

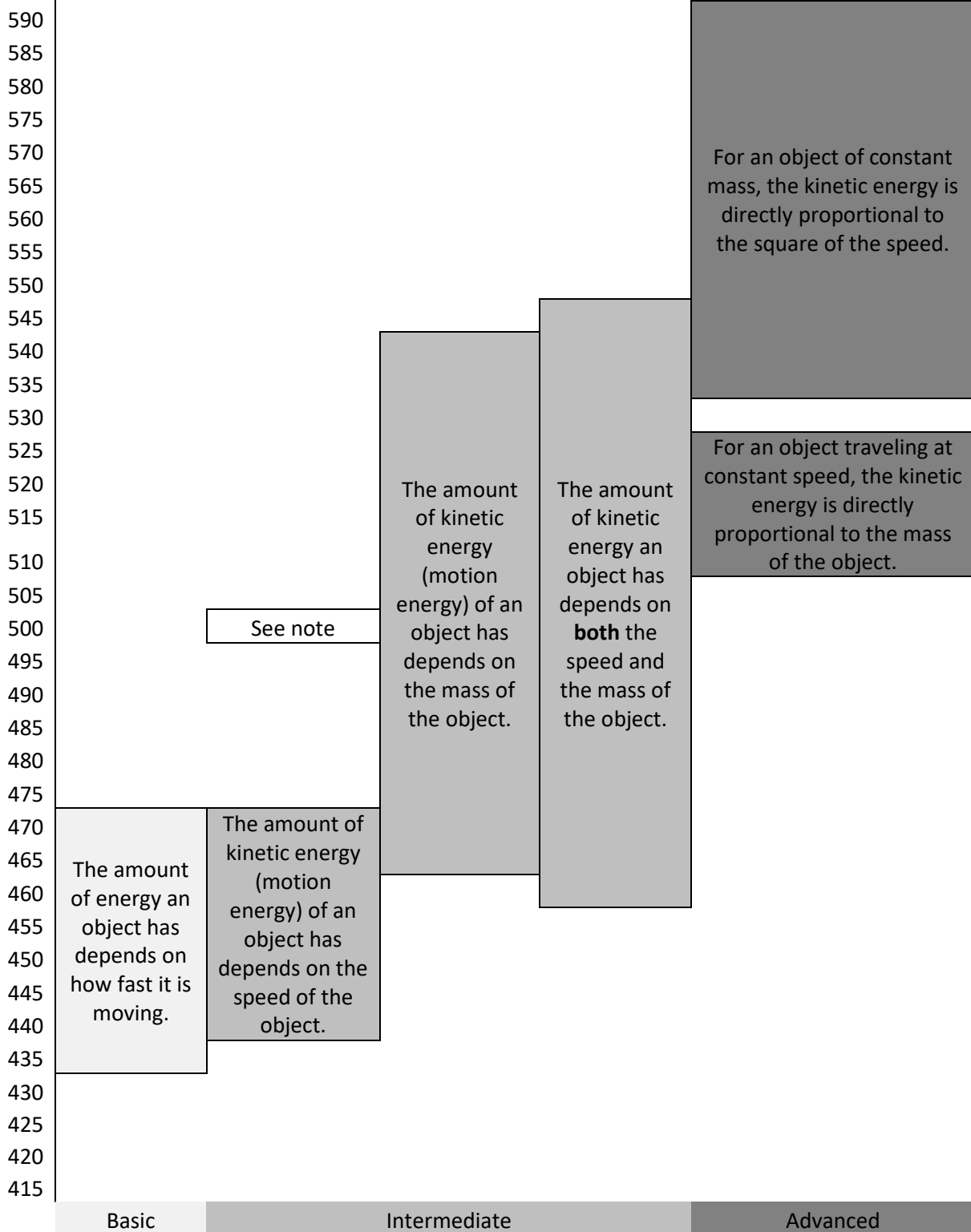
# Idea Maps for the ASPECT Project

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