Physical Science II — Name: ____________________________

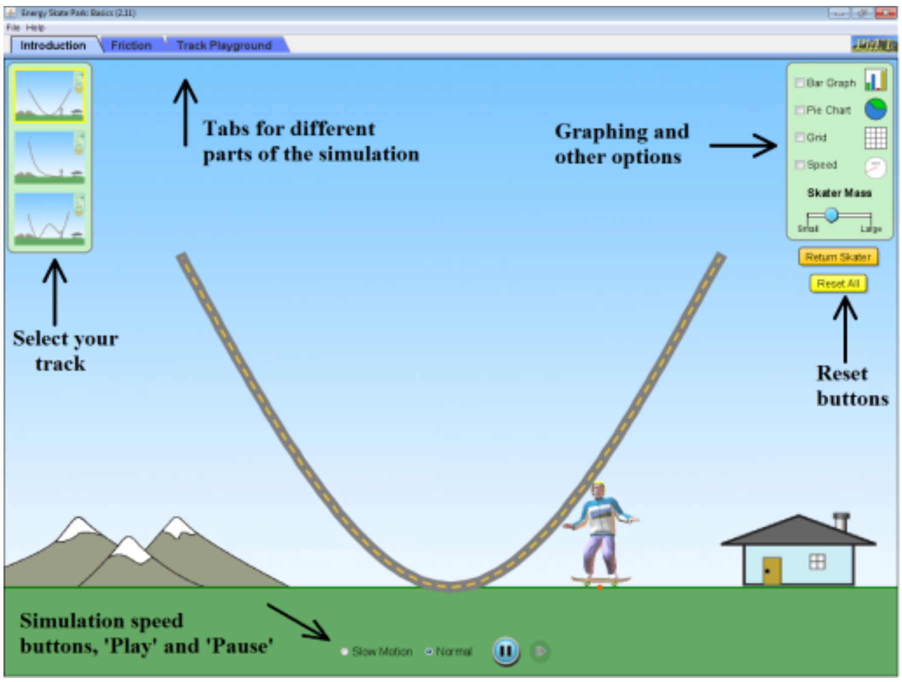
Energy Skate Park - Conservation of Energy — Hour: _____ Date: ______________

Energy Skate Park Simulation - Conservation of Energy

Purpose:
In this lab, you will analyze energy transfer between gravitational potential energy, kinetic energy, and energy lost due to collisions or friction (thermal energy) as a skate boarder rides along a track.

Instructions: Go to the web address written below, and click the "Run Now" button (Run Now!). The simulation will open in a moment.

http://phet.colorado.edu/en/simulation/energy-skate-park-basics



Take some time to play with the simulation. Turn on the '***Bar Graph***,' '***Grid***,' and '***Speed***' options on the right side of the screen. Become familiar with the '***Reset***' buttons on the right and how to change the speed of the simulation with the buttons on the bottom.

Part I: Introduction *(Turn on the '**Bar Graph**,' '**Grid**,' and '**Speed**' options.)*
Set the skater 2 meters above the ground on the ramp and release him.

1. What type of energy does the skater have at the 2 meter mark?

2. How high does the skater get on the other end of the ramp?

3. Explain, in terms of the conservation of energy, why the skater will never go higher than your answer to question 2 at this point.

Hit the 'Reset All' button.

4. If you were to place the skater at the 5 meter mark, how high will the skater go on the other side of the track?

Try it to confirm your prediction.

5. How does the skater's ***kinetic*** energy change as he moves ***down*** the ramp?

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6. How does the skater's ***kinetic*** energy change as he moves ***up*** the ramp?

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7. How does the skater's ***potential*** energy change as he moves ***down*** the ramp?

____

8. How does the skater's ***potential*** energy change as he moves ***up*** the ramp?

____

9. How does the skater's ***total*** energy change as he moves ***down*** the ramp?

____

10. How does the skater's ***total*** energy change as he moves ***up*** the ramp?

____

11. Describe the skater's ***kinetic*** energy ***at the bottom*** of the ramp.

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12. Describe the skater's ***potential*** energy ***at the bottom*** of the ramp.

____

13. What happens when ***the skater is dropped onto the ramp*** from above? (Hint: look at the bar graph.)

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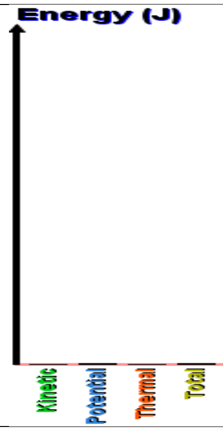
What happens to the ***total energy*** when ***the skater is dropped onto the ramp*** from above? (Again, look at the bar graph.)

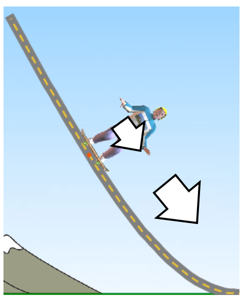
____

14. Observe the following situations. Draw the possible bar graphs for the situation shown. Compare your results with a nearby lab group, AFTER you have completed this section.

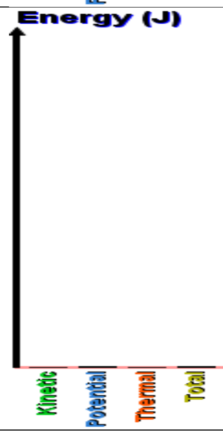
Top of the ramp, stopped for just an instance.

