Name: _____ Date: _____ Class: _____

Runaway Train!

Activity Worksheet KEY

We will measure the speed of the toy subway car at the bottom of the incline starting at various heights along the incline.

Before you begin the experiment answer the question below:

If the train is released from anywhere on the ramp and the speed at the bottom of the incline is measured to be 5 cm/sec, what do you think the speed will be at the bottom of the incline if you **double** the height of release? Pick one:

(a) Approximately 7 cm/sec
(b) Approximately 10 cm/sec
(c) Approximately 20 cm/sec

Explain your reasoning behind the prediction.

The train will start from double the height. It will go twice as fast. (one possible reasoning)

Next, complete the table below by running the experiment for 3 trials at each of the heights listed and recording the measured speed in each blank field.

Height	Trial 1 Speed	Trial 2 Speed	Trial 3 Speed
6 cm	*2.01*	*1.97*	*1.98*
12 cm	*2.81*	*2.84*	*2.81*
18 cm	*3.45*	*3.42*	*3.47*
24 cm	*4.00*	*3.98*	*4.01*

Compute the average speed for 6, 12, and 24 cm height

Add up the speeds for 6 cm: __*2.01*__ + __*1.97*__ + __*1.98*___ = ___*5.94*____

Divide that number by 3: ___*1.99*___ = average speed at 6 cm

Add up the speeds for 12 cm: __*2.81*____ + ___*2.84*___ + __*2.81*____ = ___*8.46*___

Divide that number by 3: ____*2.82*____ = average speed at 12 cm

Add up the speeds for 24 cm: __*4.00*____ + ___*3.98*___ + ____*4.01*___ = ___*11.99*_____

Divide that number by 3: ___*4.00*____ = average speed at 24 cm

Divide the average speed for 12 cm height by the average speed for 6 cm.

What do you get? _____*1.42*_____

Now divide the average speed for 24 cm by the average speed for 12 cm.

What do you get? _____*1.42*_____

Divide the average speed for 24 cm by the average speed for 6 cm.

What do you get? _____2.01_____

When does the train have the most potential energy? _When it is at the top of the 24 cm ramp___

When does the train have the least potential energy? _When it is at the bottom of the ramp_____

When does the train have the most kinetic energy? _When it is at the bottom of the 24 cm ramp_

When does the train have the least kinetic energy? _When it is at the top of the ramp_____

What connection can you make between potential energy and kinetic energy for the train?

_As the kinetic energy of the train increases, the potential energy decreases. _____

Conclusion: Write 1-2 sentences about the relationship between speed and start height of the train that you observed. Was your prediction correct?

When the start height is doubled the speed is about 1.42 times greater. When the start height is quadrupled the train goes twice as fast. My prediction was the speed would be twice as fast when the height is doubled. In reality the speed should be 5 x 1.42 = 7.1, about 7 cm/sec. Answer a was closer to the correct speed.