



GRADE 4 SCIENCE

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Answer Key provided when you book a trip



GRADE 4 SCIENCE

IN-SCHOOL PREPARATION

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BEFORE THE PARK

TEACHER'S NOTE

Welcome Grade 4 Teachers to Canada's Wonderland's Science Program!

We have provided you with activities that will take you from your classroom to an action filled day at the Park. The **BEFORE THE PARK** activities are set up for your students to practice some new skills and review some old ones before they go to the Park. The **AT THE PARK** activities are a continuation and extension of the classroom activities. The tasks set up for your students at the Park are designed to let them enjoy all that Canada's Wonderland has to offer, while gathering some data to be used back at the school. The students will use this information to complete a **SUMMATIVE ASSESSMENT** that allows them to extend the experiences that they began in the classroom before the trip. Every activity is completely linked to the new revised Science Curriculum.

Every activity is designed as a real-world experience. As in the real world, there are many possible solutions to a variety of questions. We encourage you to challenge your students to think deeply and reflect on the tasks that are set out before them. We hope that this experience will be a celebration and extension of your teaching and learning this year. In addition, some of the key skills and processes, such as **Brainstorming** and **Predicting** are highlighted to remind students the skills they can use to help complete the task. The **Design Options** are highly recommended as this is where science becomes "alive". Please invest some time and resources and allow your students the opportunity to design, test and experiment with these challenges.

Thank you for your on-going support for young people and our programs at Canada's Wonderland.

MEETING THE EXPECTATIONS

CW Physics, Science & Math Day Activities

A correlation with the Ontario Science Curriculum, Grade 4

Activity	Expectations
It's Alive	<ul style="list-style-type: none"> - analyse the effects of human activities on habitats and communities - investigate the interdependence of plants and animals within specific habitats and communities - demonstrate an understanding of habitats and communities and the relationships among the plants and animals that live in them - analyse the positive and negative impacts of human interactions with natural habitats and communities (e.g. human dependence on natural materials), taking different perspectives into account (e.g. the perspectives of a housing developer, a family in need of housing, an ecologist), and evaluate ways of minimizing the negative impacts - identify reasons for the depletion or extinction of a plant or animal species (e.g. hunting, disease, invasive species, changes in or destruction of its habitat), evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions from happening - use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs - use appropriate science and technology vocabulary, including habitat, population, community, adaptation, and food chain, in oral and written communication - use a variety of forms (e.g. oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g. use presentation software to show the steps one might follow to set up and maintain a terrarium) - demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (e.g. food, water, air, space, and light) - identify factors (e.g. availability of water or food, amount of light, type of weather) that affect the ability of plants and animals to survive in a specific habitat - demonstrate an understanding of a community as a group of interacting species sharing a common habitat (e.g. the life in a meadow or in a patch of forest)

MEETING THE EXPECTATIONS

<p>It's Alive (cont'd)</p>	<ul style="list-style-type: none"> - describe structural adaptations that allow plants and animals to survive in specific habitats (e.g. the thick stem of a cactus stores water for the plant; a duck's webbed feet allow it to move quickly and efficiently in water) - describe ways in which humans are dependent on natural habitats and communities (e.g. for water, medicine, flood control in wetlands, leisure activities)
<p>Rocks & Roll</p>	<ul style="list-style-type: none"> - assess the social and environmental impacts of human uses of rocks and minerals - investigate, test, and compare the physical properties of rocks and minerals - demonstrate an understanding of the physical properties of rocks and minerals - assess the social and environmental costs and benefits of using objects in the built environment that are made from rocks and minerals from it are persistent in the environment - analyse the impact on society and the environment of extracting and refining rocks and minerals for human use, taking different perspectives into account - use a variety of tests to identify the physical properties of minerals (e.g. hardness [scratch test], colour [streak test], magnetism) - use a variety of criteria (e.g. colour, texture, lustre) to classify common rocks and minerals according to their characteristics - use scientific inquiry/research skills to investigate how rocks and minerals are used and disposed of in everyday life - use appropriate science and technology vocabulary, including hardness, colour, lustre, and texture, in oral and written communication - use a variety of forms (e.g. oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g. use a graphic organizer to show how rocks and minerals are used in daily life) - describe the properties (e.g. colour, lustre, streak, transparency, hardness) that are used to identify minerals - describe how igneous, sedimentary, and metamorphic rocks are formed (e.g. igneous rocks form when hot, liquid rock from deep below the earth's surface rises towards the surface, cools, and solidifies; sedimentary rocks form when small pieces of the earth that have been worn away by wind and water accumulate at the bottom of rivers, lakes, and oceans and are eventually compressed into rock; metamorphic rocks form when igneous or sedimentary

rocks are changed by heat and pressure)

MEETING THE EXPECTATIONS

Rocks & Roll (cont'd)	<ul style="list-style-type: none">- describe the characteristics of the three classes of rocks (e.g. sedimentary rocks often have flat or curved layers, are composed of pieces that are roughly the same size with pores between the pieces, and often contain fossils; igneous rocks have no layers, are usually made up of two or more minerals whose crystals are different sizes, and normally do not contain fossils; metamorphic rocks may have alternating bands of light and dark minerals, may be composed of only one mineral, such as marble or quartzite, and rarely contain fossils), and explain how their characteristics are related to their origin
Up & Down & Around We Go	<ul style="list-style-type: none">- evaluate the impact of pulleys and gears on society and the environment- investigate ways in which pulleys and gears modify the speed and direction of, and the force exerted on, moving objects- demonstrate an understanding of the basic principles and functions of pulley systems and gear systems- assess the impact of pulley systems and gear systems on daily life- assess the environmental impact of using machines with pulleys and gears, taking different perspectives into account (e.g. the perspective of a car driver or cyclist, someone who is physically challenged, the owner of a multi-floor building), and suggest ways to minimize negative impacts and maximize positive impacts- use scientific inquiry/experimentation skills to investigate changes in force, distance, speed, and direction in pulley and gear systems- use technological problem-solving skills to design, build, and test a pulley or gear system that performs a specific task- use appropriate science and technology vocabulary, including pulley, gear, force, and speed, in oral and written communication- use a variety of forms (e.g. oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes- describe the purposes of pulley systems and gear systems (e.g. to facilitate changes in direction, speed, or force)- describe how rotary motion in one system or its components (e.g. a system of pulleys of different sizes) is transferred to another system or component (e.g. a system of various gears) in the same structure- distinguish between pulley systems and gear systems that increase force and those that increase speed- identify pulley systems (e.g. clotheslines, flagpoles, cranes, elevators, farm machinery) and gear systems (e.g. bicycles, hand drills, can openers) that are used in daily life, and explain the purpose and basic operation of each

MEETING THE EXPECTATIONS

Can You Feel the Energy?

- assess the impact on society and the environment of technological innovations related to light and sound
- investigate the characteristics and properties of light and sound
- demonstrate an understanding of light and sound as forms of energy that have specific characteristics and properties
- assess the impacts on personal safety of devices that apply the properties of light and/or sound (e.g. UV-coated lenses in sunglasses, safety eyes on garage door openers, reflective material on clothing, ear plugs, backup signals on trucks and cars, MP3 players, cell phones), and propose ways of using these devices to make our daily activities safer
- assess the impacts on society and the environment of light and/or sound energy produced by different technologies, taking different perspectives into account (e.g. the perspectives of someone who has to walk on the street late at night, a cottage owner, a person who is hearing impaired, manufacturers of and merchants who sell MP3 players)
- investigate the basic properties of light (e.g. conduct experiments to show that light travels in a straight path, that light reflects off of shiny surfaces, that light refracts [bends] when passing from one medium to another, that white light is made up of many colours, that light diffracts [bends and spreads out] when passing through an opening)
- investigate the basic properties of sound (e.g. conduct experiments to show that sound travels, that sound can be absorbed or reflected, that sound can be modified [pitch, volume], that there is a relationship between vibrations and sound)
- use appropriate science and technology vocabulary, including natural, artificial, beam of light, pitch, loudness, and vibration, in oral and written communication
- use a variety of forms (e.g. oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes
- identify a variety of natural light sources (e.g. the sun, a firefly) and artificial light sources (e.g. a candle, fireworks, a light bulb)
- describe properties of light, including the following: light travels in a straight path; light can be absorbed, reflected, and refracted
- describe properties of sound, including the following: sound travels; sound can be absorbed or reflected and can be modified (e.g. pitch, loudness)
- explain how vibrations cause sound
- distinguish between sources of light that give off both light and heat (e.g. the sun, a candle, an incandescent light bulb) and those that give off light but little or no heat (e.g. an LED, a firefly, a

compact fluorescent bulb, a glow stick)

MEETING THE EXPECTATIONS

A Medieval Renovation – Keep On Digging	<ul style="list-style-type: none">- assess the social and environmental impacts of human uses of rocks and minerals- investigate, test, and compare the physical properties of rocks and minerals- demonstrate an understanding of the physical properties of rocks and minerals- assess the social and environmental costs and benefits of using objects in the built environment that are made from rocks and minerals from it are persistent in the environment- analyse the impact on society and the environment of extracting and refining rocks and minerals for human use, taking different perspectives into account- use a variety of tests to identify the physical properties of minerals (e.g. hardness [scratch test], colour [streak test], magnetism)- use a variety of criteria (e.g. colour, texture, lustre) to classify common rocks and minerals according to their characteristics- use scientific inquiry/research skills to investigate how rocks and minerals are used and disposed of in everyday life- use appropriate science and technology vocabulary, including hardness, colour, lustre, and texture, in oral and written communication- use a variety of forms (e.g. oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g. use a graphic organizer to show how rocks and minerals are used in daily life)- describe the properties (e.g. colour, lustre, streak, transparency, hardness) that are used to identify minerals- describe how igneous, sedimentary, and metamorphic rocks are formed- describe the characteristics of the three classes of rocks and explain how their characteristics are related to their origin
A Medieval Renovation – If You Build It, They Will Come	<ul style="list-style-type: none">- analyse the effects of human activities on habitats and communities- investigate the interdependence of plants and animals within specific habitats and communities- demonstrate an understanding of habitats and communities and the relationships among the plants and animals that live in them- analyse the positive and negative impacts of human interactions with natural habitats and communities (e.g. human dependence on natural materials), taking different perspectives into account (e.g. the perspectives of a housing developer, a family in need of housing, an ecologist), and evaluate ways of minimizing the

negative impacts

MEETING THE EXPECTATIONS

A Medieval Renovation – If You Build It, They Will Come	<ul style="list-style-type: none">- use appropriate science and technology vocabulary, including habitat, population, community, adaptation, and food chain, in oral and written communication- use a variety of forms (e.g. oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g. use presentation software to show the steps one might follow to set up and maintain a terrarium)- demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life (e.g. food, water, air, space, and light)- identify factors (e.g. availability of water or food, amount of light, type of weather) that affect the ability of plants and animals to survive in a specific habitat- describe structural adaptations that allow plants and animals to survive in specific habitats- describe ways in which humans are dependent on natural habitats and communities- investigate ways in which pulleys and gears modify the speed and direction of, and the force exerted on, moving objects- demonstrate an understanding of the basic principles and functions of pulley systems and gear systems- use scientific inquiry/experimentation skills to investigate changes in force, distance, speed, and direction in pulley and gear systems- use technological problem-solving skills to design, build, and test a pulley or gear system that performs a specific task- use appropriate science and technology vocabulary, including pulley, gear, force, and speed, in oral and written communication- use a variety of forms (e.g. oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes- describe the purposes of pulley systems and gear systems (e.g. to facilitate changes in direction, speed, or force)- distinguish between pulley systems and gear systems that increase force and those that increase speed
A Medieval Renovation – Light, Camera, Action	<ul style="list-style-type: none">- assess the impact on society and the environment of technological innovations related to light and sound- investigate the characteristics and properties of light and sound- demonstrate an understanding of light and sound as forms of energy that have specific characteristics and properties- assess the impacts on personal safety of devices that apply the properties of light and/or sound (e.g. UV-coated lenses in sunglasses, safety eyes on garage door openers, reflective material on clothing, ear plugs, backup signals on trucks and cars, MP3 players, cell phones), and propose ways of using these devices to

make our daily activities safer

MEETING THE EXPECTATIONS

<p>A Medieval Renovation – Light, Camera, Action</p>	<ul style="list-style-type: none">- assess the impacts on society and the environment of light and/or sound energy produced by different technologies, taking different perspectives into account- investigate the basic properties of light- investigate the basic properties of sound- use appropriate science and technology vocabulary, including natural, artificial, beam of light, pitch, loudness, and vibration, in oral and written communication- use a variety of forms (e.g. oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes- identify a variety of natural light sources (e.g. the sun, a firefly) and artificial light sources (e.g. a candle, fireworks, a light bulb)- describe properties of light, including the following: light travels in a straight path; light can be absorbed, reflected, and refracted- describe properties of sound, including the following: sound travels; sound can be absorbed or reflected and can be modified (e.g. pitch, loudness)- explain how vibrations cause sound- distinguish between sources of light that give off both light and heat (e.g. the sun, a candle, an incandescent light bulb) and those that give off light but little or no heat
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ASSESSMENT RUBRIC

It's Alive; Rocks & Roll; Up & Down & Around We Go; Can You Feel the Energy?

	Level 1	Level 2	Level 3	Level 4
Knowledge and Content	Demonstrates limited understanding of the content areas, including habitats & communities, rocks & minerals, gears & pulleys, and light & sound	Demonstrates some understanding of the content areas, including habitats & communities, rocks & minerals, gears & pulleys, and light & sound	Demonstrates considerable understanding of the content areas, including habitats & communities, rocks & minerals, gears & pulleys, and light & sound	Demonstrates a thorough understanding of the content areas, including habitats & communities, rocks & minerals, gears & pulleys, and light & sound
Thinking	Uses processing skills such as gathering evidence and manipulating materials, forming conclusions and convincing arguments with limited effectiveness	Uses processing skills such as gathering evidence and manipulating materials, forming conclusions and convincing arguments with some effectiveness	Uses processing skills such as gathering evidence and manipulating materials, forming conclusions and convincing arguments with considerable effectiveness	Uses processing skills such as gathering evidence and manipulating materials, forming conclusions and convincing arguments with a high degree of effectiveness
Communication	Expresses and organizes ideas and answers, using appropriate vocabulary and scientific terminology with limited effectiveness	Expresses and organizes ideas and answers, using appropriate vocabulary and scientific terminology with some effectiveness	Expresses and organizes ideas and answers, using appropriate vocabulary and scientific terminology with considerable effectiveness	Expresses and organizes ideas and answers, using appropriate vocabulary and scientific terminology with a high degree of effectiveness
Application	Applies knowledge and skills in both familiar and unfamiliar contexts, and is able to connect learning with real-world experiences with little effectiveness	Applies knowledge and skills in both familiar and unfamiliar contexts, and is able to connect learning with real-world experiences with some effectiveness	Applies knowledge and skills in both familiar and unfamiliar contexts, and is able to connect learning with real-world experiences with considerable effectiveness	Applies knowledge and skills in both familiar and unfamiliar contexts, and is able to connect learning with real-world experiences with a high degree of effectiveness

SUMMATIVE ASSESSMENT RUBRIC

A Medieval Renovation

	Level 1	Level 2	Level 3	Level 4
Knowledge and Content	Demonstrates limited understanding of the content areas, including habitats & communities, rocks & minerals, gears & pulleys and light & sound	Demonstrates some understanding of the content areas, including habitats & communities, rocks & minerals, gears & pulleys and light & sound	Demonstrates considerable understanding of the content areas, including habitats & communities, rocks & minerals, gears & pulleys and light & sound	Demonstrates a thorough understanding of the content areas, including habitats & communities, rocks & minerals, gears & pulleys and light & sound
Thinking	Uses processing skills such as gathering evidence and manipulating materials, forming conclusions and convincing arguments with limited effectiveness	Uses processing skills such as gathering evidence and manipulating materials, forming conclusions and convincing arguments with some effectiveness	Uses processing skills such as gathering evidence and manipulating materials, forming conclusions and convincing arguments with considerable effectiveness	Uses processing skills such as gathering evidence and manipulating materials, forming conclusions and convincing arguments with a high degree of effectiveness
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IT'S ALIVE

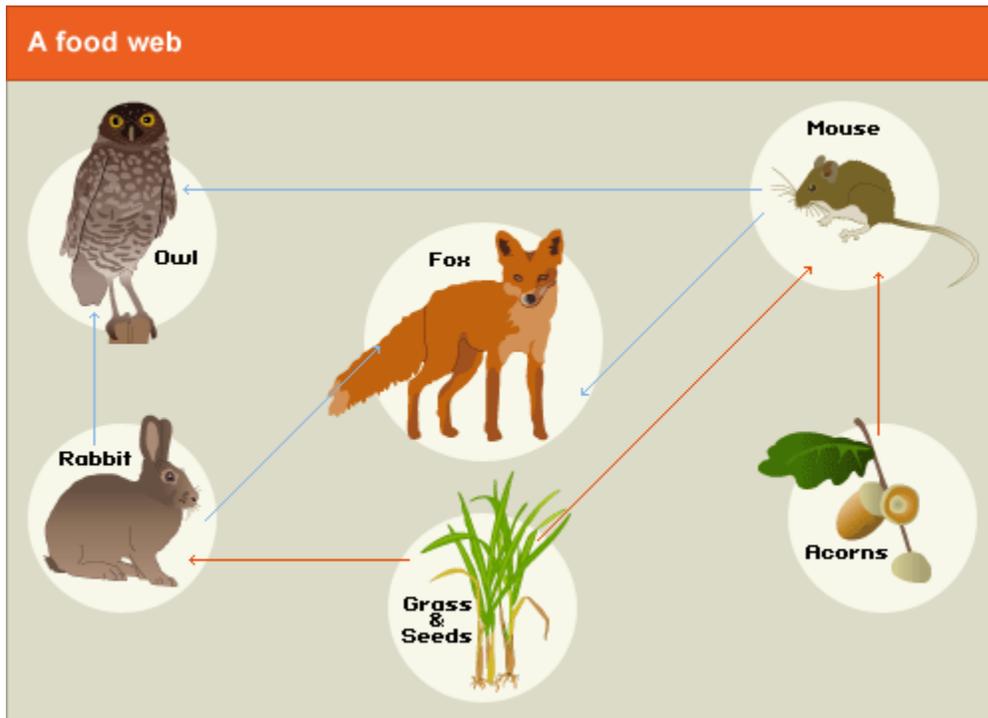
1. Describe a habitat around your school.

2. a) Brainstorm: Imagine your school playground 20 years ago. What do you think it looked like then? Use words or draw a picture.

b) What plants and animals do you think you could find then?

c) What happened to those animals when the houses and school were built?

3. Observe the following food web that could be found near your school.

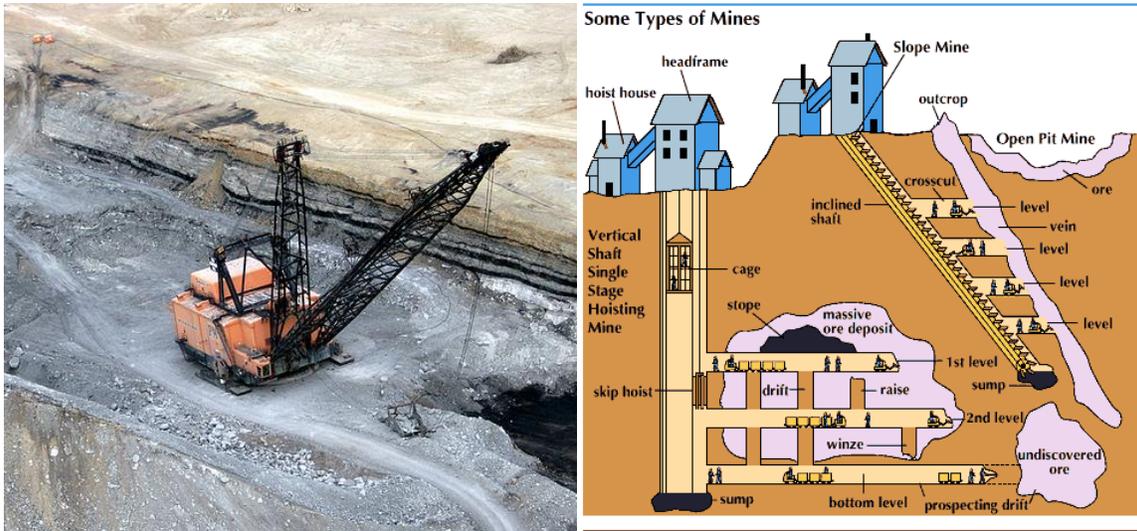


Suppose one part of the web was damaged or missing, could all the other living things keep surviving?

