



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

**S = Structures and Mechanisms
Motion**

E = Energy and Control Electricity

ACTIVITIES

**GRADE 6
specific expectations**

<p>Riptide The Bat Skyrider Vortex Mighty Canadian Minebuster Flight Deck</p>	<p>S4 – Demonstrate awareness that a moving mass has kinetic energy S5 – Demonstrate awareness that friction (e.g. rubbing hands together) transforms kinetic energy into heat energy S6 – Investigate ways of reducing friction (e.g. use of ball bearings, lubricants) so that an object can be moved more easily S8 – Formulate questions about and identify needs and problems related to structures and mechanisms in the outdoor environment, and explore possible answers and solutions S10 – Use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations</p>	<p>E1 – Investigate ways in which electrical energy can be transformed into other forms of energy (e.g. into motion) E7 – Identify different types of switches that are often used to control electrical devices (e.g. contact, tilt) and explain the key differences among them (e.g. differences in design, use, etc.) E10 – Use appropriate vocabulary, including correct science and technology, in describing their investigations and observations E19 – Describe the electrical conversions in everyday devices or systems E22 – Identify devices that use electricity to send signals (e.g. P.A. systems, telephones, radios, computers)</p>
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MEETING THE EXPECTATIONS

<p>Park Exploration</p>	<p>S1 – Describe, using their observations, ways in which mechanical devices and systems produce a linear output from a rotary input (e.g. screw, crank and slider, rack and pinion)</p> <p>S3 – Demonstrate an understanding of how linkages (systems of levers) transmit motion and force</p> <p>S4 – Demonstrate awareness that a moving mass has kinetic energy that can be transferred to a stationary object (e.g. a moving bumper car hitting a stationary bumper car causing it to move)</p> <p>S6 – Investigate ways of reducing friction (e.g. use of ball bearings, lubricants) so that an object can be moved more easily</p> <p>S10 – Use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations</p> <p>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 (e.g. measure and record the motion of moving objects)</p> <p>S12 – Communicate the procedures and results of investigations for specific purposes and to specific audiences, written notes and descriptions, charts and drawings</p> <p>S13 – Make use of physical and aesthetic properties of natural and manufactured materials when designing a product</p> <p>S16 – Identify various criteria for selecting a product (e.g. safety, reliability, durability)</p>	<p>E1 – Investigate ways in which electrical energy can be transformed into other forms of energy (e.g. into motion)</p> <p>E7 – Identify different types of switches that are used to control electrical devices (e.g. contact, tilt) and explain the key differences among them (e.g. differences in design, use)</p> <p>E8 – Formulate questions about and identify needs and problems related to the properties or uses of electrical energy, and explore possible answers and solutions</p> <p>E10 – Use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g. use terms such as <i>current</i>, <i>circuit</i>, <i>conductor</i>, <i>insulator</i>; <i>positive</i> and <i>negative charges</i>, <i>north pole</i> and <i>south pole</i> for magnetic materials)</p> <p>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 (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)</p> <p>E12 – Communicate the procedures and results of investigations for specific purposes and to specific audiences, written notes and descriptions, charts and drawings</p> <p>E19 – Describe the electrical conversions in everyday devices or systems</p>
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MEETING THE EXPECTATIONS

<p>Consumer Survey</p> <p>(Criteria for selecting new products)</p>	<p>S10 – Use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations</p> <p>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)</p> <p>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)</p> <p>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)</p> <p>S16 – Identify various criteria for selecting a product (e.g. safety, reliability, durability)</p>	<p>E10 – Use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g. use terms such as <i>current, circuit, conductor, insulator; positive and negative charges, north pole and south pole</i> for magnetic materials)</p> <p>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)</p> <p>E12 – Communicate the procedures and results of investigations for specific purposes and to specific audiences, using written notes and descriptions, charts and drawings</p>
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AMUSEMENT RIDE JOURNAL ENTRY RUBRIC

CATEGORY	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
<p>Understanding of concepts</p> <p>Demonstrates an understanding that electrical energy can be transformed into other types of energy</p>	- 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
<p>Communication</p> <p>Uses appropriate vocabulary, including correct science and technology terminology to reflect on the electrical and mechanical features of the rides</p>	- 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
<p>Relating science and technology to each other and the world outside the school</p> <p>Evaluate the design of electrical and mechanical systems used in amusement park rides</p>	- 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)		

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
HEAT ENERGY
VELOCITY
FRICTION
INERTIA
AESTHETIC APPEAL

GRAVITY
FORCE
KINETIC ENERGY
ROTARY OUTPUT
LINKAGE

LINEAR OUTPUT
ELECTRICAL ENERGY
MASS
MECHANICAL SYSTEMS
POTENTIAL ENERGY

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 is Wonderland's super swing with attitude and altitude! Riptide will take passengers through snap rollovers and 360° 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.

