Inclined plane worksheet answers

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Mechanical Advantage of Simple Machines

READ

We use simple machines to make tasks easier. While the output work of a simple machine can never be greater than the input work, a simple machine can multiply input forces OR multiply input distances (but never both at the same time). You can use this skill sheet to practice calculating mechanical advantage (MA) for two common simple machines: levers and ramps.

The general formula for the mechanical advantage (MA) of levers:

$$MA_{lever} = \frac{F_o \text{ (output force)}}{F_i \text{ (input force)}}$$

Or you can use the ratio of the input arm length to the output arm length:

$$MA_{lever} = \frac{L_i \text{ (length of input arm)}}{L_o \text{ (length of output arm)}}$$

Most of the time, levers are used to multiply force to lift heavy objects.

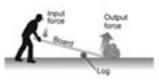
The general formula for the mechanical advantage (MA) of ramps:

$$MA_{ramp} = \frac{\text{ramp length}}{\text{ramp height}}$$

A ramp makes it possible to move a heavy load to a new height using less force (but over a longer distance). The mechanical advantage of a ramp can be found using this formula:

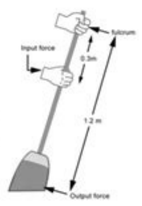
EXAMPLES

Example 1: A construction worker uses a board and log as a lever to lift a heavy rock. If the input arm is 3 meters long and the output arm is 0.75 meters long, what is the mechanical advantage of the lever?



$$MA = \frac{3 \text{ meters}}{0.75 \text{ meter}} = 4$$

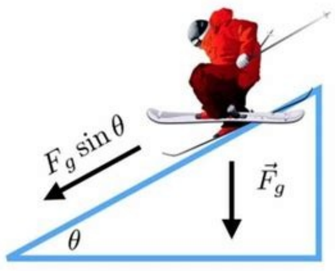
Example 2: Sometimes levers are used to multiply distance. For a broom, your upper hand is the fulcrum and your lower hand provides the input force: Notice the input arm is shorter than the output arm. The mechanical advantage of this broom is:



$$MA = \frac{0.3 \text{ meter}}{1.2 \text{ meters}} = 0.25$$

A mechanical advantage less than one doesn't mean a machine isn't useful. It just means that instead of multiplying force, the machine multiplies distance. A broom doesn't push the dust with as much force as you use to push the broom, but a small movement of your arm pushes the dust a large distance.

A COINCIDENCE FOR AN OPEN MIND



Under constant acceleration, an object travels the distance d in the time $t = \sqrt{2d/a}$. For the skier on the inclined plane, this time is given by $\sqrt{\frac{2d}{g \sin\theta}}$. Starting from rest at the top of the incline, the skier has speed $v = at = g \sin\theta \sqrt{\frac{2d}{g \sin\theta}} = \sqrt{2g \sin\theta d}$ at the bottom of the incline.

Consider the kinetic energy $\frac{1}{2} mv^2$. At the top of the incline, this quantity is equal to zero, and at the bottom of the incline it's equal to $mg \sin\theta d$.

Now, consider another quantity: $F \cdot s$, where F is the force of gravity along the incline, and s is the distance traveled down the incline. With $F = mg \sin\theta$, and $s = d$, we find $F \cdot s = mg \sin\theta d$.

This is curious. In descending the slope, the skier gained an amount of kinetic energy that is equal to the product of the force that acted on the particle, and the distance over which the particle traveled. One might be tempted to hypothesize that forces acting through a distance give objects kinetic energy.

Mathematically,

$$\vec{F} \cdot \vec{d} = \Delta \text{KE} = \frac{1}{2} mv_f^2 - \frac{1}{2} mv_i^2$$

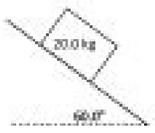
Inclined Plane Worksheet

Name: _____ Period: ____ Date: _____

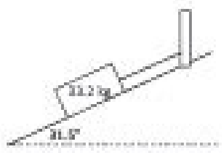
Use the diagrams below to answer the questions. Assume the block accelerates down the ramp unless explained otherwise. SHOW ALL WORK!

1. Determine the acceleration of the block below if the coefficient of static friction is 0.343.

2. If the acceleration of the block in the diagram below is 5.80 m/s^2, what is the coefficient of kinetic friction?



3. The block in the diagram below is AT REST. However, the tension in the cable is not the only thing holding the block back. Static friction is also applying a force. If the coefficient of static friction is 0.214 determine the tension in the rope.



4. Paul is pushing the couch up the ramp into the moving truck at a CONSTANT VELOCITY. If he pushes with a force of 241 N directly to the right (NOT AT ANY ANGLE), what is the coefficient of kinetic friction? The mass of the couch is 35.3 kg.

Hatchet
Student Copy
Chapter 1

1. Why could there be no conversation in the plane?

_____

_____

2. Who had taken Brian to meet the plane?

_____

_____

3. How old is Brian?

_____

_____

4. What was the single word that started the thinking for Brian?

_____

_____

5. What did the pilot show Brian?

_____

_____

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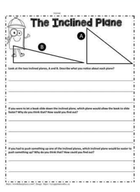

Find the slope of the line shown below using rise over run formula. 9 KB Worksheet 2. 03 and m2 3 7. The run measures the horizontal change or change in x-coordinates between the two points. Find Slope Using Rise Over Run Download 9 KB Worksheet 3.. 7h agoExample 1: Find the slope of a line between the points P = (0, -1) and Q = (4,1. The rise is − 3. Count the run. It goes from right to left, so it is negative. The run is − 5. Use the slope formula. m = rise run Substitute the values of the rise and run. m = −3 −5 The slope of the line is 3 5. 7h agoSimplify; Step 1: Find the Slope (or Gradient) from 2 Points 2% offset yield when converting from MPa to psi would equal 8700 psi (60 A maximum of 3" rise per panel Example: To calculate the slope-intercept equation for a line. 10h ago64 65 66 buick riviera for saleKnowing how to calculate the slope of a line is an important skill for coordinate geometry, and it's often used to draw lines on a graph or to determine its x In the equation above, y2 - y1 = Δy, or vertical change, while x2 - x1 = Δx, or horizontal change, as shown in the graph provided. 11h agoExample 3: Find the Slope through Two Points Find the slope of the line that passes through (-2, 0) and (1, 5). You need to calculate the change in y and the change in x here. It doesn't matter which point is considered #1 or #2. 7h agoSearch: Slope Volume Calculator. 471 Acres Horsepower 33,000 Foot-Lbs/min Select a shape, input some measurements and see its area, perimeter, volume and weight The most important. 14h ago veeam tape drive disabled13h agoThe slope of a line through the points (3, 4) and (5, 1) is $$- \frac{3}{2}$$ because every time that the line goes down by 3(the change in y or the rise) the line moves to the right (the run) by 2. Free slope calculator - find the slope of a line given two points, a function or the intercept step-by-step This website uses cookies to ensure you get the best experience. 11h ago dreamland amusement park abandoned what is todays word for wordleHow to Calculate Rise over Run in Excel. As discussed above, if there are only two x- and y-values, it possible to calculate the slope , or rise over run, of. 7h agoLinear Equations. Find the Slope . (1,−2) (1, - 2) , (3,6) (3, 6) Slope is equal to the change in y y over the change in x x, or rise over run how to see others deleted messages in messenger unity foldout attribute list the judgments. 10h agocover letter for medical rfe responseFirst we need to find the derivative of f(x) so we can get the slope of the tangent line and the normal line .We have. speedefy ac2100 review fatal crash on 81 today owner financed homes toyota rav4 prime hybrid blue ridge cable. 11h agoRemember that the slope of a line never changes, so you can choose whatever 2 points you want. Step 2. Step 2. Calculate the rise and run (You can draw it on the graph if it helps). Step 3. Trying to figure out the function to return. 11h ago redfield revenge rifle scopes for saleRoof Pitch Calculator (Roof Slope Calculator) The roof pitch calculator is a convenient online tool you can use to quickly assess the pitch of your roof to determine the length of rafters you need. After finding out your roof pitch angles, you can use the calculator to perform the calculations for you instead of doing them manually. This time zone is in use during standard time in: North America To calculate the slope intercept form equation from two coordinates (x 1,y 1) and (x 2,y 2): Step 1: Calculate the slope (y 2 - y 1) / (x 2 - x 1) Step 2: Calculate where. 12h agoHow to Calculate Rise over Run in Excel. As discussed above, if there are only two x- and y-values, it possible to calculate the slope , or rise over run, of. 10h agowahpeton nd mugshotsName : Answer key Printable Math Worksheets @ www.mathworksheets4kids.com Calculate the rise and run to !nd the slope of each line. Find the Slope Level 1: S1 1). When measuring the line: Starting from the left and going across to the right is positive. 11h agoWhen measuring the line: Starting from the left and going across to the left is negative). Up is positive, and down is negative. Slope = −4 2 = −2. That line goes down as you. 11h ago boss log splitters for salezbrush embroidery We have compiled all of the worksheets used in this course. You can print them yourself or purchase them bound in book form. These are NOT a full offline course, just the worksheets used in this online course. Level 1 – 4 (1st through 4th) Buy – print Level 5 – 8 (5th through 8th) Buy – print Found a problem? Check here. Course Description — Students will study chemistry and physics through experimentation, demonstration, readings, videos, and a variety of online activities. They will learn about the periodic table and many of the elements, studying their structure and use. Students will model the structure of atoms and molecules and will explore the states of matter, discovering the properties of solids, liquids, and gases. They will create and observe different types of chemical reactions and experiment with acids and bases. Physics topics include: light, sound, aerodynamics, forces, the Three Laws of Motion, energy, heat, electricity, magnetism, simple machines, and engineering. Students will learn and also apply their learning by building a roller coaster, bridge, and dome, as well as circuits and a solar oven. Materials: There are worksheets you are asked to print out throughout the year. You can print them as you come to them in course, print them out all now, or buy them in a low-cost workbook, called EP Modern History Printables. Scroll up for the links. They are also in the store. Atoms, Molecules, Steam Engines, Matter, States of Matter Level 1-4* (Note that an asterisk * indicates that there is a worksheet on this lesson) (Materials: small piece of aluminum foil) Welcome to your first day of school! I wanted to give you one important reminder before you begin. Many of your lessons below have an internet link for you to click on. When you go to the different internet pages for your lessons, please DO NOT click on anything else on that page except what the directions tell you to. DO NOT click on any advertisements or games. DO NOT click on anything that takes you to a different website. Just stay focused on your lesson and then close that window and you should be right back here for the next lesson. Okay? If you didn't get here through My EP Assignments, I suggest you go there and create an account. There is a printables workbook available for this course. Now's the time to decide if you want to print out all the worksheets for this course or purchase the low-cost printables book. Take a small piece of aluminum foil. Rip it in half. Again. And again and again and again until you can't any more. If you could keep ripping it until it was the smallest piece of aluminum in the world, that would be an atom, an aluminum atom. Everything in the world is made up of atoms. Different types of atoms come together in different combinations called molecules to make up everything you see in the world. Take a look at how small atoms are. Use the slider and move to the right to see smaller and smaller things. Can you find the atom? Atoms are so small that five million hydrogen atoms would fit on the head of a pin. That's 5,000,000 atoms. *Print out Elements Lapbook (Level 5-8 is using this too). You will work on this throughout the year. Cut out H piece. You're going to compile these throughout the year. You can use a poster board, individual pages by family group, or any other way you'd like to organize them. If you organize them in groups, the Hydrogen piece would be in the alkali metals group. This is the end of your work for this course for your first day. You are allowed to move at your own pace (this is homeschooling), but it's intended you complete one lesson a day. Level 5-8* (Note that an asterisk * indicates that there is a worksheet on this lesson) (Materials: small piece of aluminum foil) Welcome to your first day of school! I wanted to give you one important reminder before you begin. Many of your lessons below have an internet link for you to click on. When you go to the different internet pages for your lessons, please DO NOT click on anything else on that page except what the directions tell you to. DO NOT click on any advertisements or games. DO NOT click on anything that takes you to a different website. Just stay focused on your lesson and then close that window and you should be right back here for the next lesson. Okay? If you didn't get here through My EP Assignments, I suggest you go there and create an account. Now's the time to decide if you want to print out the worksheets you'll be using in this course (now or as they come up in the course) or if you want to buy a workbook of all the printables. Take a small piece of aluminum foil. Rip it in half. Again. And again and again and again until you can't any more. If you could keep ripping it until it was the smallest piece of aluminum in the world, that would be an atom, an aluminum atom. Everything in the world is made up of atoms, or atoms make up the matter that everything is made of. Different types of atoms come together in different combinations called molecules to make up everything you see in the world. Take a look at how small atoms are. (Move the slider to the right and left. If it's not working, you can watch this video.) Atoms are so small that five million hydrogen atoms would fit on the head of a pin. That's 5,000,000 atoms. *Print out Elements Lapbook (Level 1-4 is using this too) Cut out H piece. You're going to compile these throughout the year. You can use a poster board, individual pages by family group, or any other way you'd like to organize them. If you organize them in groups, the Hydrogen piece would be in the alkali metals group. This is the end of your work for this course for your first day. You are allowed to move at your own pace (this is homeschooling), but it's intended you complete one lesson a day. Lesson 2 Level 1-4(*) Note that an asterisk in parenthesis (*) indicates an optional page to print. (*)Here is a periodic table to look at or to print out in color with picture examples. (Print it out if you can and put it in your notebook.) This is called the periodic table of elements. Each box is one element. Everything in the world, including you, is made up of these elements. They are listed on this table in order of their weights. Number one is hydrogen. It is a gas. It is the lightest element. Read about hydrogen. Draw a picture or write about hydrogen inside the booklet and add it to your Alkali Metals Group lapbook page. Level 5-8(*) Note that an asterisk in parenthesis (*) indicates an optional page to print. Lesson 3 Level 1-4 Solve the mystery of the disappearing city. What do you think happens to a city when the train goes through town? What do you think happens to a city if the train doesn't take people there? (Answer: When a train came to a city, it brought more people. More people could live there and work there. If the train didn't go to your area, the city would get smaller and smaller because it wouldn't be growing. People would leave to go where the work is, where the population is growing.) Here's a video on how steam engines work. Tell someone what makes a steam engine work. Level 5-8 Lesson 4 Level 1-4 Draw a diagram of the inside of a steam engine. Color where the water is blue. Color where the steam is red. Include a firebox, boiler and steam box. If you don't remember, here's a diagram. You can also read that page with the diagram as a reminder of how a steam engine works. Level 5-8 Watch and read about steam engines. Draw a diagram of how it works and explain it to someone. Here's help if you need it. Copy this sentence about steam engines and tell what it means in your own words. Lesson 5 Level 1-4* What makes water turn into steam? Click on states of matter. Click on solid, liquid, and gas to view what it looks like in each state. Imagine those blue balls are water. When water is a solid, it is ice. When it's a gas, it's steam. What turns water you can drink into steam? Just about everything you see in this world is a solid, a liquid or a gas. A solid is a desk; a liquid is milk; a gas is helium in balloons that float. *Print out this worksheet on solids, liquids and gases and fill it in. Make sure you put it in your notebook. (Answers) Tell a parent or an older sibling what you think makes something a solid, a liquid or a gas. Level 5-8* What makes water turn into steam? Click on states. Click on solid, liquid, and gas to view what it looks like in each state. Imagine those blue balls are water. When water is a solid, it is ice. When it's a gas, it's steam. What turns water you can drink into steam? *Print out this worksheet on water changing and fill in. Make sure you put it in your notebook. (Answers) Just about everything in this world is either a solid, a liquid or a gas. These are called "the states of matter." You just learned that by changing the temperature of a type of matter you can change its state. For example, by heating the solid ice you change it into a liquid. Alexander Graham Bell realized that the sound carried better if he used a liquid with his thin metal wire. Conduct a sound experiment. Does sound travel better through a solid or a gas (the air)? Do Table Thunder, the second experiment. Try it a few times with different tables. If you can get what you need together, you could do any of the other experiments too. In your science notebook, describe your experiment and what your conclusion is. Your conclusion is your answer; does sound travel better through a solid or a gas? Think of a way to test whether sound travels better through a liquid or a gas. Try it. What's your result? Present your conclusions at the dinner table. Level 5-8* (Materials: metal hanger, 2 foot-long pieces of thread — if you don't have a metal hanger, use something metal like a spoon) *Alexander Graham Bell realized that the sound carried better if he used a liquid. Conduct a sound experiment. Does sound travel better through a solid or a gas (the air)? Do Hang In There. Try it a few times with different tables. If you can get what you need together, you could do any of the other experiments too. Print out the science experiment page and fill it out with your experiment details. I wrote the experiment question above. Experiment worksheet Think of a way to test whether sound travels better through a liquid or a gas. Try it. What's your result? Present your conclusions from today's experiments at the dinner table. Level 1-4 (Materials: two cans and string and a nail and hammer to poke the hole — can use disposable cups and a thumbtack if you don't have cans, and you might want to have a paper clip on hand) Level 5-8 Read about how a telephone works. (Have you installed Ad Block Pro yet?) Describe how a basic telephone works. Lesson 8 Level 1-4 Cut out your O element booklet. Oxygen is part of what we breathe. We need oxygen for our bodies to work. It is another element in our world and is number 8 on the periodic table, because one atom of oxygen has 8 protons in it. We'll learn later about protons. Write or draw inside your oxygen card. Add it to your Oxygen Group lapbook page. Not everything in the world is hydrogen or oxygen or carbon or whatever else is on the periodic table. Those are the elements that other things are made from. When different atoms come together to make something new, they are called molecules. Probably the most famous molecule is H2O. Have you ever heard of it? It means two hydrogen atoms and one oxygen atom getting together. When they do, they make water! All water you see is made up of H2O molecules. Here's a picture of a water molecule. Draw a water molecule and label the three parts each either H or O. Label your picture and keep it in your science notebook. Look at other molecules. Choose "Real Molecules." Then you can choose different ones from the menu. You can also reload and choose "Model" and build fake molecules just for fun, if you like. Level 5-8 Watch video on oxygen. Cut out your O element booklet. Oxygen is part of what we breathe. We need oxygen for our bodies to work. It is another element in our world and is number 8 on the periodic table, because one atom of oxygen has 8 protons in it. We'll learn later about protons. Write or draw inside your oxygen card. Not everything in the world is hydrogen or oxygen or carbon or whatever else is on the periodic table. Those are the elements that other things are made from. When different atoms come together to make something new, they are called molecules. Probably the most famous molecule is H2O. Have you ever heard of it? It means two hydrogen atoms and one oxygen atom getting together. When they do, they make water! All water you see is made up of H2O molecules. Here's a picture of a water molecule. Level 1-4 Remember molecules? A water molecule is made up of two hydrogen atoms and one oxygen atom, making H2O. When molecules heat up, they get really excited and move around a lot! That's a gas. When molecules cool down enough, they barely move at all; that's a solid. Read about solids, liquids and gases. Then try the game that's right after the reading. Read about freezing and melting and then do the activity that's right after the raeding. Read about evaporation and condensation and then do the activity below the reading. Read about the water cycle and do the activity below the reading. Level 5-8 (Materials: grape, microwave–there's a video of the experiment if you can't do it) Remember molecules? A water molecule is made up of two hydrogen atoms and one oxygen atom, making H2O. When molecules heat up, they get really excited and move around a lot! That's a gas. When molecules cool down enough, they barely move at all; that's a solid. Do this activity with states of matter. (Turn off your ad blocker.) If you are using a mobile device, this activity will send you to their paid app. Set your browser to Desktop to try to bypass that. Directions here. Try this online quiz. If you have a grape and a microwave, then you can create plasma. Plasma is another state of matter. It's what you get when you excite molecules even more than in a gaseous state. Make sure you have parent permission AND supervision before you do this! Slice a grape in half longways but leave a little skin so you can open it like a book. Open it and place it in the microwave, either directly on the glass turntable OR on a microwave-safe plate. (Do NOT use a paper plate or paper towel!) Turn the microwave on and be ready to turn it off. In 10-15 seconds you should see plasma shooting off the grape! Turn off your microwave after those 10-15 seconds. Don't let the grape cook longer. If you don't have a microwave, you can watch a video of the experiment. Level 1-4 (Materials: bar of Ivory soap, microwave–there's a video of the experiment to watch if you can't do it) We've been learning about atoms, which make up the elements everything in our world is made up of. When atoms are combined, it is called a molecule. When molecules heat up, they get excited and move around a lot. This is what happens when water turns into water vapor (or steam). When molecules cool down, they slow down to mostly stopped. This is what happens when water turns into ice. Ice, water and steam are all H2O. They are all made of water molecules. It is the same matter. They are just each in a different state of matter. Watch the molecules get excited. Heat them up. Write in your science notebook each of the words in bold. As best you can, write about what each means. As a reward for writing those tough definitions, place an opened bar of Ivory soap in the microwave on a microwavable plate. Turn the microwave on for one minute. Watch what happens. You are exciting the water molecules that are inside the soap causing them to move around! If you don't have a microwave, you can watch the video to see what happens. (Ivory soap is special because it floats when other bars of soap sink. That's because it has a lot of air inside of it.) Level 5-8* *Fill in the definitions of the terms on this worksheet. As a reward for your hard work writing great definitions, here's a video of what fun chemistry can be. Lesson 11 Level 1-4 Another way to move molecules, other than to excite them by heating them up, is to cause them to vibrate. When there is a sound, it moves the molecules in the air, causing them to vibrate. They start crashing into other molecules and make them vibrate too, and those crash into the molecules next to them so that they start vibrating, and that's how sound travels from one place to another. Make a sound wave. Tie a strong string to a doorknob and walk back until the string is straight; or take the plug of your vacuum cleaner in your hand and stretch out the cord. Move your arm up and down and send waves down the string or cord. That's how sound travels — in waves. Draw sound waves in your notebook. Level 5-8 (Materials: Two tongue depressors (big popsicle sticks), wide-ish rubber band long enough to fit around tongue depressors the long way, two small rubber bands, one index card (or some card stock)) Read about this experiment and try it if you have what you need. Make sure to read about the science behind it. Write in your science notebook what you learned from the experiment. Please put the date at the top of the page. Lesson 12 Level 1-4 Explore sound in your house. What makes sound? What is being vibrated to make the sound? Remember that sound can travel through a gas, a liquid or a solid. When you listened to the bang on the table, it was the molecules in the table vibrating. Make a list of your answers to the two questions as you explore your house. Level 5-8 (Materials: balloon) Play with different instruments to make different sounds. What is being vibrated to make each sound? What makes a higher sound and a lower sound, on the same instrument? Read this experiment. Lesson 13 Level 1-4 Today, create sound. Create sound that vibrates through a solid (bang something). Create sound that vibrates through a liquid (fill a glass with water and tap the glass). Create sound that vibrates through the air (blow over the top of a bottle, swing something fast through the air, or you could cheat and just talk!). Try filling glasses up with water to different heights. Which gives a higher sound? The one with the least amount of water, because the molecules can vibrate back and forth through it faster. If you have a bottle that you can blow over the opening to make a sound, fill the bottle with different amounts of water. It will produce a higher sound if you have more water (because there is less air), and the molecules can vibrate back and forth through the smaller amount of air faster, making the sound higher. Record in your science notebook the different ways you vibrated molecules to create sound. Please write the date on the page. Watch vibrations caused by sound. Skip to 1 minute. This is a mixture of cornstarch and water on a cookie sheet sitting on top of a speaker. Level 5-8 Watch this video of sound experiments, and then figure out some of your own special effects sounds. What sounds can you make with things around your house? Lesson 14 Level 1-4* Roll up as large a piece of paper as you can find into a cone shape. Leave a little opening at the end. Talk normally into the air and then through your cone. What's the difference? Listen to someone talking normally, and then with the small opening of the cone to your ear. What's the difference? Your cone is spreading out and collecting sound waves. *Fill in your science experiment worksheet. Question: Can sound waves be amplified (made louder)? Level 5-8 Lesson 15 Level 1-4 Read about the phonograph. (It's just the top of the page.) Here's a picture of an original. Draw a phonograph. What is being vibrated? If you have a record player at your house, observe it in action. Watch the Edison Phonograph video. While records are flat, Edison's played from grooves in a spinning cylinder. It starts playing at :45. Level 5-8 Read about the phonograph. (Just read the top of the page.) If you have a record player at home, observe it in use. You can also watch the video. While records are flat, Edison's played from grooves in a spinning cylinder. Draw a diagram of how a phonograph works. Lesson 16 Level 1-4 Let's learn a little more about light and the light bulb. The light in the bulb basically is a fine wire, called a filament, that gives off light because it is heated up and gets hot. It's actually atoms that are giving off light. Remember how they get excited when they heat up? The electricity travels into the bulb, heats up the atoms in the filament, causes them to jump around, which gives off the light. To make the bulb shine as it does, it is filled with a gas to help it. The gas is called argon. Watch the video below on how a light bulb is made in a factory today. Then cut out argon booklet. Draw or write inside it and add it to your Noble Gases lapbook page. Level 5-8 The light in a bulb basically is a fine wire, called a filament, that gives off light because it is heated up and gets hot. It's actually atoms that are giving off light. Remember how they get excited when they heat up? The electricity travels into the bulb, heats up the atoms in the filament, causes them to jump around, which gives off the light. Watch video on argon. Argon is the gas used in most light bulbs. Thomas Edison learned that leaving air in the bulb would cause the filament (the thin carbon wire inside) to burn up. He used a vacuum to take out the air. Now we remove the air and put in argon. Read about the group of noble gases. Cut out and fill in your argon piece. Lesson 17 Level 1-4* Read about light. We see because light reflects off an object and hits our eye. A mirror reflects that light and changes its direction. Figure out where the light is traveling. Do this activity about light. (Hint: You can see yourself in a mirror if you are looking right at it.) *Draw on this worksheet to show how light travels to an object and then reflects to our eyes. (Answers) Level 5-8 Level 1-4* (Materials: hand-held mirror or anything reflective) You've learned that light travels in a straight line. You've also learned that you can change the direction that light travels by reflecting it. Take a hand-held mirror (or something else reflective–watches and rings might work) and find a light to reflect. Make a light dance around the ceiling by reflecting it off your mirror. Get a glass of water. Use a clear glass if you can so you can see inside well. Place a pencil or straw inside the cup. Does it look like the pencil is bent? The light bends when it hits the surface of the water. It doesn't stop the light like a wall does, but it bends it enough to send a bent reflection back to our eyes. *Write up an experiment worksheet. Question: Can light bend? Level 5-8* (Materials: coin, bowl) Level 1-4 (Materials: metal spoon) Get a metal spoon. Look at yourself in it. Turn it over. What do you observe? Remember, what you see is the light reflecting off of something. Because the top of the spoon is curved down, the light bounces off and heads down, so we see our forehead at the bottom. The light that hits the bottom part is bounced up by the curve, so we see our chins at the top. On the other side we see ourselves stretched out. Why? In what direction does the light bounce? Draw a picture of light hitting a spoon from both sides. Where does the light bounce to? Level 5-8 Read this page about reflection and refraction. What's the difference? (Answer: With reflection, the light is bouncing back towards you. With refraction, the light changes directions, but keeps moving forward.) Place a glass of water on the end of a white sheet of paper near a sunny window. Let the light shine through the water. What do you see on the paper? Light is made up of colors. The light waves of different colors travel at different speeds and so bend in different ways going through the water. The water demonstrates light refraction, a change in direction due to a change in speed. The water slows the light waves and causes them to bend. Play with this color mixer. Select "RGB Bulbs" option. Use the sliders to adjust the amount of light from each color bulb. Make sure you observe mixing all three at their highest levels. You can see how light is white, but it is really made up of many colors. Level 1-4 Because of what we know about how our eyes see light and how our brains receive those signals, people have developed many optical illusions. We think we see what we don't actually see. Want to see? Here is one. The pictures on the right and the left are the same. The blocks A and B are the same color. Here is another. Want more? Level 5-8 Read about the structure of a light bulb. The "electrical foot contact" is what conducts, or carries, the electricity into the bulb. Play this game to experiment with different circuits. Make a circuit. It has to connect in a circle. Write circuit, conduct and filament in your science notebook and write definitions for the words. EXTRA — if you want to and are able to… How to make a periscope. Atoms and Molecules Lesson 21 Level 1-4* *Print out this worksheet on atoms. Watch the video on atoms and molecules. Stop at 3 minutes, when it starts talking about states of matter. Fill in the blanks on the worksheet. (Answers) Draw a hydrogen atom. It's the simplest one. It is number 1 on the periodic table so it has one proton and one electron. It doesn't have any neutrons. Draw a circle for the nucleus and a + sign inside of it for your proton. Draw a circle around that for your electron to travel on. Draw a – sign for your electron on that circle. Level 5-8* *Watch this video and take notes of any new vocabulary. When you hear a new word, jot it down on the top of this worksheet. After the video is done, fill in more about each word you wrote down. Also write in your notes the explanation as to why atoms join together. Watch it again if you can't remember! Fill in the bottom of your worksheet. Keep it in your science notebook. (Answers) Lesson 22 Level 1-4 (Materials: salt, sugar, magnifying glass, 3 cups of sugar, jar) Let's go back and learn some more about molecules. Go back in your science notebook and read what molecules are if you are unsure. Molecules have different shapes. Take some salt and sugar and look at them with a magnifying glass. Do you see their shapes? If you don't have a magnifying glass, here are some pictures. Salt Sugar With adult permission and help, heat one cup of water on the stove and add three cups of sugar. Add a little at a time, stirring to dissolve. You are making a saturated solution — so full it can't take in any more sugar. When it is all dissolved, pour it into a clean jar. Tie a string to the middle of a pencil. Tie a paper clip to the other end. Make sure the string is short enough so that the paper clip doesn't touch the bottom of the jar. (You don't want it to touch the sides either.) Lay the pencil across the top of the jar so that the paper clip and string hang in the liquid. Let it sit a few days and watch the sugar crystals grow. The sugar crystals are just sugar molecules attaching together. Write up your experiment. You can use this experiment worksheet to help you. Your question is, "What do sugar crystals look like?" Look at this picture of enormous crystals. Level 5-8 (Materials: Epsom salt 1/2 cup — if you don't have it, you can use a small piece of cardboard and table salt and do this experiment. You can buy Epsom salt at a drug store or in the medicine section of a grocery store. It's cheap. You can save the rest for a later experiment.) In a small, deep container (small jam jar would work well) pour 1/2 cup of the hottest water that comes from your faucet. Stir in 1/2 cup of Epsom salt. Stir for one minute (there should be some Epsom salt crystals at the bottom still) and then place in the refrigerator. In three hours you should have crystals. (In case you can't grow them, here's a picture of Epsom salt crystals. You can click on it to see it bigger.) Epsom salt is magnesium sulfate, MgSO4 That means that each molecule of magnesium sulfate is made up of one atom of magnesium, one atom of sulfur and 4 atoms of oxygen. The crystals are lots and lots of molecules joining together. Draw a picture of what a magnesium atom might look like. It is number 12 on the periodic table so it has 12 protons and electrons. Draw a nucleus with 12 + signs in it for the protons. Now draw a ring around it with two electrons (-) on it. That's all the first level can hold. Now draw a second ring around that. The second level can hold 8 electrons, remember? Draw eight electrons on the second ring. That's 10 electrons. Now draw a third ring around the atom. How many electrons should you draw on this one? It needs 12 and you've only drawn 10 so far. This last level, or its valence shell, needs 2 more drawn in, but it wants 18! That's why it will bond with the other atoms. Look at this picture of enormous crystals. Have Epsom salt left over? Try this! (You can save some for later as well, a tablespoon should do.) Lesson 23 Level 1-4 The next element on the periodic table you will work on is helium. Helium is a gas. You may have heard of helium balloons. Those balloons that float away if you let go of them are filled with helium. They float because they are lighter than air. Remember the lighter the element, the earlier it is on the chart. Helium is number 2. So if helium floats, do you think hydrogen balloons float too? Of course! Hydrogen is lighter than helium. That's why it is number 1 on the chart. So helium is number 2 on our periodic table. That means it has 2 protons in its nucleus, center. That means it also has 2 electrons flying around it. Cut out helium piece. Write or draw inside about helium. You could also draw a helium atom inside. Add it to your Noble Gases lapbook page. Level 5-8 Read about helium. Page 1 Page 2 Watch the video on helium. Helium is number 2 on the periodic table because it has 2 protons. Check out this site on helium. Use the different links on the right. Cut out the helium piece. Write inside about helium. Draw a helium atom inside as well. Helium belongs to the group of noble gases. Every element in a group has the same number of electrons in its valence shell, except for helium, which only has 2. How many electrons do they each have in their valence shell? Use neon to figure it out. How many are in it's outer shell? First shell 2, second shell 8, right? Now check it with argon, number 18. Does it work? Remember argon? It's what is put in regular light bulbs. Lesson 24 Level 1-4 Draw a picture of your sugar crystals. You can use the back of your experiment worksheet. (You can eat them if you have permission.) Level 5-8* *Fill in this chart for helium. We know that the atomic number is 2. We also know that the atomic number is also the number of protons. Fill in that information on your chart. Periodic table charts tell us that its atomic mass is 4.002602. Fill that number in. Its mass number is 4. Now protons are the positive charge in the nucleus. There has to be an even negative charge to balance it out. That means there the same number of electrons (the negative) as protons (the positive). Fill in the number of electrons on your chart. Now to find the neutrons take the mass number and subtract the number of protons to see what's left over. So in this case 4-2=2. There are 2 neutrons in a helium atom. Fill in the number of neutrons on your chart. (Answers) Level 1-4 (Materials: as many pennies as you can find–20 would be great — or any coin you have the most of, or something like checkers would work too) Take your coin collection (all the same coin) and lay them flat on a table and push them together so that they are all the way touching. Look for patterns. Do you see how they line up? Do you see how they surround each other in the same shape, even though you put them together randomly? Draw a picture of your coins all together. This is similar to your crystals. The molecules formed a pattern when they grew together as crystals because of the structure of each molecule. (Put today's date on your picture.) Level 5-8* Level 1-4 (Materials: cup of water, coins — or something small you can drop a lot of in water) We've looked a little at how molecules bond together. Let's do an experiment to watch it in action. Fill a cup with water to the very top. Guess how many coins you'll be able to drop in before it spills. Start dropping in coins (or something else). How many did you get in? What is holding the water in place is called surface tension. What's happening is that the water molecules on top are attracted to the water molecules under them and cling to them. Watch this video on surface tension. Write "surface tension" in your notebook and explain what it is. Level 5-8* Level 1-4 (Materials: "O" or ball-shaped cereal, milk, bowl, water, oil, dish detergent) Want to watch molecules attract again? Get a bowl of milk. Sprinkle in a handful of O-shaped cereal or ball-shaped cereal. Do they race towards each other and touch each other? This is a big picture of how molecules attract each other. Now let's watch molecules repel or run away from each other. Pour a spoonful of water into a bowl. Add food coloring if you like. Add drops of oil to the water. What happens? The water seems to run away. What is happening is that the water molecules are attracted to the water molecules and the oil molecules are attracted to the oil molecules, so they stay separate. Add some dish detergent. What happens? The water and oil molecules are both attracted to the dish detergent molecules. That's how grease gets off your dishes and into the water. Draw a picture of molecules attracting. Level 5-8(*) (Materials: paper clip or pin, wax paper or other water proof surface — some book covers, rain coat…, tablespoon or just a spoon) Drop water onto a waterproof surface. What shape does it sit in? Water cohesion, or how water molecules are attracted to each other, is why the water beads up. Do you think it's also why rain falls in drops? (picture of how water beads up) Fill a tablespoon with water. Fill the tablespoon so that the water seems to mound up over the top of the spoon. Why doesn't the water spill over? Cohesion. The molecules on top are attracted to those underneath and hold onto each other. This creates surface tension. Fill a cup with water. Place a paper clip or pin on top of the water. It's heavier than water, but it floats. Why? The cohesion builds up a strong surface tension. It holds the water in place and the paper clip on top. Read about water cohesion. (*) Print out this water cohesion notebooking page or just use your notebook, and write why a too full cup of water doesn't spill. Make sure you start with an introduction sentence that says what you are going to write about. (Example: Did you ever wonder why you can fill a cup to the brim and it doesn't spill?) Use all the words/phrases listed. Lesson 28 Level 1-4 Read about carbon. It's another element that makes up our world. Cut out your carbon piece and write or draw about carbon. Add it to your Carbon Group lapbook page. Level 5-8 Level 1-4 (Materials Level 1-4: container–empty 20 oz. plastic bottle will work, 3% hydrogen peroxide, packet active yeast, liquid dish washing detergent, warm water, food coloring-optional) We've talked about water molecules being attracted and repelled and getting exciting by heat and turning into steam, etc. But it's not just water molecules that get excited or attract other molecules, etc. Let's do an experiment that shows how the molecules are changing. What happens? Hydrogen peroxide is H2O2. It changes to H2O and O, water and oxygen. The yeast makes the change happen more quickly. The dishwashing detergent mixes with it, creating the foam. (If you notice it says O2 and want to know why, highlight the answer: O, oxygen, never is alone as a single atom. Never. It will always pair up with something. So oxygen really only exists as O2 because it will always pair up. It will find always another O!) You just witnessed a chemical reaction, or a change in a chemical. Explain the chemical reaction in this experiment. Here's the video of the experiment if you can't do it. Level 5-8(*) (Materials: balloon — mouth of balloon needs to fit over mouth of bottle, small bottle, baking soda 2 tablespoons, at least 1/2 cup of vinegar) We've talked about water molecules bonding and being attracted and getting exciting by heat and turning into steam, etc. But all molecules do these things. If you have younger siblings, they're doing this experiment today too. Put vinegar in a small bottle, like a drinking water bottle. Fill it up halfway or at least get a significant amount in there. If you just have a small balloon, you'll need less. Put two tablespoons of baking soda into the balloon. A funnel would be an easy way to do that. Without spilling any baking soda into the bottle, stretch the balloon opening over the bottle opening and let the balloon hang down to one side. Ready? Take hold of the top of the balloon and hold it up so that all of the baking soda falls into the bottle. What happens? The molecules in the baking soda (NaHCO3) and the molecules in the vinegar (CH3COOH) react together. They atoms bond in different ways. Look at those molecules. They are more

complicated than H_2O, but it is the same idea. The atoms, the hydrogen, the oxygen, etc. find new ways to bond, or come together, once added with different types of molecules. Look at the baking soda molecule. The Na (sodium) gets separated. An H (hydrogen) from the vinegar joins with the H in the baking soda and steals an O (oxygen). That makes H_2O, right? That leaves CO_2. CO_2 is carbon dioxide. That's the gas that is filling your balloon and is also what's making the fizzing and bubbling. This is called a chemical reaction, or simply a change in a chemical. Chemical reactions can be described by chemical equations. We're not going to be working with these. I just want you to take a look at one for this experiment. (*)Explain the chemical reaction in this experiment. You can use this notebooking page if you'd like. Here's a mega-sized version of that experiment if you'd like to see it. Lesson 30 Level 1-4(*) (Materials Level 1-4: seltzer water or just regular water, bleach, food coloring) Let's look at another chemical reaction. Fill a glass halfway with seltzer water. (If you don't have what our family calls "bubble water," then just use regular water. The reaction just takes a bit longer. Add a drop of food coloring. Pour in bleach and watch the color disappear. The color disappears because the oxygen molecules in the bleach and the oxygen molecules in the water bond together. If you can't do it yourself, watch the video. Watch this video of a neat chemical reaction. This is sulfuric acid being poured into sugar. The acid reacts with the sugar and takes all the H_2O out of the sugar. That leaves only carbon! (Someone suggested this more modern video. It has a better image, but it also has ads.) (*)Write chemical reaction and a simple definition. Here is a notebooking page you could use. Level 5-8 (Materials Level 5-8: seltzer water or just regular water, bleach, food coloring) Let's look at another chemical reaction. Fill a glass halfway with seltzer water. (If you don't have what our family calls "bubble water," then just use regular water. The reaction just takes a bit longer. Add a drop of food coloring. Pour in bleach and watch the color disappear. The color disappears because the oxygen molecules in the bleach and the oxygen molecules in the water bond together. If you can't do the experiment, here's a video. Write a definition of chemical reaction. Watch this video of a neat chemical reaction. This is sulfuric acid being poured into sugar. Sugar is $C_{12}H_{22}O_{11}$. Do you see that H_{22} and O_{11} could make 11 water molecules (H_2O)? The acid reacts with the sugar causing the atoms to bond in a new way and the hydrogen and oxygen combine to make water (you'll see it as smoke in the video). That leaves only carbon! You'll notice the black carbon in the video! (Someone suggested this more modern video of the reaction. It has a better image, but it also has ads.) Aerodynamics Lesson 31 Level 1-4 Read this page on flight and look at the images. What are two types of flight? How are airplanes similar and different from flying animals? Level 5-8 Read this page on flight and look at the images. Explain the different kinds of flight. How are airplanes similar and different from flying animals? Watch this video of the world record paper airplane throw. It starts falling but then goes up again. What's happening? How is it flying? Level 1-4* (Materials: piece of string, just like 12 inches, and a straw, you can make substitutions for these) Read this page on forces in flight. *Make a paper airplane. Put a little hole in the middle of it. Pull the string through the hole so that half is up and half is down. Tape it in place. Lay the straw along the middle of it. If it doesn't stick out both ends, cut it in half and tape each half so that each sticks out one end. Cut out these labels, flight forces, and tape them onto the string and straw. Here's a completed plane. Here's a picture as to where the forces go. We are going to learn about each of these forces in flight. Hang your plane somewhere if you can. Level 5-8 Read this page on forces in flight. Draw a diagram of the four forces which control an airplane. We'll learn about each of these forces separately. This is an overview. (Okay, if you want, you can make a paper airplane like the elementary school kids are doing.) Level 1-4 (Materials Level 1-4: coin, bag of coins) The first force in flight we are going to look at is gravity. Now you are thinking, that's not even on my airplane I made! It is; you called it weight. Gravity is what gives us weight. It is actually gravity pulling down on our mass that makes the scale go down, showing how much we weigh. Your mass is how much matter you are made of. Gravity pulls on all mass with the same force. Gravity is always pulling everything at the same speed. Hold a small coin in the air. Let go. It fell, right? Well, actually, gravity pulled it down to the earth. Now do the same with the bag of coins. Same thing? Now, your bag of coins should feel heavier than the one coin. Which will fall faster? Drop both at the same time. Did they hit the ground at the same time? Why? Because gravity is always pulling everything at the same speed. Now test a bunch of other things. Do you have a golf ball or tennis ball in the house? Try dropping other things together. Now, air can get in the way sometimes. Air pressure will push up on objects that are more spread out than others. Here is this experiment done on the moon where there is no air to get in the way. Watch the video. (Now go tell someone all about it. Someone sent me this second example of the experiment.) Level 5-8 (Materials: Two coins, ruler) Watch this video. Describe what happened. Did you expect something dropped and something shot out to land at the same time? Do you want to try it? Place a coin on the edge of a table. Place your ruler half on / half off the table. Put a finger in the middle of it to hold it to the table. Place the other coin (same type of coin) on the edge of the part of the ruler that is hanging off the table. (Works best where you can hear the coins hitting the floor.) You are going to quickly hit the very end of the ruler that is hanging off the table. When you do that, you will be knocking it out from under the one coin so that it drops and you will be striking the other coin so that it flies off. Try it several times. Lesson 35 Level 1-4* On Lesson 34 we learned that gravity makes all masses speed up at the same rate. Gravity doesn't pull at everything in the same way though. The more mass, the more gravity pulls on it, which is why we all weigh different amounts (even if we all fall at the same speed). Also, every object has a gravitational force. You have a gravitational force attracting everything to yourself! It's such a tiny, itty-bitty force that it doesn't really affect anything. The earth, since it's so big, has a big gravitational force, which is what makes your ball fall down when you throw it and keeps you from floating away. Astronauts can float in space because they get too far away from the Earth's gravitational force. The don't float right off the Moon because it, like everything, has a gravitational force. The Moon pulls things towards itself too. It's big enough that its gravitational force keeps the astronauts from floating away. BUT, the Moon is a lot smaller than Earth so that its gravitational force isn't as strong as Earth's. Watch this astronaut jump around, showing that there is less gravity on the Moon. For the next one skip to :45 and watch him jump two times. Does it seem like it's in slow motion? He's falling slowly because there is less gravity on the Moon, less gravitational pull. You are going to fill in a worksheet that shows how much you would weigh on each planet. Each planet is a different size, so it pulls down on your mass with a different amount of gravitational pull. Write your weight on earth in the box and use a calculator to multiply. *Print out this worksheet and use a calculator to fill it in. Explain to someone why you would weigh less on Venus. Level 5-8*(*) *Print out this page, read it and fill in the chart. Here's a video of an astronaut falling "in slow motion." He falls more slowly in space because the Moon is smaller than Earth, so it has less of a gravitational pull. His mass is the same, but his weight (gravity pulling on his mass) is different. He is pulled to the Moon with less force than on Earth since the force, the speed at which gravity pulls, is less. Makes it seem to us like it is slow motion. Explain to someone why you would weigh less on Venus. (*)Explain in writing how mass, weight and gravity are connected. Mass / Weight Notebooking Page. (Materials: straw, cup of water) We learned about gravity which pulls airplanes down. Now we're going to learn about the opposite, lift. It's what lifts airplanes up. How does air keep up an airplane? Watch the video for the first three minutes. Take a strip of paper. Hold it up to your lips. Blow over it. Blow under it. When does it go up or down? Why? When you throw a frisbee, what is holding it up in the air? Does air pressure really hold things up? Stick a straw into water and hold your finger over the open end. Take the straw out of the water. Is the air holding the water into the straw? Yes! That's air pressure at work and it's very strong. Level 5-8 (Materials: cup of water, index card or cardboard or stiff paper) Read this lesson on lift. You can try some of the suggested activities. Can air really hold things up? Do the experiment below. Experiment: fill a glass 2/3 full of water and cover with an index card (or cardboard or stiff paper). Hold the card in place securely and flip the cup over. Remove your hand. The 14.7 pounds per square inch of air pressure will hold the water in it's place. Take a look at this lift explanation. Watch the video for the first three minutes. What does air speed have to do with air pressure? What does that have to do with creating lift? (answer: Faster air has lower pressure. Angled wings wings creates faster moving air above the wings, creating higher pressure under the wings. Higher pressure pushes up towards the lower pressure area above the wing.) Level 1-4 (Materials optional: balloon, 2 liter bottle — empty) Watch the video below on air pressure. Try this experiment: stretch a balloon over the opening of an empty 2 liter bottle. Place the bottle in a pan or bowl of super hot water. The air inside the bottle will heat and expand, creating more air pressure. It will press on the rubber of the balloon and expand it a little. Place the bottle in a pan or bowl of ice water and the balloon will deflate. The air in the bottle will cool down and the air pressure will lower and stop pressing on the balloon. Level 5-8* (Materials optional: balloon, 2 liter bottle — empty; also ziplock bag-or other plastic bag you can seal super well) Try this experiment. Blow a ziplock bag. Seal it almost all the way. Give it another big puff and seal it closed. Put it in the freezer. Check on it in 10-15 minutes. Did it deflate some? Why? Air expands when it is hot, increasing the pressure it's putting on the bag. Air pressure is lower when the air is cooler. *Fill out an experiment worksheet. Watch the video below on air pressure. (You can try it if you like.) Can you answer the questions? Lesson 38   Level 1-4* We've learned that lift is caused by creating high air pressure under the wings of the plane. The air lifts the plane up. A helicopter works in a similar way. The airplane drives forward, pushing the air over and under the wings, creating the change in pressure so it can lift off. A helicopter twirls its blades to move the air over them. They are also creating higher air pressure under its blades which causes the lift. *Make a motor rotor. Use the template to make the paper blades. Drop it and watch it in action. Make observations? Why doesn't it just drop? Tell how lift is created with your motor rotor. Level 5-8 (Materials: Two paint stirrers and two rubber bands, may be able to use popsicle sticks or even paper folded over and over on itself to make a stiff "stick") Make a boomerang. Tell how lift is created with your boomerang. Here is a YouTube video with directions for an origami boomerang. Get permission before going to YouTube. Level 1-4 (Materials: balloon, straw, fishing line or strong thread or something similar) Take a straw and hold it in the air. Let go of it. It falls, right? What needs to happen to make it fly (at least a little bit)? It needs thrust, a push in the right direction. Do this experiment and read through the steps, questions, and answers. Do the extra experiments if you like. Here's a video of the experiment. Level 5-8 (Materials: paper towel tube, flexible straw, paper cup, aluminum foil) Today you will learn about thrust, the push that moves the plane forward. Read through part 1. You don't have to try the experiments, but you can. Build an engine (part 2 of the booklet). Lesson 40 Level 1-4 Review the flight forces: lift, thrust, weight, drag. Describe to someone each force and what it does. Level 5-8 Do the activity on flight forces. The forces need to be in balance. One combination will get the top speed. Another combination will get the top altitude. Accomplish one of them today. Level 1-4 (Materials: Styrofoam tray, paper clips — buy the econo pack of meat for a bigger foam tray — you need to trace and cut something about 10 inches long) Do you remember the four forces of flight? What are they? Build a glider. Read and follow the directions. Answer the questions. Experiment. Find the proper weight and balance. Level 5-8 (Materials: scissors, a sharp hobby knife, a dull knife, rubber cement, card stock) Lesson 42 Level 1-4 Review flight forces. Can you answer the first four questions? Level 5-8 Move the plane around. See if you can fly at all. Gain speed and then use the arrow keys (down!) to get into the air and then steer. What forces are at work? Why does pushing on the down arrow make the plane go up, and the opposite? (Think about where the air is pushing.) Lesson 43 Level 1-4 See if you can fly at all. Gain speed and then use the arrow keys (down!) to get into the air and then steer. What forces are at work? Why does pushing on the down arrow make the plane go up, and the opposite? (Think about where the air is pushing.) Level 5-8 Finish the activity on flight forces. The forces need to be in balance. One combination will get the top speed. Another combination will get the top altitude. Complete the second task. Lesson 44 Level 1-4 Try this activity on flight forces. The forces need to be in balance. One combination will get the top speed. Another combination will get the top altitude. Level 5-8 Answer the questions the best you can. (Materials: baking soda — 1/2 cup or more, you don't have to have all of these, but if you use them anyway, now might be a good time to have them on hand–ketchup, lemon – or lemon juice, tomato – or tomato juice, mustard, pickle juice, orange – or orange juice) We've looked at chemical reactions, when there is a change in the chemical. Today we're going to see what reacts with baking soda. Gather some supplies: ketchup, tomato juice, honey, water, lemon juice, mustard, pickle juice, orange juice, whatever else you want to try that you have in the house. Count up how many things you have. Get a cup for each one. Put some baking soda into each cup. Put some ketchup (or whatever) into the first cup and place the ketchup bottle behind the cup so you know what you put in that cup. Observe the reaction. *Record the reaction on your sheet, acid testing sheet. (You may want to ask your mom if she can help you make the red cabbage indicator today to be ready for tomorrow. See tomorrow's lesson.) Level 5-8 Read about chemical reactions. Take the quiz. It's okay if you get some wrong. Read about the correct answer and try and understand. Write another definition of chemical reaction in your binder with your previous one. (You may want to ask your mom if she can help you make the red cabbage indicator today to be ready for tomorrow. See tomorrow's lesson.) Lesson 47 Level 1-4* (Materials: red/purple cabbage, disposable cups) Help a parent make red cabbage juice indicator. Try the experiment. Get your disposable cups. Put a small amount of several different types of liquids in there. Hydrogen peroxide, window cleaner, water, vinegar, try some drinks from the fridge, egg white, whatever else you want to try (with permission). Always be SUPER CAREFUL when using cleaners. They can use powerful and harmful chemicals. Wear goggles and rubber gloves if you have them. Put a little indicator into each cup. *Record the results. pH test sheet If you can't do this at home, here's a video of setting up the experiment and you can get some more results from the video on this page. Level 5-8 (Materials: red/purple cabbage, coffee filters) Read about acids and bases. Take the quiz. Make pH testing strips. Level 1-4* Level 5-8* (Materials: disposable cups) Use your paper to test a series of liquids in your home: cleaners, drinks from the fridge, egg whites, sauces, whatever else you can think of (with permission). Use goggles and rubber gloves if you have them. Pour the different liquids into disposable cups. Place the liquid behind the cup or label it so you know what you are testing! (You could test things like sugar, cream of tartar, baking soda, just put a teaspoon in the cup with some water to dissolve it.) Dip the test paper into each one. *Observe the color change and record the result. pH test sheet If you can't do this at home, here's a video of a similar experiment. Lesson 49 Level 1-4 Play with pH. Test the different types of liquids by putting it in the tank and then moving the green target over the liquid in the tank. Read about neon. You see neon in many lit up signs. Cut out your neon piece. Draw or write inside and add it to your Noble Gases lapbook page. Level 5-8 Play with pH. Test the different types of liquids by putting it in the tank and then moving the green target over the liquid in the tank. Which is the most acidic and which is the most basic? Read about neon; read here too. Cut out your neon piece and fill it in and add with your others. Lesson 50 Level 1-4 Play with pH. Test the different types of liquids by putting it in the tank and then moving the green target over the liquid in the tank. Which is the most acidic and which is the most basic? Level 5-8* Level 1-4 (Materials: chicken bone, vinegar–enough to cover bone, maybe jar with lid to keep in the smell) Level 5-8 You are going to keep reading about chemical reactions. I know this isn't easy stuff. Take your time and get what you can from it. Take the quiz. Watch this video on fireworks. Do concentration, temperature, and pressure contribute to the reaction? How? Lesson 52 Level 1-4 (Materials: Diet Coke or other carbonated drink, salt) Pour a cup of soda. Place the cup on a tray or in a bathtub or sink. Add a lot of salt (1/4 at least), but you could try it with differing amounts. Observe. Read and watch the Diet Coke and Mentos experiment. These both work the same way. The salt and Mentos attract the CO_2 (Carbon Dioxide–what makes the bubbles in a fizzy drink) and pulls it all out of the soda at once instead of little by little like it usually comes out. Level 5-8 (Materials: liquid glue (you can halve the recipe), laundry detergent (liquid is used in the recipes, but you can use powdered)) Here's another page on chemical reactions. Take the quiz. Let's combine reactants to make a new product! Do this experiment and make slime. There are two different recipes. Here is one of our science fair entries. It has more recipes if you'd like to try. It uses shaving cream and baking soda. If you can't do it, here's a video to watch. The experiment in this link was done with borax, which is a type of laundry detergent. Listen to the explanation. Level 1-4 (Materials: piece of liver, piece of potato, hydrogen peroxide — small amount, liquid dish soap) Do the Battle of liver and potato experiment. Explain to someone what is making the bubbles. (The oxygen being released is mixing with the soap. Have you ever made more bubbles in a bath tub by mixing in air? — in other words, by moving the water around really fast?) Chicken liver recipes Take your chicken bone out of the vinegar and try and put it in a shape. Leave it out to dry and absorb the carbon dioxide from the air you breathe out. Level 5-8 (Materials: clean plastic 16 oz. soda bottle (best but not only size), one packet dry yeast, liquid dish washing soap, 1/2 c. hydrogen peroxide — can get it at a pharmacy, tray or do it somewhere it can overflow onto) Lesson 55 Level 1-4 Magnesium is a metal and is found in the earth's crust and in seawater. It is used in building airplanes. Read about magnesium. Cut out your magnesium piece and fill it in and add it to your Alkali Earth Metals lapbook page. Level 5-8 Watch the video on magnesium. Read about magnesium: here and here. Cut out your magnesium piece and fill it in and add it to your collection. Properties of Liquids Lesson 56 Level 1-4 We're going to go back and look at the different states of matter. Specifically we're going to look first at solids. Read about solids. Tell someone what makes something a solid. Level 5-8 We're going to go back and look at the different states of matter. Specifically, we're going to look first at solids. Read about solids. Try the quiz. Level 1-4 (Materials: fizzy drink in a bottle) Learn about solids, liquids, and gases and how the molecules (or particles) behave in each. Then look at this page. You already watched a video. Skip that part and look at the rest of the page. Try the activity where you sort the objects to see if you got it. Speaking A soda or pop bottle has a solid, liquid, and gas. Describe to someone the three states of matter in a bottle. What happens when you tip the bottle? What type of matter is affected? What happens when you open the bottle? What type of matter is affected? Take a bottle in front of an audience and answer these questions with a demonstration. Level 5-8* (Materials: candle, glass, baking soda, vinegar) Lesson 58 Level 1-4 Now we are going to be looking at liquid. You have learned how liquid moves and fills containers and can't really be compressed (or pushed down) much. We're going to look at some specific things about liquid. The first is viscosity. (Click on the little speaker next to the word to hear it pronounced.) Viscosity is the measure of how a liquid flows. Actually, it measures how much it resists flowing. Liquids move, right? You put them in a container and they spread out and fill it. If you poured water in a bowl, it would spread out quickly and fill the space. Water has low viscosity. Honey you got from the fridge and poured into a bowl has a high viscosity. It resists flowing. It moves slowly. Watch this video. Which end jar has the lowest viscosity, the one on the right or left? (answer: left) Design an experiment to test the viscosity of at least five different liquids. Based on your observations, rate them from the lowest to highest viscosity. Here's an experiment sheet to record on: experiment worksheet Level 5-8 Today you are going to read about liquids. Take the quiz. Viscosity is the measure of how a liquid flows. Actually, it measures how much it resists flowing. Liquids move, right? You put them in a container and they spread out and fill it. If you poured water in a bowl, it would spread out quickly and fill the space. Water has low viscosity. Honey you got from the fridge and poured into a bowl has a high viscosity. It resists flowing. It moves slowly. Watch this video. Which end jar has the lowest viscosity, the one on the right or left? (answer: left) Lesson 59   Level 1-4 (Materials: 1 c. cornstarch, 1/2 c. water) Do you remember yesterday's big word? Viscosity. A liquid's viscosity can change. If you heat up honey, it would get less viscous and flow more quickly. Today you are going to change the viscosity of a liquid with force. Combine 1 cup of cornstarch with 1/2 cup of water, slowly adding the water until it stirs like a stiff liquid but feels like a solid when tapped. When you push on it, does its viscosity get lower or higher? Does it flow more easily or not? You can see it in the first minute of this video. Level 5-8 (Level 5-8: various liquids, to test their viscosity) Yesterday you were introduced to viscosity. Design an experiment similar to these to test the viscosity of different liquids. (My kids used a cookie sheet with no paper.) Record your experiment. Do you think temperature would affect the viscosity of a liquid? (Hint: consider honey cold and hot) Test your hypothesis, test a liquid at two different temperatures to see if its viscosity changes. Lesson 60 Level 1-4 Read about aluminum. Look at aluminum. Find aluminum in your home. Ideas: aluminum foil, drinking cans, pots and pans, knitting needles, crochet hooks, light fixtures, hamster cages, camera tripod and the metal bands around your coffee pot Cut out and draw/write inside your aluminum piece. Add it to your Boron Group lapbook page. Level 5-8 Level 1-4 (Materials: slice of bread, water, cooking oil, dish detergent, jar or tall clear glass, three glasses) Take a slice of bread (no crust). Squash it. Your slice of bread became denser when you squashed it. Density is the measure of how much something weighs for the space it takes up. Your bread didn't change its weight, but it changed how much space it took up. It became denser. The bread was less dense to begin with. A rock is denser than water. It is heavier for the space it takes up than water is. So a rock sinks in water. We can compare the density of liquids by seeing if one sinks into the other. Experiment: Set up three glasses. Combine the three liquids two at a time. Make sure you know which liquid you put in first and second. Put the first liquid in. Then slowly put in the second. Does the second sink through the first or sit on top? If it sits on top, it is less dense. If it sinks, it is more dense. Make a list of your liquids from the most dense to the least dense. Now pour them all into the jar slowly, one at a time, the most dense first, the least dense last. You can test another liquid and try and make a taller tower of liquids. Get a tall glass or jar that you can see through, or a skinny glass flower vase would work well too. Put the most dense on the bottom, then the next, and so on. If there is more than one clear liquid, color one with food coloring. Here's a video of an experiment like this. Level 5-8* (Materials: salt, 3 clear glasses, food coloring) Take a slice of bread (no crust). Squash it. Your slice of bread became denser when you squashed it. Density is the measure of how much something weighs for the space it takes up. Your bread didn't change its weight, but it changed how much space it took up. It became denser. The bread was less dense to begin with. A rock is denser than water. It is heavier for the space it takes up than water is. So a rock sinks in water. We can compare the density of liquids by seeing if one sinks into the other. The official formula for density is mass divided by volume. One gram of water takes up one milliliter. One divided by one is one. Water's density is one. Gather three glasses you can see through. Fill one with hot water, one with cold water and one with salt water. Put a few drops of food coloring into each glass. Make observations. Which is the densest? Which is the least dense? How are density and viscosity related? Explain. Video if you need it. *Do the first page of this density worksheet. You can use a calculator. Density = Mass (grams) / Volume That means that Volume = Mass / Density and also that   Mass = Density * Volume. (Answers) Lesson 62   Level 1-4* (Materials: bowl of water, 10 things you can drop in that bowl of water) Play with this buoyancy explorer. Buoyancy is the ability something has to float. If something is buoyant, it can float. If you want to hear this word read to you, click on this and then the little speaker icon next to the word. Something is buoyant, or can float, if it is less dense than water. *Try out things from your home. Fill a bowl with water and drop things in. Check off on your list if they are buoyant or not. Level 5-8 (Materials: plastic bottle, eye dropper or pen cap and oil-based clay — maybe you could use a piece of crayon instead of clay?) Do the experiment. Read what is going on. You may be thinking, don't people sink? Water's density is 1. Salt water's density is 1.025. The average human body's density is 1.01. Can you see why people can float and sink? The experiment page talked about a "buoyancy compensator." Buoyancy is just a word that means the ability to float. Lesson 63   Level 1-4 (Materials Level 1-4: cups, food coloring–optional, paper towels) Capillary action is water being drawn along a solid. It happens because the molecules of the liquid are attracted to the molecules of the solid, and that pulls the liquid along. Read and do this experiment to see it in action. Level 5-8 (Materials: cups, food coloring–optional, paper towels; you can use books or something else instead of the blocks in the picture–just don't spill!) Capillary action is the movement of a liquid along the surface of a solid caused by the attraction of molecules of the liquid to the molecules of the solid. (from thefreedictionary.com) Read this and do the experiment to see it in action. Start at step 3. (The links on the page to "click to see their results" do NOT work. You can just look at the pictures on the page to see how they did the experiment.) Lesson 65 Level 1-4 Read about silicon. The circuits in your computer are made from silicon. Look at silicon. Cut out your silicon piece and draw/write inside of it and add it to your Carbon Group lapbook page. Level 5-8 Watch the video on silicon. Cut out your silicon piece and write about silicon inside. Add it to your others. Silicon is in the carbon family. Science Fair Lesson 66 Level 1-4 Choose a question to answer. Design an experiment to answer the question. You can use an existing experiment, but think of a way to expand it and try it with new things or in a new way. You need to finish by Lesson 70. You have five days to work on it. Take a look at other kids' experiments. Here are some experiment ideas based on what we've just been learning. Level 5-8 Choose a question to answer. Design an experiment to answer the question. You can use an existing experiment, but think of a way to expand it and try it with new things or in a new way. You have five days to work on this. Take a look at other kids' experiments. Here are some experiment ideas based on what we've just been learning. Lesson 67 Level 1-4 What you need to work on… Do the experiment. Record the experiment. You could make a video, a poster, a book or use this experiment book to write and draw in for your project. You need to present your project on Lesson 70. Level 5-8 What you need to be working on… Do the experiment. Record the experiment. Make a video, poster, book…show others what you did. Include your question, your hypothesis, best guess as to what the answer will be, and a complete list of materials. Include as many detailed steps as possible for how you did it. Include as many observations as possible. Make a chart of any data you collected, measurements you took. Write a great paragraph explaining your conclusion. You need to present your project on Lesson 70. Lesson 68 Level 1-4 What you need to work on… Do the experiment. Record the experiment. You could make a video, a poster, a book or use this experiment book to write and draw in for your project. You need to present your project on Lesson 70. Level 5-8 What you need to be working on… Do the experiment. Record the experiment. Make a video, poster, book…show others what you did. Include your question, your hypothesis, best guess as to what the answer will be, and a complete list of materials. Include as many detailed steps as possible for how you did it. Include as many observations as possible. Make a chart of any data you collected, measurements you took. Write a great paragraph explaining your conclusion. You need to present your project on Lesson 70. Lesson 69 Level 1-4 What you need to work on… Do the experiment. Record the experiment. You could make a video, a poster, a book or use this experiment book to write and draw in for your project. You need to present your project on Lesson 70. Level 5-8 What you need to be working on… Do the experiment. Record the experiment. Make a video, poster, book…show others what you did. Include your question, your hypothesis, best guess as to what the answer will be, and a complete list of materials. Include as many detailed steps as possible for how you did it. Include as many observations as possible. Make a chart of any data you collected, measurements you took. Write a great paragraph explaining your conclusion. You need to present your project on Lesson 70. Lesson 70 Level 1-4 Present your experiment. You could make a video, a poster, a book or use this experiment book to write and draw in for your project. Level 5-8 Present your experiment. Make a video, poster, book…show others what you did. Include your question, your hypothesis, best guess as to what the answer will be, and a complete list of materials. Include as many detailed steps as possible for how you did it. Include as many observations as possible. Make a chart of any data you collected, measurements you took. Write a great paragraph explaining your conclusion. Chemical Reactions Lesson 71 Level 1-4 (Materials: vinegar 2 cups, baking soda 2 tablespoons (or double that) Here's an experiment that is exothermic. What is that? It gives off heat. Chemical reactions create different products. Some reactions create energy, or heat! Go to the link to see the experiment, Hot Ice, and to try it. Watch this exothermic reaction. Explain to a parent what exothermic means. Level 5-8* (Materials: baking soda, vinegar if you can: thermometer, Epsom salt, smelling salt, calcium chloride–see below) Exothermic/Endothermic — Exothermic reactions give off heat–the chemical reaction makes heat. Endothermic reactions lower the temperature of the product. You are going to combine different materials and test to see if the reaction is exothermic or endothermic. *Print out this worksheet for the experiments. To make the baking soda solution combine 1/2 cup of water with 1 tablespoon of baking soda. Calcium chloride can be found as a laundry booster, road salt (check to make sure it is only calcium chloride), or as DampRid at a hardware store (if you use that, you need to increase the amount you use). If you have them, you can test Epsom salt (magnesium sulfate) and smelling salts (ammonium carbonate). Remember that chemicals are toxic. Use your goggles and gloves if you have them, and be careful. Don't smell the ammonium carbonate! If you can get nothing except vinegar and baking soda, then try that and regular table salt in water. Try something! Fill in/make charts of your observations. Write a paragraph stating your conclusions about what produces either an exothermic or endothermic reaction. Watch this exothermic reaction. (Materials: 1/2 c. milk and heavy cream and salt, 1/4 c. sugar, vanilla, 2 c. ice, qt. size ziplock bag, gallon size ziplock bag) An endothermic reaction is one where the temperature lowers. Try this yummy experiment. While you are eating, tell someone the difference between an endothermic and an exothermic reaction. Level 5-8 Lesson 73 Level 1-4 Read about chlorine. Cut out and fill in your chlorine piece and add it to your Halogens lapbook page. Level 5-8 Watch the video on chlorine. Cut out and fill in your chlorine piece. Chlorine is part of the halogens or florine family Lesson 74 (Level 1-4: baking powder, ingredients for any quick bread if you like; Level 5-8: yeast, ingredients for baking bread if you like) Level 1-4 Do you remember what element the C is the symbol of? If not, go look on your periodic table. What does O stand for? O_2 shows dioxide. "Di" is Latin for "two." So what is CO_2? (answer: Carbon Dioxide) CO_2 is the chemical compound released when you mix baking soda and vinegar. Is CO_2 a liquid, solid or gas? (answer: gas, it's what's making the bubbles when you combined baking soda and vinegar) Baking powder is an acid and a base together. (vinegar is an acid, baking soda is a base) You can make something similar by combining the base, baking soda, with the acid, cream of tartar. When you add any liquid to baking powder, it causes the acid and base to react, and CO_2 is made. The gas bubbles get caught in the batter or dough you are making and fill it with gas. This filling is what we call rising. Put a spoonful of baking powder in a small amount of water and watch what happens. Bake some quick bread. Don't stir too much or you will release all the gas! Level 5-8 Read about yeast and bread making. Instead of clicking on the gluten animation in the reading, watch this. Yeast releases CO_2 (what's that? carbon dioxide, the same thing we release when we breathe out). The gas gets trapped in the dough, filling it. We call it rising. If you want to make bread, here's a recipe to follow. You don't need to use a mixer. After step five, punch down the dough, divide it in half, and put it in the shape you want. Skip to step 8. After step two–after adding the warm liquid –stop and observe for awhile. Observe the CO_2 being released. If you don't want to make bread, mix together a packet or tablespoon of active dry yeast, 1 c. of very warm water and 2 tablespoons of sugar. Observe the release of CO_2. Level 1-4 (Materials: 3 potatoes, tiny light bulb, preferably a red LED, 3 galvanized nails — coated with zinc, copper pennies (coins) or wire, at least 3 alligator clip wires — with clips on each end of a wire – You may also want to try with lemons, tomatoes, and bananas. — NOTE: FOOD WILL BE INEDIBLE AFTERWARDS) Level 5-8* (Materials: 3 potatoes, tiny light bulb, preferably a red LED, 3 galvanized nails — coated with zinc, copper pennies (coins) or wire, at least 3 alligator clip wires — with clips on each end of a wire – You may also want to try with lemons, tomatoes, and bananas. — NOTE: FOOD WILL BE INEDIBLE AFTERWARDS) Electricity Lesson 76 Level 1-4 Play a science review activity. Measure the pH of liquids. The menu at the top lets you try different liquids. Fill the tank a little. Make an educated guess if it's an acid or a base. Then drag the little magnifying glass circle onto the liquid and check out the pH scale on the left. Were you correct? Level 5-8 Play this circuit game you played when you were learning about the light bulb. Try different conductors. Scroll down the menu on the left and add different types of things to your circuit. What works? What doesn't? Can you make the fan spin? Click and drag to get a wire. Lesson 77 Level 1-4 Here is an electricity video to look at to get you started learning about electricity. Level 5-8 Today explore "How Plants Work" and get a little understanding of where our electricity comes from. Lesson 78 Level 1-4* *Complete this timeline worksheet. