**

**ICT 5–1 Physics of a Roller Coaster**

{AB.Sc24.B.S.2.iii}{AB.Sc24.B.K.1.i}

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Energy is the ability to do work. Using these web sites, you will:

• define potential and kinetic energy; and

• describe how potential energy can be converted into kinetic energy.

**What to Do**

• Follow the steps.

• If you are doing this from a printed master, record your answers in your Science Log or notebook.

• If you are using a word processor, enter your answers electronically. Remember to save your work as you go.

**Part 1:**

1. Go to the Fear of Physics-Roller Coaster web site.

2. Select the track style that you would like to use (Track 1, Track 2, or Track 3).

3. Select the starting height of the car on your roller coaster.

4. Click “Go” and test your roller coaster.

5. Select a lower starting height for the car on the roller coaster and test it again.

6. Answer the questions that follow.

**What Did You Discover?**

1. What determines the potential energy of a roller coaster?

2. Which has more potential energy a high roller coaster or one built closer to the ground?

3. What happens if you try to start the roller coaster when it is too close to the ground?

4. What is kinetic energy?

5. What is the relationship between the speed of a roller coaster and its kinetic energy?

6. Describe what happens to the potential and kinetic energy as a roller coaster car rolls downhill.

7. Describe what happens to the potential and kinetic energy as the car goes uphill.

# Part 2

1. Go to the Funderstanding Roller Coaster web site.

2. Your mission is to design a roller coaster that will provide maximum thrills and chills without crashing or flying off the track.

3. You are responsible for setting the controls for the following:

• the height of hills 1 and 2

• the size of the loop

• the initial speed of the coaster

• the mass

• the gravity at work

• the amount of friction on the track

4. Use the sliders to set variables.

5. Use a chart such as the one below to Record the relative position of each variable and then test your design.

6. Change the variables, retest your roller coaster, and record your observations.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Hill 1****Position** | **Hill 2****Position** | **Loop****Position** | **Speed****Position** | **Mass****Position** | **Gravity****Position** | **Friction****Position** | **Observations** |
| Example | mid point | positive (+) | positive(+) | mid point | close to negative | mid point | close to negative | car doesn’t make it up the second hill |
| Trial 1 |  |  |  |  |  |  |  |  |
| Trial 2 |  |  |  |  |  |  |  |  |
| Trial 3 |  |  |  |  |  |  |  |  |
| Trial 4 |  |  |  |  |  |  |  |  |
| Trial 5 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

# What Did You Discover?

1. What happens if the hill 2 is higher than hill 1?

2. What happens if you make hill 1 much higher than hill 2?

3. What happens if you maximize the speed of the car?

4. Describe what happens to the car as it climbs up the second hill? Is it gaining or losing kinetic energy?

5. Write a sentence that explains how a roller coaster converts potential energy into kinetic energy and kinetic energy into potential energy.