# GRADE 6 SCIENCE

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# GRADE 6 SCIENCE

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# CW Physics, Science & Math Day Activities

## A correlation with the Ontario Science Curriculum Grade 6

### Grade 6

**Understanding Structure and Mechanisms: Flight**

**E = Energy and Control Electricity**

| ACTIVITIES | GRADE 6<br>specific expectations |
|---|---|
| **Riptide**<br>**The Bat**<br>**Vortex**<br>**Mighty Canadian Minebuster**<br>**Flight Deck** | **S 2.5** use technological problem-solving skills (see page 16) to design, build, and test a device<br>that transforms electrical energy into another form of energy in order to perform a function<br>**S 2.6** use appropriate science and technology vocabulary,<br>including current, battery, circuit, transform,static, electrostatic, and energy, in oral and written communication<br>**S 2.7** use a variety of forms (e.g., oral, written, graphic,<br>multimedia) to communicate with different audiences and for a variety of purposes<br>**S 3.2** use the principles of static electricity to explain<br>common electrostatic phenomena<br>**S 3.4** describe how various forms of energy can be transformed into electrical energy<br>**S 3.5** identify ways in which electrical energy is transformed into other forms of energy<br>**S 3.6** explain the functions of the components of a<br>simple electrical circuit |

## MEETING THE EXPECTATIONS

| | | |
|---|---|---|
| **Consumer Survey**<br><br>(Criteria for selecting new products) | S10 – Use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations<br>S11 – Compile data gathered through investigation in order to record and present results, using tally charts, tables, labelled graphs and scatter plots produced by hand or a computer (e.g. measure and record the motion of moving objects<br>S12 – Communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, written notes and description , charts, drawings and oral presentations (e.g. describe how a product was created from the first idea to the final model)<br>S14 – Show awareness of the effect on design on the unavailability of specific materials (e.g. the design of a pair of scissors may change if only plastic was available instead of metal)<br>S16 – Identify various criteria for selecting a product (e.g. safety, reliability, durability) | E10 – Use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g. use terms such as *current*, *circuit*, *conductor*, *insulator*; *positive* and *negative charges*, *north pole* and *south pole* for magnetic materials)<br>E11 - Compile data gathered through investigation in order to record and present results, using tally charts, tables, labelled graphs and scatter plots produced by hand or a computer (e.g. record in a journal all uses of electrical energy in the amusement park, classify the various uses, and present the findings using tables and graphs)<br>E12 – Communicate the procedures and results of investigations for specific purposes and to specific audiences, using written notes and descriptions, charts and drawings |

## AMUSEMENT RIDE JOURNAL ENTRY RUBRIC

| CATEGORY | LEVEL 1 | LEVEL 2 | LEVEL 3 | LEVEL 4 |
|---|---|---|---|---|
| **Understanding of concepts**<br><br>Demonstrates an understanding that electrical energy can be transformed into other types of energy | - shows limited understanding of how electrical energy is converted into mechanical energy | - shows some understanding of how electrical energy is converted into mechanical energy | - shows understanding of how electrical energy is converted into mechanical energy | - shows thorough understanding of how electrical energy is converted into mechanical energy |
| **Communication**<br><br>Uses appropriate vocabulary, including correct science and technology terminology to reflect on the electrical and mechanical features of the rides | - communicates information and ideas with limited clarity and precision | - communicates information and ideas with moderate clarity and precision | - communicates information and ideas with clarity and precision | - communicates information and ideas with a high degree of clarity and precision |
| **Relating science and technology to each other and the world outside the school**<br><br>Evaluate the design of electrical and mechanical systems used in amusement park rides | - shows limited understanding of how science and technology are utilized in the design and manufacture of amusement park rides | - shows some understanding of how science and technology are utilized in the design and manufacture of amusement park rides | - shows understanding of how science and technology are utilized in the design and manufacture of amusement park rides | - shows thorough understanding of how science and technology are utilized in the design and manufacture of amusement park rides |

## BASIC MEASUREMENTS

To get ready for the trip to Canada's Wonderland for the Physics, Science and Math program, you should find answers to all of the questions below. On the day of the trip, take this sheet with you so you can use the numbers.