**QUESTIONS**

3. **[S8]** List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?

4. **[E22]** What device uses electricity to send signals to the loud speaker?

5. **[E7]** 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



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. [E1] What is used to transform electrical energy into kinetic energy in this ride?

10. [S4] Where on this ride is the train's kinetic energy the highest?

11. [S4] Answer the following questions for the vertical spin.
 - (a) At what point(s) are you losing speed?

 - (b) At what point(s) are you gaining speed?

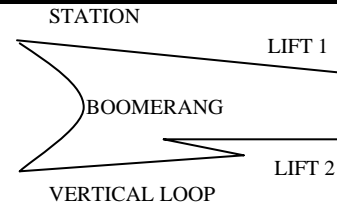
 - (c) At what point(s) do you feel the lightest?

 - (d) At what point(s) do you feel the heaviest?

THE BAT

GRADE 6

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.

QUESTIONS



4. [S8] List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?
5. [E22] What device uses electricity to send signals to the loud speaker?
6. [E7] Identify where you find the switches that control the electrical motor, which takes the roller coaster cars from the loading platform to the track.
7. List three things that have been done to this ride to make it look fun, attractive and exciting.
8. Determine the following in seconds:
 - (a) the average time for one ride
 - (b) the average time the ride stays at the loading platform



QUESTIONS

9. 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.)

10. [S3] Describe how the train gets to the top of the first ramp (use words such as motor, forces and linkages). Include diagrams.

11. [E1] What is used to transform electrical energy into kinetic energy in this ride?

12. [S4] Where on this ride is the train's kinetic energy the highest?



QUESTIONS

13. [S4] Answer the following questions for the vertical loop, which is beyond the boomerang.
- (a) At what point(s) are you losing speed?
 - (b) At what point(s) are you gaining speed?
 - (c) At what point(s) do you feel the lightest?
 - (d) At what point(s) do you feel the heaviest?
14. 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.
15. If you are using an accelerometer what happens to the mass when you feel lightest and heaviest?
16. 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?



QUESTIONS

17. [S5] Are the wheels of the roller coaster car experiencing more or less friction when the car and its passengers feel heavier? Explain.

18. [S5] Compared to other amusement rides that you have experienced in the past was this ride smoother or bumpier?

19. [S5] Does a smoother ride mean a faster ride? Do smoother riding wheels mean better performance? (Explain using the concept of friction)

20. [S5] Kinetic energy is transformed into heat energy by means of friction. Where on this ride would the track and wheels generate the most heat?

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



QUESTIONS

22. Estimate the length of one train. Show your calculations.
23. **[S5]** Explain why the train is not able to climb to the top of the second ramp without help from a motor. (Try to use some of the scientific terms described on the Scientific Language page of this booklet)
24. Conduct your **CONSUMER SURVEY** or complete your **RIDE SAFETY EXERCISE** if you haven't already done so.
25. **[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.

**QUESTIONS**

3. [S8] List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?

4. [E22] What device uses electricity to send signals to the loud speaker?

5. [E7] 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



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. [S3] Describe how the train gets to the top of the first ramp (use words such as motor, forces and linkages). Include diagrams.

10. [E1] What is used to transform electrical energy into kinetic energy in this ride?

11. [S4] Where on this ride is the train's kinetic energy the highest?

**QUESTIONS**

12. [S4] Answer the following questions for the vertical loop.
- (a) At what point(s) are you losing speed?

 - (b) At what point(s) are you gaining speed?

 - (c) At what point(s) do you feel the lightest?

 - (d) At what point(s) do you feel the heaviest?
13. Draw a picture of a vertical loop and label the points on the loop that your body feels lightest and heaviest.
14. If you are using an accelerometer what happens to the mass when you feel lightest and heaviest?
15. 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?