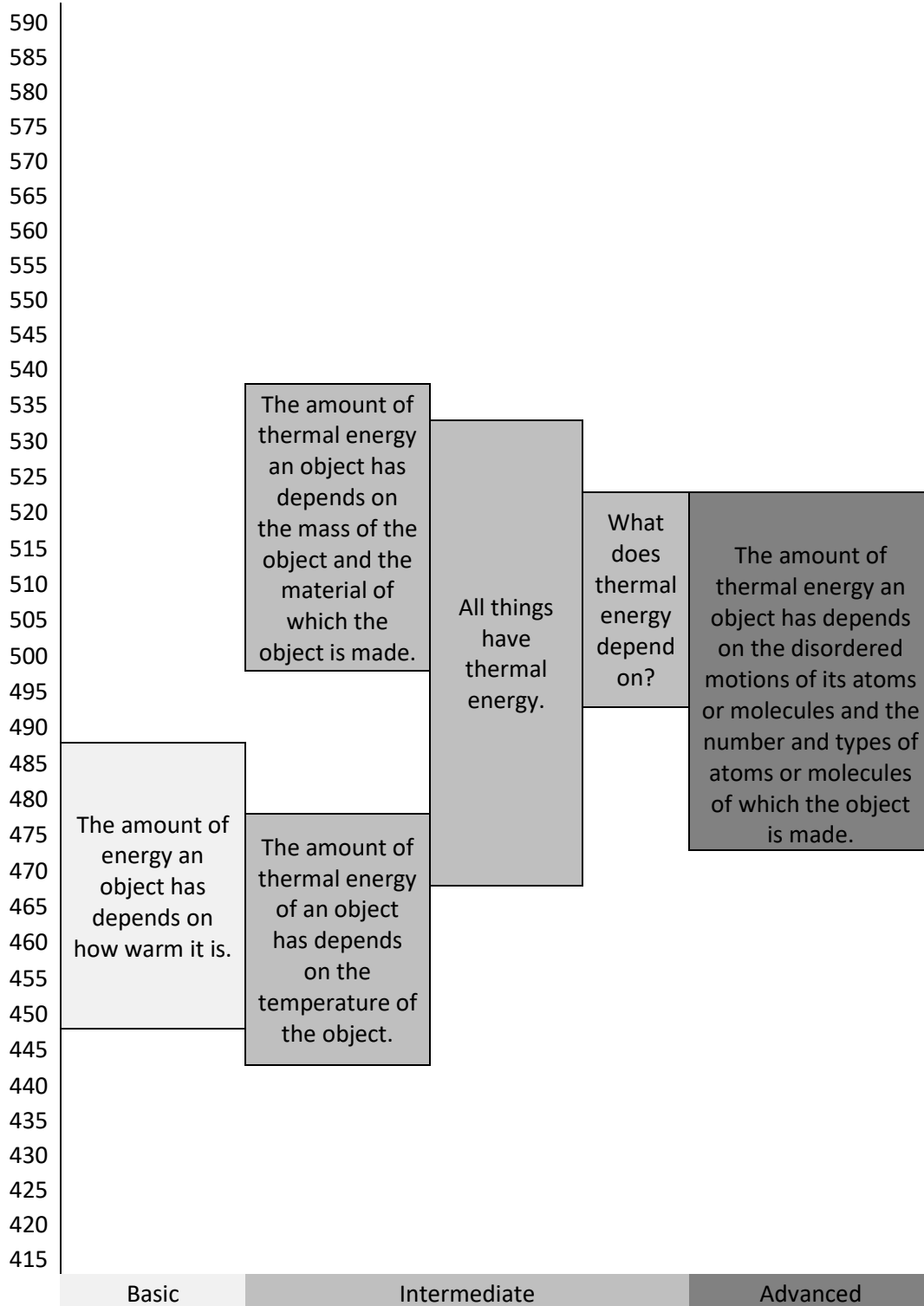
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# Kinetic Energy

