Class: **6th Science** Dates**: 4/27- 5/1 – week 2** Expected time on tasks: **30 Min / school day**

Grading in Science: In our Distance Learning term, your science "class" will be project based. Each week there will be a final project that is required. The project will be broken into chunks that will each get independent grades outlined in the Focus chart below.

Week 2 Project: Conduct background research to understand what energy is and how it behaves.

Key Concepts:

- When the **motion** energy of an object changes, there is some other change in energy at the same time.
- Temperature is a measure of the mean/average **kinetic** energy of particles of matter, so when the kinetic energy of an object changes, so does the temperature of the particles in that object.
- Energy always transfers from hotter environments to cooler ones until the two environments are balanced.

Content Focus and Materials	Directions	Check-ins and support	Submission of work
Focus: ***What is Energy?*** Background research: • Ducksters: What is energy • Ducksters: The Science of Heat • Bill Nye: Energy (if possible) • Kinetic Energy article(s) Response Journal (can be completed on regular writing paper, they do not need to be printed.)	1) Read the two articles and complete the Reflection/Response. 2) If possible, watch the Bill Nye segment at: https://www.youtube.com/watch?v=8qmSzMwTkpk&t=33s 3) Read the Kinetic energy article(s) and complete the Reflection/Response. *Although the assignments are not technically due until 5/8, next week's Project will be based on the information in this week's background research, so please be sure to have gone through the exercises before you begin the week 3 project.	**E-mail office hours**: every school day, 8AM-3:30PM, after hours emails may be available if teacher schedules allow. **Video office hours:** **JOHNSTON** (history/science): Monday-Friday: 10:30 AM-12:30 PM Includes "Lunch with your Teachers" **MARTIN** (math/science): Monday – Thursday: 9:00 AM – 10:30 AM and 4:45 PM – 5:15 PM Friday: 9-10:30 and 12-12:30 "Lunch with your Teachers" **WHITE** (ELA/science): Monday-Thursday: 10:00 AM – 11:00 AM and 5:00PM-6:00PM Friday: 10:00AM-11:30 and 12:00-12:30 "Lunch with your Teachers"	***Since hard-copy work will not be returned to students, we request that as much work as possible be turned in on-line as the students complete it.*** Submission of paper copies of work can be made on 5/8 at Freiler.

Energy and Heat Reflection and Response:

(can be completed on paper, digitally as a Word doc, or printed and filled out – if submitting digitally, please ensure that pictures of paper work are clear)

Vocab: define these words Energy Equilibrium Conduction *one more word of your choice from either of the articles	As you read these two articles, what are 3 things you thought of that are related (they can be things you've experienced, read about, seen, in school or outside of it)? Explain why you think the experiences are related to the articles.
What are three things that you read in the article that you already knew?	What are two questions related to heat and energy that the articles made you wonder (that weren't answered in either article)?
Focus Question: In a well-written **paragraph**, explain how heat and energy are related/work together?	

Kinetic Energy Response and Reflection:

List 5 examples of kinetic energy in the real world.	Where are places/what are things around you that are examples of different types of energy? (Try to find examples of each of the types listed in the Ducksters "What is Energy" article)
Try this outside (be ready to chase your scientific evidence): Find a large ball and one that is smaller (example, a basketball and a tennis ball). Balance the smaller ball on top of the larger one and then let go of the larger one. Describe what happened (you can diagram it also if it will help your explanation), and where you think potential and kinetic energy were at work in your experiment.	
Focus Question: Why is understanding how energy works important?	

Class: **6th Science** Dates**: – week 3** Expected time on tasks: **30 Min / school day**

Week 3 Project: Plan an investigation to determine the relationships between energy transferred, the type of matter it is transferred to, the mass of the matter, and the change in average kinetic energy of the particles of the matter (measured by the matter's temperature).

START HERE: If possible, watch this: https://www.youtube.com/watch?v=hNGJ0WHXMyE - this is what our project is about this week! Things to remember when you think about the video: the matter (cake and pan) were in the same temperature surroundings (the oven), but they transferred energy at different speeds – they are different types of matter, and there were different amounts (mass) of each type.