**QUESTIONS**

16. [S5] Are the wheels of the roller coaster car experiencing more or less friction when the car and its passengers feel heavier? Explain.

17. [S5] Compared to other amusement rides that you have experienced in the past was this ride smoother or bumpier?

18. [S5] Does a smoother ride mean a faster ride? Do smoother riding wheels mean better performance? (Explain using the concept of friction)

19. [S5] Kinetic energy is transformed into heat energy by means of friction. Where on this ride would the track and wheels generate the most heat?

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

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.

**QUESTIONS**

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. **[S5]** Which hill on this ride is the highest? State why it must be the highest.

9. 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?

10. 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.)

11. **[S3]** Describe how the train gets to the top of the first ramp (use words such as motor, forces and linkages). Include diagrams.



QUESTIONS

12. [EI] What is used to transform electrical energy into kinetic energy in this ride?
13. [S4] Where on this ride is the train's kinetic energy the highest?
14. [S4] Answer the following questions for **Vortex**.
- (a) At what point(s) are you losing speed?
 - (b) At what point(s) are you gaining speed?
 - (c) At what point(s) do you feel the lightest?
 - (d) At what point(s) do you feel the heaviest?
15. If you are using an accelerometer what happens to the mass when you feel lightest and heaviest?
16. 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?

**QUESTIONS**

22. Estimate the length of one train. Show your calculations.
23. Conduct your **CONSUMER SURVEY** or complete your **RIDE SAFETY EXERCISE** if you haven't already done so.
24. **[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.

**QUESTIONS**

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 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. **[S3]** Describe how the train gets to the top of the first ramp (use words such as motor, forces and linkages). Include diagrams.



QUESTIONS

15. [S6] Compared to other amusement rides that you have experienced in the past was this ride smoother or bumpier?

16. [S6] Does a bumpier ride mean a faster ride? Do smoother riding wheels mean better performance? (Explain using the concept of friction)

17. [S5] Kinetic energy is transformed into heat energy by means of friction. Where on this ride would the track and wheels generate the most heat?

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

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

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. **[S8]** List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?
5. **[E22]** What device uses electricity to send signals to the loud speaker?



QUESTIONS

6. [E7] Identify where you find the switches that control the electrical motor, which takes the roller coaster cars from the loading platform to the track.

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

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

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

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

10. [S3] Describe how the train gets to the top of the first ramp (use words such as motor, forces and linkages). Include diagrams.

QUESTIONS



11. [E1] What is used to transform electrical energy into kinetic energy in this ride?
12. [S4] Where on this ride is the train's kinetic energy the highest?
13. [S4] Answer the following questions for the vertical loop.
- (a) At what point(s) are you losing speed?
 - (b) At what point(s) are you gaining speed?
 - (c) At what point(s) do you feel the lightest?
 - (d) At what point(s) do you feel the heaviest?
14. Draw a picture of a vertical loop and label the points on the loop that your body feels lightest and heaviest.



QUESTIONS

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

16. 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?

17. **[S5]** Are the wheels of the roller coaster car experiencing more or less friction when the car and its passengers feel heavier? Explain.

18. **[S6]** Compared to other amusement rides that you have experienced in the past was this ride smoother or bumpier?

19. **[S6]** Does a smoother ride mean a faster ride? Do smoother riding wheels mean better performance? (Explain using the concept of friction)

20. **[S5]** Kinetic energy is transformed into heat energy by means of friction. Where on this ride would the track and wheels generate the most heat?

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. **[S8]** List the materials used to build this ride. How do Canada's Wonderland engineers protect these materials from the outdoor environment?

QUESTIONS



4. [E22] What device uses electricity to send signals to the loud speaker?
5. [E7] 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 (e.g., form, colour, pattern, type, surface)
7. 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
8. 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.)



QUESTIONS

9. [S3] Describe how the train gets to the top of the first ramp (use words such as motor, forces and linkages). Include diagrams.

10. [EI] What is used to transform electrical energy into kinetic energy in this ride?

11. [S4] Where on this ride is the train's kinetic energy the highest?

12. [S4] Answer the following questions for the ride.
 - (a) At what point(s) are you losing speed?

