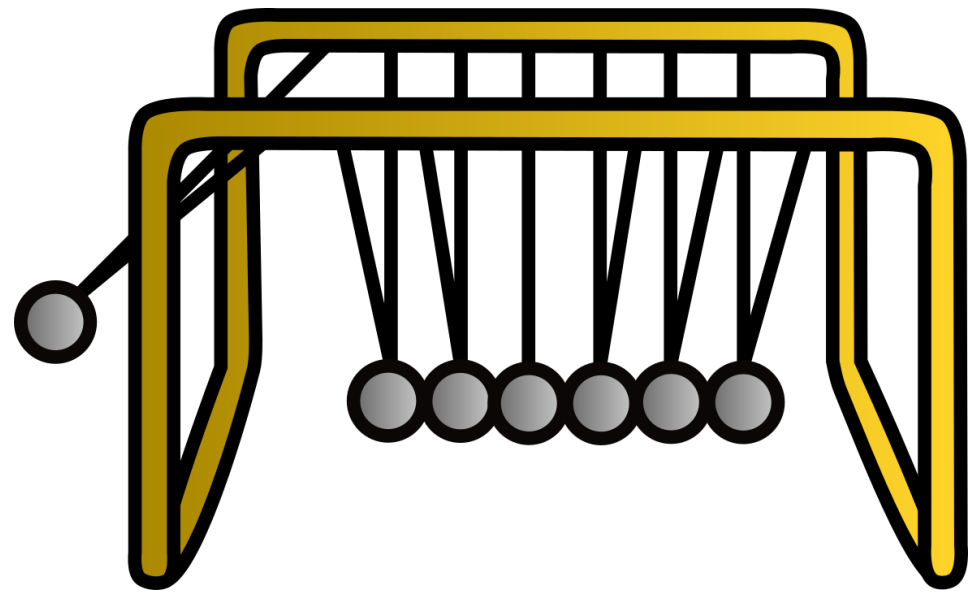
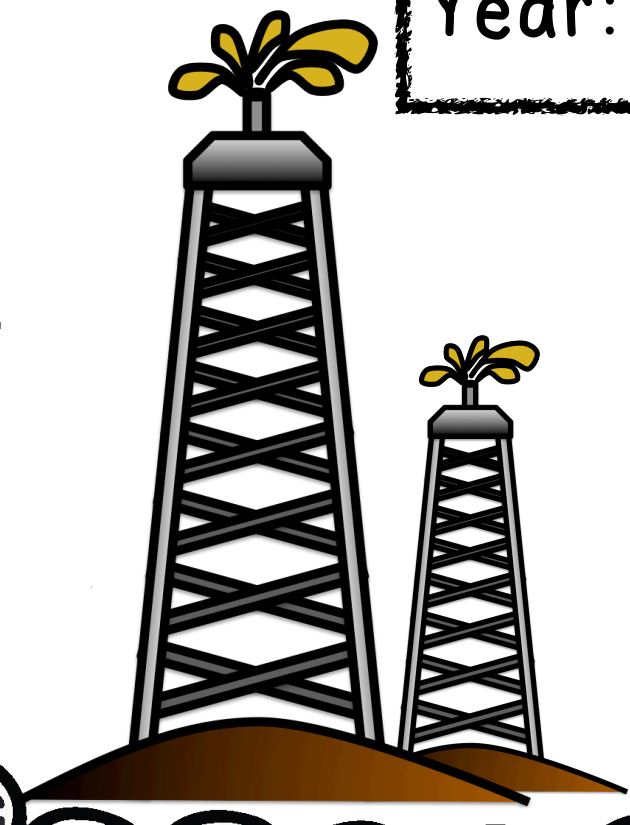


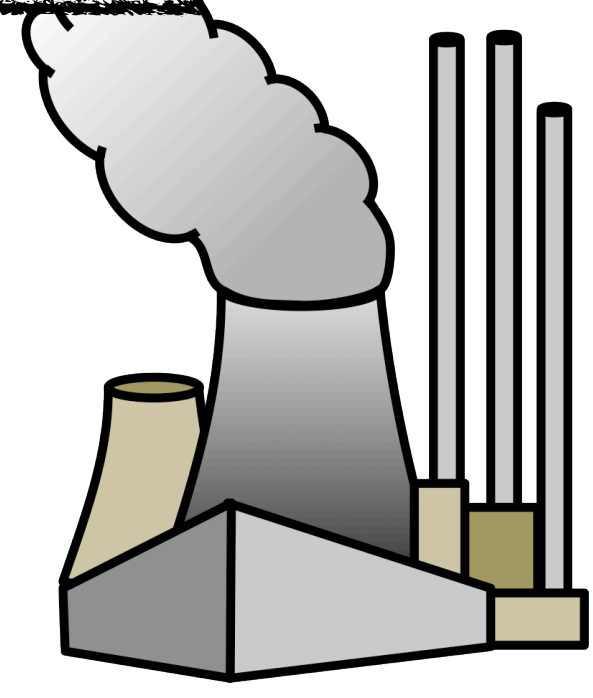
Energy

Name:

Class:

Year:



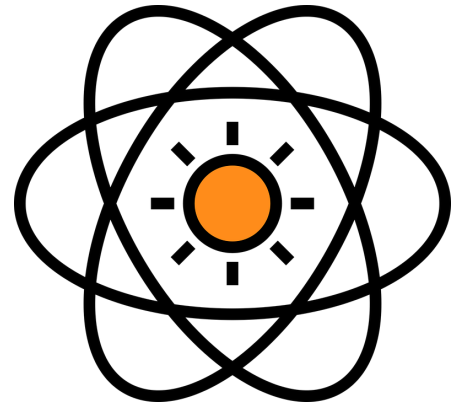


What is a Science Journal?

Welcome to our Physical Science unit. We are going to be learning about energy which is...

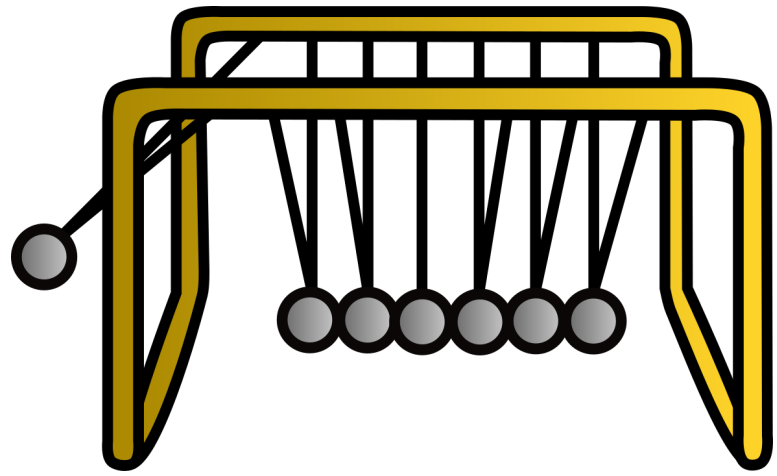
This journal is your place to record discoveries. Like all scientists, you will wonder, think, try, observe, record, and discover. As you do so, it is important to keep a record of your work. Your questions, investigations, answers, and reflections can then be shared and returned to at any time.

Enjoy, take pride in your work by keeping your journal in great condition, and share your discoveries—science depends on scientists like you! Enjoy your learning journey.



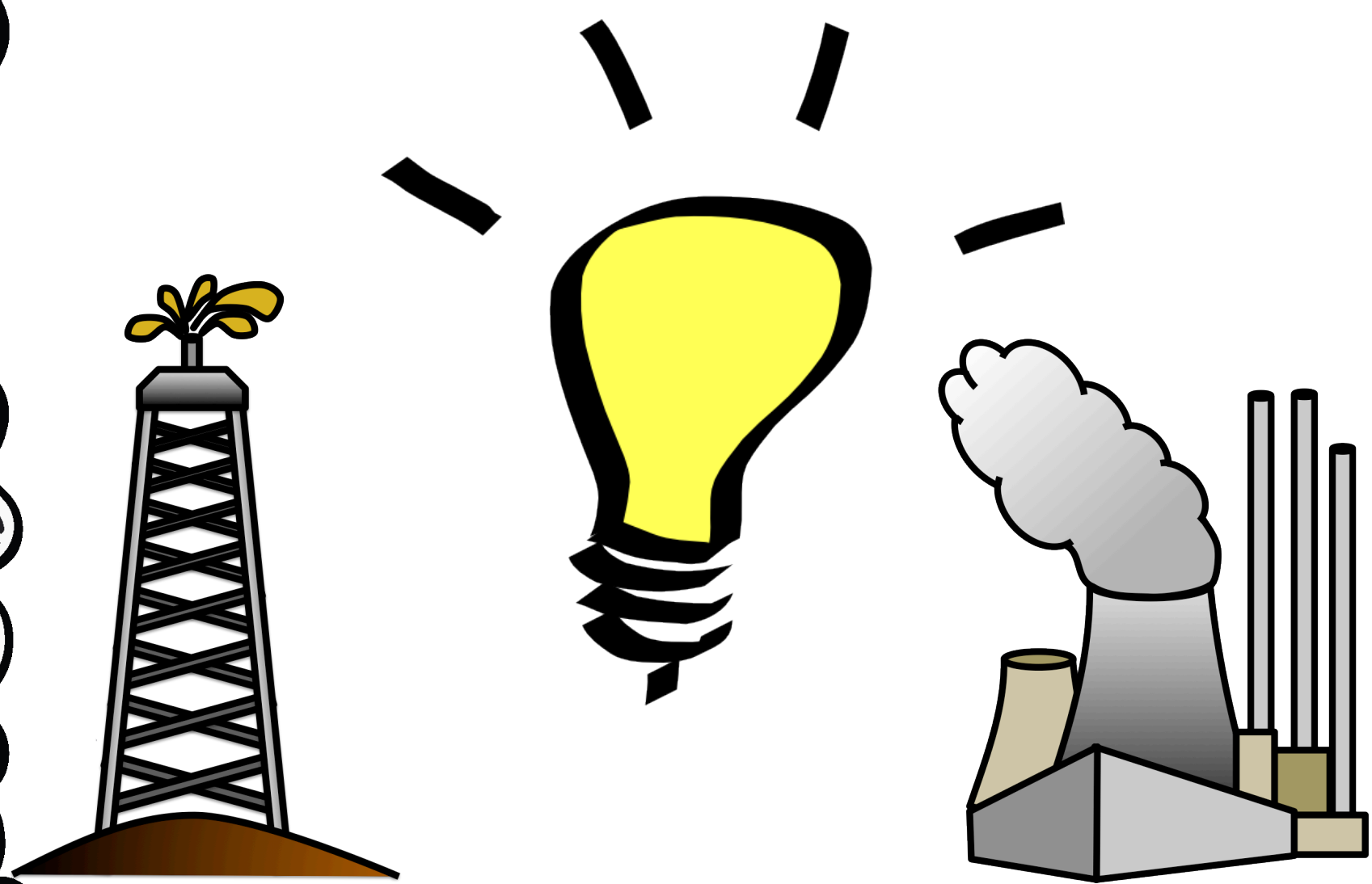
overview

LESSON 1 What is Energy?	**LESSON 2** Potential and Kinetic Energy	**LESSON 3** Potential and Kinetic Energy
LESSON 4 Elastic Potential Energy	**LESSON 5** Energy Transference	**LESSON 6** Forms of Energy
LESSON 7 Energy Transfers and Transformations	**LESSON 8** Electrical Energy	**LESSON 9** Energy Sources
LESSON 10 Renewable and Nonrenewable sources	**END OF UNIT PROJECT** WACKY RUBE GOLDBERG MACHINES	



Lesson 1

What is Energy?

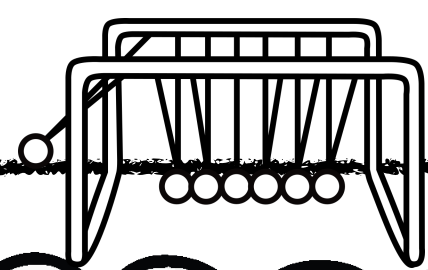


Time to Think!

Let's find out what you already know, and what you would like to know, about ENERGY!

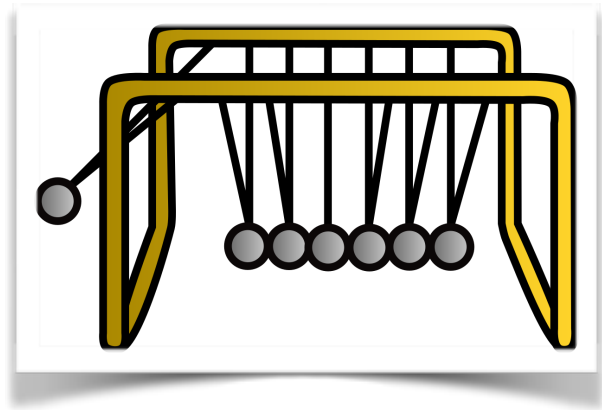
What do you already know about energy?

What do you want to know about energy?



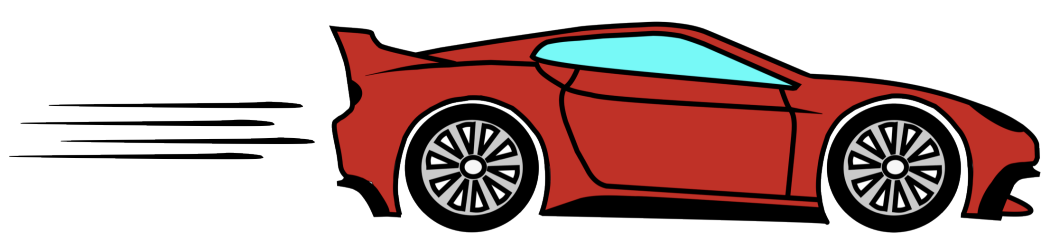
What is Energy?

"Energy is the ability to do work"



We all know what it feels like to be energetic, to have energy that allows us to move. Energy causes things to happen around us. Energy is everything and it is everywhere. It makes change; it does things for us. It moves cars along the road and boats over the water. It bakes a cake in the oven and keeps ice frozen in the freezer. It plays our favorite songs on the radio and lights our homes. Energy makes our bodies grow and allows our minds to think. But what is energy, where does it come from?