**TIME**

Number of seconds per minute _____

Number of minutes per hour _____

Number of seconds per hour _____

**YOUR BODY MEASUREMENTS**

Height _____ cm _____ m

Arm span _____ cm _____ m

Length of shoe _____ cm _____ m

Hand Span _____ cm _____ m

**PULSE AND BREATHING RATES**

| | Pulse Rate (beats per minutes) | Breathing Rate (breaths per minute) |
|---|---|---|
| Sitting | | |
| Standing (before exercise) | | |
| Standing (after exercise) | | |

## MATH PRACTICE

1. Discuss in class how to find each of the following numbers:
   a) pulse rate (per minute)
   b) breathing rate (per minute)
   c) the perimeter of a square, a rectangle, or other polygon
   d) the diameter of a circle
   e) the circumference of a circle
   f) multiplying two numbers with units

      e.g. 6 paces x 40 cm/pace = 240 cm
      5 hand spans x 18 cm/hand span = 90 cm
      3 cars x 4 passengers/car = 12 passengers

   g) the average of two or more numbers

2. Solve the following problems. Where possible, show how you calculated the answer.
   a) Julie measures 36 heart beats in 30 seconds. What is her pulse rate per minute?

   b) Soo-Jin breathes 26 times in two minutes. What is her breathing rate per minute?

   c) Terry measures 19 pulse beats in 15 seconds. What is his pulse beat per minute?

   d) Determine the perimeter of this page in centimetres.

## MATH PRACTICE

e) Measure your hand span in centimetres. Then use you hand span to estimate the length of a desk.

f) Measure your average pace in centimetres. Use your pace to find the length and width of your classroom.

g) How many desks are there in a room that has 5 rows of desks with 6 desks in a row?

h) Teepu's mass is 42 kg and Angela's mass is 54 kg. Find the average of their masses.

## LEARNING SCIENCE LANGUAGE

### TEACHER DEFINITIONS

**Aesthetic Appeal** An amusement ride has a certain aesthetic appeal. This consideration deals with the safety and comfort of the ride as well as its appearance.

**Electrical Energy** All atoms contain particles called electrons, protons, and neutrons. If there are more electrons than protons, the atom becomes negatively charged. Removing the electrons from atoms produces a flow of negative charges, which provides electrical energy in the form of a current. This energy can be converted to other energy forms.

**Force** Simply, a push or a pull. Forces cause things to speed up or down and can also cause matter to compress and stretch. If an object is stationary, its forces are balanced. When its forces become unbalanced, for example, if the object is pushed or pulled, the object will move.

**Friction** Friction is a force of resistance that moving objects experience when in contact with other objects. Frictional force converts a moving object's kinetic energy (energy of motion) into another form of energy called **heat energy**.

**Gravity** The force of gravity acts between any two objects that have mass. Every mass on earth (large or small) feels the force of gravity pulling it towards the earth. This pull gives you your weight.

**Inertia** All objects on earth resist change in their state of motion. For example, if a person is standing on a stationary bus and the bus starts to move, the person's body wants to stay at rest because of its inertia. The larger the mass of the object, the greater the inertia.

**Kinetic Energy** All objects that move have kinetic energy. The amount of kinetic energy that a moving object has depends on its mass and speed. A heavy, fast-moving roller coaster has high kinetic energy that decreases as the car slows down. When stationary, the roller coaster no longer has kinetic energy.