Does it take the same amount of energy to melt an ice cube as it does to melt the same amount of frozen orange juice, or frozen milk, or frozen steak? Will a big ice cube melt at the same rate as a small ice cube when they are absorbing the same amount of heat energy from the sun?

TASK: For this week's project, you will be planning an experiment. You do not HAVE to do the experiment, however, if you design something that you can do (with your parents' permission), you will be able to describe your steps and the results much more easily – PLUS you could send us pictures of you doing it!!! ☺

Content Focus and Materials	Directions	Check-ins and support	Submission of work
Focus: How could prove that there is a relationship between the mass (size) of something, its content, and how much energy transfer there is in the object?	Your PLAN (20 points total) can be written up/organized in any way that makes sense to you. It MUST include the following: • An intro statement telling what you are trying to explore or prove – this should be a complete sentence. (2 points) • A list of materials you will need (or if you did the investigation, the materials you used) (2 points) • The steps you followed in your experiment/investigation. Be clear enough in your description of the steps that any other 6th grader could complete the same experiment and get the same results (5 points) • The data you collected – this is important, all scientists collect data to prove their discoveries. (2 points) • **A paragraph or two** about what you discovered from your investigation. (If you do not really do your investigation, write **a paragraph or two** about what you THINK will happen, and why you think that). (5 points) • Sketches or pictures of what the investigation looks like (or would look like if you did it).(4 points) *When conducting a scientific investigation, it is usually done multiple times to be sure that the results are consistent. Your plan should include multiple trials.	**E-mail office hours**: every school day, 8AM-3:30PM, after hours emails may be available if teacher schedules allow. **Video office hours:** **JOHNSTON** (history/science): Monday-Friday: 10:30 AM-12:30 PM Includes "Lunch with your Teachers" **MARTIN** (math/science): Monday – Thursday: 9:00 AM – 10:30 AM and 4:45 PM – 5:15 PM Friday: 9-10:30 and 12-12:30 "Lunch with your Teachers" **WHITE** (ELA/science): Monday-Thursday: 10:00 AM – 11:00 AM and 5:00PM-6:00PM Friday: 10:00AM-11:30 and 12:00-12:30 "Lunch with your Teachers"	***Since hard-copy work will not be returned to students, we request that the work on this project be submitted via email or pictures if at all possible.*** If necessary, hard-copy work can be turned in at Freiler following the calendar, however that work will **NOT** be returned to students. Week 3 hard-copy work is due on or before 5/15.

https://www.ducksters.com/science/energy.php

Physics for Kids: Energy

What is Energy?

The simplest definition of energy is "the ability to do work". Energy is how things change and move. It's everywhere around us and takes all sorts of forms. It takes energy to cook food, to drive to school, and to jump in the air.

Energy can take a number of different forms. Here are some examples:

- **Chemical** - Chemical energy comes from atoms and molecules and how they interact.
- **Electrical -** Electrical energy is generated by the movement of electrons.
- **Gravitational** - Large objects such as the Earth and the Sun create gravity and gravitational energy.
- **Heat** - Heat energy is also called thermal energy. It comes from molecules of different temperatures interacting.
- **Light** - Light is called radiant energy. The Earth gets a lot of its energy from the light of the Sun.
- **Motion -** Anything that is moving has energy. This is also called kinetic energy.
- **Nuclear** - Huge amounts of nuclear energy can be generated by splitting atoms.
- **Potential** - Potential energy is energy that is stored. One example of this is a spring that is pressed all the way down. Another example is a book sitting high on a shelf.

In physics, the standard unit of measure for energy is the joule which is abbreviated as J. There are other units of measure for energy that are used throughout the world including kilowatt-hours, calories, newton-meters, therms, and foot-pounds.

Law of Conservation of Energy

This law states that energy is never created or destroyed, it is only changed from one state to another. One example is the chemical energy in food that we turn into kinetic energy when we move.

Renewable and Nonrenewable Energy

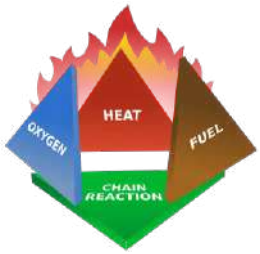
As humans we use a lot of energy to drive our cars, heat and cool our houses, watch TV, and more. This energy comes from a variety of places and in a number of forms. Conservationists classify the energy we use into two types: renewable and nonrenewable. Nonrenewable energy uses up resources that we cannot recreate. Some examples of this are gas to run our car and coal burned in power plants. Once they are used, they are gone forever. A renewable energy source is one that can be replenished. Examples of this include hydropower from turbines in a dam, wind power from windmills, and solar power from the sun.

The more renewable power we use the better for our planet and for future generations as they won't run out of resources someday.

Fun Facts about Energy

- In 2008 about 7% of the energy used in the United States was from renewable sources.
- A modern windmill or turbine can generate enough electricity to power around 300 homes.
- People have used waterpower to grind grain for over 2,000 years.
- Geothermal power uses energy from geysers, hot springs, and volcanoes.
- The entire world could be powered for a year from the energy from the sun that falls on the Earth's surface in one hour. We just need to figure out how to harness it!

www.ducksters.com: **Science of Heat**



Heat is the transfer of energy from a one object to another due to a difference in temperature. Heat can be measured in joules, BTUs (British thermal unit), or calories.

Heat and temperature are closely related, but they are not the same thing. The temperature of an object is determined by how fast its molecules are moving. The faster the molecules are moving the higher the temperature. We say objects that have a high temperature are hot and objects with a low temperature are cold.

Transferring of Heat

When two items are combined or touching each other, their molecules will transfer energy called heat. They will try to come to a point where they both have the same temperature. This is called equilibrium. Heat will flow from the hotter object to the colder. The molecules in the hotter object will slow down and the molecules in the colder object will speed up. Eventually they will get to the point where they have the same temperature.

This happens all the time around you. For example, when you take an ice cube and put it into a warm soda. The ice cube will become warmer and melt, while the soda will cool down.

Hot Objects Expand

When something gets hotter it will expand, or get bigger. At the same time, when something gets colder it will shrink. This property is used to make mercury thermometers. The line in the thermometer is actually liquid mercury. As the liquid gets hotter, it will expand and rise in the thermometer to show a higher temperature. It's the expansion and contraction due to temperature that allows the thermometer to work.

Heat Conduction

When heat transfers from one object to another, this is called conduction. Some materials conduct heat better than others. Metal, for example, is a good conductor of heat. We use metal in pots and pans to cook because it will move the heat from the flame to our food quickly. Cloth, like a blanket, isn't a good conductor of heat. Because it's not a good conductor, a blanket works well to keep us warm at night as it won't conduct the heat from our bodies out to the cold air.

Matter Changing State

Heat has an impact on the state of matter. Matter can change state based on heat or temperature. There are three states that matter can take depending on its temperature: solid, liquid, and gas. For example, if water is cold and its molecules are moving very slow, it will be a solid (ice). If it warms up some, the ice will melt and water becomes a liquid. If you add a lot of heat to water, the molecules will move very fast and it will become a gas (steam).

Modified from https://mocomi.com/kinetic-energy/ and
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Every day we do hundreds of tasks from the time we wake up, untill the time we sleep. Do you know where we get this ability to work? From energy! We have many sources of energy like the sun, water, wind etc. Food also gives us energy to make our muscles move.

All energy in the world is divided into two types: Potential Energy and Kinetic Energy. Potential energy is the energy that is stored in an object like a big rock. Kinetic energy is the energy of anything in motion like a car in motion or a football when kicked. For example, river water, air, electricity are all forms of kinetic energy. Even planets, which constantly rotate or smaller objects like atoms have kinetic energy. The heavier something is and the faster it moves, the more kinetic energy it has in it.

Relationship between Potential and Kinetic Energy: All objects have potential energy in them. When these objects move, this energy changes into kinetic energy. For example, let us look at a big rock sitting on top of a mountain. When it is just sitting, it has potential energy. If the rock falls from the mountain slope, it will keep rolling down causing a lot of damage. This potential energy is now changed into kinetic energy. In contrast, if we have a very small rock and it falls down the mountain slope, it will stop after going a few meters and would also not cause any damage or destruction. Thus, heavier objects have more kinetic energy.

