Grade Seven Science

Aligned to the Alberta Curriculum

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The lessons and experiments in this book fall under 5 main topics that relate to the Alberta curriculum for Grade 7 Science – Unit A: Interactions and Ecosystems, Unit B: Plants for Food and Fibre, Unit C: Heat and Temperature, Unit D: Structures and Forces and Unit E: Planet Earth. In each lesson you will find teacher notes designed to provide guidance with the learning intentions, the success criteria, materials needed and a lesson outline. As well, the notes will provide some insights on what results to expect when the experiments are conducted. Suggestions for differentiation or accommodation are also included so that all students can be successful in the learning environment.

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AT A GLANCE

FOUNDATIONS

This resource is structured to address the four program foundations of science literacy.

Foundation 1: Science, Technology and Society (STS)
Students will develop an understanding of the nature of science and technology, the relationships between science and technology, and the social and environmental contexts of science and technology.

Nature of Science: *learning about the nature of things, based on observation and evidence. Scientific activity provides a conceptual and theoretical base that is used in predicting, interpreting and explaining natural and technological phenomena. Science-based ideas are continually being tested, modified and improved as new knowledge and explanations supersede existing knowledge and explanations.*

Science and Technology: *solving practical problems that arise from human needs. In technology the focus is on the development of solutions, involving devices and systems that meet a given need within the constraints of the problem. The test of science knowledge is that it helps us explain, interpret and predict; the test of technology is that it works - it enables us to achieve a given purpose.*

Social and Environmental Contexts of Science and Technology: *Many new technologies have influenced, solved or given rise to complex social and environmental issues. The potential of science to inform and empower decision making by individuals, communities and society is a central role of scientific literacy in a democratic society.*

Foundation 2: Knowledge
Students will construct knowledge and understandings of concepts in life science, physical science and Earth and space science, and apply these understandings to interpret, integrate and extend their knowledge.

Life Science: *The growth and interactions of life forms within their environments reflect their uniqueness, diversity, genetic continuity and changing nature. Life science includes such fields of study as ecosystems, biological diversity, the study of organisms, the study of the cell, biochemistry, genetic engineering and biotechnology.*

Physical Science: *Chemistry and physics deal with matter, energy and forces. Matter has structure, and there are interactions among its components. Energy links matter to gravitational, electromagnetic and nuclear forces in the universe. The conservation laws of mass and energy, momentum and charge, are addressed in physical science.*

Earth and Space Science: *Earth and space science brings global and universal perspectives to student knowledge. Earth, our home planet, exhibits form, structure and patterns of change, as does our surrounding solar system and the physical universe beyond it. Earth and space science includes such fields of study as geology, meteorology and astronomy.*

Foundation 3: Skills
Skills - Students will develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively and for making informed decisions.

Expectations in Each Unit of Study: *Students will ask questions about the relationships between and among observable variables, and plan investigations to address those questions. Students will conduct investigations into the relationships between and among observations and gather and record qualitative and quantitative data. Students will analyze qualitative and quantitative data and develop and assess possible explanations. Students will work collaboratively on problems; and use appropriate language and formats to communicate ideas, procedures and results.*

Foundation 4 – Attitudes
Students will be encouraged to develop attitudes that support the responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society and the environment.

Expectations in Each Unit of Study: *Students will be encouraged to show interest and appreciation, seek and apply evidence, work collaboratively with others, demonstrate a responsibility in pursuing a balance between the needs of humans and a sustainable environment and show a concern for safety.*

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UNIT A: INTERACTIONS AND ECOSYSTEMS
***F*ocusing Questions: How do human activities affect ecosystems? What methods can we use to observe and monitor changes in ecosystems and assess the impacts of our actions?** *Students will investigate and describe relationships between humans and their environments, and identify related issues and scientific questions. Students will trace and interpret the flow of energy and materials within an ecosystem. Students will monitor a local environment, and assess the impacts of environmental factors on the growth, health and reproduction of organisms in that environment. Students will describe the relationships among knowledge, decisions and actions in maintaining life-supporting environments.*
UNIT B: PLANTS FOR FOOD AND FIBRE
Focusing Questions: How do we produce useful plant products? What techniques do we use, what knowledge are these techniques based on, and how do we apply these techniques in a sustainable way? *Students will investigate plant uses; and identify links among needs, technologies, products and impacts. Students will Investigate life processes and structures of plants, and interpret related characteristics and needs of plants in a local environment. Students will analyze plant environments, and identify impacts of specific factors and controls. Students will identify and interpret relationships among human needs, technologies, environments, and the culture and use of living things as sources of food and fibre.*
UNIT C: HEAT AND TEMPERATURE
Focusing Questions: What heat-related technologies do we use to meet human needs? Upon what scientific principles are these technologies based? What implications do these technologies have for sustainable use of resources? *Students will illustrate and explain how human needs have led to technologies for obtaining and controlling thermal energy and to increased use of energy resources. Students will describe the nature of thermal energy and its effects on different forms of matter, using informal observations, experimental evidence and models. Students will apply an understanding of heat and temperature in interpreting natural phenomena and technological devices, Students will analyze issues related to the selection and use of thermal technologies, and explain decisions in terms of advantages and disadvantages for sustainability.*
UNIT D: STRUCTURES AND FORCES
Focusing Questions: How do structures stand up under load? What forces act on structures, and what materials and design characteristics contribute to structural strength and stability? *Students will describe and interpret different types of structures encountered in everyday objects, buildings, plants and animals; and identify materials from which they are made. Students will investigate and analyze forces within structures, and forces applied to them. Students will investigate and analyze the properties of materials used in structures. Students will demonstrate and describe processes used in developing, evaluating and improving structures that will meet human needs with a margin of safety.*
UNIT E: PLANET EARTH
Focusing Questions: What do we know about Earth - about its surface and what lies below? What evidence do we have, and how do we use this evidence in developing an understanding of Earth and its changes? *Students will describe and demonstrate methods used in the scientific study of Earth and in observing and interpreting its component materials. Students will identify evidence for the rock cycle, and use the rock cycle concept to interpret and explain the characteristics of particular rocks. Students will investigate and interpret evidence of major changes in landforms and the rock layers that underlie them. Students will describe, interpret and evaluate evidence from the fossil record.*

Taken from the Alberta Education Grade 7 Science Curriculum.

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HUMAN BEINGS AND THEIR ENVIRONMENTS

Learning Intention:

Students will investigate and describe relationships between humans and their environments, and identify related issues and scientific questions.

Success Criteria:

- illustrate how life-supporting environments meet the needs of living things for nutrients, energy sources, moisture, suitable habitat, and exchange of gases
- describe examples of interaction and interdependency within an ecosystem
- identify examples of human impacts on ecosystems, and investigate and analyze the link between these impacts and the human wants and needs that give rise to them
- analyze personal and public decisions that involve consideration of environmental impacts, and identify needs for scientific knowledge that can form those decisions

Materials Needed:

- a copy of ***Living Things and their Environments*** Worksheets 1 and 2 for each student
- a copy of ***Relationships in the Ecosystem*** Worksheets 3 and 4 for each student
- a copy of ***Human Beings and Their Environments Questions*** Worksheets 5 and 6 for each student
- pencils, pencil crayons
- internet access, video equipment

Procedure:

***This lesson can be done as one long lesson or divided into shorter lessons.**

1. Introduce the idea of relationships with other living things and with non-living things in the environment. Give students Worksheets 1 and 2. Read as a class or have students read independently. Check for understanding and assign work. Review as needed when work is complete.
2. Write out the definitions of the three relationships from Worksheet 3 but without the terms (*when two different organisms benefit from the relationship as partners*, *when one organism benefits from a relationship but the other organism is not affected, when on organism benefits from a relationship but the other organism is harmed by the relationships)*. Lead a discussion about the types of relationships and give examples of each one. Ask students why they think these different kinds of relationships develop, which ones are healthy and which ones are not. Ask students about what they need to survive. List examples of needs and wants and how we meet them, to further distinguish the two concepts.
3. Give students Worksheets 3 and 4. Read as a group or have students read independently. Monitor their progress and check for understanding.
4. Give students Worksheets 5 and 6. Read assigned questions as a group. Check for understanding and assign work. Review as needed when work is complete.

Differentiation:

Slower learners or students in need of accommodations may benefit from verbal presentation of the material on the worksheets or more time to process the work. Start these students before of the rest of the class with a small group so they can contribute in later discussions and complete work on time.

For enrichment or extension, faster learners can research and report on some of the more interesting mutual, commensal and parasite relationships found so far in the world.

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Answer Key

Most questions in the worksheets may be answered in sentences or paragraphs. For brevity, the answer key may be reduced to point-form notes.

Worksheet 2

- Mosquito: animal blood; pond water; Wetlands; air (as adult) or siphon tubes as larva
- Ant: leaves and seeds; rain, droplets or puddles; colonies in spaces dug underground; air through tiny holes in body)
- Moose: vegetation; streams, lakes and ponds, forest; air with lungs
- Orca Whale: sea creatures; sea water; ocean water; air with lungs and blow hole
- Aspen Tree: photosynthesis; rain water; forest areas; carbon dioxide through leaves

Worksheet 5

1. a) Biotic means the living things in a physical environment or habitat, like an otter.
   b) Abiotic means the non-living things in a physical environment or habitat, like water.
2. a small ecosystem – a pond – a medium-sized ecosystem – a lake – a large ecosystem – an ocean
3. population
4. A species of organism has a niche when that species finds a way to survive and function as part of the biotic community.
5. Butterflies drinking nectar and pollinating plants - mutual
   A tick biting and embedding itself in the leg of a deer - parasite
   Remora (or suckerfish) following a manta ray - commensal
   A bird standing on the back of cattle and eating flies – mutual
6. Answers will vary.
7. Answers will vary

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Living Things and their Environments

Ecology is the study of the relationships between non-living things and living things that make up an environment. An ecosystem can be a small place like under a rock or a larger place like a marsh or schoolyard, or even a vast region such as the Great Plains. Each ecosystem had abiotic and biotic components.

Abiotic means the non-living things in a physical environment or habitat. This includes the soil, mineral nutrients, water sources, air. It also includes how the land is arranged and formed, or what is called its **physiography**. The climate is also one of the abiotic components of an ecosystem.

Biotic means the living things in a physical environment or habitat. This includes plant communities, animal communities and microbe communities, all working in the food webs of the ecosystem.

A **community** is a term used to describe the groups or populations of living organisms in an ecosystem. A community can have decomposers, consumers and producers together. A **population** is the number of individuals of a particular organism or species. For example, researchers may study the Canada Geese population or beaver population. A **species** within an ecosystem refers to a living thing that can reproduce and have young that will reproduce as well.

What Do Living Things Need?

Living things have 4 basic needs:

Food for energy

Water for body functioning

Space, or a suitable habitat

An exchange of gases, such as oxygen and carbon dioxide

Living things respond to their environments in search of these needs. Living things have adapted to their surroundings in order to fit into an ecosystem. When they find a way to survive and function as part of the biotic community, it is said that they have a **niche**. An adaptation is inherited from one generation to the next through reproduction in its environment. However, some adaptations are learned, such as changes in behaviour, over the course of an organism's lifetime.

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Name: _____

For each living thing in the following list, identity how it would satisfy its basic needs. Think of the ecosystem it would live in, what it would eat and what it would need for a home.

Mosquito

Food _____

Water _____

Space / Habitat _____

Breath _____

Ant

Food _____

Water _____

Space / Habitat _____

Breath _____

Moose

Food _____

Water _____

Space / Habitat _____

Breath _____

Orca Whale

Food _____

Water _____

Space / Habitat _____

Breath _____

Aspen Tree

Food _____

Water _____

Space / Habitat _____

Breath _____

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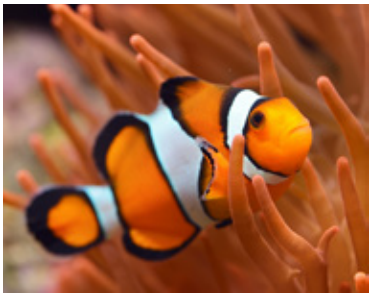
Name: _____

Relationships in the Environment

When two or more species live closely together in a relationship that lasts over time, we call that relationship a **symbiosis**. This symbiosis can take many forms. For example, a beaver may build a lodge to live in. However, muskrats have been found to use beaver lodges for shelter too, even though they didn't build the home. Another example of symbiosis can be found in the beaver's digestive system. The wood beavers chew can be very tough to digest. Beavers have a pouch at the beginning of their intestine which releases special microorganisms or bacteria. This bacteria eats the wood fibre and helps make the nutrients from the wood digestible for the beaver.

Three Kinds of Relationships

Mutualism: when two different organisms benefit from the relationship as partners, we call it mutualism. Flowering plants depend on bees for pollination and reproduction, but bees depend on plants for making honey. They both benefit from the relationship.



Commensalism: when one organism benefits from a relationship but the other organism is not affected, we call it commensalism. A clownfish has a special coating which protects it from the stinging tentacles of sea anemones. The clownfish can make a home in the tentacles. The anemone, however, is not affected by the presence of the clownfish.

Parasitism: when on organism benefits from a relationship but the other organism is harmed by the relationships, we call it parasitism. Fleas can live and feed off a dog, but they can be painful and annoying to the dog.

Organisms interact with each other in may different ways. Other relationships come from physical changes to the ecosystem and the natural resources of an area. When beavers build a dam, it changes the level of water in a wetlands area. This in turn gives small fish a chance to increase their population. Birds such as Great Blue Herons then find those wetlands better places to fish and raise their own young. Human beings can benefit from the beaver's work as well. The wetlands become natural flood-breakers, holding extra water after a winter's thaw. This slows down the flow of large amounts of water, all thanks to the busy beaver.

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What Do Human Beings Need from the Environment?

What would you say is the difference between a need and a want?

Needs are basic to survival in an ecosystem but wants make survival more interesting, more comfortable and more enjoyable. In some ecosystems, where natural resources are scarce, living things compete for survival. Each time a need or a want is satisfied, natural resources or energy are used to satisfy it.

When beavers build a dam, the flow of water below the dam changes. If the water in the ecosystem below the dam is scarce, organisms living there may not satisfy their basic need for water. For everything that happens in an ecosystem there is a resulting effect and reaction which will change the make-up of the ecosystem in some way.

The relationship between human beings and the environment has changed a lot through our history. In the past, people depended on the local natural resources. Today, through technology and transportation, people depend on the natural resources from distant places. Fruit like bananas may be grown thousands of miles away and then shipped or delivered to many places across the world. Products are made and packaged on different continents but then shipped to stores for us to purchase.

Like any change in an ecosystem, technology and transportation have resulting effects and reactions in the environment. Before and during the 1800s, very few people in Europe, Canada and the US ate bananas. Today, it is possible in Canada for a person to eat a banana every day even if we don't grow the fruit in Canada.

Banana farming and production grew by 30 percent in the 1990s and it continues to grow. This means more land is cleared or used for growing bananas and more sea ships or transport trucks are used to deliver bananas across the globe. This affects the wildlife and ecosystems because the banana plant, which had a niche, now takes over most of an ecosystem.

Transporting foods from around the world gives us choice in the foods we eat, but it also puts pollution in our air. Packaging material from used products takes up space in landfills or takes energy and more transportation to recycle.

Sometimes what we want and need can actually create problems, even if we don't mean to create those problems. When we realize that our choices may threaten the health of our own ecosystem and other ecosystems, we have an opportunity to find more responsible choices. We can decide what is important and what kind of relationship we want to have with the ecosystem.

What kind of relationship or role would you like with your environment? ***Mutual***, ***commensal*** or ***parasite?*** And what choices can you make to manage that relationship?

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Human Beings and Their Environments Questions

Use information from the worksheets and other sources to answers the following questions. If you need more space, use a separate piece of paper.

1. An ecosystem has biotic and abiotic parts. In your own words, describe what the two terms mean. Give an example for each as well.

   biotic _____

   _____

   abiotic _____

   _____

2. Give an example of:

   a small ecosystem _____

   a medium-sized ecosystem _____

   a large ecosystem _____

3. A number of individuals of the same species living together in the same area is called what? _____

4. Explain in your own words what is meant by a niche.

   _____

   _____

   _____

5. Label each of the following relationships as parasite, mutual or commensal.

   Butterflies drinking nectar and pollinating plants _____

   A tick biting and embedding itself in the leg of a deer _____

   Remora (or suckerfish) following a manta ray _____

   A bird standing on the back of cattle and eating flies _____

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6. In England, researchers found that certain highways and roads cut through the natural breeding environments of animals. Vehicle traffic ended up killing many of the animals. As a result the country built tunnels so that animals such as badgers, toads and frogs could cross the road without being harmed.

   Canadian highways include road signs for warnings of animal crossings by turtles, elk, deer, moose and other animals.

   Investigate either the animal tunnels or the use of road signs or some other method of solving these animal problems. Do you think they are effective ways to solve the problems? Write about 5 to 6 sentences in your report.

7. Think about your favourite vegetables and fruits. Pick one that is not grown locally or by someone you know. Conduct an investigation to find out how it got from the farm where it was grown to your kitchen. The label or sticker may give you a company name, or an internet search might get you started. Use a separate sheet of paper. Include a paragraph of 6 to 8 sentences and a diagram showing different steps in the production, packaging, transportation and purchasing process.

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