**Linear Output** An event which causes an object to move in a straight line.

## LEARNING SCIENCE LANGUAGE

### TEACHER DEFINITIONS (cont'd)

| | |
|---|---|
| **Linkage** | Any objects that are connected together are done so through a series of linkages. |
| **Mass** | The amount of matter in an object. Mass is measured in kilograms and is different from weight. An object always has the same mass, whereas its weight may change depending on its location. |
| **Potential Energy** | Potential energy is stored in stationary objects that have the potential to move. For example, a roller coaster car that is 20 meters above the ground has gravitational potential energy. |
| **Rotary Output** | An event which causes an object to move in a circular fashion. |
| **Switches** | Switches are used to complete or break electrical circuits. Switches contain contacts which can be held together or kept apart. When the contacts are together, electric current can flow through the circuit. |
| **Velocity** | How far an object travels in a unit of time. If a roller coaster car travels at a constant speed in a given direction, it has a constant velocity. |
| **Weight** | The force of gravity on an object. The weight of an object can vary since the force of gravity can vary depending on its location. |

## LEARNING SCIENCE LANGUAGE

Applying science language to an amusement ride:

A **FORCE** occurs when there is a push or a pull.

The force of **GRAVITY** between the roller coaster train in which you are riding and the earth pulls you down the roller coaster hills.

The greater the **WEIGHT** of the roller coaster train, the more strength the structure must have to support the tracks.

The addition of more passengers will increase a roller coaster's **MASS** and weight.

The **VELOCITY** of the roller coaster train increases as it rolls down a hill.

**ELECTRICAL ENERGY** is transformed into **POTENTIAL ENERGY** as the roller coaster car is pulled up the first hill. A roller coaster has the most **POTENTIAL ENERGY** when it is at the highest peak of the ride. As the velocity increases going down a hill, a roller coaster train gains **KINETIC ENERGY**.

**SWITCHES** are used to control electrical devices, which release the train from the loading platform.

The turning of the gears of a bicycle is known as a **ROTARY OUTPUT**, which causes the bicycle to move in a straight line, known as a **LINEAR OUTPUT**.

**INERTIA** causes the passenger to lean forward when the roller coaster train stops at the end of the ride.

The chain that lifts a roller coaster up the first hill is an example of a **LINKAGE** that transmits motion and force from the coaster's electrical motor to the train.

The rubbing between the roller coaster train's wheels and the track causes a **FRICTIONAL** force, which slows the roller coaster train down and causes **HEAT ENERGY**. There are many ways to **REDUCE FRICTION**, such as the use of oil and bearings on wheel axles.

Many of the attractions that you see at Canada's Wonderland have been chosen because they are attractive and have a certain **AESTHETIC APPEAL** to the Park's customers.

## SCIENCE LANGUAGE EXERCISE

Select the correct word and complete each sentence:

| | | |
|---|---|---|
| **WEIGHT** | **GRAVITY** | **LINEAR OUTPUT** |
| **HEAT ENERGY** | **FORCE** | **ELECTRICAL ENERGY** |
| **VELOCITY** | **KINETIC ENERGY** | **MASS** |
| **FRICTION** | **ROTARY OUTPUT** | **MECHANICAL SYSTEMS** |
| **INERTIA** | **LINKAGE** | **POTENTIAL ENERGY** |
| **AESTHETIC APPEAL** | | |

1. The roller coaster train increases its _____ as well as its _____ as it rolls down a hill.

2. The force of _____ pulls you down the roller coaster hills.

3. The force of _____ slows you down throughout your roller coaster trip and causes _____ energy.

4. The most attractive rides in the Park have the most _____.

5. _____ is transformed to _____ as the roller coaster car is pulled up the first hill.

6. When the gears that lift the roller coaster turn, they create a _____ output.

7. The chain that lifts the roller coaster moves in a straight line, which is known as _____ output.

8. The electrical devices that control the amusement ride's motion are called _____.

9. The chain that lifts a roller coaster up the first hill is an example of a _____ that transmits motion and force from the coasters electrical motor to the train.

# GRADE 6 SCIENCE

## AMUSEMENT RIDE ACTIVITIES

**RIPTIDE**

**THE BAT**

**DRAGON FIRE**

**VORTEX**

**MIGHTY CANADIAN MINEBUSTER**

**FLIGHT DECK**

**THE FLY**

## RIPTIDE

***Riptide*** *is Wonderland's super swing with attitude and altitude!* ***Riptide*** *will take passengers through snap rollovers and 360º twists and turns as they are propelled through moments of zero gravity and an inescapable wall of water.* ***Riptide*** *is the ultimate experience for thrill seekers who think they have done it all.*

**QUESTIONS**

1. Look for the safety guide.

   (a) What are the ride restrictions? Explain each one.

   (b) What are the ride requirements? Explain what they mean.

2. Write out all the instructions to riders you can see and hear at the loading platform.

## RIPTIDE

### QUESTIONS

3. **[Flight 1.1]** List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?

4. **[Energy S 2.5]** What device uses electricity to send signals to the loud speaker?

5. **[Energy S 3.6]** Identify where you find the switches that control the electrical motor, which runs the ride.

6. List three things that have been done to this ride to make it look fun, attractive and exciting.

7. Determine the following in seconds:
   (a) the average time for one ride

   (b) the average time the ride stays at the loading platform

8. Put the parts listed below in the order in which they occur during one complete ride: unloading; lift; highest speed; braking; loading; vertical spin (Note: Several parts may be listed more than once.)

9. **[Energy S 3.5]** What is used to transform electrical energy into kinetic energy in this ride?

## RIPTIDE

**QUESTIONS**

10. Draw a picture of a vertical spin and label the points in the spin that your body feels lightest and heaviest.

11. If you are using an accelerometer what happens to the mass when you feel lightest and heaviest?

12. At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the passenger compartment with its passengers heavier when this occurs?

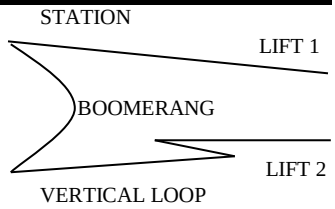
13. State your hand span in centimetres. Use your hand span to calculate the inside width of the passenger compartment. (Show your work.)

14. Conduct your CONSUMER SURVEY or complete your RIDE SAFETY EXERCISE if you haven't already done so.

15. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the electrical and mechanical features that are used to create an exciting but safe ride.

## THE BAT

*On **The Bat**, riders are pulled backwards and launched through an unyielding corkscrew and a breathtaking loop. After one trip through **The Bat's** intense, tight track, riders have little time to catch their breath when **The Bat** climbs its second launch to take riders through one more time – backwards.*




### QUESTIONS

1. Look for the safety guide.

   (a) What are the ride restrictions? Explain each one.

   (b) What are the ride requirements? Explain what they mean.

2. Describe the feature(s) that prevent injury to people walking on the entrance path under the train from objects that may fall out of riders pockets

3. Write out all the instructions to riders you can see and hear at the loading platform.

## THE BAT

**QUESTIONS**

4. **[Energy S 2.5]** What device uses electricity to send signals to the loud speaker?

5. **[Energy S 3.6]** Identify where you find the switches that control the electrical motor, which takes the roller coaster cars from the loading platform to the track.

6. List three things that have been done to this ride to make it look fun, attractive and exciting.

7. Determine the following in seconds:
   (a) the average time for one ride

   (b) the average time the ride stays at the loading platform

## THE BAT

**QUESTIONS**

8. Put the parts listed below in the order in which they occur during one complete ride: unloading; lift; highest speed; braking; loading; vertical spin (Note: Several parts may be listed more than once.)

9. **[Energy S 3.5]** What is used to transform electrical energy into kinetic energy in this ride?

10. Draw a picture of a vertical loop, which is beyond the boomerang and label the points on the loop that your body feels lightest and heaviest.