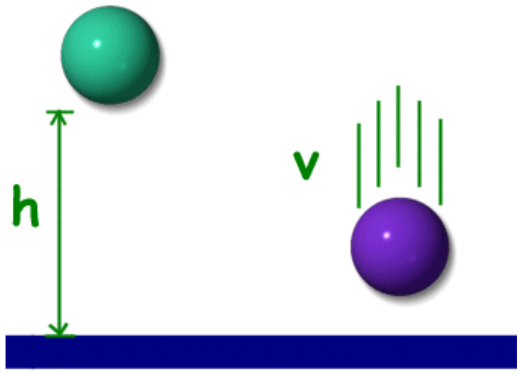
Kinetic energy is the reason why any fast moving object cannot stop all of a sudden. So, a fast moving bus cannot immediately stop, or if you are riding a bicycle, you cannot immediately put brakes. Kinetic energy can be passed from one object to another by collision. A good example is a bowling game, where the pins begin moving when the moving ball collides with them.

From: https://www.ducksters.com/science/physics/kinetic_energy.php

What is kinetic energy? Kinetic energy is the energy an object has due to its motion. As long as an object is moving at the same velocity (speed), it will maintain the same kinetic energy. The kinetic energy of an object is calculated from the velocity and the mass of the object. As you can see from the equation below, the velocity is squared and can have a significant impact on the kinetic energy.

How to Measure Kinetic Energy**:** The standard unit for measuring kinetic energy is the joule (J). The joule is the standard unit for energy in general. Other units for energy include the newton-meter (Nm) and the kilogram meter squared over seconds squared (kg m^2/s^2). Kinetic energy is a scalar quantity, which means it only has a magnitude (size/dimension) and not a direction.

How is it different from potential energy? Kinetic energy is due to an object's motion while potential energy is due to an object's position or state. When you calculate an object's kinetic energy, its velocity is an important factor. Velocity, however, has nothing to do with an object's potential energy.

	The green ball (the ball on the left) has potential energy due to its height. The purple ball (the ball on the right) has kinetic energy due to its velocity.

One way to think of potential and kinetic energy is to picture a car on a roller coaster. As the car travels up the coaster it is gaining potential energy. It has the most potential energy at the top of the coaster. As the car travels down the coaster, it gains speed and kinetic energy. At the same time it is gaining kinetic energy, it is losing potential energy. At the bottom of the coaster the car has the most speed and the most kinetic energy, but also the least potential energy.

Example problem:
A car and a bicycle are traveling at the same speed, which has the most kinetic energy? The car does because it has more mass (weight).

Interesting Facts about Kinetic Energy

- If you double the mass of an object, you double the kinetic energy.
- If you double the speed of an object, the kinetic energy increases by four times.
- The word "kinetic" comes from the Greek word "kinesis" which means motion.
- Kinetic energy can be passed from one object to another in the form of a collision.
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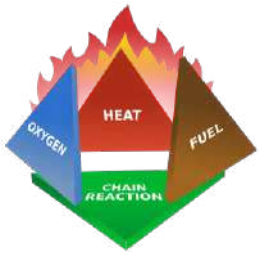

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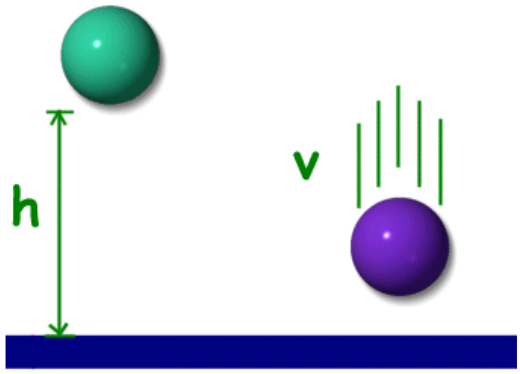	The green ball (the ball on the left) has potential energy due to its height. The purple ball (the ball on the right) has kinetic energy due to its velocity.

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