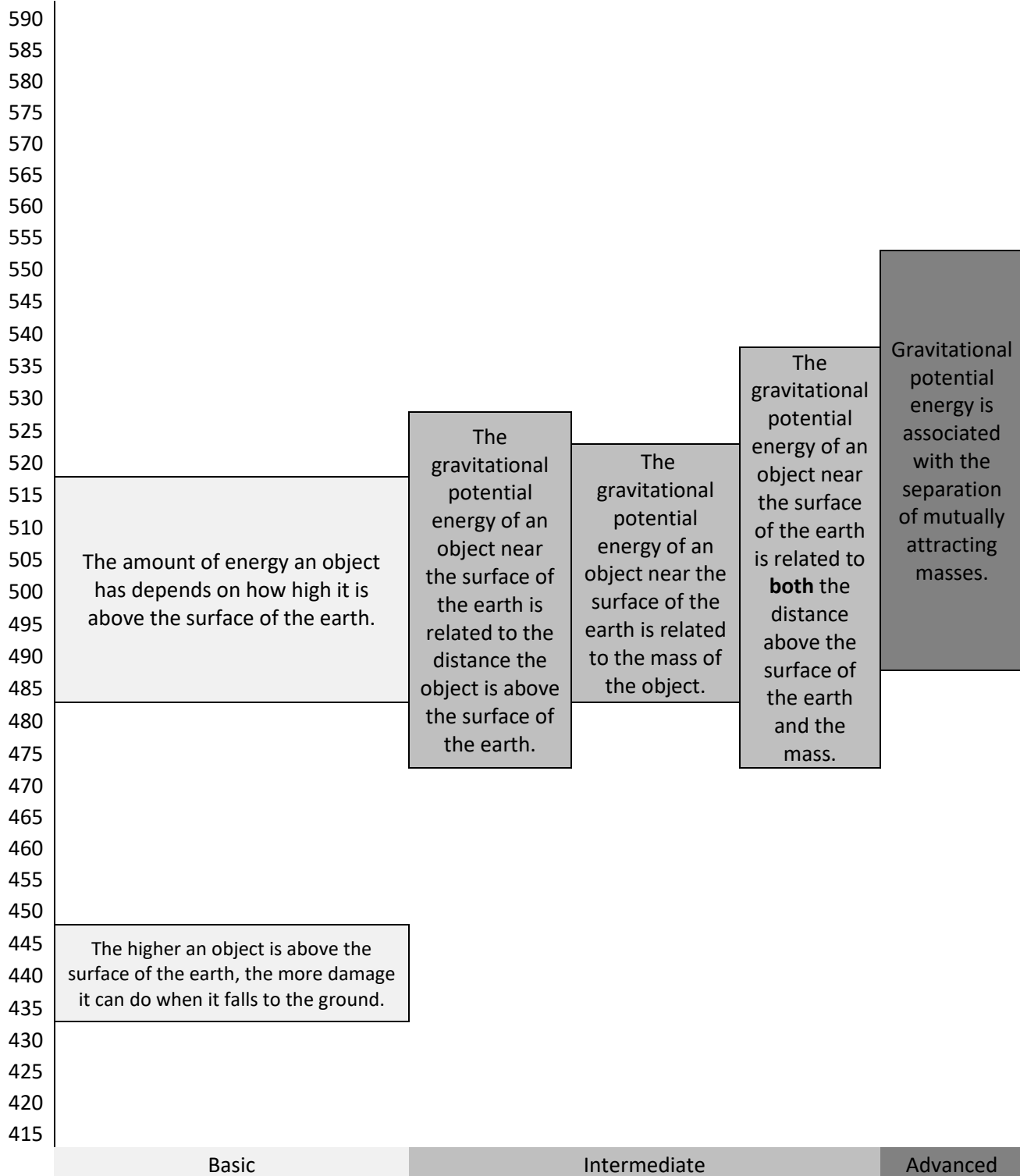


NOTE: This question at 500 is an intermediate level question that targets the misconception that kinetic energy depends on the direction the object is traveling.

# Thermal Energy



# Gravitational Potential Energy



# Elastic Potential Energy

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	Basic	Intermediate	Advanced

The amount of elastic potential energy an elastic object has depends on how difficult it is to stretch or compress the object.

The amount of elastic potential energy stored in a stretched or compressed elastic object increases when the object is further stretched or compressed because the distances between the atoms and molecules that make up the object changes.

The amount of elastic potential energy an elastic object has depends on how much the object is stretched or compressed.

The amount of energy an elastic object has depends on how much the object is stretched or compressed.

The more an elastic object is stretched or compressed, the farther it can propel itself or another object when released.

# Chemical Energy

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See Note 1

Some chemical reactions release energy into the surroundings, whereas other chemical reactions take in energy from the surroundings.

Chemical energy is associated with the arrangement of atoms that make up the molecules of the reactants and products of a chemical reaction. Because the arrangement of atoms making up the molecules is different before and after the chemical reaction takes place, the amount of chemical energy in the system is also different.

See Note 2

Energy is released when fuel is burned. Energy is also released when food is used as fuel in animals.

Basic	Intermediate	Advanced
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Note 1: The question at 565 is an intermediate level question but it involves an abstract context.  
 Note 2: The question at 490 asks students to recall the fact that the chemical energy is associated with the types and number of atoms and how they are arranged into molecules. The students are not required to apply the knowledge.