Physicists are scientists who study force, motion and energy. Physicist define energy as the ability to do work, and 'work' is moving something against a force, like gravity. There are a lot of different kinds of energy in the universe, and that energy can do different things. All types of energy fall into one of two types, potential and kinetic. The amount of energy in the world never changes, it is always the same amount. This is because you cannot create or destroy energy, energy can be transformed from one type to another but it is always constant.



Let's check your understanding...

Q 1: What is energy?

Q2: What four examples of energy are described in this passage?

Q3. What is the name of scientists who study force, motion and energy?

Q4. What does 'work' mean?

Q5. Can you name a type of energy?

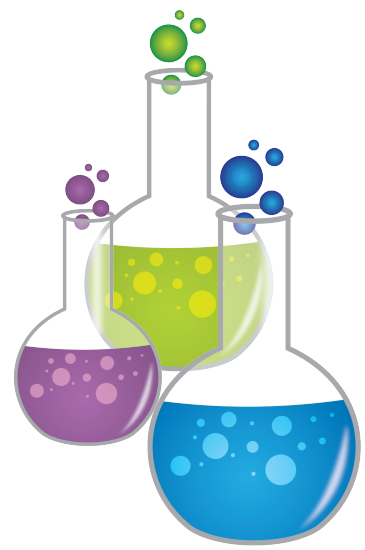
Score	/5

Dye Dispersion Experiment

Today we will be investigating to see if food dye mixes at different speeds in different temperatures of water. Here are a list of materials you will need to conduct this experiment:

Materials

- 3 clear cups
- Hot Water, room temperature water and ice water
- Thermometer
- Timer/Stopwatch
- Colored Dye
- Plastic Dropper



Question:

Does temperature affect the rate dye disperses in water?

Prediction:

What do you predict will happen in this experiment? Will the temperature affect the rate the dye mixes in the water? Why do

Instructions

1. Pour 50 ml of ice/room/hot water into each of your cups. Collect 10 ml of colored dye using the plastic dropper.
2. Pour 10 ml of dye into the ice water cup and start the timer. Observe the dye spreading. Once the dye has completely dispersed stop the timer and record below.
3. Repeat 3 times altogether.
   Now, repeat the experiment for the room temperature water and the hot water.
4. Record all your data below.

Temp	Time 1	Time 2	Time 3	Average
Ice Water				
RT Water				
Hot Water				

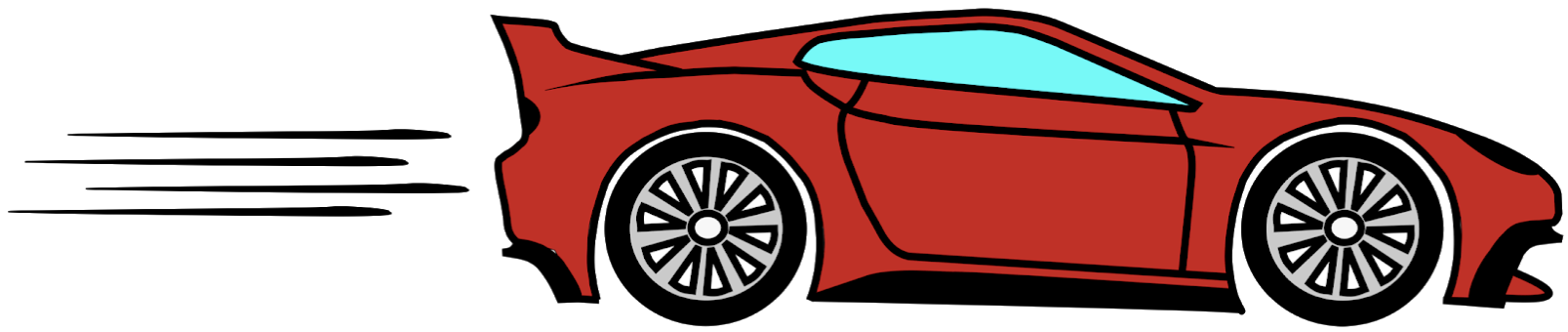
Results

From looking at your data, can you answer our question - Does temperature affect the rate of dye dispersal? Why?

Reflection

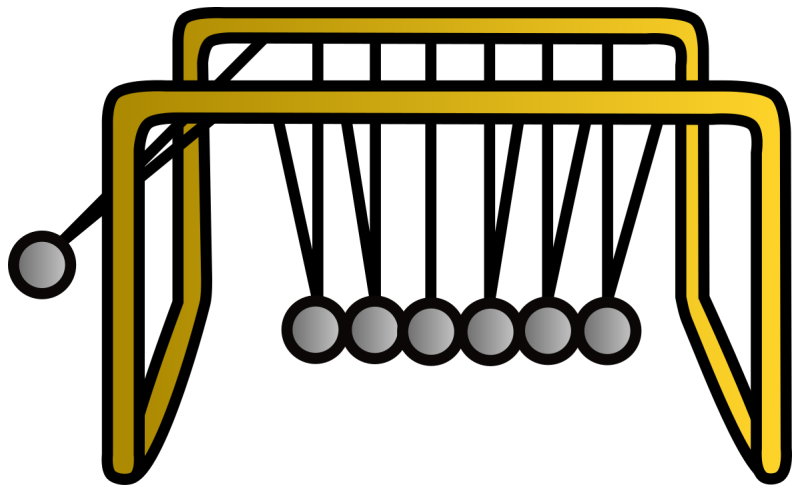
Date: _____

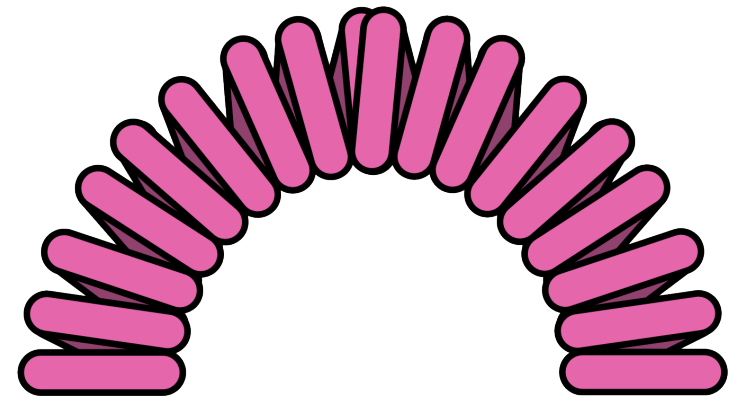
What have you learned about energy so far? What examples of energy can you find in your everyday life? What questions do you still have about energy? Write a short reflection here.



Lesson 2

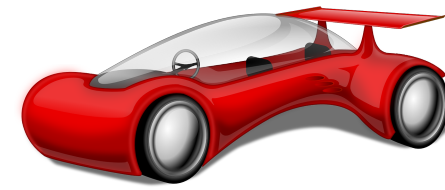
Potential and Kinetic Energy





ROCKIN' Race Cars

After watching the "Hot Wheels" video, write a short reflection of your observations.

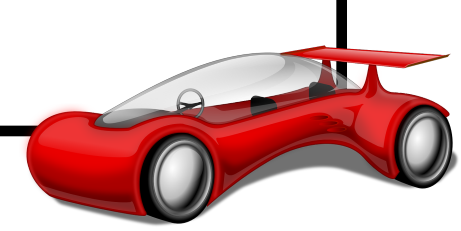


- What did you notice about the design of the ramp?
- What did you notice about the track and the car?
- How was the car different from cars you usually see people drive?
- How were the tracks different from the streets in your neighborhood?

ROCKin' Race Cars

As an engineer how would you design a ramp to make a car go as far as possible?

Ideas:



Task: EXPLORE! With a partner, in a group or even by yourself, build a ramp that can make a car go as far as possible. Try different things, see what works, ask questions, gather data, and most importantly, have fun!

ROCKIN' Race Cars

Draw the ramp that went the furthest distance.

Draw the ramp that went the shortest distance.

What is different about the two ramps?

<u>Can you complete the following paragraph by adding in the missing words?</u>

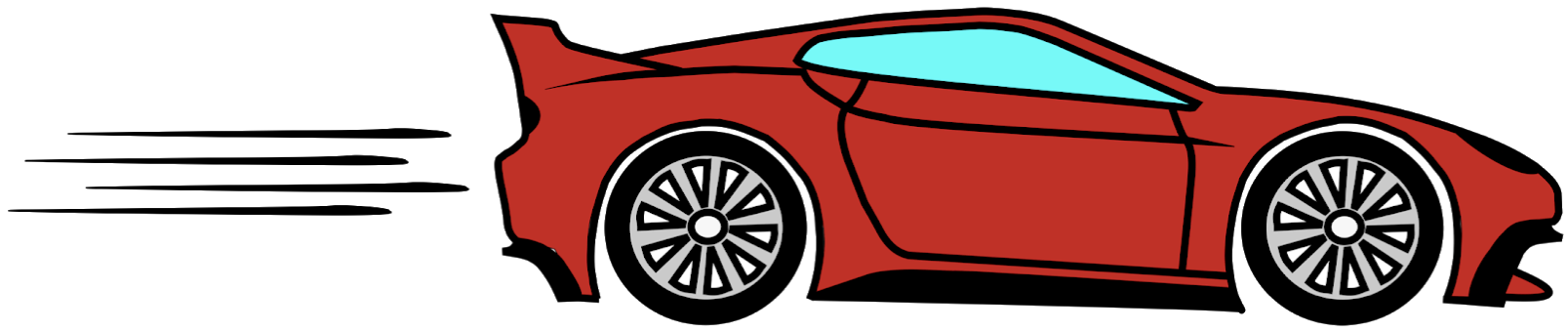
Vocabulary
kinetic
gravity
potential
raise
further

If you _____ the height of the ramp, the car will go _____ .The reason this happens is because the car has more energy which comes from the Earth's _____. When the car moves down the ramp it builds _____ energy. This is what allows the car to travel forward once it has reached the ground.

Reflection

Date: _____

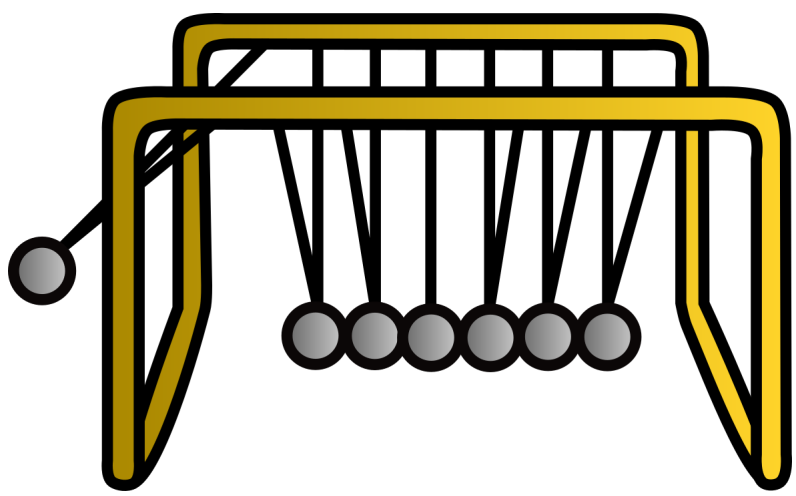
If you were an engineer, how would you design a ramp to make sure the car could go as far as possible? Explain using scientific reasoning and vocabulary.

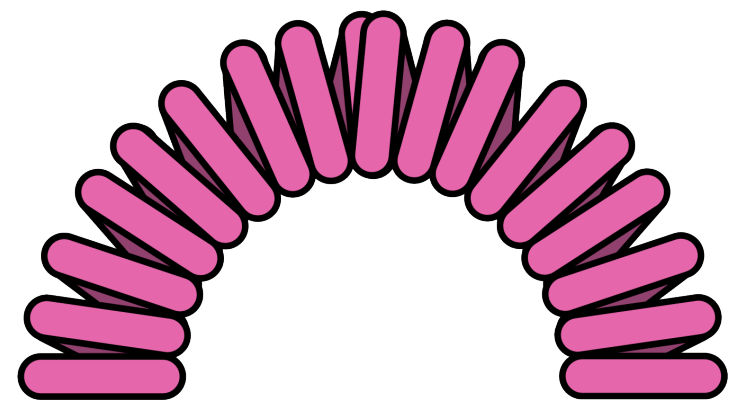


Lesson 3

Potential and Kinetic Energy

continued...





Vocabulary Word search

Can you find important vocabulary from our learning so far?