11. If you are using an accelerometer what happens to the mass when you feel lightest and heaviest?

12. At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

## THE BAT

**QUESTIONS**

13. State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

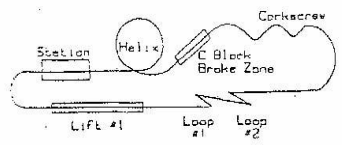
14. Estimate the length of one train. Show your calculations.

15. Conduct your CONSUMER SURVEY or complete your RIDE SAFETY EXERCISE if you haven't already done so.

16. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the electrical and mechanical features that are used to create an exciting but safe ride.

## DRAGON FIRE

*On **Dragon Fire**, unrelenting speed and loops are just some of this coaster's tricks. This immense steel coaster hurls riders through two 360º loops, a full corkscrew and a side-winding helix.*




**QUESTIONS**

1. Look for the safety guide.

   (a) What are the ride restrictions? Explain each one.

   (b) What are the ride requirements? Explain what they mean.

2. Write out all the instructions to riders you can see and hear at the loading platform.

## DRAGON FIRE

**QUESTIONS**

3. **[Energy S 2.5]** What device uses electricity to send signals to the loud speaker?

4. **[Energy S 3.6]** Identify where you find the switches that control the electrical motor, which takes the roller coaster cars from the loading platform to the track.

5. List three things that have been done to this ride to make it look fun, attractive and exciting.

6. Determine the following in seconds:
   (a) the average time for one ride

   (b) the average time the ride stays at the loading platform

## DRAGON FIRE

**QUESTIONS**

7. Put the parts listed below in the order in which they occur during one complete ride: unloading; lift; highest speed; braking; loading; vertical spin (Note: Several parts may be listed more than once.)

8. **[Energy S 3.5]** What is used to transform electrical energy into kinetic energy in this ride?

9. Draw a picture of a vertical loop and label the points on the loop that your body feels lightest and heaviest.

10. If you are using an accelerometer what happens to the mass when you feel lightest and heaviest?

11. At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

## DRAGON FIRE

**QUESTIONS**

12. State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

13. Estimate the length of one train. Show your calculations.

14. Conduct your CONSUMER SURVEY or complete your RIDE SAFETY EXERCISE if you haven't already done so.

15. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the electrical and mechanical features that are used to create an exciting but safe ride.

## VORTEX

*On **Vortex**, riders will enjoy the thrills of Canada's first suspended roller coaster. This steel coaster plunges over Wonder Mountain, reaching speeds of 90 km/h. **Vortex's** invisible track drives riders through unrelenting turns, swooping, diving, and plunging over a scenic waterscape.*

### QUESTIONS

1. Look for the safety guide.

   (a) What are the ride restrictions? Explain each one.

   (b) What are the ride requirements? Explain what they mean.

2. Write out all the instructions to riders you can see and hear at the loading platform.

## VORTEX

### QUESTIONS

3. **[Energy S 2.5]** What device uses electricity to send signals to the loud speaker?

4. **[Energy S 3.6]** Identify where you find the switches that control the electrical motor, which takes the roller coaster cars from the loading platform to the track.

5. List three things that have been done to this ride to make it look fun, attractive and exciting. (e.g. form, colour, pattern, type, surface)

## VORTEX

**QUESTIONS**

6. Determine the following in seconds:
   (a) the average time for one ride

   (b) the average time a train stays at the loading platform

7. At the bottom of the first drop, which way does the train turn? Which way do the cars swing? Why do you think they swing this way?

8. Put the parts listed below in the order in which they occur during one complete ride: unloading; lift; highest speed; braking; loading (Note: Several parts may be listed more than once.)

9. **[Energy S 3.5]** What is used to transform electrical energy into kinetic energy in this ride?

## VORTEX

**QUESTIONS**

10. If you are using an accelerometer what happens to the mass when you feel lightest and heaviest?

11. At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

12. State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

13. Estimate the length of one train. Show your calculations.

14. Conduct your **CONSUMER SURVEY** or complete your **RIDE SAFETY EXERCISE** if you haven't already done so.

15. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the electrical and mechanical features that are used to create an exciting but safe ride.

## MIGHTY CANADIAN MINEBUSTER

*The **Mighty Canadian Minebuster** is the largest and longest wooden coaster in Canada. Its immense wooden track is full of side-winding turns, stomach lifting camel humps, and breath-taking drops. The **Minebuster** reaches astounding speeds of more than 90 km/h on its 4000 feet of serpentine designed track.*

**QUESTIONS**

1. Look for the safety guide.
   (a) What are the ride restrictions? Explain each one.

   (b) What are the ride requirements? Explain what they mean.

2. Write out all the instructions to riders you can see and hear at the loading platform.

## MIGHTY CANADIAN MINEBUSTER

**QUESTIONS**

3. **[Energy S 2.5]** What device uses electricity to send signals to the loud speaker?

4. **[Energy S 3.6]** Identify where you find the switches that control the electrical motor, which takes the roller coaster cars from the loading platform to the track.

5. List three things that have been done to this ride to make it look fun, attractive and exciting.

6. Determine the following in seconds:
   (a) the average time for one ride

   (b) the average time a train stays at the loading platform

7. Put the parts listed below in the order in which they occur during one complete ride: unloading; lift; highest speed; braking; loading (Note: Several parts may be listed more than once.)

## MIGHTY CANADIAN MINEBUSTER

**QUESTIONS**

9. **[Energy S 3.5]** What is used to transform electrical energy into kinetic energy in this ride?

10. If you are using an accelerometer what happens to the lead weight when you feel lightest and heaviest?

11. At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

12. State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

13. Estimate the length of one train. Show your calculations.

## MIGHTY CANADIAN MINEBUSTER

**QUESTIONS**

14. Conduct your CONSUMER SURVEY or complete your RIDE SAFETY EXERCISE if you haven't already done so.

15. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the electrical and mechanical features that are used to create an exciting but safe ride.

## FLIGHT DECK

***Flight Deck*** *is Canada's only inverted looping jet coaster. This mega coaster simulates flight with speeds of 90 km/h, exhilarating 90º vertical climbs, barrel rolls, inverted wind loopovers, a 270º after burn and an complete snap roll over. Riders take flight in a fully open cockpit suspended beneath the coaster's steel track as the sky races below.*

**QUESTIONS**

1. Look for the safety guide.
   (a) What are the ride restrictions? Explain each one.

   (b) What are the ride requirements? Explain what they mean.

## FLIGHT DECK

**QUESTIONS**

2. As you are moving to the entrance to the loading platform, you pass through areas that are informative as well as entertaining. Describe the features of the areas listed below (include both qualitative and quantitative descriptions).
   (a) the aircraft carrier

   (b) the engine room

   (c) the ranger deck

   (d) the bridge

3. Write out all the instructions to riders you can see and hear at the loading platform.

4. **[Energy S 2.5]** What device uses electricity to send signals to the loud speaker?

## FLIGHT DECK

**QUESTIONS**

5. **[Energy S 3.6]** Identify where you find the switches that control the electrical motor, which takes the roller coaster cars from the loading platform to the track.

6. List three things that have been done to this ride to make it look fun, attractive and exciting.

7. Determine the following in seconds:
   (a) the average time for one ride

   (b) the average time a train stays at the loading platform

8. Put these parts in the order in which they occur: Side winder; roll over; brakes; highest hill dewinder; loading; spin

## FLIGHT DECK

**QUESTIONS**

9. **[Energy S 3.5]** What is used to transform electrical energy into kinetic energy in this ride?

10. Draw a picture of a vertical loop and label the points on the loop that your body feels lightest and heaviest.

11. If you are using an accelerometer what happens to the lead weight when you feel lightest and heaviest?

## FLIGHT DECK

**QUESTIONS**

12. At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

13. State your hand span in centimetres. Use your hand span to calculate the inside width of a car. (Show your work.)

14. Estimate the length of one train. Show your calculations.

15. Conduct your **CONSUMER SURVEY** or complete your **RIDE SAFETY EXERCISE** if you haven't already done so.

16. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the electrical and mechanical features that are used to create an exciting but safe ride.

## THE FLY

***The Fly*** *takes four thrill seekers at a time over an exhilarating 50-foot drop, through hairpin twists and turns and wild, breathtaking bumps. This coaster's unique design provides each rider with the feeling that they are riding in the front car while allowing for some of the wildest side winding turns ever experienced in a coaster.*

### QUESTIONS

1. Look for the safety guide.
   (a) What are the ride restrictions? Explain each one.

   (b) What are the ride requirements? Explain what they mean.

2. Write out all the instructions to riders you can see and hear at the loading platform.

3. **[Energy S 2.5]** What device uses electricity to send signals to the loud speaker?

4. **[Energy S 3.6]** Identify where you find the switches that control the electrical motor, which takes the roller coaster cars from the loading platform to the track.

## THE FLY

QUESTIONS

5. List three things that have been done to this ride to make it look fun, attractive and exciting (e.g., form, colour, pattern, type, surface)

6. Determine the following in seconds (show your work):
   (a) the average time for one ride

   (b) the average time a train stays at the loading platform

7. Put the parts listed below in the order in which they occur during one complete ride: unloading; lift; highest speed; braking; loading; zigzag (Note: Several parts may be listed more than once.)

8. Describe how the train gets to the top of the first ramp (use words such as motor, forces and linkages). Include diagrams.

9. **[Energy S 3.5]** What is used to transform electrical energy into kinetic energy in this ride?

## THE FLY

**QUESTIONS**

10. Draw a picture of an initial drop and label the points that your body feels lightest and heaviest.

11. If you are using an accelerometer what happens to the lead weight when you feel lightest and heaviest?

12. At what location(s) do you feel pressed down on your seat the most? Why does this occur? Is the car with its passengers heavier when this occurs?

13. State your hand span in centimetres. Use your hand span to calculate the inside width of a car (show your work).

14. Estimate the length of one cart. Show your calculations.

## THE FLY

**QUESTIONS**

15. Conduct your CONSUMER SURVEY or complete your RIDE SAFETY EXERCISE if you haven't already done so.

16. **[ALL EXPECTATIONS MAY BE USED]** In a journal entry, reflect on all of the electrical and mechanical features that are used to create an exciting but safe ride.

# GRADE 6 SCIENCE

## OTHER ACTIVITIES

**PARK EXPLORATIONS**

**PARK EXPLORATIONS #2**

**CONSUMER SURVEY**

**RIDE SAFETY EXERCISE**

## PARK EXPLORATIONS

1. Travel to each of the following rides at Canada's Wonderland and explain how the following scientific concepts relate to the ride shown.

| Amusement Ride | Type of Mechanical System |
|---|---|
| **The Bat** - friction | |
| **Riptide** – simple lever | |
| **Vortex** – control switches | |
| **Dragon Fire** – rotary output causing linear output | |
| **Mighty Canadian Minebuster** – linkages | |
| **Flight Deck** – aesthetic appeal | |

2. While walking past the attractions at Canada's Wonderland, make a list of all safety features you observe. Across from each safety feature, identify its function.

| Safety Feature | Function |
|---|---|
| *e.g. fences surrounding amusement rides* | *Prevent injury* |
| | |
| | |
| | |
| | |
| | |
| | |

## PARK EXPLORATIONS

3. Travel to each of the following rides at Canada's Wonderland and indicate the type of energy conversion that occurs within the ride.

Types of energy: Electrical Energy, Potential Energy, Kinetic Energy

| Amusement Ride | Energy Conversion |
|---|---|
| **The Bat** – motor, gear and pulley attached to steel cable pulling car up first incline | |
| **Riptide** – motor turning passenger compartment in a vertical spin | |
| **Vortex** – moving from top of first hill to bottom | |
| **Dragon Fire** – moving from loading platform to first hill | |
| **Mighty Canadian Minebuster** – moving from the bottom of the first hill to the top of a second hill | |
| **Flight Deck** – moving from the top of a loop to the bottom of a loop | |

**JOURNAL QUESTION**

In a journal entry, suggest ways of reducing friction when creating an amusement ride. (e.g. aerodynamics reduces frictional force of the air)

## CONSUMER SURVEY

Canada's Wonderland conducts many consumer surveys, which are designed to gain an understanding of consumer expectations about selecting a new amusement ride. The consumer survey is intended to gather information on public opinion of many topics that are of interest to

businesses and the public. In each of the activities you are asked to conduct a survey which will identify consumer expectations regarding the function and effectiveness of amusement rides.

### *I* YOUR CHALLENGE *(Authentic Problem)*

You have been hired by Canada's Wonderland as a junior researcher who is gathering information on the current rides in the Park in order to choose a new ride for next season. Your job before you come to the Park is to design a survey, which will allow you to gather information on student opinions about criteria for a new ride. You know that the main function of an amusement ride is excitement and that safety is one indicator of the effectiveness of an amusement ride. Your task, when you return to your school, is to write a report to your supervisor at Canada's Wonderland explaining your findings.

### *II* DESIGNING YOUR SURVEY *(Pre-visit)*

Survey topic: Choosing a New Amusement Park Ride

1) Generate 5 open ended questions for your survey
2) Prepare 5 sheets of paper, use one sheet for each question to collect an array of data

### *III* CONDUCTING YOUR SURVEY

1) Choose a sample group of 15 people (e.g., boys age 12)
2) Approach your population one person at a time or small groups
3) Ask all 5 questions to each person and create an array of data for each on your pre-prepared sheets

### *IV* ANALYZING YOUR RESULTS

1) Summarize your data gathered in tally charts
2) Display your data using appropriate graphs
3) Analyze and interpret your data to determine, based on your findings, the kind of ride you feel should be considered for next season
4) Write a report to your supervisor at Canada's Wonderland explaining your findings.

### *V* JOURNAL QUESTION

Interview a classmate about their consumer survey. In a journal entry identify bias in your classmate's questions, data collection methods, sample group or analysis of data. If you are unable to find bias, explain in detail the things that your classmate did to avoid bias.

## RIDE SAFETY EXERCISE

Canada's Wonderland provides for the safety of their guests in many ways. Security personnel walk the grounds, making sure Park rules are followed by all guests and Park staff. Park ride operators are well informed about the rides and are always watching to be

sure that the ride is operating properly and safely. Rules are posted at each ride and are to be obeyed for a safe and enjoyable ride.

**Select two different types of rides and answer the following questions on the table.**

| QUESTIONS | FIRST RIDE | SECOND RIDE |
|---|---|---|
| 1. What is the name of the ride? | | |
| 2. What type of ride is it? (Is it a wooden roller coaster, loop-the-loop roller coaster, circular ride, etc?) | | |
| 3. Do you have to be a certain height to ride the ride? If so, how is this height measured? | | |
| 4. What safety checks does the ride operator make prior to starting the ride? | | |
| 5. How does the ride operator start and stop the ride? | | |
| 6. Does the ride have a lap bar or safety belt that holds you firmly in the seat? If so, what form of safety belt is used and how does if work? | | |
| 7. Are there specific rules or restrictions posted at the ride? If so, what are they? | | |
| 8. What other safety features or operation checks do you see on the ride? | | |
| **GENERAL QUESTIONS** | | |
| 9. Why is there a height rule for some rides and not others? | | |
| 10. Which rides are more likely to have safety belts or lap bars? | | |