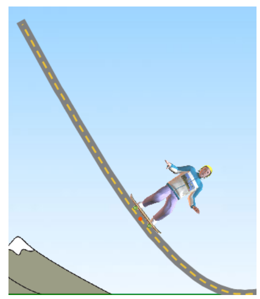


Bottom of the ramp, zooming past the middle.



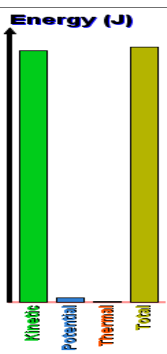
Mid-way down the ramp, moving about mid-speed.

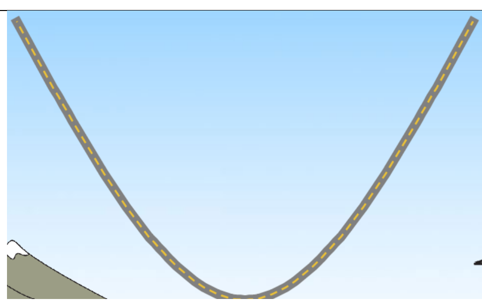


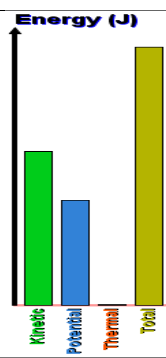


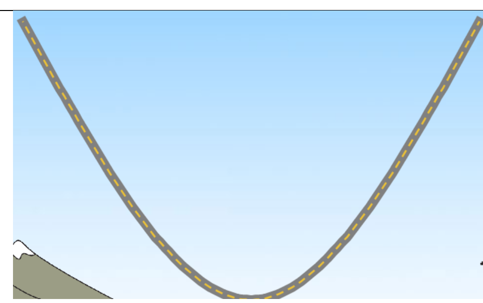
3/4 of the way down the ramp, moving pretty fast.

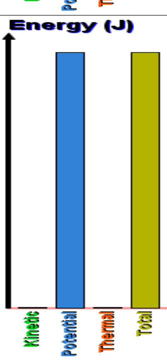
15. Draw where the skater might be based on the bar graphs shown. Compare your results with a nearby lab group, AFTER you have completed this section.

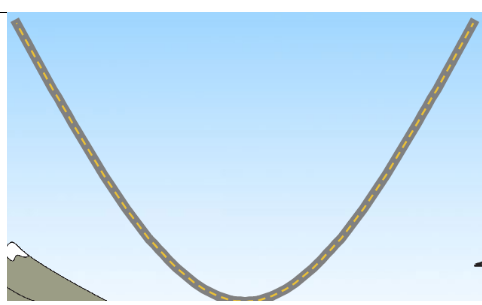


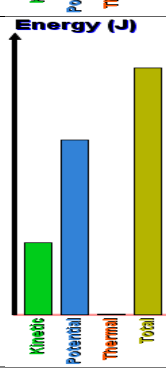


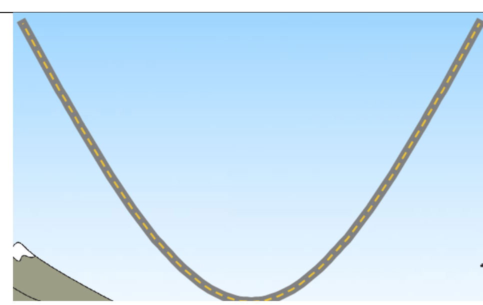


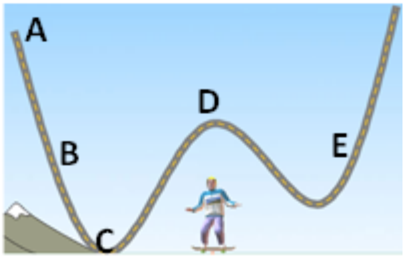










	16. Consider this track. What point or points on this track would the skater have ... The ***most kinetic*** energy? _____ The ***most potential*** energy? _____ The ***same kinetic*** energy (two points) _____ and _____

Part II: Elastic Potential Energy
http://phet.colorado.edu/simulations/sims.php?sim=Masses_and_Springs
Click on the Run Now button

Directions: Move the friction slider to none for this activity. Keep the cylinders visible in the screen window for calculations. You can use **Pause** or change the Time Rate for closer analysis

1. By investigation, determine when the Elastic Potential Energy is zero. Make sure you test your idea with several masses, all three springs and vary the stiffness of spring three. Write down how you determined the zero location(s) and explain why the position for zero makes sense.

2. Why did you need to use varying conditions?

3. By investigation, determine when the Kinetic Energy is zero. Make sure you vary the conditions for your experiment. Write down how you determined the zero location(s) and explain why the position for zero makes sense. *Simulation hint: The KE will not be calculated when you are moving the cylinder with the mouse*

4. Put a mass on a spring and observe the total energy graph as it oscillates. Pay attention to details of the energy distribution. Think about why the energy is distributed differently for several situations. For example: When is there only kinetic energy? What makes the elastic energy increase?
   - Test your ideas with varying conditions; write down your observations and conclusions.

5. Suppose you have a skater going back and forth on a ramp like this. How does his energy distribution as he rides compare and contrast to that of the mass moving on a spring? You can run the *Energy Skate Park* simulation to test your ideas.