# Transferring Energy by Conduction

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555		See Note 1	Energy is transferred by conduction through a material by the random collisions of atoms and molecules that make up the material.
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505	See Note 2		
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475	When two things touch, the warmer things get cooler and the cooler things get warmer until they all are the same temperature.		
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	Basic	Intermediate	Advanced

NOTE 1: This question at 555 is an intermediate level item that involves using an ice pack in a lunch bag to cool a can of juice. Many students selected the distractor that said that coldness is transferred from the ice pack to the can.

NOTE 2: This question at 505 tests the basic level idea but in the context of a very hot object coming in contact with a cooler object. Many students selected the distractor that said that the very hot object will stay the same temperature and not get cooler.

# Transferring Energy by Convection

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540		See Note 2	
535	See Note 1		The differences in density of regions in a fluid lead to an imbalance between the downward gravitational force and upward forces exerted by the surrounding fluid, creating currents that contribute to the transfer of energy.
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500		Temperature variations in fluids such as air and water lead to currents that circulate the fluid and transfers energy from place to place in the fluid.	
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490	When water moves to another location, it can change the temperature of the water at that location.		
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	Basic	Intermediate	Advanced

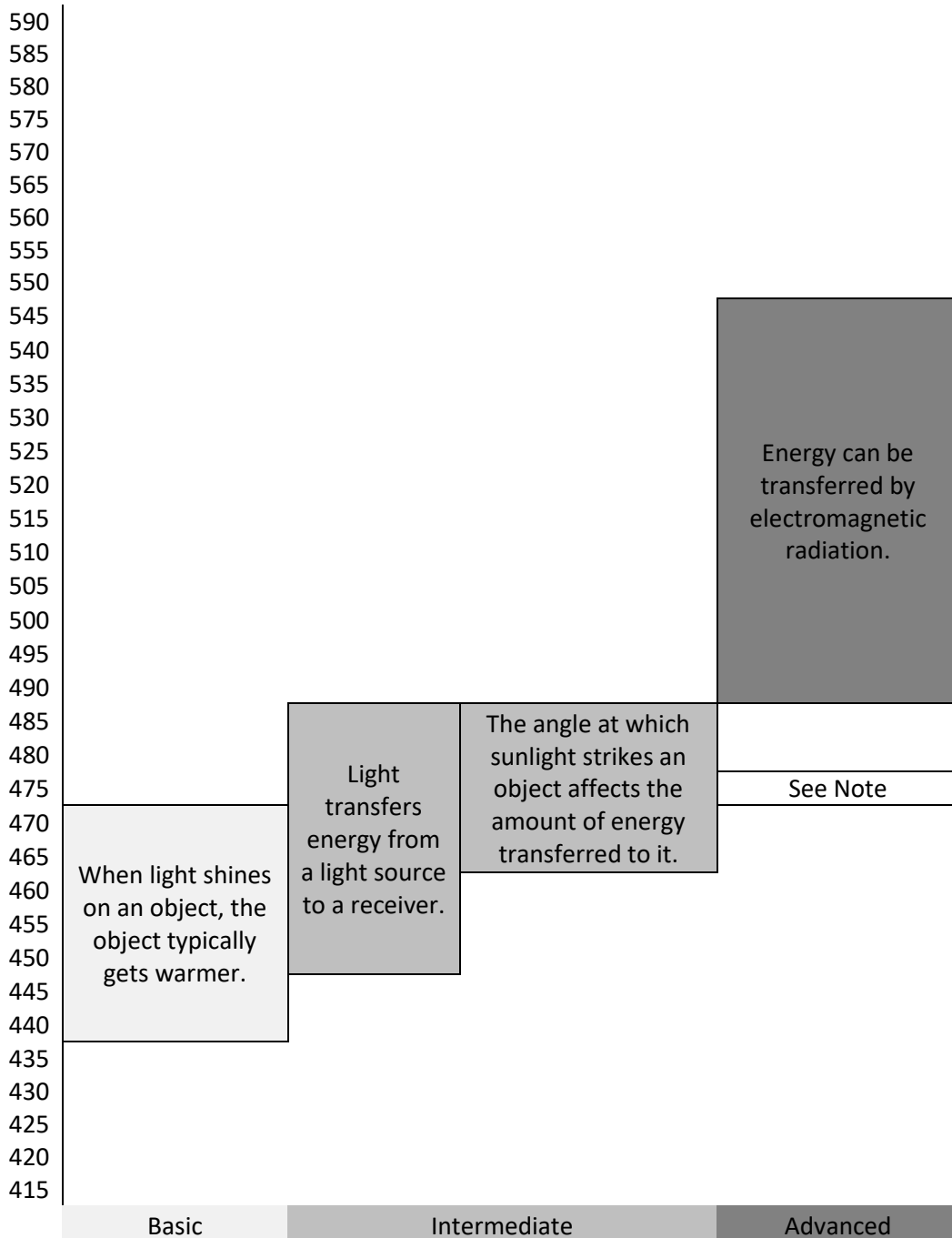
Note 1: This question at 535 is the only basic level question that targets the idea the when air moves to another location, it can change the temperature of the air at that location.

Note 2: The question at 540 is an intermediate level question that involves a container of water that contains small, visible particles. Students are asked to describe the motion of the particles when the container is over a flame.

Note 3: The question at 580 is an advanced level question that asks students to select a table that describes the temperature and density of different regions in water being heated over a flame.

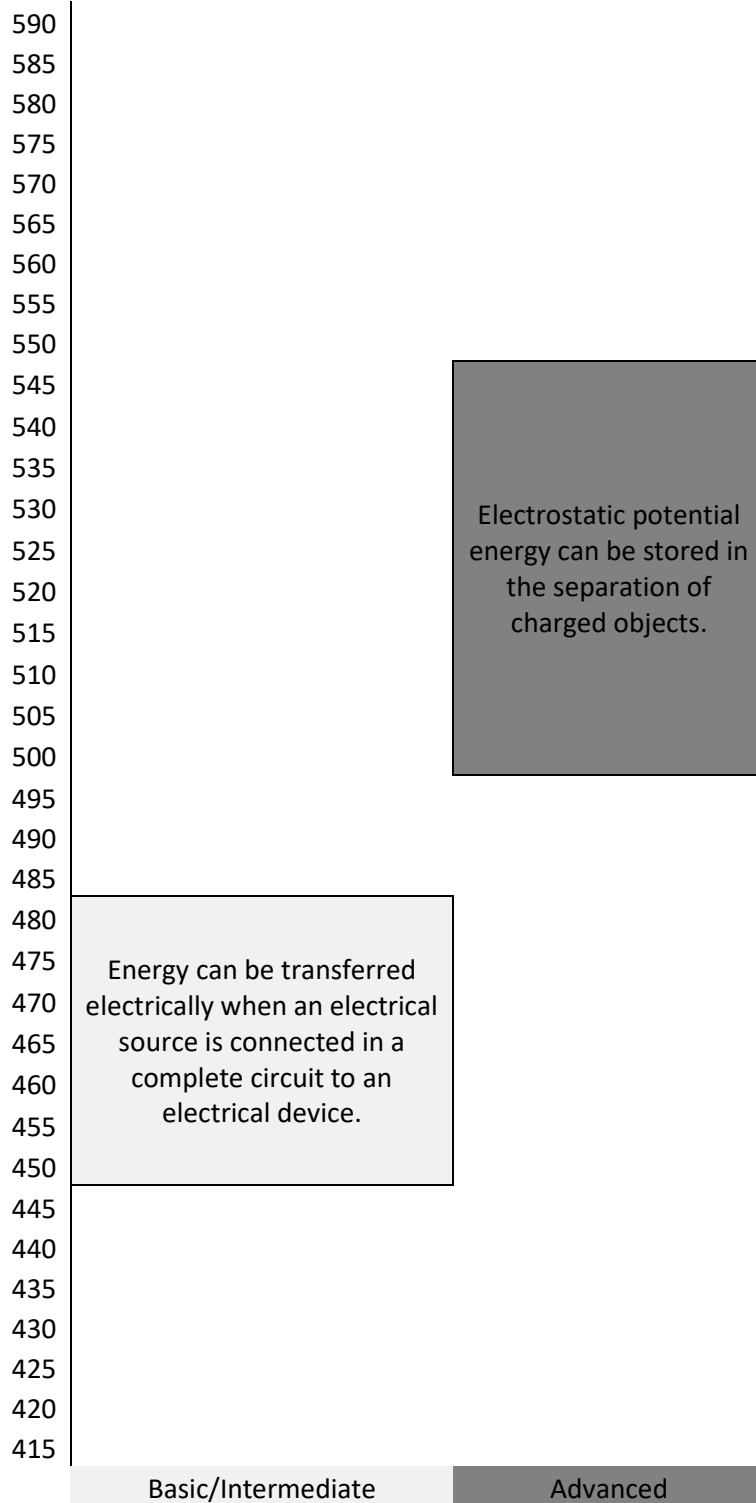


# Transferring Energy by Radiation



NOTE: This question at 475 requires students to select a graph that describes the rate at which energy is being absorbed and emitted by a sample of water over time.

# Transferring Energy Electrically



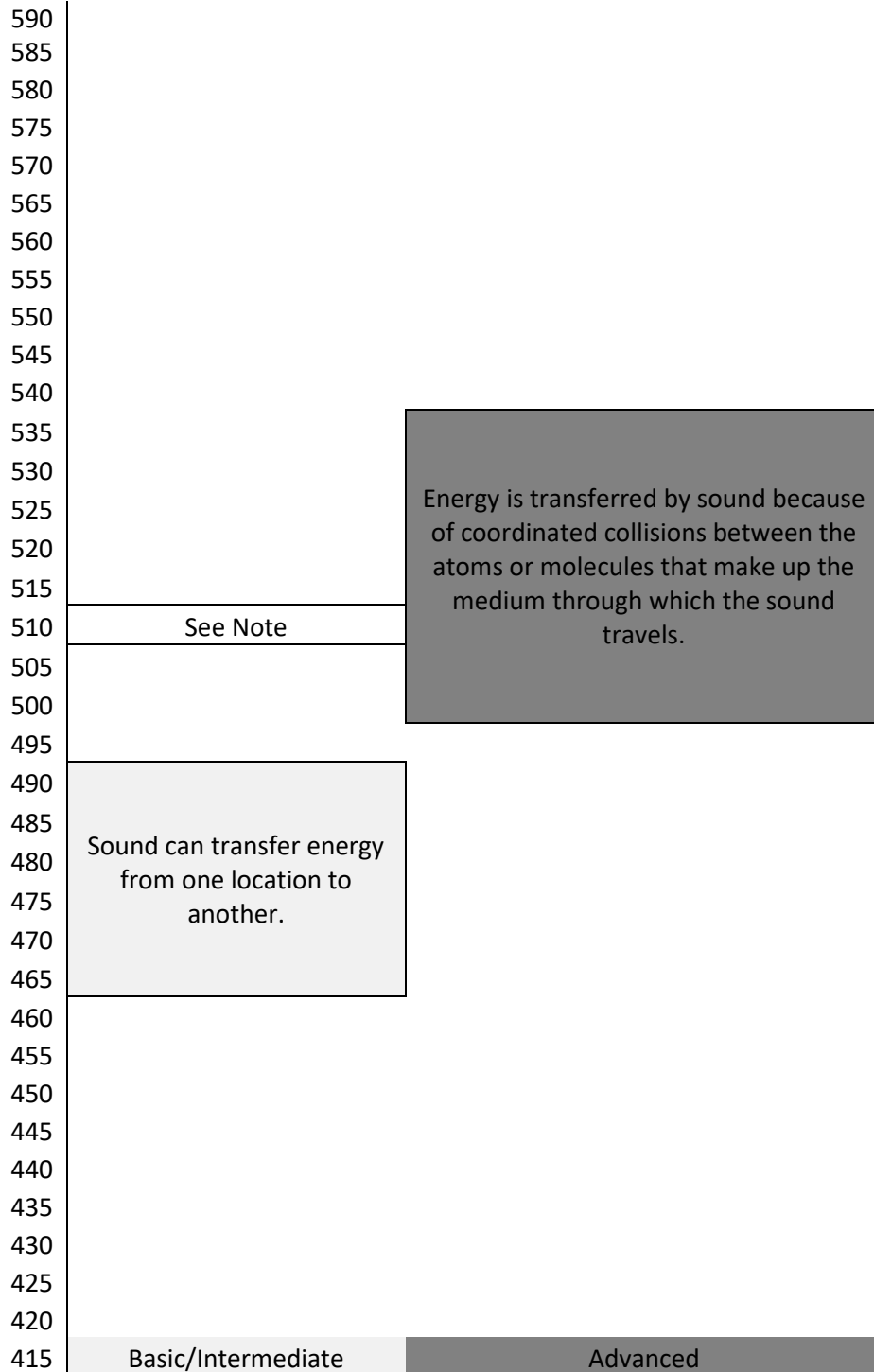
# Transferring Energy by Forces

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535	See Note 1	Energy is transferred mechanically when an object exerts a force, either by contact or at a distance, on another object.	When two objects change relative position as a result of a gravitational, magnetic, or electric force, the potential and kinetic energies of the system change.
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485	Contact forces can transfer energy from one object to another resulting in a change in the objects' motion.		
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	Basic	Intermediate	Advanced

Note 1: This basic level question at 535, unlike the others, targets a very popular force misconception that it is a force (not energy) that is transferred during a collision.

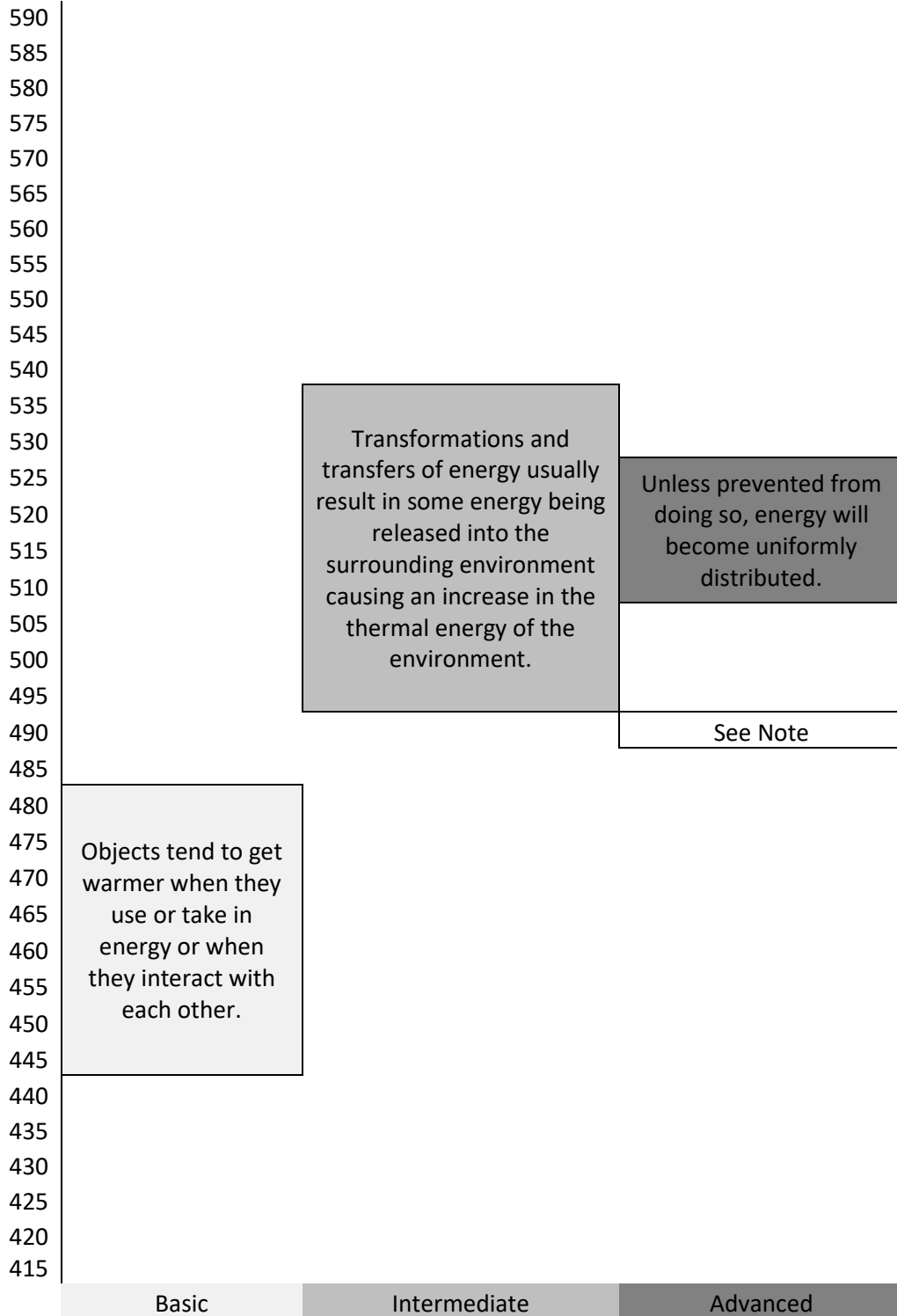
Note 2: This question at 455 is an intermediate level question that asks students whether a stronger or weaker magnet will transfer more energy to a metal ball.