 - (b) At what point(s) are you gaining speed?

 - (c) At what point(s) do you feel the lightest?

 - (d) At what point(s) do you feel the heaviest?



QUESTIONS

13. Draw a picture of an initial drop and label the points that your body feels lightest and heaviest.
14. If you are using an accelerometer what happens to the lead weight when you feel lightest and heaviest?
15. 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?
16. **[S5]** Are the wheels of the roller coaster car experiencing more or less friction when the car and its passengers feel heavier? Explain.
17. **[S6]** Compared to other amusement rides that you have experienced in the past was this ride smoother or bumpier? Why?
18. **[S6]** Does a smoother ride mean a faster ride? Do smoother riding wheels mean better performance? (Explain using the concept of friction).



QUESTIONS

19. [S5] Kinetic energy is transformed into heat energy by means of friction. Where on this ride would the track and wheels generate the most heat?

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

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

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

23. **[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

- 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
e.g. Skyrider -linear output from rotary output	<i>Gears turn chain causing train to climb straight up the first hill</i>
The Bat - friction	
Riptide – simple lever	
Vortex – control switches	
Dragon Fire – rotary output causing linear output	
Mighty Canadian Minebuster – linkages	
Flight Deck – aesthetic appeal	

- 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
<i>e.g. fences surrounding amusement rides</i>	<i>Prevent injury</i>

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

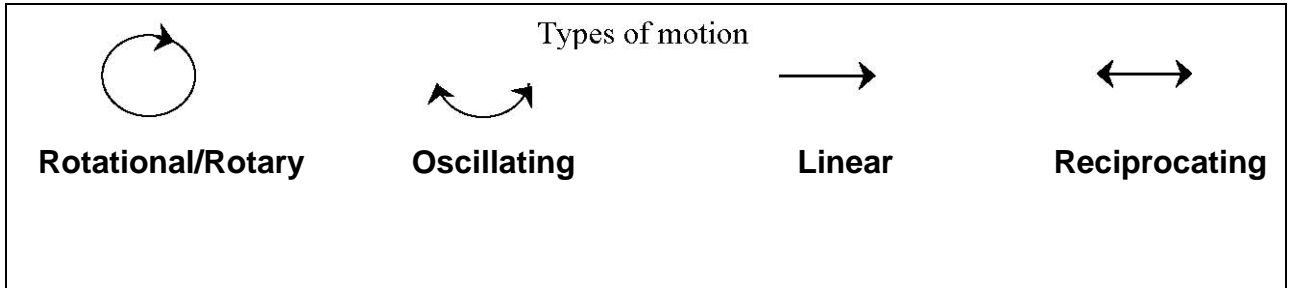
Types of energy: Electrical Energy, Potential Energy, Kinetic Energy

Amusement Ride	Energy Conversion
e.g. Skyrider – moving from the top of the first hill to the bottom	<i>Potential energy to kinetic energy</i>
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)

MOTION FORCES IN THE PARK



1. **[S1] Observe Shockwave.**
 - (a) What type of motion do you observe?

 - (b) How many different examples of this type of motion do you observe? Explain.

2. **[S10] Observe Klockwerks.**
 - (a) What type of motion do you observe?

 - (b) Explain how the oscillating motion is achieved, using appropriate vocabulary related to levers. Use a diagram showing load, effort, and fulcrum.

 - (c) Find another ride that uses the same type of mechanism.

3. **[S4] Observe The Fly.**
 - (a) How do the cars get up the first hill? What types of motion are involved in this?

 - (b) What makes the cars stop at the end?

4. [S3] Observe **Antique Carrousel**.
 (a) What types of motion do the horses exhibit?

 (b) What mechanism causes the horses to move up and down? Where is it?
5. [S1] Visit three rides that are not roller coasters. Identify the different types of motion that you observe with a check mark.

Ride Name	Type of Motion Observed			
	Rotational / Rotary	Oscillating	Reciprocating	Linear
Riptide				
Night Mares				
Drop Tower				
The Rage				
Spinovator				
Krachenwagon				
Klockwerks				
Shockwave				
Orbiter				
Xtreme Skyflyer				
Swing of the Century				
Psyclone				
Antique Carrousel				

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 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.

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 it 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?		

