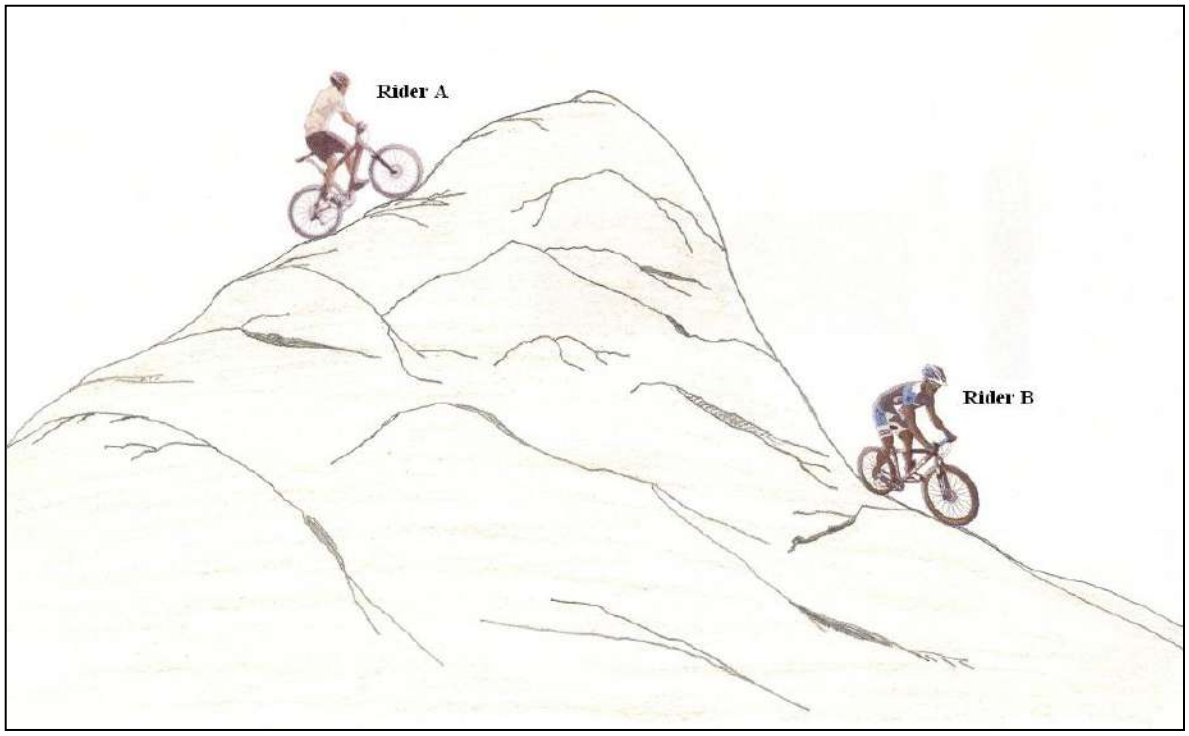
TRANSFORMATION OF ENERGY
SUMMATIVE ASSESSMENT

Question #1



Two mountain bike riders are at different locations on a section of the race course that contains a hill. The two riders have the same mass.

A. Which rider has more Gravitational Potential Energy (GPE)? Explain how you arrive at your answer.

B. If both riders are moving at the same speed, how would their kinetic energies (KE) compare? Explain your answer.

Question #2

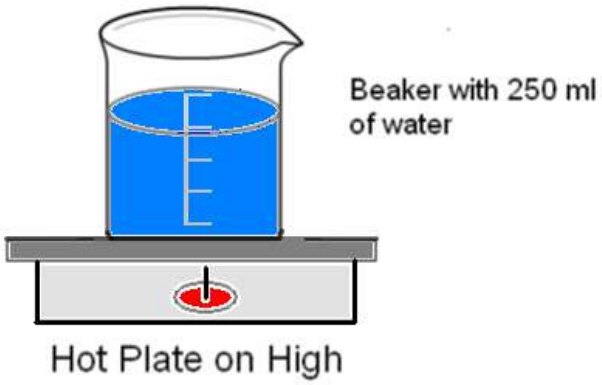
When the physically disabled or very small children participate in bowling, they often use a ramp so that they do not have to roll the ball down the bowling alley themselves. The person can rest the ball on top of the ramp and give it a gentle push so that it rolls down the ramp and onto the alley. The ramp equipment is illustrated above.

A. In the space below, list the forms of energy that are present in this version of the sport. Start with the energy of the ball when it is released from rest on top of the ramp. End with the ball hitting the pins and everything coming to rest.

B. Use your response from Part A to draw an energy chain that describes where the energy was transferred and where it was transformed. Start with the energy of the ball when it is released from rest at the top of the ramp. End with the ball hitting the pins and everything coming to rest.

Question #3

A beaker of water rests on a hot plate that serves as a source of heat energy. The starting temperature of the water is 22°C. After 5 minutes, the temperature of the water is 55°C and after another 5 minutes the temperature increases to 80°C. The temperature of the room is 28°C.



A. Use the Particle Model to explain heat energy.

B. Use the Particle Model to describe the difference between the water particles when the temperature of the water is 80°C and when the temperature of the water is 55°C.

C. Use your understanding of the Particle Model and of heat energy transfer by **conduction** and **convection** to describe how the energy from the hot plate reaches the water particles at the surface of the water. Be sure to include all heat energy transfers that take place between the hotplate and the top surface of the water.

The hot plate is turned off.

D. Explain what will happen to the temperature of the water in the beaker after 5 hours? Use the Particle Model and your knowledge of heat energy transfer to justify your answer.

Question #4

A band of outlaws in the Old West plans to rob the train that comes through Sagebrush Canyon. One of the cowboys keeps his ear to the train rail while the others attempt to block the track so that the train has to stop.

The cowboy knows that some of the train's energy moves through the rail in the form of mechanical waves. Use your knowledge of energy and the Particle Model to explain why the cowboy has decided to put his ear to the metal rail to hear the approaching train instead of just listening for it in the air.

Question #5

Sarah and her mother go to the beach during the summer. Sarah notices that the sand is very hot on a bright, sunny day. Her mother explains that the Sun heats the sand.

Describe how the Sun can heat the sand even though there is no heat energy coming from the Sun?

Question #6

On a sunny, summer day, Bob mows the grass at his house. He wore a shirt but no sunscreen. When he takes off his shirt later, he notices that he is burned (red) in all of the areas that were not covered by the shirt.

Sunburn is caused by ultraviolet (UV) waves interacting with skin. Use your knowledge of how energy is transferred by waves to explain why Bob got sunburn only in the uncovered areas of his body.