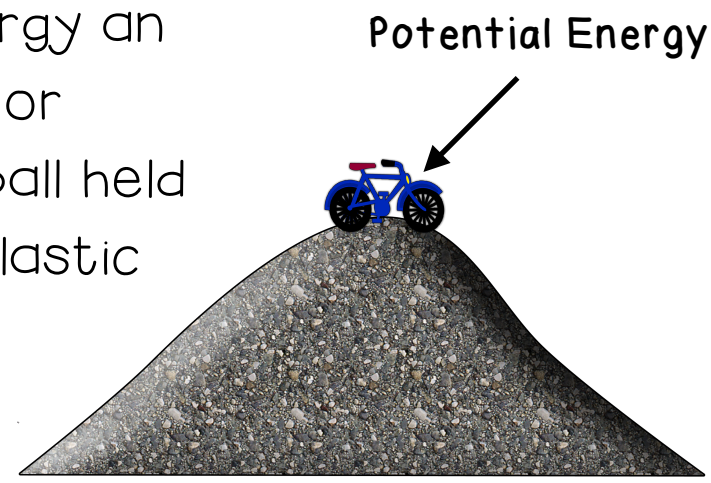
D	P	O	T	E	N	T	I	A	L
T	R	A	I	T	S	N	G	H	S
A	K	I	N	E	T	I	C	Y	D
I	N	H	E	N	E	R	G	Y	H
Q	E	E	W	R	T	I	O	I	E
V	M	O	T	I	O	N	T	C	A
L	K	J	H	G	F	C	I	A	T
M	N	V	D	S	P	T	O	L	N
W	O	R	K	N	I	S	N	S	M
B	E	H	A	V	I	O	R	A	L

Vocabulary:

- ENERGY
- WORK
- MOTION
- KINETIC
- POTENTIAL
- HEAT

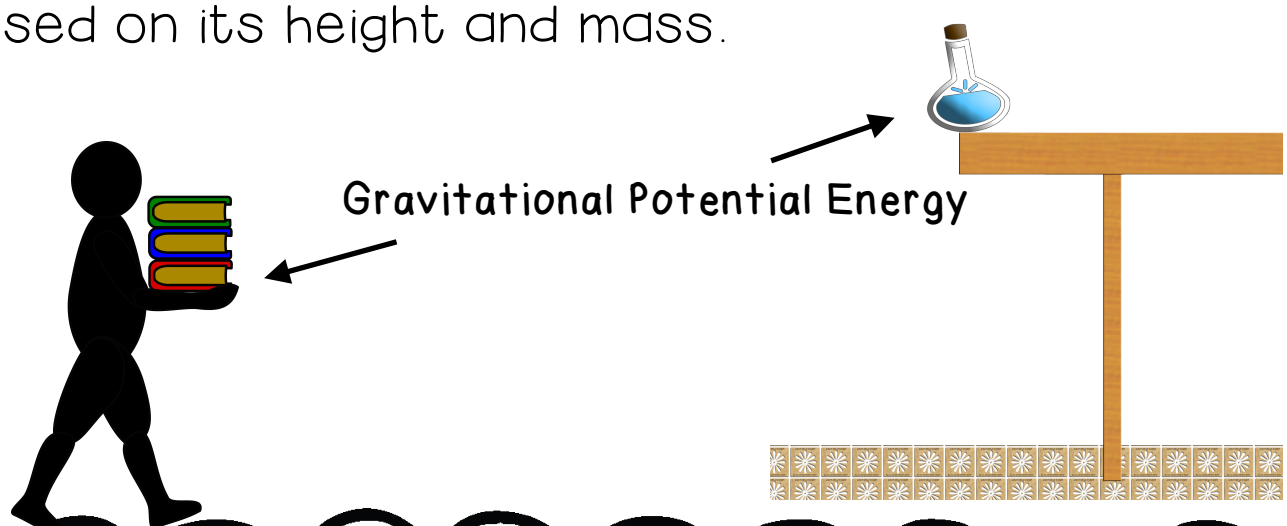
Potential and Kinetic Energy

Potential energy is the stored energy an object has because of its position or state. A bicycle on top of a hill, a ball held over your head, and a stretched elastic band all have potential energy.



Potential energy is stored energy while kinetic energy is the energy of motion. When potential energy is used it is converted into kinetic energy. You can think of potential energy as kinetic energy waiting to happen.

One type of potential energy comes from the Earth's gravity. This is called gravitational potential energy (GPE). Gravitational potential energy is the energy stored in an object based on its height and mass.

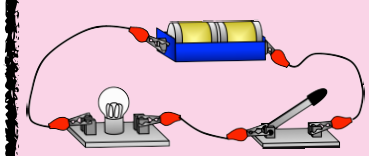


Potential and Kinetic Energy

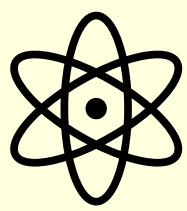
How much potential energy something has depends on how much work must be done to get it into its position. For example, lifting a small book and putting it on the table gives the book the same amount of energy it took to lift it. Lifting a bowling ball and putting it on the table takes much more energy and therefore, it has more gravitational potential energy.

Other Types of Potential Energy:

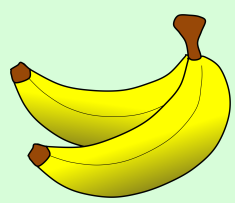
Elastic - Elastic potential energy is stored when materials stretch or compress. Examples of elastic potential energy include springs, rubber bands, and slingshots.



Electric - Electric potential energy is the capacity for doing work based on the object's electric charge.



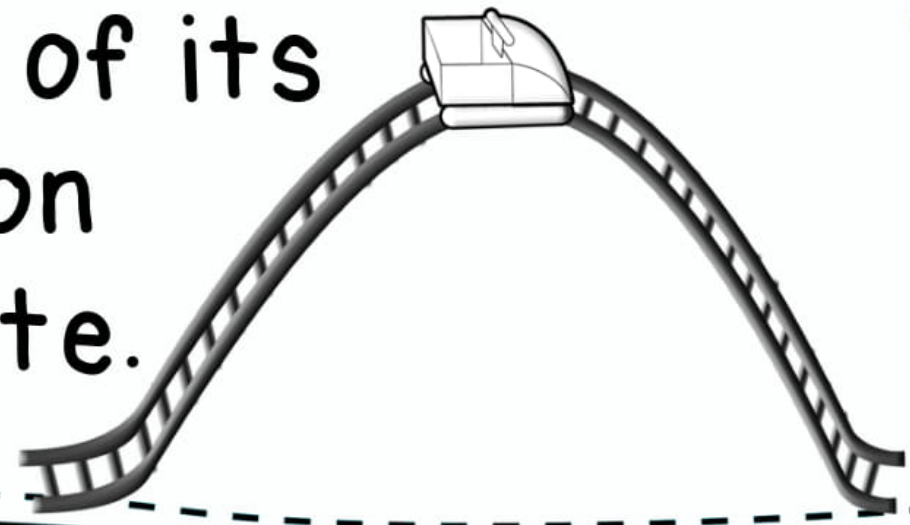
Nuclear - The potential energy of the particles inside an atom.



Chemical - Chemical potential energy is the energy stored up in substances due to their chemical bonds. One example of this is the

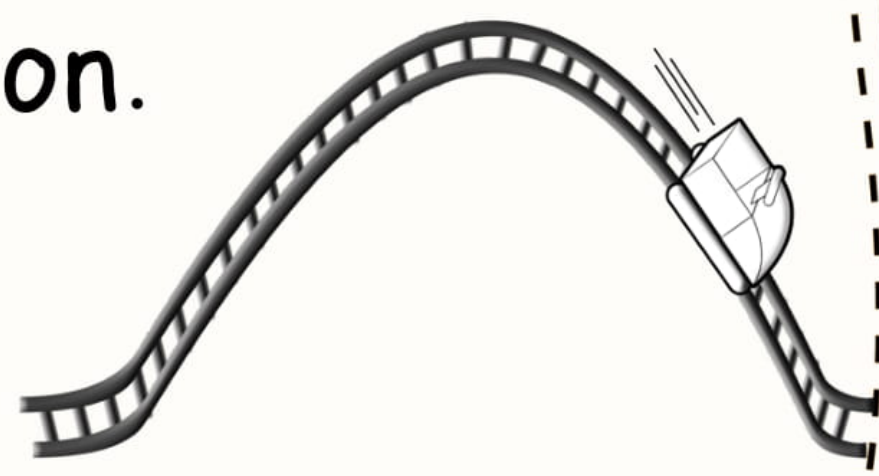
Potential Energy

Energy stored in an object as a result of its position or state.



Kinetic Energy

Energy an object has because it is in motion.



Let's check your understanding...

Use the information on the previous page to answer the following questions:

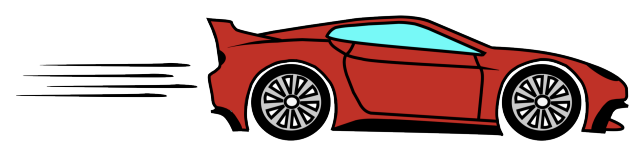
Q1: What is potential energy?

Q2: What is kinetic energy?

Q3: What type of energy has the capacity for doing work based on the object's electric charge.

Q4. Name one type of potential energy:

Q5: What type of energy does a moving car have?



Score	/5

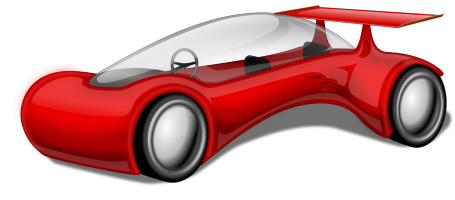
ROCKIN' Race Cars

Question: What happens to the distance your car travels as you increase the height of the ramp?

Height of Ramp	Distance			
	1st attempt	2nd attempt	3rd attempt	Average

What do you think would be the best way to display this data?

Bar Graph ☐
Line Chart ☐
Pie Chart ☐



Rockin' Race Cars

Create a graph to display your data:

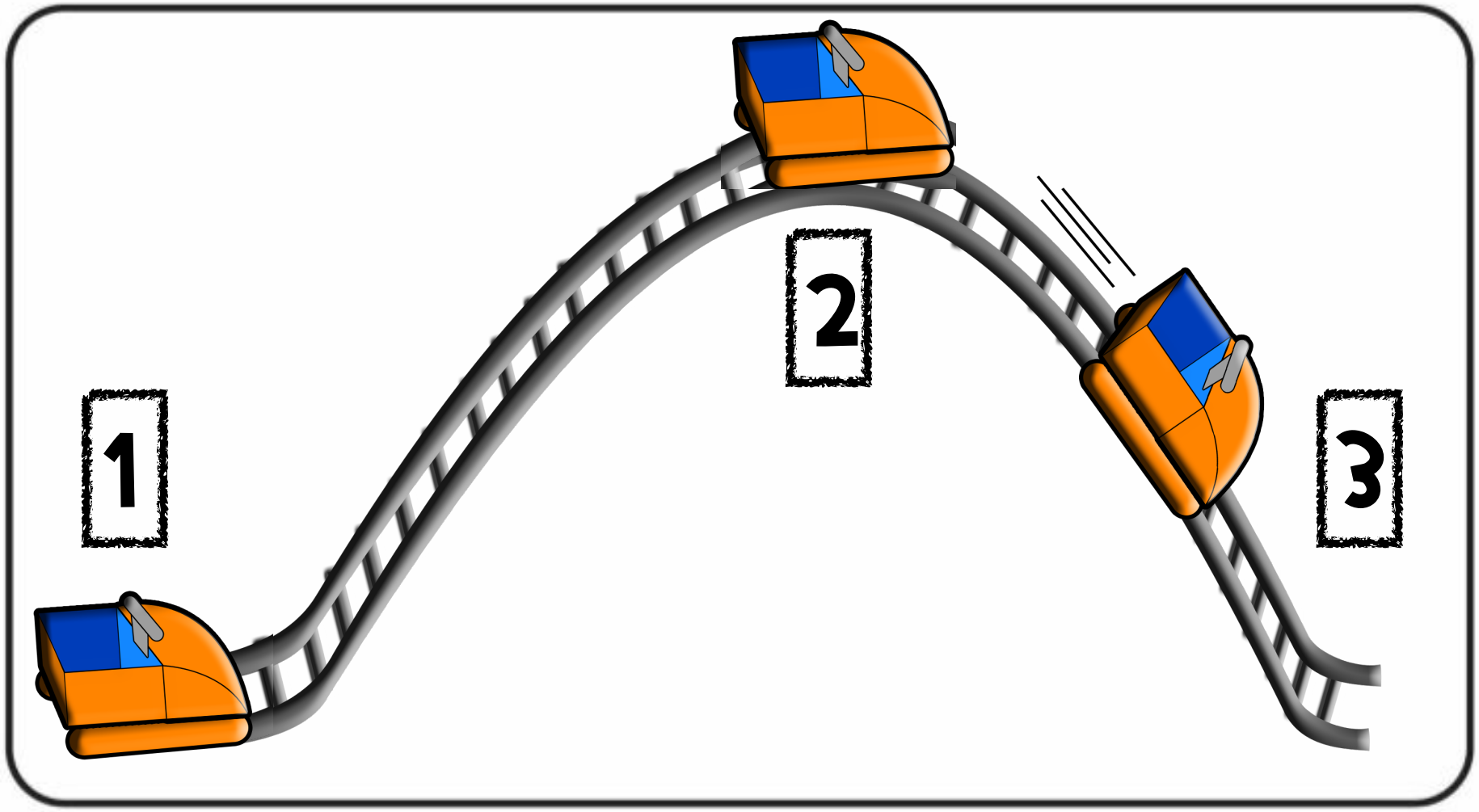
Conclusion:

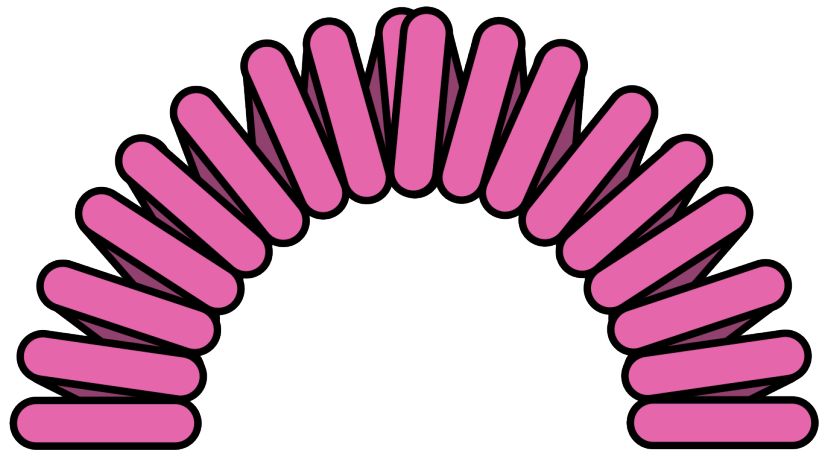
Now it's time to look at your graph and write your conclusion. Use scientific vocabulary, and your knowledge of potential/kinetic energy to explain your results.

