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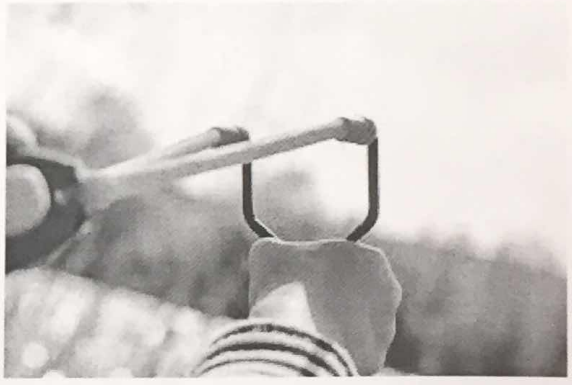
Tying it all Together: Forces & Energy

1. There are many forms of energy. All energy falls into one of two categories; either potential or kinetic energy. A roller coaster at different points along its path, involves kinetic energy being transformed into potential energy.

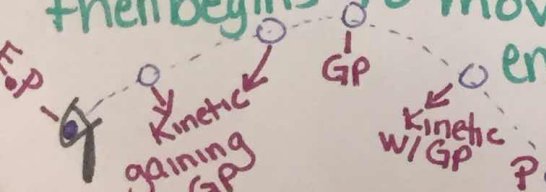
Using the ***law of conservation of energy***, ***explain*** in detail how the kinetic energy is transformed into potential energy on a rollercoaster. *Be sure to explain the differences and similarities between kinetic and potential energy in your response*.

The law of conservation of energy says energy cannot be created nor destroyed, but can only be transformed. On a roller coaster energy transforms between potential energy (stored energy; when not in motion) and kinetic energy (energy of motion; when coaster is moving). Energy transforms between the two depending where the cart is on the track.

2. A student uses a slingshot to launch a rock through the air. **Describe** the changes in potential and kinetic energy of the rock as the student pulls it back in the sling and releases it, and then as the rock flies upward through the air, curves downward, and finally hits the ground. Specify what form(s) of energy the rock has at each point in its journey. **Create a diagram** to support your answer.



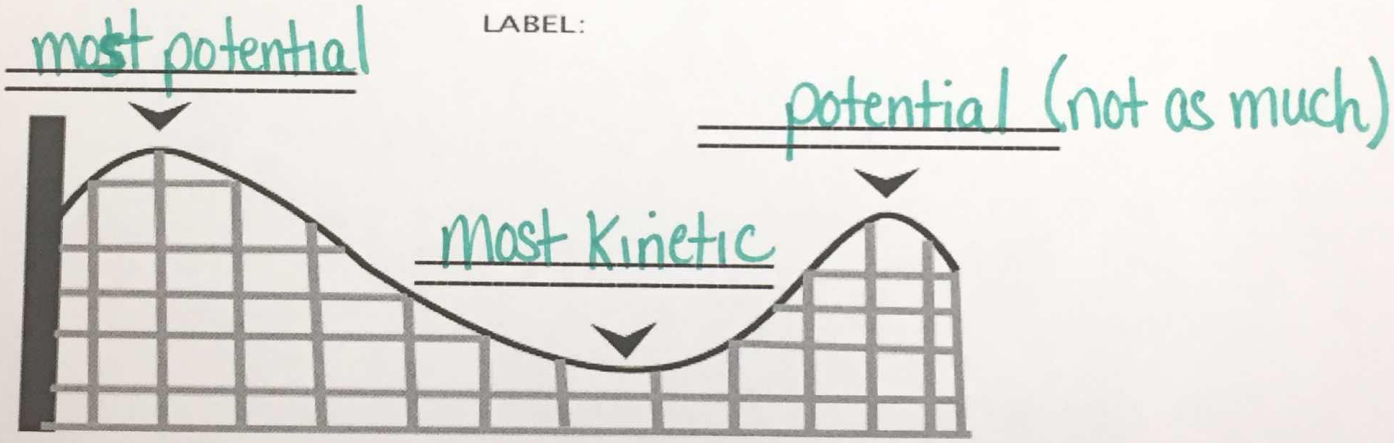
As the student pulls the sling back energy is in the form of elastic potential. When the rock is released energy is transformed in to Kinetic energy as it flies upward. It is also gaining gravitational potential. At its maximum height, the rocks energy transforms into gravitational potential then begins to move downward toward ground transforming energy into Kinetic energy. Once the rock hits the ground energy is transformed back into potential



3. Potential energy is energy that is stored and ready to be released. Look at the image to the right and identify when the child in the swing has potential energy. **Justify** why this is the case at the points you identify.

The child has the maximum potential energy at the 'top' where the mom has pulled back ready to release the swing. The energy transfers between potential + kinetic energy depending on location of swing.

4. Where is the kinetic energy greatest on the course of the roller coaster illustrated below? Where is the potential energy greatest?



5. Why is the first hill on all the roller coasters always the highest one?

This hill provides the most potential energy that will decrease and transfer into kinetic energy. This transfer into kinetic allows the coaster to gain momentum and proceed through the track.

6. Classify the following as a type of potential energy or kinetic energy (use the letters K or P).

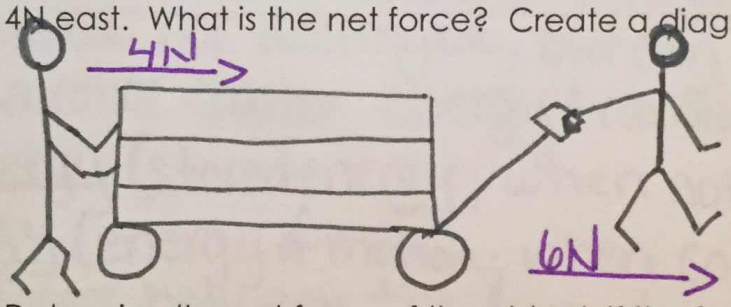
A bicyclist pedaling up a hill	K	An archer with his bow drawn	P
A volleyball player spiking a ball	K	A baseball thrown to second base	K
The chemical bonds in sugar	P	The wind blowing through your hair	K
Walking down the street	K	Sitting in the top of a tree	P
A bowling ball rolling down the alley	K	A bowling ball sitting on the rack	P

7. What examples can you find in your home that are examples of kinetic and potential energy (name two for each type of energy)?

Answers will vary

a. Kinetic: _____
b. Kinetic: _____
c. Potential: _____
d. Potential: _____

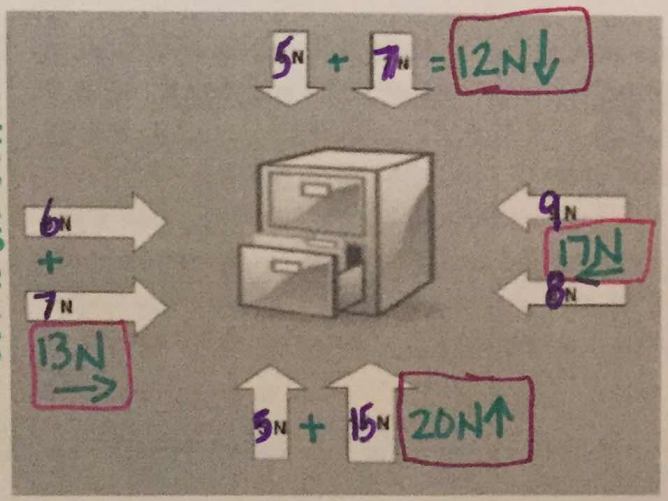
8. A boy pulls a wagon with a force of 6N east as another boy pushes it with a force of 4N east. What is the net force? Create a diagram to support your answer.



Net Force
4N + 6N = 10N east
(add - same direction)

9. Determine the net force of the object, if the forces are balanced or unbalanced, and what direction the box will move.

Subtract = opposite direction
add = same direction



Balanced or Unbalanced?

20N - 12N = 8N up ↑

Net Force: 17N - 13N = 4N left ←

Direction of Box: _____

10. In the rollercoaster lab, if you increased the size of the marble, and therefore its mass, how would the potential and kinetic energy change?

If the mass (size) of the marble increased, the potential and Kinetic energy would increase (In theory the marble would have greater acceleration)