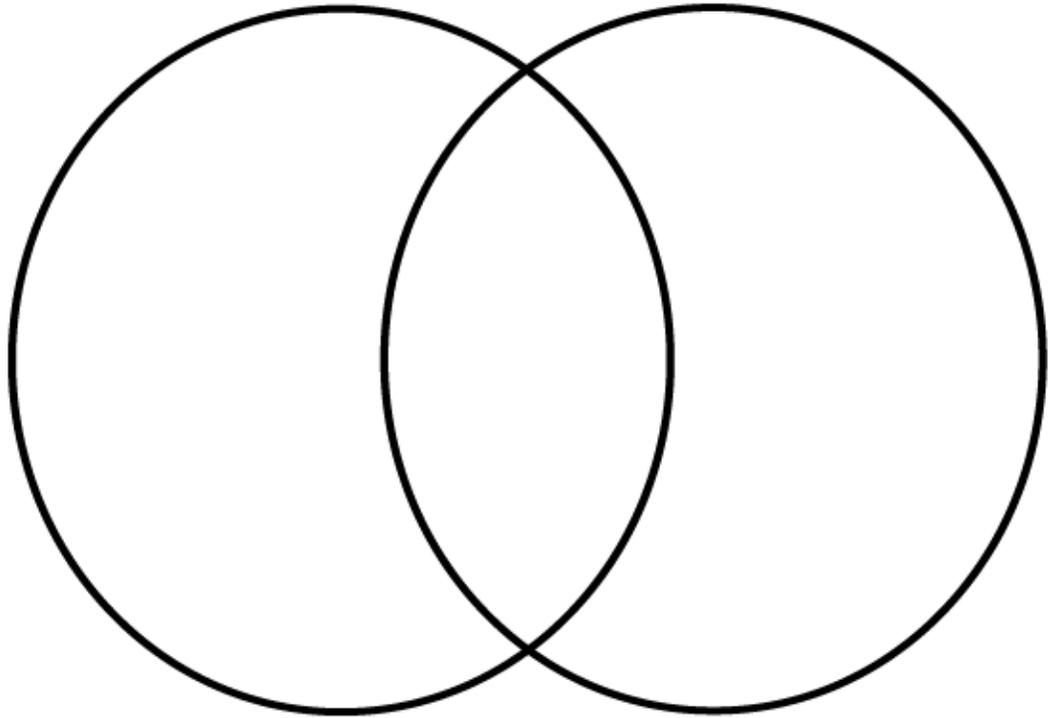
4. **Predict:** In what ways do the plants and animals around us help our lives?

ROCKS & ROLL

Observe the following picture of **strip mining** and **shaft mining**.



1. **In Groups:** Create a Venn diagram on the similarities and differences of these 2 types of mining.



BEFORE THE PARK

ROCKS & ROLL

2. What do you think happens to all the rocks that aren't used from the strip mining?

3. What impact does mining have on the environment?

4. Collect and examine 2 rock samples from your teacher. How many similarities and differences can you find between them?

5. How do you think these rocks were formed? Igneous, Sedimentary or Metamorphic?

BEFORE THE PARK

UP & DOWN & AROUND WE GO

UP & DOWN & AROUND WE GO

1. a) **Design and Test:** Create a single pulley to lift a weight.

b) **Design and Test:** Repeat the same task using a single to single pulley and a double to double pulley.

c) **Vocabulary:** Simple machines always have a *trade-off*, meaning they do something good, but unfortunately, there is a bad part. For each pulley combination, list what was good about it and what was bad about it.

	Good	Bad
Single pulley		
Single to single		

Double to double		

2. Where are pulleys useful in your life?

BEFORE THE PARK

UP & DOWN & AROUND WE GO

3. a) **Design and Test:** Create a gear train where a:
- i) medium gear turns a small gear
 - ii) medium gear turns a medium gear
 - iii) medium gear turns a large gear.

b) Fill out the table to describe the trade-off.

	Good	Bad
Medium gear turning a small gear		

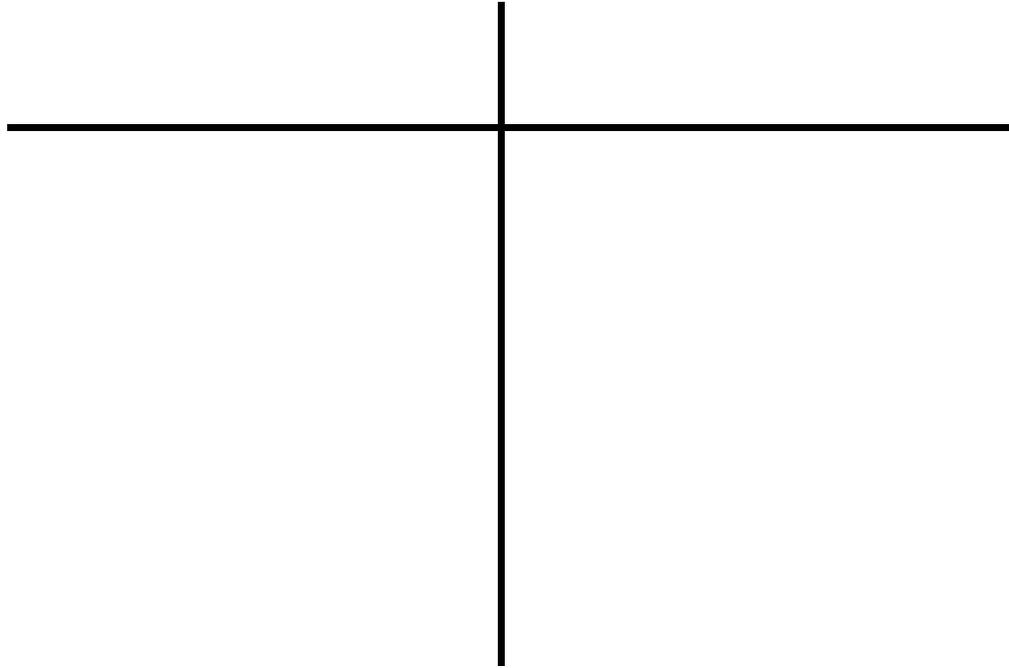
Medium gear turning a medium gear		
Medium gear turning a large gear		

4. Where do we find gears in your life?

BEFORE THE PARK

UP & DOWN & AROUND WE GO

5. **In Groups:** Simple machines make work easier for us, for example, cars and bicycles both use gears. Do all simple machines help the environment? Use the following T-chart to help organize.



BEFORE THE PARK

CAN YOU FEEL THE ENERGY?

CAN YOU FEEL THE ENERGY?

1. **Brainstorm:** Look around your classroom. List all the sources of light.

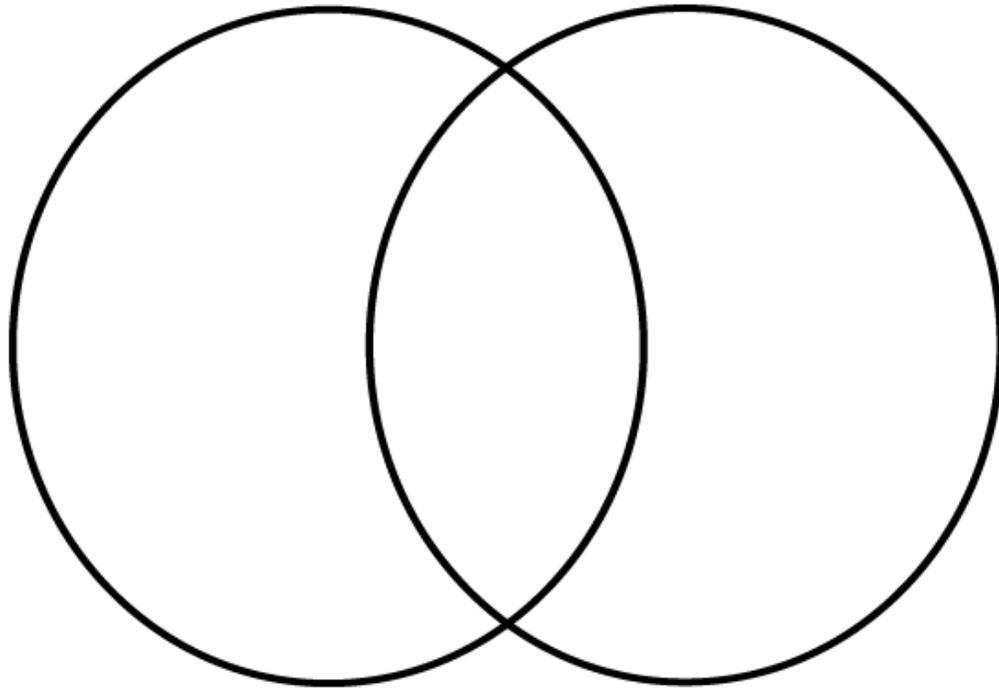
2. **Design and Test in Groups:** Design an experiment to prove that light travels in a straight line until it hits something where it can be reflected or absorbed.

3. Describe some positive and negative benefits of light in everyday life.

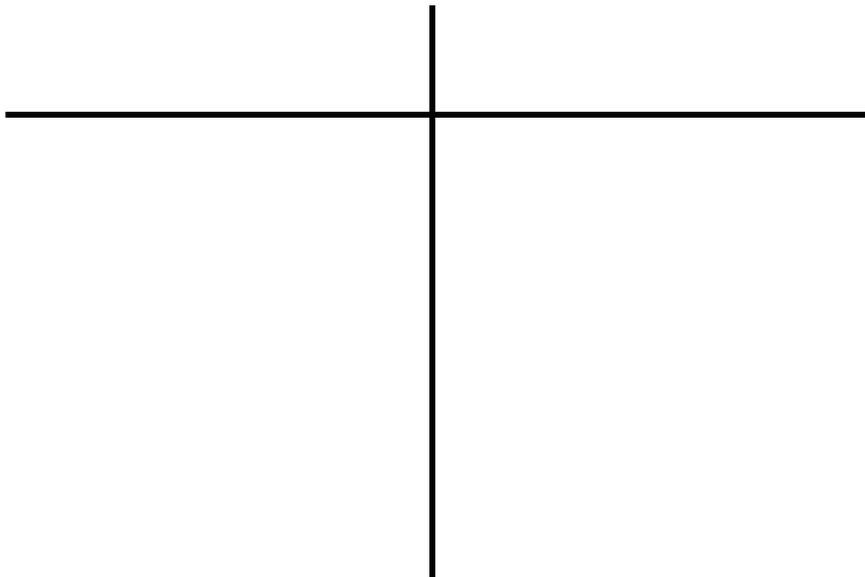
BEFORE THE PARK

CAN YOU FEEL THE ENERGY?

4. Use a Venn diagram to compare sound and light.



5. Technology has made great advancements in sound. For example, your parents did not have tiny MP3 players. Use the T chart to explain how this has helped our world, but also had some negative impact as well.





GRADE 4 SCIENCE

AMUSEMENT RIDE ACTIVITIES

AT THE PARK

SUMMATIVE ASSESSMENT

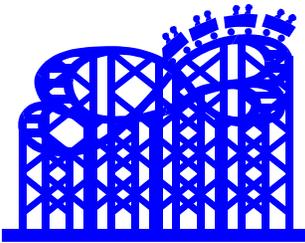
AT THE PARK

IT'S ALIVE

IT'S ALIVE



1. Before Canada's Wonderland was built in 1981, it was a field with tall grass, shrubs and some trees. What types of plants and animals do you think you could find there?



2. Find some examples where Canada's Wonderland has integrated natural habitats within the Park and rides.

3. How does the natural habitat benefit the people who attend the Park?

AT THE PARK

IT'S ALIVE

4. Based on what you saw at Canada's Wonderland, is it possible for humans, plants and animals to live together? Provide reasons.

5. In what ways do plants, animals and humans have to adapt in order to live in the same environment?

AT THE PARK

ROCKS & ROLL

ROCKS & ROLL

1. When Canada's Wonderland was first built, it was dug up and there was a lot of left over rocks. Some of those rocks are still there today. How are rocks being used there today?

2. Some of the left over rocks were transformed into different products. Find some examples of how these rocks have been reused. *Hint:* look down at your feet.

3. How do rocks help create a natural habitat at Canada's Wonderland?

AT THE PARK

ROCKS & ROLL

4. Find a rock at Canada's Wonderland and write down all of its characteristics. When you get back to school, see if you can use your skills to classify it using *colour*, *texture*, *hardness* and *lustre*.

AT THE PARK

UP & DOWN & AROUND WE GO

UP & DOWN & AROUND WE GO

1. Find some examples of machines that could use gears or pulleys at Canada's Wonderland.

2. What is their trade-off?

3. **Predict:** What would happen if the gears were installed backwards on your example?

4. Some simple machines require electricity to make the gears and pulleys move which can damage the environment. Find some examples where Canada's Wonderland uses natural energy to propel its rides.

5. Some rides need electricity. How can we reduce the impact those rides have on the environment?

4. When you are riding on a roller coaster, describe all the sounds you hear. Why is it that you cannot hear your friends if they are sitting behind you on the ride, but you can hear them just fine once you are off the ride?

A MEDIEVAL RENOVATION

Prior Classroom Learning Required

- ✓ Problem Solving and Reasoning Skills
 - ✓ Basic Concepts of the Grade 4 Science Strands:
 - Habitats and Communities
 - Pulleys and Gears
 - Light and Sound
 - Rocks and Minerals
 - ✓ Group Work
 - ✓ Design Process
-
- Canada’s Wonderland has decided to relocate their Medieval Attraction to a new area. The highlight of this new centre will be a new and improved large castle with a performance stage in the middle of the courtyard. Being mindful of the environment, Canada’s Wonderland has vowed to make this their “Greenest” attraction ever.
 - Using a variety of skills and information, which you mastered over your Grade 4 year, you will be responsible for making decisions and designing this new attraction from the ground up.

NOTE These Summative Assessment activities are for the purpose of this program and do not accurately reflect operational procedures or plans for Canada’s Wonderland.

SUMMATIVE ASSESSMENT

KEEP ON DIGGING!

A MEDIEVAL RENOVATION

Keep on Digging!

Canada's Wonderland has decided to move their new Medieval Attraction to the edge of their park boundaries. The current area is very rocky, so they have hired you to oversee the strip mining of the area.

1. **Research:** You suspect that you are digging into shale. Find 3 facts about shale.

2. **Design Option:** Use colour, texture and hardness tests to determine if you have shale.

3. Congratulations! You have determined that this area is suitable to build your new castle. Unfortunately, you have large mounds of rock left over. Your boss called a company to come and remove all of the rocks. You told your boss to wait because you have a better idea. How could you reuse some of the rocks in building your new attraction and the surrounding area?

4. Draw a picture of your new castle and label where you recycled some of the leftover stones.

5. When using large machinery to strip mine and remove a lot of earth, what environmental issues are there?

6. Is it possible to fix any of the environmental problems?

2. What will the people who attend the attraction have to do to make sure that they can co-exist with the animals and plants? Make a sign below that you will hang up around the attraction to remind them what to do and not to do.

A large, empty rectangular box with a thin black border, intended for the student to draw a sign. The box is centered on the page and occupies a significant portion of the lower half of the document.

3. The Chief Builder has come to you to help solve some problems.

a) We have a 2000 kg piece of metal that we need to get from the ground to the top of the castle roof. It is too heavy and tall to lift by hand. How should we get it up there? Explain how you would solve this problem.

b) The stage is in the centre of the courtyard and the stands surround it. That means when the performers are on stage, their backs will be facing some of the people. We want to make the stage rotate, but we cannot figure out how to do it. Explain how you would solve this problem.

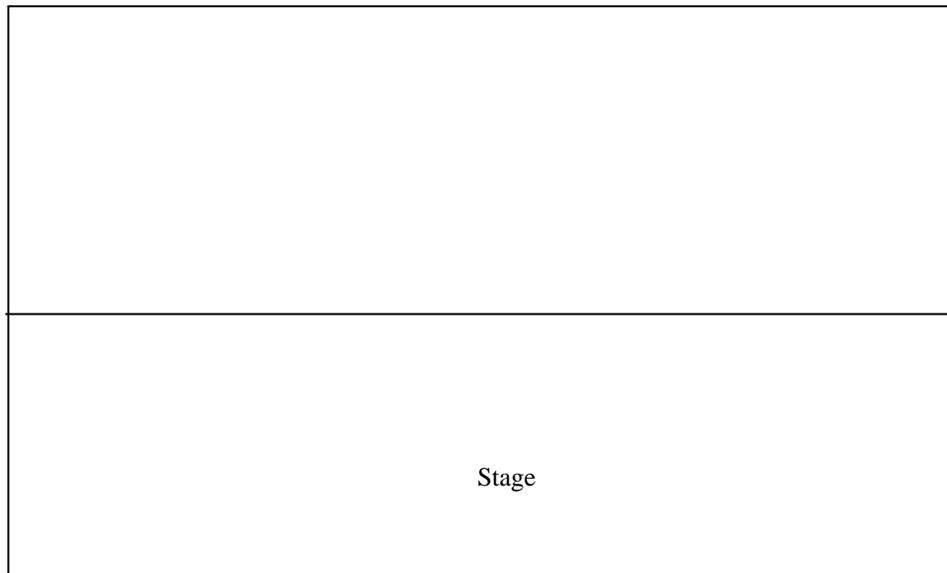
c) **Design Option:** Build a model of either situation a) or b) to demonstrate how you solved the problem.



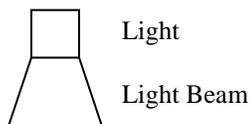
A MEDIEVAL RENOVATION
Lights, Camera, Action!

You have finished building the castle. Now it is time to install the lights and sound system for the performances. Below is a front view of the stage and the supports where the lights will be mounted.

Bar to Mount Lights



1. Below is a light sample and the angle which the light leaves the bulb. How many lights will you need to light the entire stage? Explain how you determined your answer.



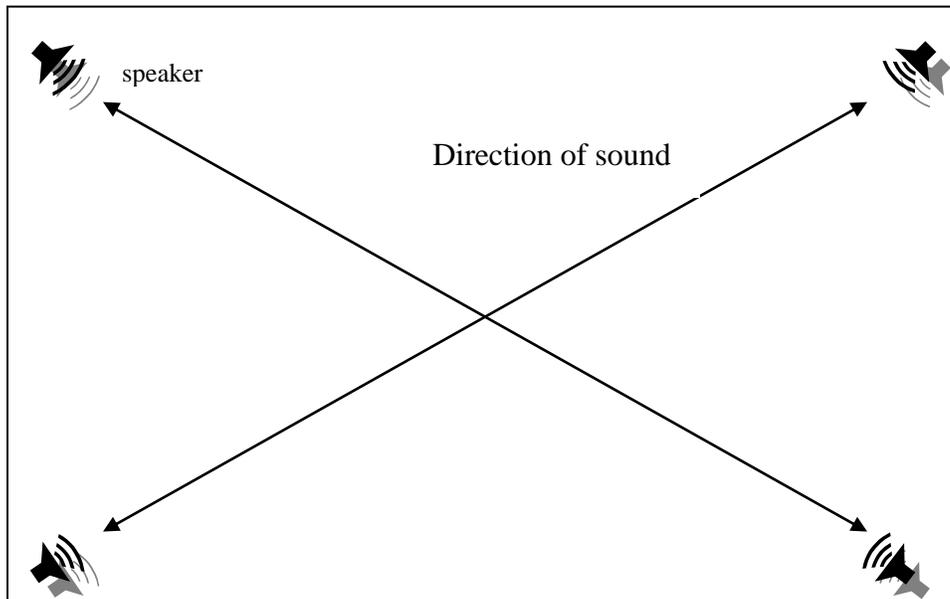
2. Some of the performers have complained that the lights produce a lot of heat which makes it uncomfortable to perform. How could you use additional lighting sources to solve this problem?

3. Recall that this is an environmentally friendly attraction. Which light source will you choose to light up your stage? Explain why.

4. a) You have learned about trade-offs in various tasks. By choosing a better light source, you have made an environmentally friendly choice. What are some negative outcomes of choosing that light source? *Hint:* Does it bother the people, environment, animals, plants?

b) Fix or minimize 1 of those problems.

5. The sound technician is concerned that they only have 4 speakers in the entire courtyard. The technician claims that only the people in the direct pathways of the speakers will hear the sound. You have assured your friend that everyone will hear regardless of where they are sitting. **Use your knowledge of how sound travels to explain why everyone will hear the performance.**



6. **Design Option:** Any good castle has to have a Draw Bridge. Build a model of a working draw bridge using your knowledge of gears and/or pulleys.



A MEDIEVAL RENOVATION

Dear General Manager...

Congratulations! You have finished building a fantastic new attraction that is very environmentally friendly. Write a letter to the General Manager of Canada's Wonderland explaining everything you did to ensure that this new castle will be the "Greenest" attraction at the Park!