Reflection

Date: _____

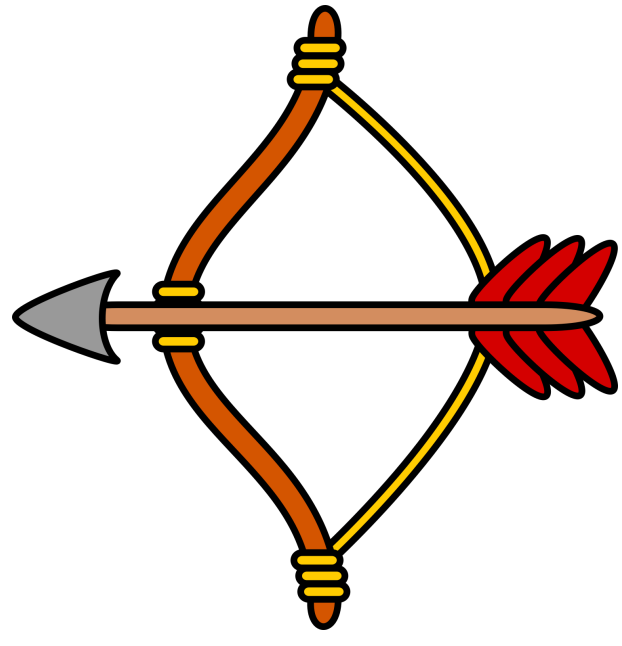
On a roller coaster, energy changes from potential to kinetic energy and back. Can you describe the energy of each stage of this roller coaster going up and down a hill?





Lesson 4

Elastic Potential Energy



Time to Think!

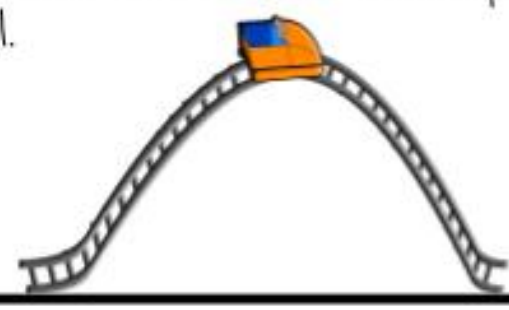
Can you identify if the image is an example of potential or kinetic energy? Write **p** or **k** next to the image.

A bike at the top of a hill

A bike moving down a hill

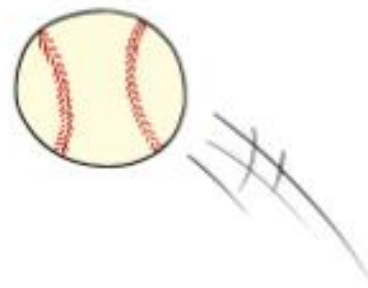
Holding a ball above your head.

A roller coaster at the top of a hill.



A parked car

A ball moving through the air



A batter waiting to bat

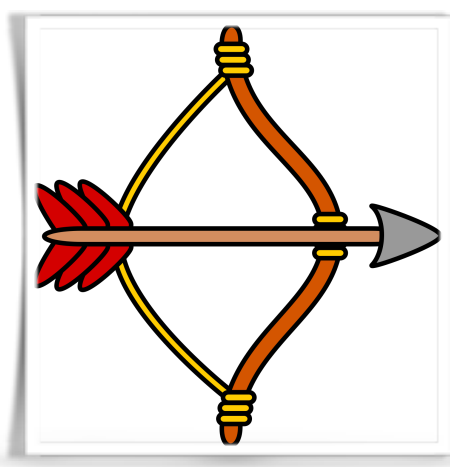
A bottle on the edge of a table

Elastic Potential Energy

Energy is the capacity to do any work. Potential energy is a form of energy that an object possess because of its position, in other words, it has stored energy. Potential Energy can be one of three types:

- ☑ Gravitational
- ☑ Chemical
- ☑ Elastic

Elastic potential energy is the energy stored in elastic materials such as springs and rubber bands. If we compress a spring, the force we apply to it will be stored as elastic potential energy. If we move our hand the spring will bounce back and return to its original position. Elastic bands also store potential energy, the further it is stretched the more potential energy it has. A bow and arrow uses elastic potential energy to make the arrow move. The further back you pull the elastic will determine how far the arrow goes because the more you stretch it, the more potential energy you are creating.



Let's check your understanding...

Use the information on the previous page to answer the following questions:

Q1, What are the three types of potential energy?

Q2. What is elastic potential energy?

Q3. What would happen if you compressed a spring with your hand and then let go?

Q4. How does a bow and arrow use elastic potential energy?

Q5. If I wanted to make the arrow go further away what would I need to do?

.

Score	/5

Catapult Challenge!

Let's explore Elastic potential energy by building an awesome catapult

What you will need:

- 4 x Pencils
- 1 x Popsicle stick
- 1 x Plastic bottle top
- Tape or Glue
- Scissors
- 10 x Elastic Bands

*** Follow the instructions on the video on how to build your catapult***

<u>Crazy Catapult Competition!</u>

1. Find a partner or play in teams.
2. Set 3 bowls in front of the catapult at 3 different distances.
3. Take it in turns to fire a paper ball into the bowls.
4. The bowls score 1 2 and 3 points. The furthest being 3.
5. Take it in turns until each team has played 10 times
6. The highest score wins.
7. Use the recording sheet on the following page.

Crazy Catapult Competition

Team 1	Team 2
Total	Total

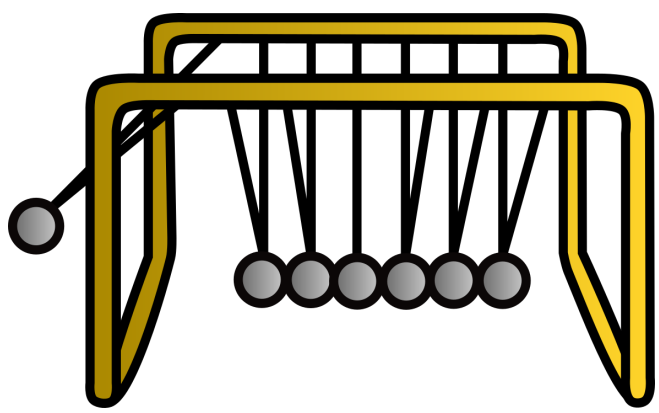
Reflection

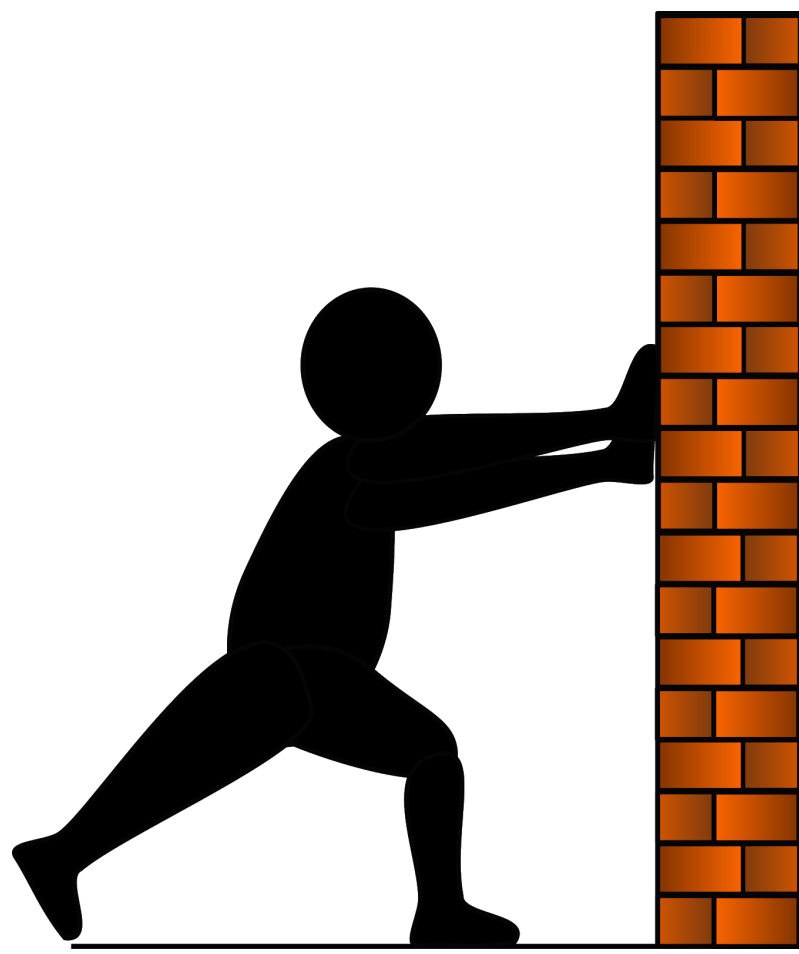
Date: _____

How did you make the catapult shoot different distances? Explain your strategy using your knowledge of energy.

Lesson 5

What happens when two objects collide?





Time to Think!

When you catch a moving ball, what happens to the kinetic energy? Why does the ball just stop moving? Where did the energy go? What happens when your hand and the ball collide?

What happens when two objects collide?

If energy can neither be created or destroyed, where does the energy go when you catch a moving ball? When two things collide with each other, they exchange energy. The energy is either transferred to or it is converted. When you catch a moving ball the kinetic energy is transferred to your hand. That is why your hand may move back when you catch the ball. Imagine if someone threw a bowling ball at you!When you go bowling, you roll the ball down the lane giving it kinetic energy. When the ball collides with the pins the energy is transferred and the pins fall over.

Anything that has mass and velocity (is moving) has kinetic energy, and the heavier your car and the faster you're going, the more kinetic energy it has. However, the driver and passengers inside the car also have kinetic energy. So, if you suddenly need to stop the car, or the car collides with something, such as another car, then the energy from the car is transferred to the object it collides with but the passengers remain to have kinetic energy and will keep moving forward until the energy is transferred or converted. This is why safety features such as seatbelts and airbags were invented to help keep passengers safe in a collision. If you've ever experienced a collision, you would have noticed that you were jolted forward and your seatbelt held you back

What do you thin will happen if a D-Cell battery and a sugar cube collide?

Crush the Cube!

First, complete the activity without cushion wrap. Then design a protective coat for the sugar cube and repeat. Record your observations in the boxes

You will need:

- ☑ A kitchen roll tube
- ☑ A D-cell Battery
- ☑ Cushion Wrap
- ☑ Sugar Cubes

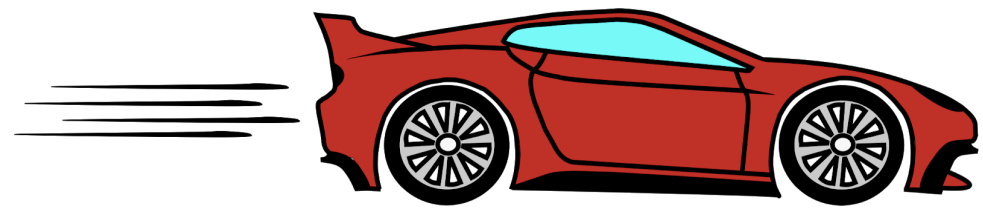
Distance	Without cushion Wrap	With Cushion Wrap
2cm		
5cm		
10cm		
15cm		

Reflection

Date: _____

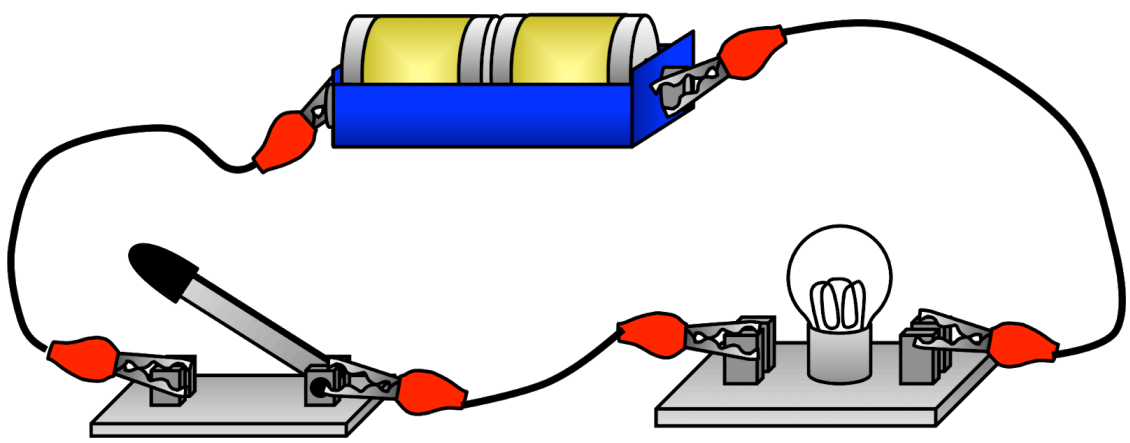
Draw a sketch of your protective design from today's task.

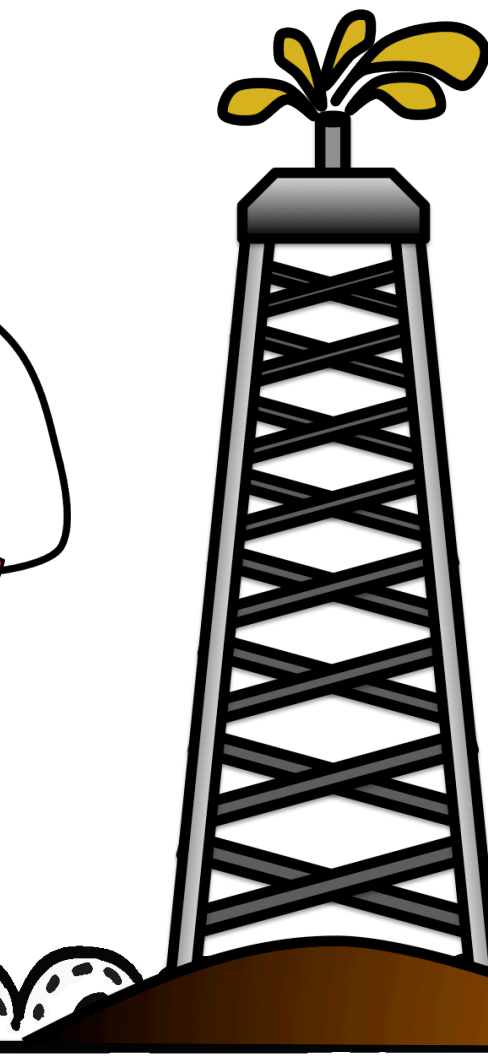
How does cushion wrap protect a sugar cube from a collision with a battery?



Lesson 6

Forms of Energy





Time to Think!

You're going to need good research skills to deal with this unit. What are some examples of effective research techniques?

Fill out a do's and don'ts, about how to conduct good research, and then share with a friend.

DO'S

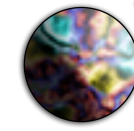
- Use different sources

DON'TS

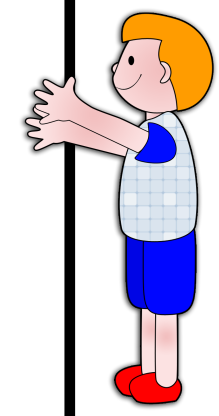
- Use one source

Forms of Energy

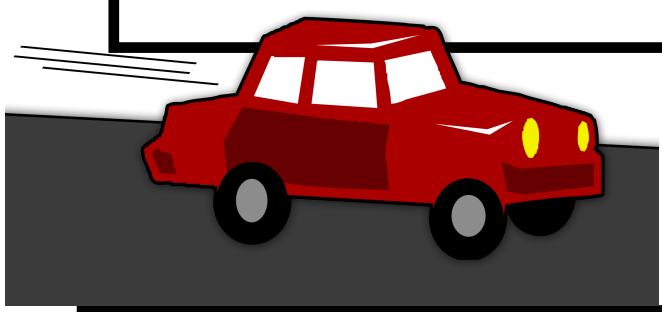
Energy comes in two basic forms: potential and kinetic. Potential Energy is any type of stored energy whereas Kinetic Energy is found in movement. There are many different types of potential and kinetic energy. Your tasks is to conduct some research to find out more about them.



Read the following instructions:



1) You must define the form of energy
2) Find out if it is a potential or kinetic form of energy
3) 3) Look for examples of how this energy is used in the world today.



Challenge:

Once you have completed your research. Choose one form of energy to research in more detail. Use this research to create an informational text, a poster, or a presentation about this form of energy.

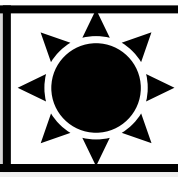
Forms of Energy- Research

Type of Energy		Chemical Energy
Definition		
Potential or Kinetic		Example

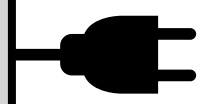
Type of Energy		Nuclear Energy
Definition		
Potential or Kinetic		Example

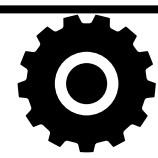
Forms of Energy- Research

Type of Energy		Gravitational Energy
Definition		
Potential or Kinetic		Example

Type of Energy		Radiant Energy
Definition		
Potential or Kinetic		Example

Forms of Energy- Research

Type of Energy		Electrical Energy
Definition		
Potential or Kinetic		Example

Type of Energy		Mechanical Energy
Definition		
Potential or Kinetic		Example

Forms of Energy- Research

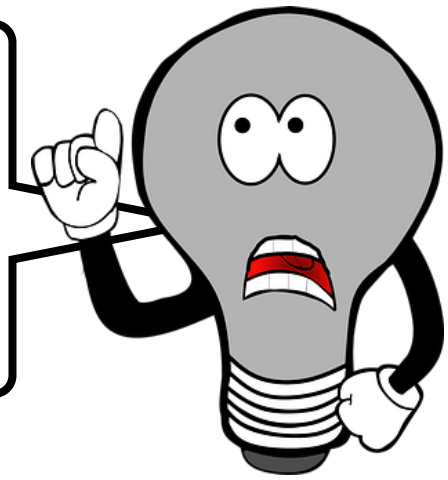
Type of Energy		Sound Energy
Definition		
Potential or Kinetic		Example

Type of Energy		Thermal Energy
Definition		
Potential or Kinetic		Example

How am I supposed to remember all those forms of energy?

Easy...Just remember:

Cam **N**ewton **L**ikes **M**aking **S**tinky **T**acos!



or...

SCREAM **T**oday

Can you create your own mnemonic to remember the 7 forms of energy?

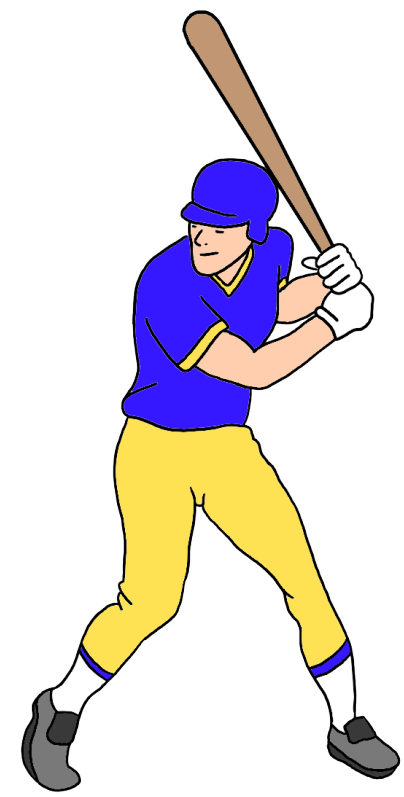
Reflection

Date: _____

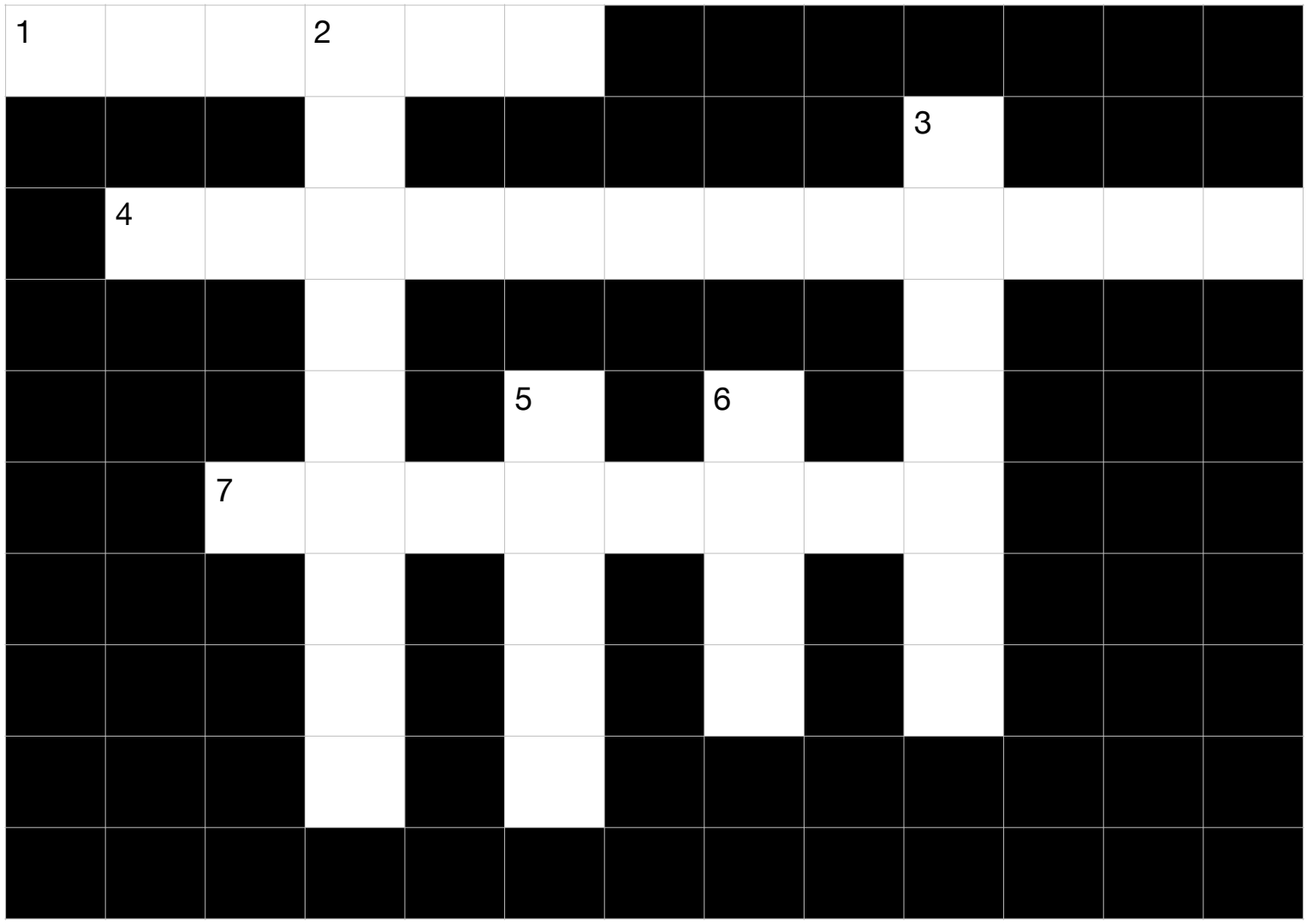
What form of energy do you think is the most useful on Earth? Why? Explain your ideas below:

Lesson 7

Energy Transfer and Transformation



Vocabulary Crossword



Across

1)What we need to work and play

4) An energy source that can run out

7) The energy source we use in a car

Down:

2) An energy source that will never run out

3) An energy source used in flashlights

5) Energy that comes from the sun

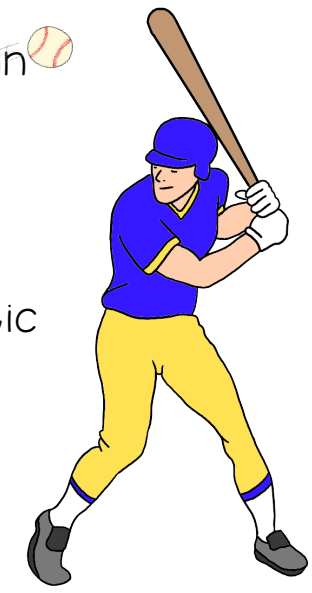
6. Energy source that uses windmills

Energy Transfer and Transformation

So.... What do we know about energy so far? Let's recap!

- ☑ **All things possess energy even if they are not moving.**
- ☑ **Energy cannot be created or destroyed. This statement is known as the Law of Conservation of Energy. It means that the amount of energy in the universe is always the same.**

If the amount of energy is always the same then how does an object get more or less energy? When we learned about collision, we discovered that energy can be transferred to another object, for example, when a bat hits a ball, the kinetic energy from the bat is transferred to the ball which causes the ball to move.



Energy can also be transformed into a different form for example, a firework is one of the most spectacular energy transformations; you can not only see it but also hear, feel and smell it. When fireworks are ignited, the chemical energy stored in the substances inside them is quickly transformed into movement (kinetic energy), light energy, sound energy and thermal energy (more commonly called heat).

Scan the QR code to find out more!

Let's check your understanding...

Use the information on the previous page to answer the following questions:

Q 1: What is the Law of Conservation of Energy?

Q2. Give an example of energy transfers?

Q3. What is energy transformation?

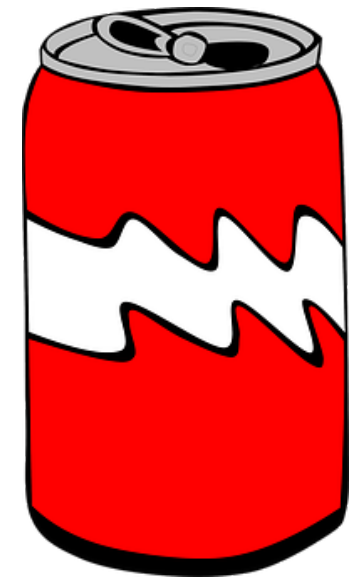
Q4. What form of energy is the chemical potential energy of a firework transformed into?

Q5. Can you give an example of energy transformations?

Score	/5

"The Most Outrageous Way to Share a Coke"

Scan the QR code to watch this video. Take notes of any energy transfers or transformations that you see.



Transfers	Transformations

Energy Transformations

Take a look around the classroom. Can you find 3 examples of energy transformations? Draw a picture of each object and explain the energy transformations.

Helpful Vocabulary:

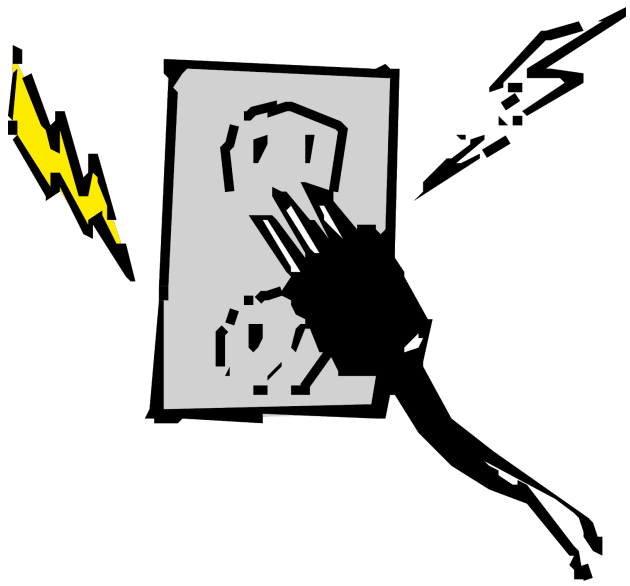
radiant (light) thermal (heat), sound, mechanical, potential, kinetic, chemical

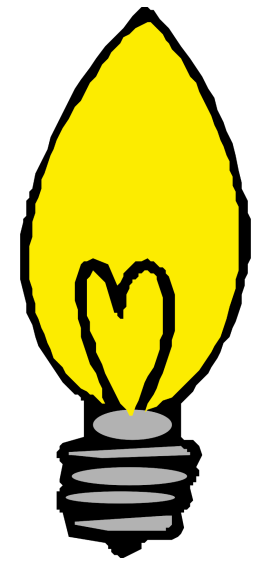
Picture	Energy Transformation

Reflection

Date: _____

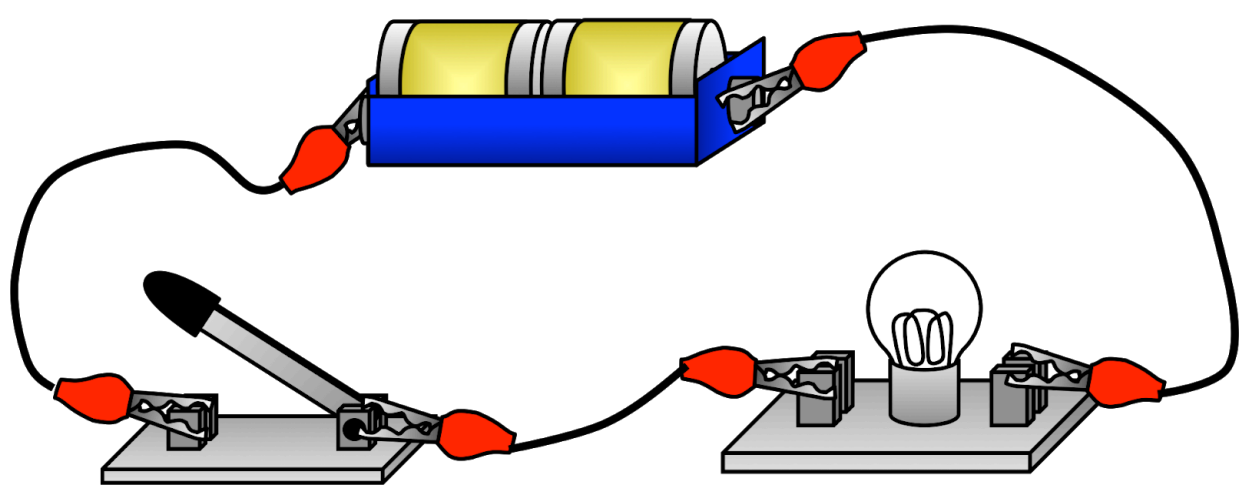
What is the difference between an energy transfer and transformation? Use "The most outrageous way to share a coke" to give examples.





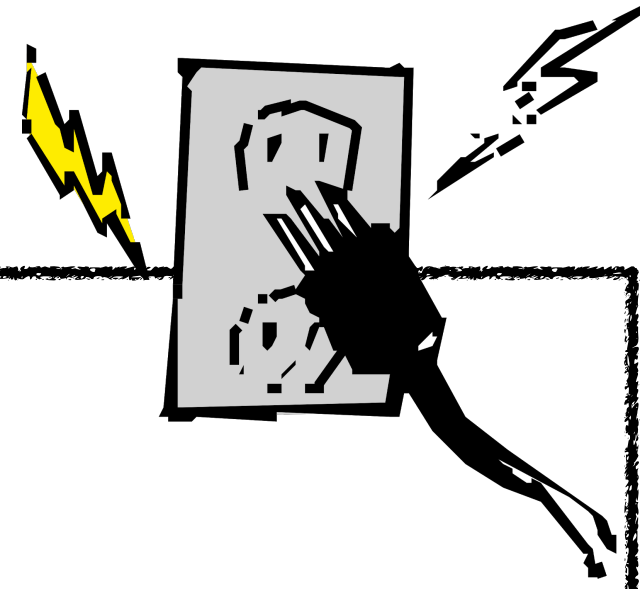
Lesson 8

How can we convert electrical energy?



Time to Think!

How many electrical items have you used today?



Welcome to the Science Lab

Today your classroom has been transformed into a 'lab'. Scientists use labs to conduct science experiments and observations. Scientists know they must work safely when conducting any experiments. So, when we compete this experiment you must make sure to follow these rules:

1. Listen to the teacher's instructions
2. Read the activity instructions before starting
3. Ask questions if you do not understand
4. Keep your work area neat and clean
5. Clean up any spills or messes straight away
6. Never taste or smell substances unless your teacher tells you to.
7. Handle sharp items carefully at all times.
8. Tell your teacher if you have an accident or something looks unsafe.
9. NEVER use products or tools for anything other than their purpose
10. Wash your hands when finished

Today's Task

Today you will visit a range of stations where you will be observing how electrical energy is transformed into other forms of energy.

Instructions:

1. Go to the station you are assigned by your teacher.
2. Read the directions at the station very carefully.
3. Choose one member of the group to follow the instructions carefully as the rest of your group members read the instructions.
4. Discuss your observations with your group members.
5. Record your observations and conclusions on your lab report.
6. When instructed by your teacher, clean up the station to its original set-up.
7. Move on to your next station and repeat.

Lab Report

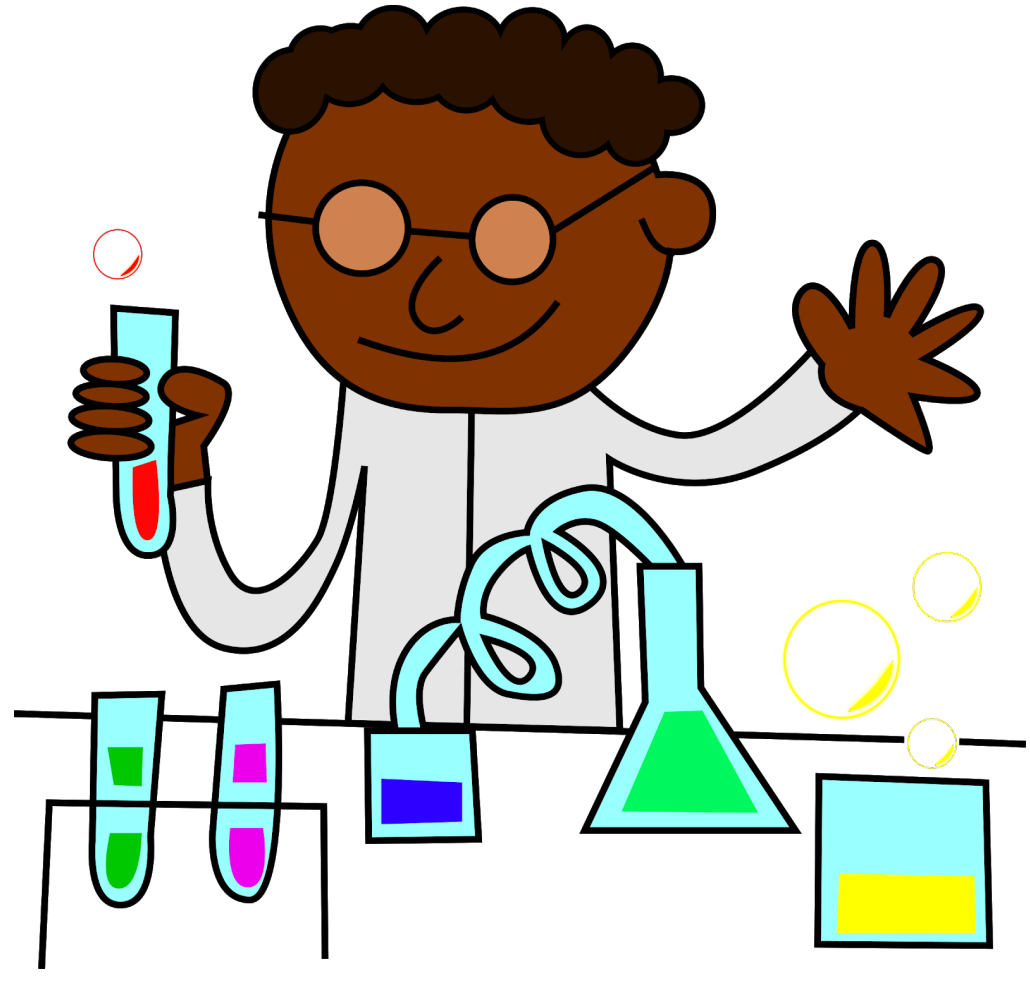
Station A	Hypothesis
	Observations/Conclusions
Station B	Hypothesis
	Observations/Conclusions

Lab Report

Station C	Hypothesis
	Observations/Conclusions
Station D	Hypothesis
	Observations/Conclusions

Lab Report

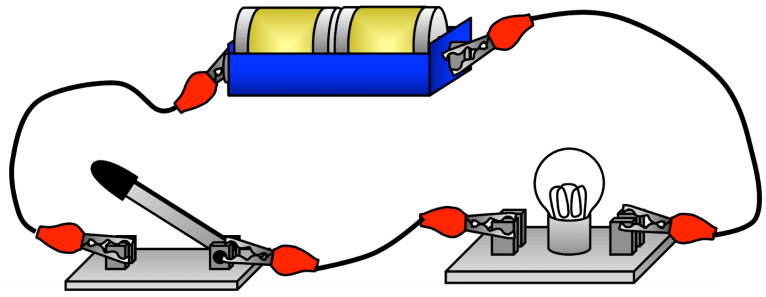
Station E	Hypothesis
	Observations/Conclusions

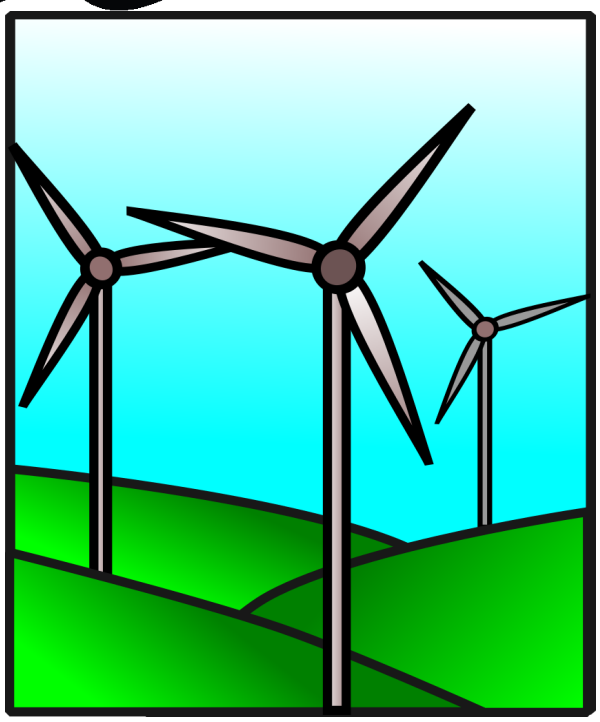


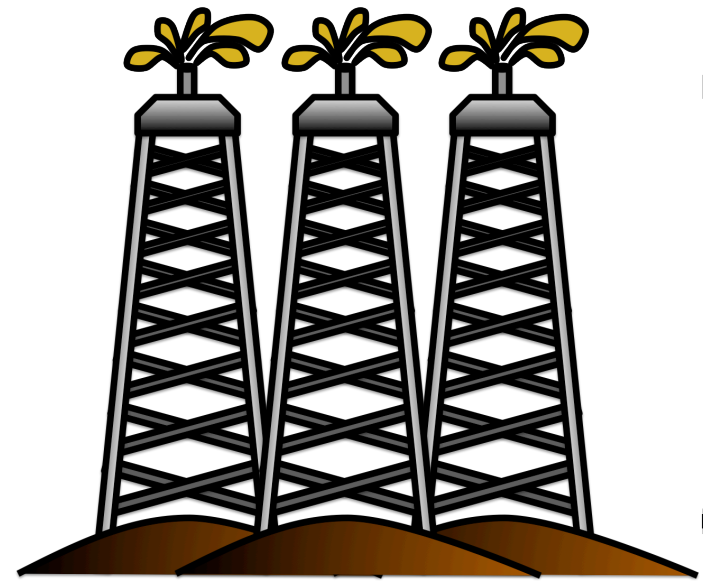
Reflection

Date: _____

What would your life be like without electricity?

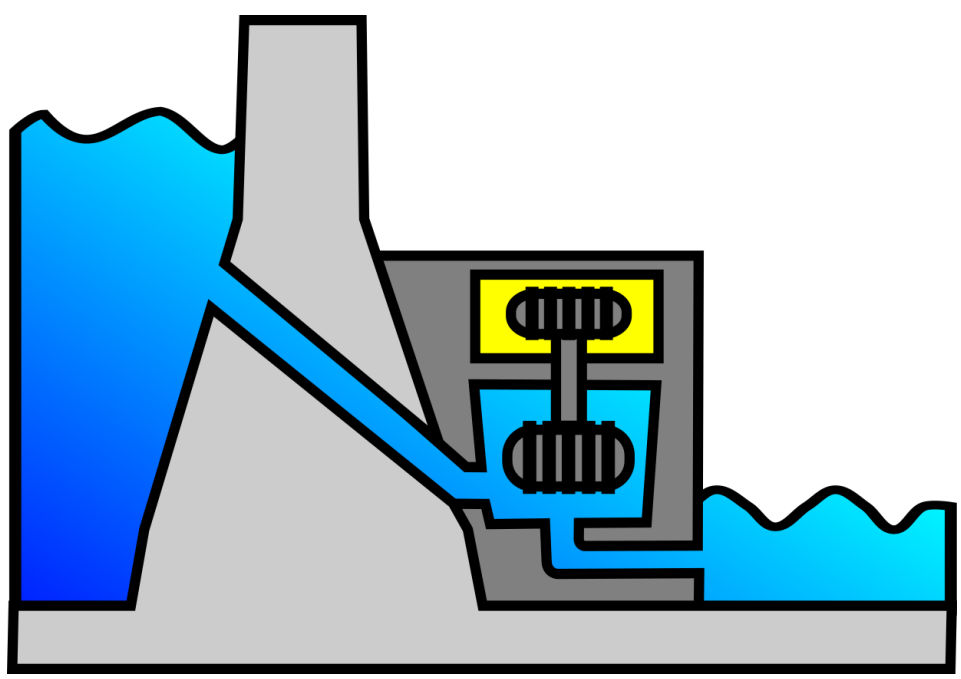


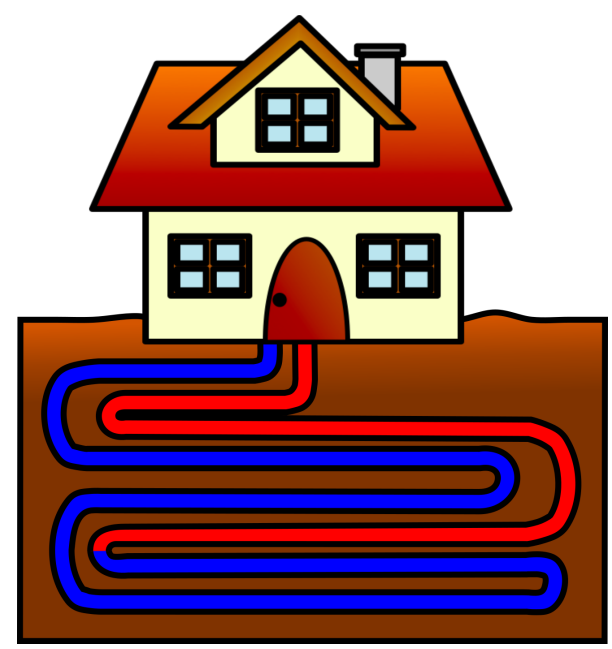




Lesson 9

Where does energy come from?



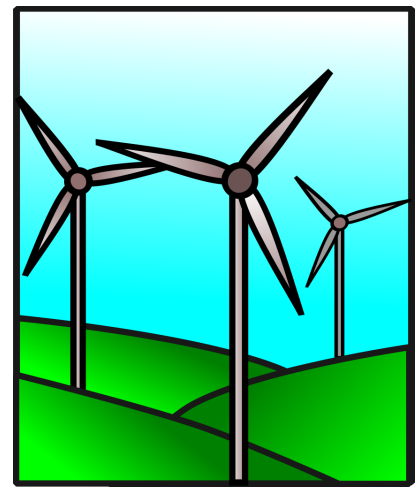


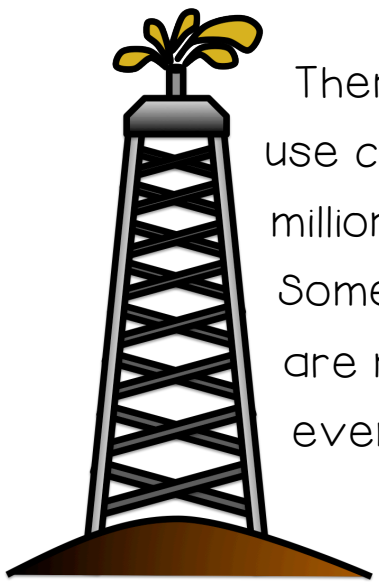
Time to Think!

Where does energy come from?

Where does energy come from?

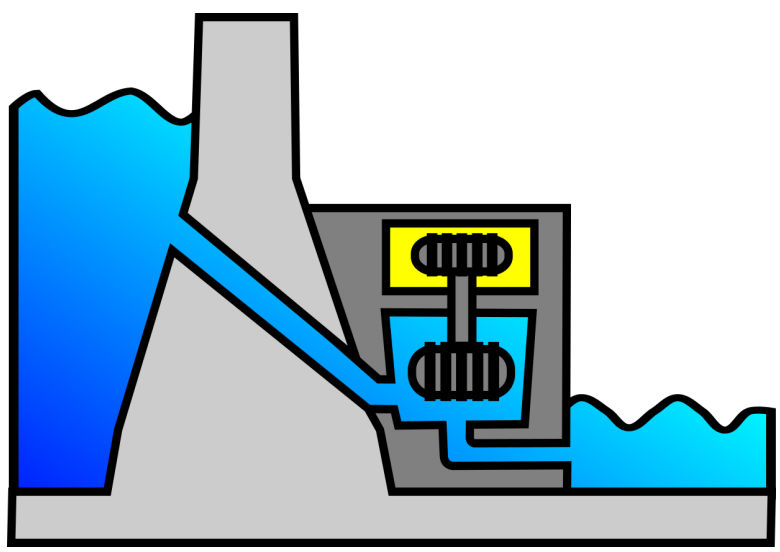
You use many different kinds of energy everyday. In fact you are using energy right now. Whenever your body does something you are using chemical energy. When you look at something you are making use of light energy and if your feeling cold, you warm yourself by a fire, you are using heat energy. But where does this energy come from?

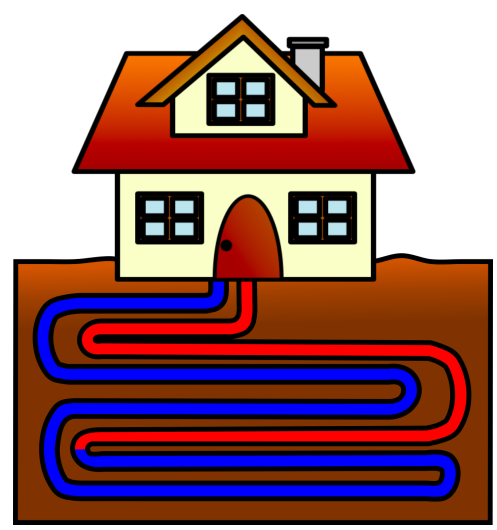




There are many sources of energy Most of the energy we use comes from fossil fuels. Fossil fuels are formed over millions of years from the remains of dead plants and animals. Some examples include, coal, natural gases, and oil. Fossil fuels are nonrenewable, which means we can't make more so eventually they will run out.

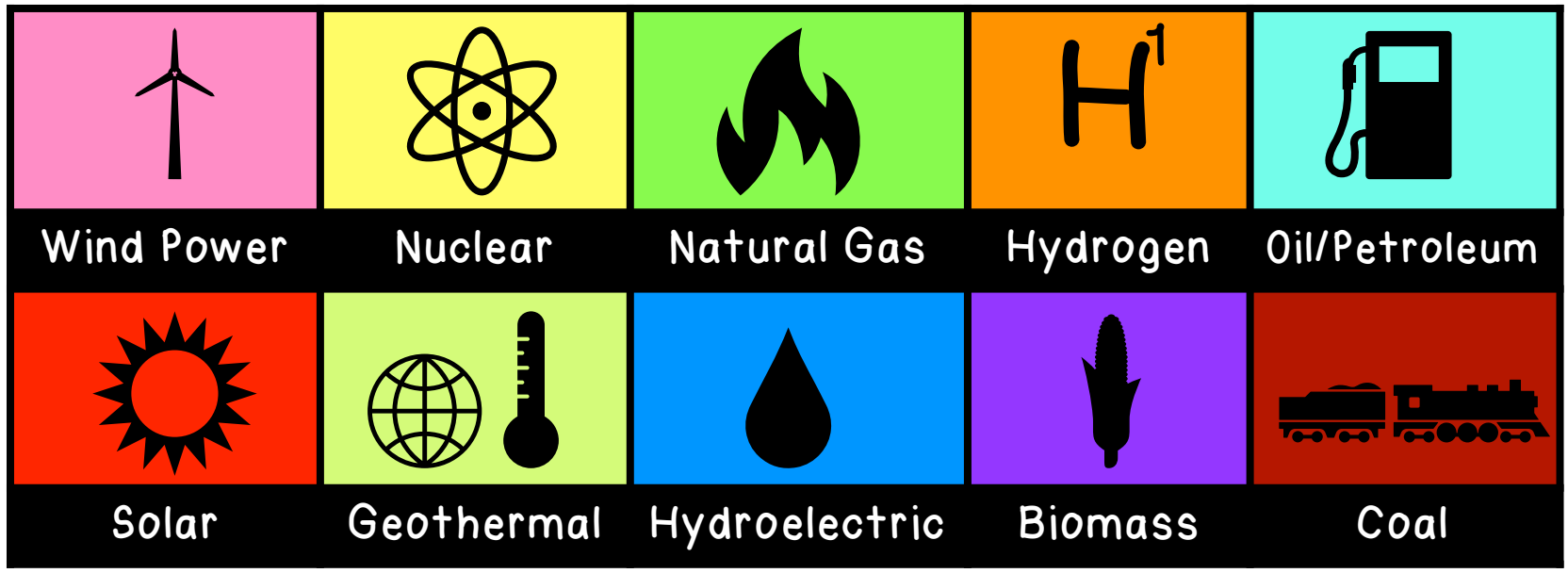
We can also generate energy from renewable sources. We use the Earth's natural elements to gather energy, for example we use the solar energy from the sun, wind energy, and water.We use these energy sources to transform that energy into different uses.





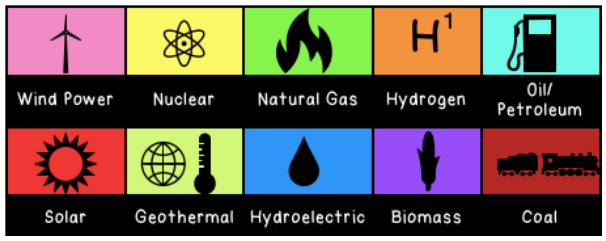
Energy Sources

Match the correct energy source to the definition.



Source	Definition
	Black rock burned to make electricity
	Energy from heat inside the earth
	Energy from flowing water
	Energy from wood, waste and garbage
	Energy from moving air
	Energy from splitting atoms
	Fossil fuels for cars, trucks and jets
	Energy in rays from the sun
	Fossil fuel gas moved by pipeline
	Portable fossil fuel used in grills

Information Report



Choose one energy source and create a report answering these questions:

1) Describe the energy source. (What is it? How does it work?)

2) Is the energy source considered renewable or nonrenewable?

3) What is the history of the energy source?

4) Where is the energy source found?

5) How is the energy source recovered?

6) How is the energy source stored once it is recovered?

7) How is the energy source used today?

8) What are the advantages of the energy source?

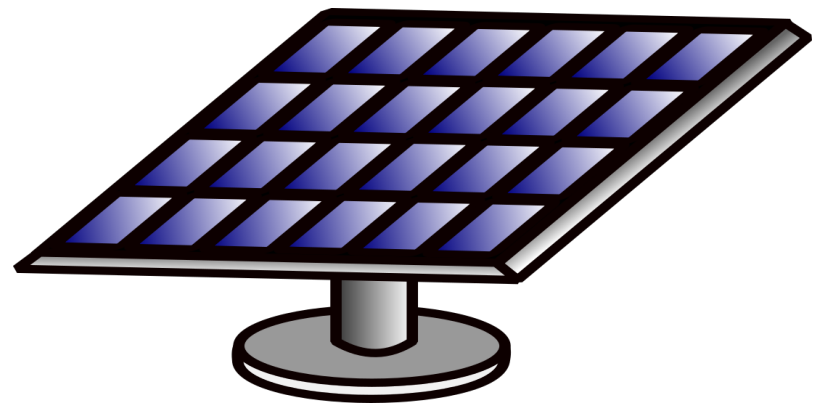
9) What are the disadvantages of the energy source?

10) Are there any other interesting facts about the energy source?

11) What is the future of the energy source?
12) What were the sources of your information?

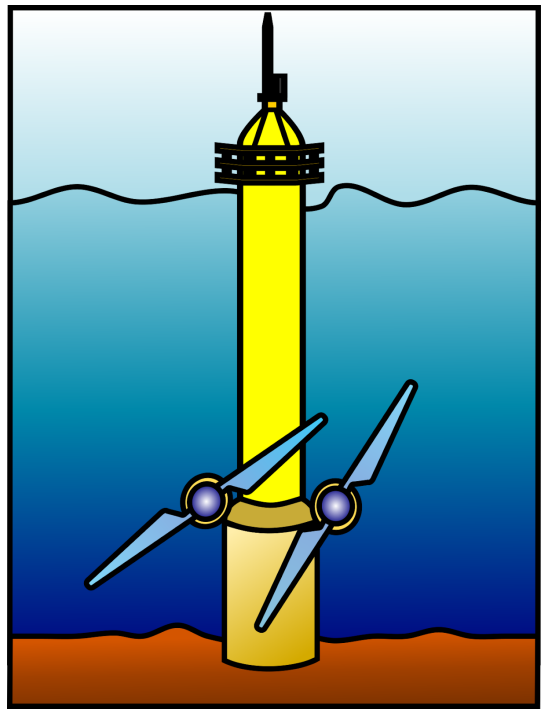
Information Report:

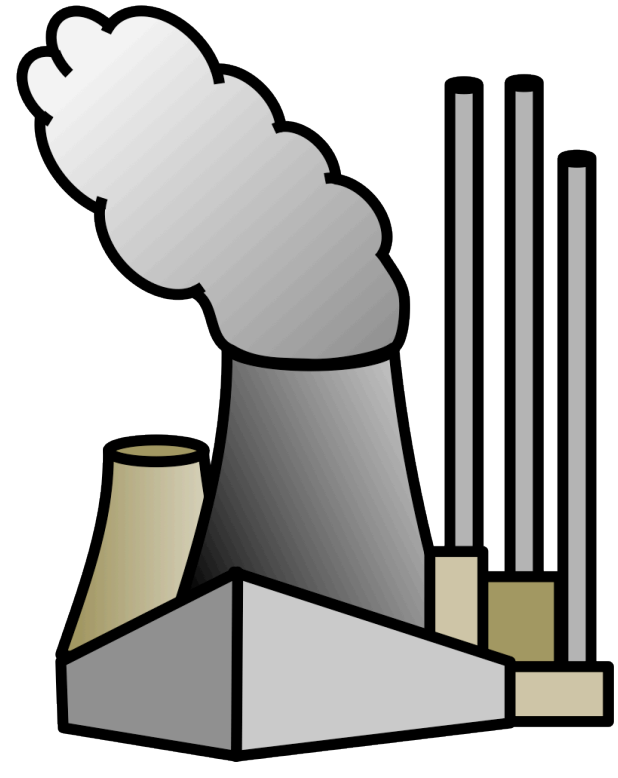
_____



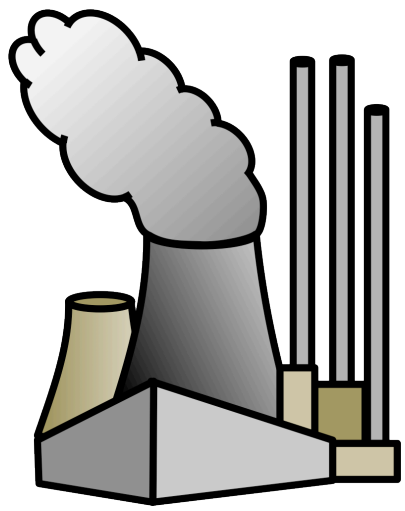
Lesson 10

Renewable and Nonrenewable energy





Time to Think!



How do you think this nuclear plant affects the Earth?

Fossil Fuels

Fossil fuels are formed from the remains of ancient plants and animals, buried deep inside the Earth for millions of years.

Over a long, long time, heat and pressure has turned these remains into the fossil fuels that we call coal, oil and natural gas. Today, fossil fuels are mined and burned to release the energy stored inside them.

Fossil fuels are widely used because there is a good supply and they are fairly cheap to mine and drill for. However, fossil fuels are non- renewable, which means that one day they will be all gone. People can't make fossil fuels!

Another problem with using fossil fuels is the effect on the environment. When they are burned, they release a variety of poisonous gas which pollutes the air we breathe and affects our atmosphere. Additionally, retrieving the fossil fuels requires big machinery to dig under the Earth's crust which causes damage to our lands and the animals and plants that live there.

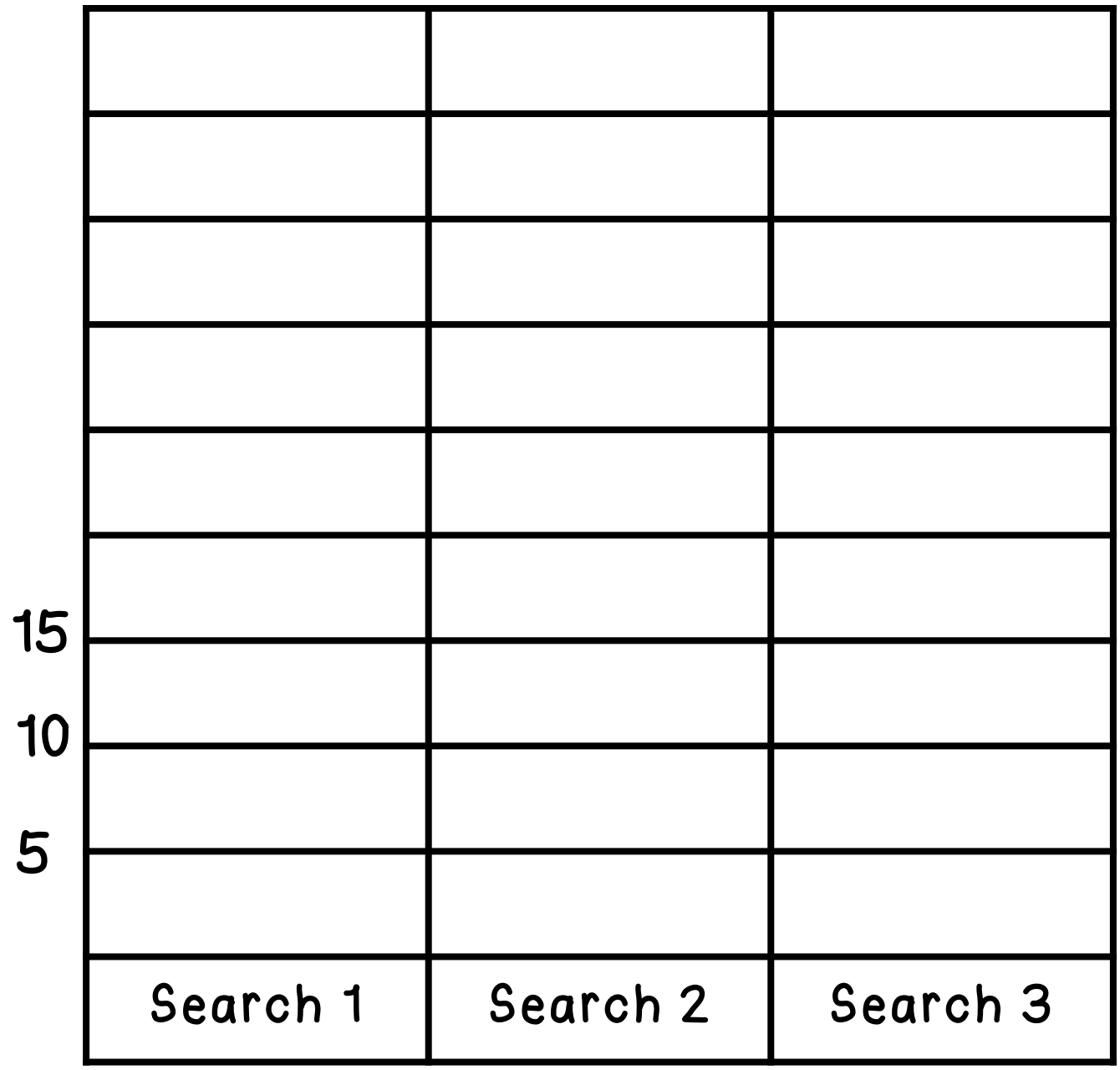
Energy Hunt

You've been hired by an energy company to find coal deposits. The coal you find will be burned to produce electricity for homes and businesses.

In this activity, you will search for pennies three times. You only have 30 seconds to search each time! After each search, you will count the pennies, record the total, and deposit them in the correctly numbered cup.

Round	How many pennies did your group find?
1	
2	
3	

Graph your results:



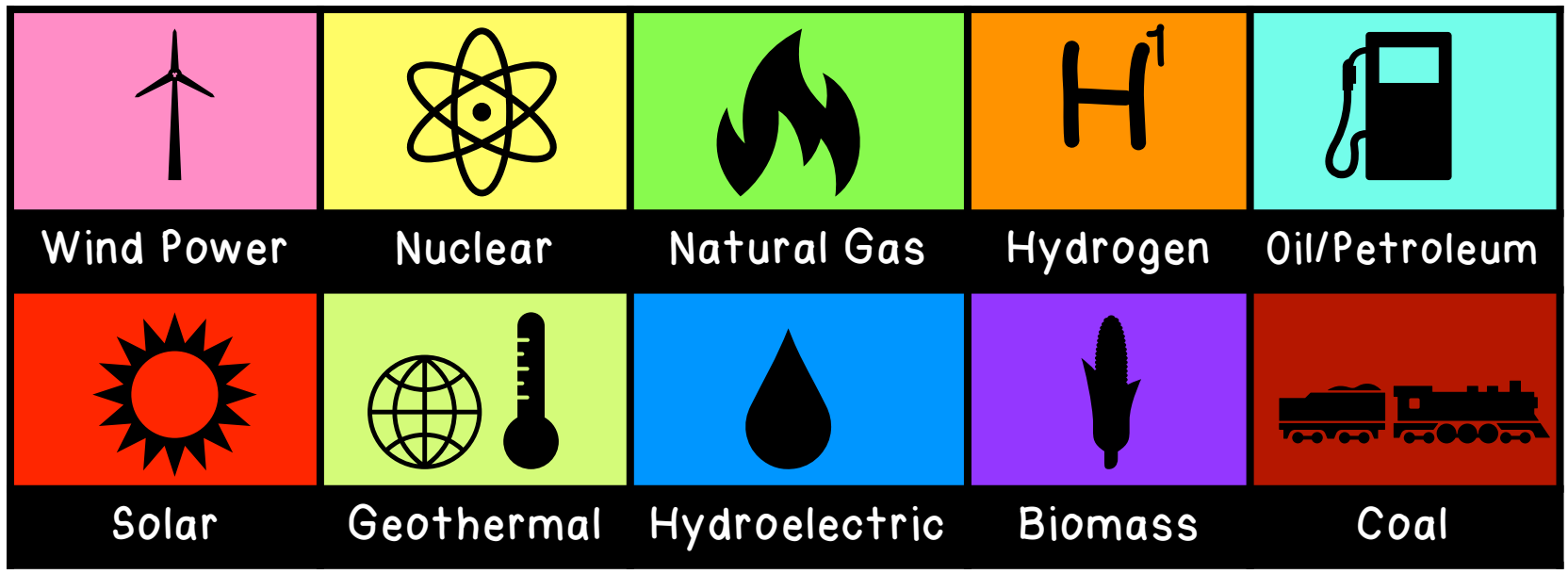
Reflect:

When did you find the most pennies?

Did the number of available pennies increase or decrease?

Renewable and Nonrenewable Energy

Can you organize the energy sources into renewable and nonrenewable?



Renewable	Nonrenewable

Renewable Energy

Renewable energy is any form of energy that comes from natural sources. What are some of the advantages and disadvantages of these renewable energy sources?

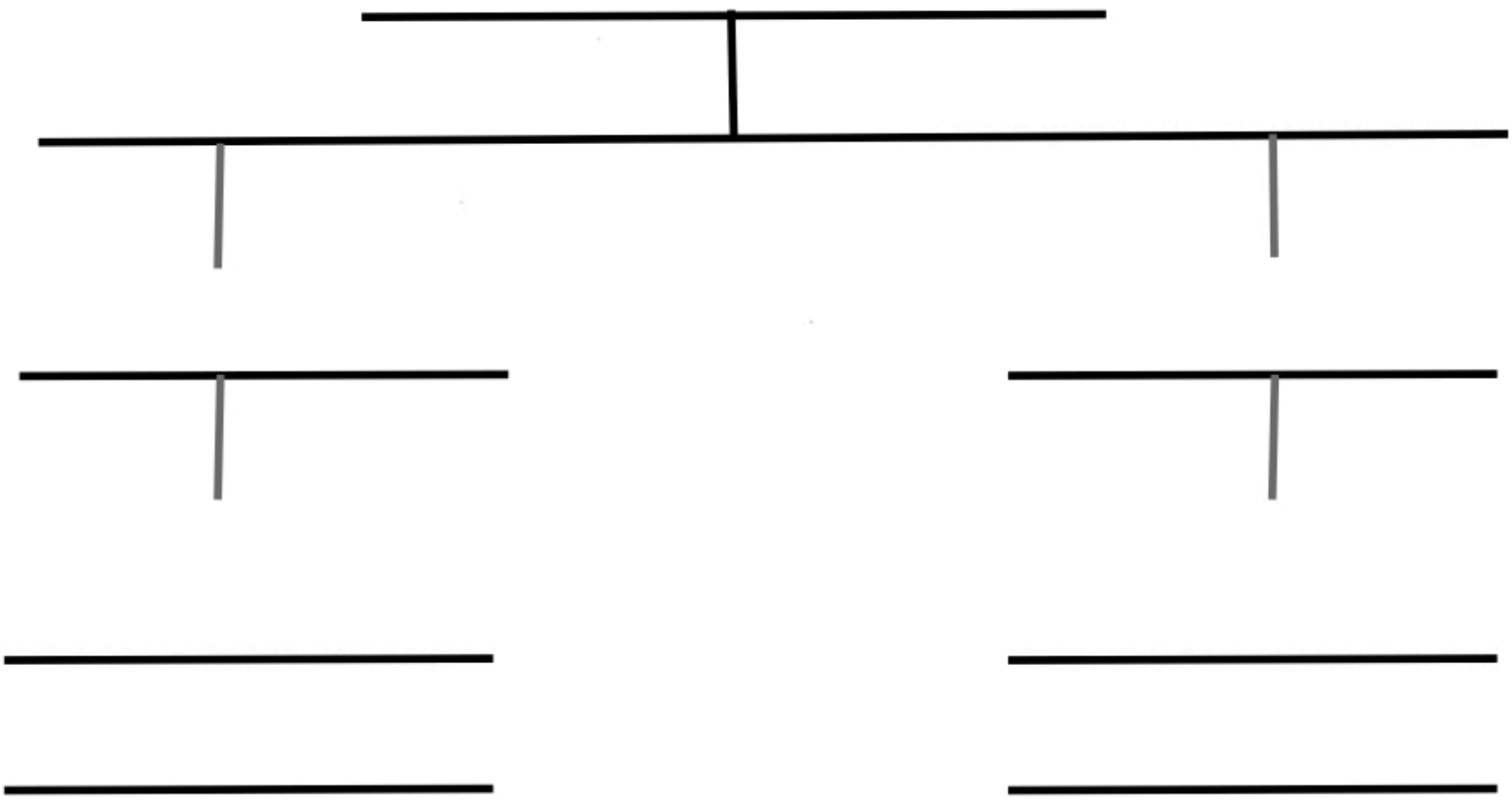
Energy	Adbantages	Disadvantages
wind power		
solar power		
geo - thermal		
Hydro electric		
Biomass		

Energy Sources

Can you complete the following tree map using these words about energy?

Energy Renewable Nonrenewable Solar Energy Battery

Gasoline Fossil Fuels Wind Energy Energy from Waves



Reflection

Date: _____

What is the difference between renewable and nonrenewable energy sources. What are some advantages and disadvantages of both?

End of Unit Assessment	
Q1	**The sun's energy provides Earth with:** a) hot objects b) speed of light c) light and speed d) lightning flashes
Q2	**Which of these best demonstrates radiation?** a) Glass of water left standing in the sun b) Cookies baking in the oven c) Pot of pasta boiling on the stove d) Thermos of hot chocolate
Q3	**A wind turbine converts:** a) Potential energy into electrical energy b) Kinetic energy into potential energy c) Chemical energy into kinetic energy d) Kinetic energy into electrical energy
Q4	**Nonrenewable resources:** a) Can be replenished in a few years b) Can take millions of years to form but not be replaces c) Can be easily transformed into renewable resources d) Are plentiful and do not need renewing.
Q5	**Which of these is an example of a biomass fuel?** a) Oil b) Natural gas c) Wood d) Coal

Q6	**Energy of motion is** A) Mass B) Potential C) Gravity D) Kinetic
Q7	**What is the result of using fossil fuels more rapidly then they are formed?** A) The reserve will eventually be used up B) The reserves will be refilled more quickly C) The reserves will not be affecte D) The price of fossil fuels will fall
Q8	**The three major fossil fuels are coal, natural gas and** A) Wood B) Oil C) Uranium D) Electricity
Q9	**What are the advantages of using solar energy to generate electricity and the disadvantages of using solar energy to generate electricity. (2 marks)** Advantage: Disadvantage:
Q10	**What is the difference between energy transfer and energy transformation?(2 marks)** Energy transfer is: Energy transformation is:

Total: / 12