/fn-an/label-etiquet/nutrition/index_e.html
Visit Health Canada to understand and learn how to use nutrition information on food labels.

Healthy Eating is in Store for You
http://www.healthyeatingisinstore.ca
The Canadian Diabetes Association and Dietitians of Canada have joined forces to create Healthy Eating is in Store for You™ (HESY), a program that helps consumers to make healthy food choices through better use of the nutrition information on the label of packaged foods.

ACTIVE LIVING AND PHYSICAL ACTIVITY

Canada's Physical Activity Guides for Children and Youth
http://www.phac-aspc.gc.ca/pau-uap/paguide/child_youth/index.html
Visit this web site produced by the Public Health Agency of Canada to learn about Canada's Physical Activity Guide or call 1-888-334-9769 to order copies by phone.

Active Healthy Kids Canada
http://www.activehealthykids.ca/
http://www.activ8.org
Developed for Active Healthy Kids Canada, Activ8 is a national, curriculum-based, physical activity challenge program that helps children and youth (kindergarten to Grade 8) of all abilities develop their fitness and skill levels. Activ8 consists of eight pre-planned lessons for each grade including warm-ups, cool-downs and fun physical activity challenges that can be implemented in any elementary school across Canada.

Physical & Health Education Canada (PHE Canada)
http://www.cahperd.ca
PHE Canada is a national charitable, voluntary-sector organization whose primary concern is to influence the healthy development of children and youth by advocating for quality, school-based physical and health education.

Long Live Kids
www.longlivekids.ca
The Long Live Kids campaign is an initiative of the Children's Healthy Active Living Program (CHALP) that provides Canadian children with tools for healthy eating, active living and improved media literacy in order to support a balanced lifestyle and achieve optimal health and development.

Additional Resources

MISSION 4

Healthy Active Schools
www.everactive.org
This website offers resources with information, activities and ideas for teachers, parents, administrators and community leaders to promote healthy active lifestyles. The resources also provide information on how to make our homes, schools and communities healthier by thinking 'Outside the Box' when it comes to healthy eating, active living and tobacco reduction.

ParticipACTION
www.participaction.com
ParticipACTION's mission is to provide leadership in collaboration and communications to foster the "movement" that inspires and supports Canadians to move more.

BODY IMAGE

National Eating Disorder Information Centre
www.nedic.ca
The National Eating Disorder Information Centre (NEDIC) is a Canadian, non-profit organization, established in 1985 to provide information and resources on eating disorders and weight preoccupation.

Canadian Child Care Federation
http://www.cccf-fcsge.ca/subsites/familytp/english/resourcesh10_en.htm
The Canadian Child Care Federation website provides an overview on Enhancing Children's Self Esteem that discusses how parents and educators can help children build positive self-esteem.

ACTIVITY 4:1

Learning About Nutrition Information on Food Labels

OVERVIEW

Nutrition information on food labels can help you make informed food choices. Nutrition information can be found in the Nutrition Facts table, the ingredient list and nutrition claims. You can use this information to help you choose foods to meet your total daily servings from each of the four food groups from Canada's Food Guide.

Ingredient List: The ingredient list tells you what ingredients are in the food from most to least. The ingredient that is present in the largest amount is listed first. The ingredient list also helps people with food allergies to avoid certain ingredients.

Nutrition Facts Table: The Nutrition Facts table must be shown on most packaged foods in Canada. The Nutrition Facts table has information on Calories and 13 nutrients (such as fat, carbohydrates and sodium). You can compare the nutrition information of different foods using the Nutrition Facts table.

Nutrition Claims: Nutrition claims point out certain features of the food, such as "high in fibre" or "low in fat". A nutrition claim may also point out a link between nutrition and a disease. For example, "A diet high in vegetables and fruit may reduce the risk of some types of cancer".

Student Directions

Bring in an empty, clean food package from home that displays a Nutrition Facts table. It is helpful if it is a food that you would usually eat. Use your package to answer the questions below.

1. Complete the blank Nutrition Facts table to the right with the information found on your food package.

Nutrition Facts

Per

Amount	% Daily Value
Calories	
Fat g	%
Saturated g + Trans g	%
Cholesterol mg	
Sodium mg	%
Carbohydrate g	%
Fibre g	%
Sugars g	
Protein g	
Vitamin A %	Vitamin C %
Calcium %	Iron %

2. What is the name of the food you brought from home? _____

_____

3. Does your food fit into the four food groups from Canada's Food Guide? If so, which food group(s) does it belong to? _____

_____

4. Find the ingredient list on your food or beverage label. What are the first two ingredients in your food?

_____

_____

5. What is the serving size of your food? (hint: look at the top of the Nutrition Facts table) _____

_____

6. Take a closer look at the serving size. Is this the amount you would usually eat?

YES or NO (circle one)

If NO, how much of this food do you normally eat? _____

_____

_____

7. How many Calories are in one serving of your food? _____

8. What nutrients are listed on the Nutrition Facts table of your food? _____

_____

_____

_____

_____

9. Below are the nutrients that provide your body with energy. How much of each of these nutrients does your food contain?

Fat _____ grams

Carbohydrate _____ grams

Protein _____ grams

10. Are there any nutrition claims on your food label? (e.g., low fat, high in fibre). If so, what are they?

_____

_____

11. What are the benefits of looking at the Nutrition Facts table on food products? _____

_____

_____

_____

_____

12. List any questions that you still have about reading food labels. _____

_____

_____

_____

ACTIVITY 4:2

Interpreting Nutrition Facts Tables

On the next page are four Nutrition Facts tables. Each one is from a different food product. Work in the group assigned by your teacher to match each Nutrition Facts table with the food product it represents. Write the correct table number below each product. On the lines below the product name, write 2 reasons why you think the Nutrition Facts table matches the product.

Hints:

1. Look at the serving size.
2. Compare the % Daily Value for carbohydrate and fat and think about which foods might be higher in carbohydrate or fat.
3. Look at the amount of fibre and think about which foods might be high in fibre.
4. Compare the % Daily Value for the vitamins and minerals and think about which foods might have these nutrients.

Table 1	Table 2	Table 3	Table 4

Nutrition Facts
Serving Size 1 cup (55 g)

Amount	% Daily Value
Calories 180	
Fat 1 g	**2** %
Saturated 0 g + Trans 0 g	**0** %
Cholesterol 0 mg	
Sodium 340 mg	**14** %
Carbohydrate 44 g	**15** %
Fibre 6 g	**24** %
Sugars 16 g	
Protein 5 g	
Vitamin A	0 %
Vitamin C	0 %
Calcium	2 %
Iron	50 %

Nutrition Facts
Serving Size 2/3 cup (150 g)

Amount	% Daily Value
Calories 80	
Fat 0 g	**0** %
Saturated 0 g + Trans 0 g	**0** %
Cholesterol 0 mg	
Sodium 0 mg	**0** %
Carbohydrate 19 g	**6** %
Fibre 2 g	**8** %
Sugars 17 g	
Protein 0 g	
Vitamin A	4 %
Vitamin C	30 %
Calcium	2 %
Iron	2 %

Nutrition Facts
Serving Size 1 container (100 g)

Amount	% Daily Value
Calories 110	
Fat 2 g	**3** %
Saturated 1 g + Trans 0 g	**5** %
Cholesterol 5 mg	
Sodium 50 mg	**2** %
Carbohydrate 20 g	**7** %
Fibre 0 g	**0** %
Sugars 16 g	
Protein 3 g	
Vitamin A	2 %
Vitamin C	0 %
Calcium	10 %
Iron	0 %

Nutrition Facts
Serving Size 3 pieces (100 g)

Amount	% Daily Value
Calories 190	
Fat 7 g	**11** %
Saturated 1 g + Trans 0 g	**5** %
Cholesterol 15 mg	
Sodium 650 mg	**27** %
Carbohydrate 21 g	**7** %
Fibre 1 g	**4** %
Sugars 4 g	
Protein 12 g	
Vitamin A	0 %
Vitamin C	0 %
Calcium	2 %
Iron	10 %

Breaded Chicken Strips

Table#_____

_____

_____

_____

Bran Cereal with Raisins

Table#_____

_____

_____

_____

Canned Peaches

Table#_____

_____

_____

_____

Fruit Yogurt

Table#_____

_____

_____

_____

ACTIVITY 4:3

Exercising for Energy

Overview

Participating in a variety of physical activities can help keep your heart and lungs in shape, build muscle strength and endurance and improve your flexibility. Being physically active helps you to stay relaxed and to feel good about yourself. Plus you can have lots of fun being active with your friends and family!

Try to get involved in a mix of activities to keep fit. Endurance activities like running to school, riding your bike, swimming, and walking up stairs keep your heart, lungs and circulatory system in shape.

Flexibility activities like gentle stretching, bending and reaching keep your muscles relaxed and your joints mobile. Activities like walking with a backpack, sit-ups and push-ups strengthen muscles and bones. Remember that the more active you are, the more food energy you will need to fuel your activity.

Student Directions

In groups assigned by your teacher, perform this experiment to see how your body reacts to physical activity.

You'll need:

✓ A bench, a moveable step, or the bottom of a staircase

1. Measure your pulse before you begin by placing your index and middle finger on the inside of your wrist and counting the number of beats you feel in 30 seconds (multiply this number by 2 to get your pulse rate per minute).

2. In the chart below record your pulse rate before exercise as well as how you feel before exercise (e.g., tired, energetic, etc.).

	BEFORE EXERCISE	AFTER EXERCISE
Pulse Rate		
How do you feel		

3. Then do 25 step-ups on the bench or bottom step at a reasonably fast rate. Stop and sit down. Check your pulse again. Record your pulse rate now. How do you feel after exercising? How has your body reacted to this exercise? Record your observations in the chart above.

Student Responses

1. After everyone in your group has taken a turn and recorded their own observations, talk with your group about your body's reaction to exercise.

2. Make a list of activities that you would enjoy doing at least once or twice a week. _____

_____

_____

_____

_____

3. Where would your body get the energy for these activities? _____

_____

_____

_____

4. Why is daily physical activity important? _____

_____

_____

_____

_____

5. On the next page, record a personal physical activity goal and write a plan for achieving your goal.

SETTING A PHYSICAL ACTIVITY GOAL

Physical Activity Goal: _____

Plan for achieving your goal: _____

_____

_____

_____

_____

Obstacles that may make it hard to achieve my goal	Ways to overcome obstacles

Things that will motivate me to achieve my goal:

- _____
- _____
- _____

ACTIVITY 4:4

Tune into your Body

Overview

Eating well and being active helps you to feel great. Being active can help you feel more energetic, relaxed and better about yourself. Regular meals and snacks keep your body fuelled with energy while supplying essential nutrients. When you go several hours without eating, such as overnight or between meals, your body uses the energy that it has stored in order to perform basic body functions such as breathing. You also use energy when you are physically active.

When your energy reserves need refilling, your body sends you hunger signals telling you that it's time to eat. When you eat, your body signals that it has been refuelled and that you are full. Tuning into these feelings helps you maintain a healthy energy balance.

Student Directions

Use the following Appetite and Activity Record to keep track of the feelings you experience before and after eating and activity. If you run out of room, use your own paper to continue your record.

TIME OF DAY	BODY SIGNAL	WHAT DID YOU DO?	RESULTS
(Example) 7:15 am	stomach rumbling	have breakfast - toast with jam, yogurt and apple juice	rumbling stopped felt full

Student Responses

Based on your completed Appetite and Activity Record, work with a small group of classmates to answer the questions below, adding each other's ideas to your own record.

1. What are the feelings that you have when you are hungry? _____

_____

_____

_____

2. Do these feelings happen at set times during the day or at any time? _____

_____

_____

3. What happens if you don't eat when you're feeling hungry?_____

_____

_____

_____

4. After a meal or a snack, how do you know that your body is satisfied? _____

_____

_____

_____

5. Do you ever eat when you are not hungry? If so, why?_____

_____

_____

_____

6. How do you feel when you are physically active?_____

_____

_____

_____

7. How do you feel if you don't fit any physical activity into your day? _____

_____

_____

_____

8. Explain how eating regular meals and snacks and being active makes you feel.

_____

_____

_____

_____

_____

_____

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