# Transferring Energy by Sound



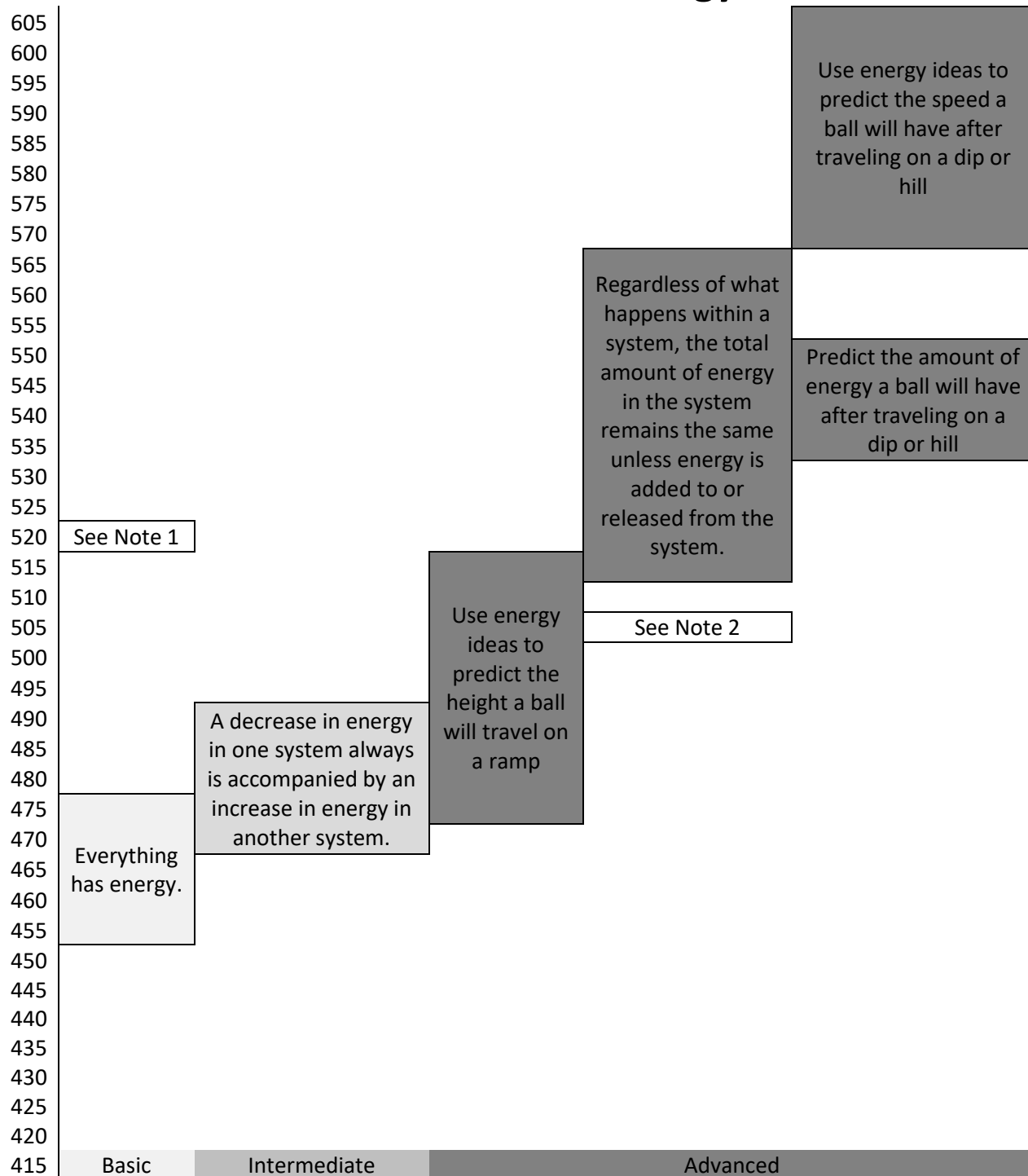
NOTE: This basic/intermediate question, unlike the others, targets a very popular force misconception that it is a force (not energy) that is transferred during a collision.

# Dissipation of Energy



Note: This item asks the students to select the graph that represents the change in energy concentration over time.

# Conservation of Energy



Note 1: This question at 520 is a basic level question that asks student whether a falling rock and/or a rock sitting on a cliff have energy. This differs from the other questions that ask if an object has energy because it requires the students to know that the rock on the cliff has gravitational potential energy.

Note 2: This question at 505 is an advanced level item that asks student to recognize the general principle of energy conservation, whereas the other questions require students to apply the principle to scenarios.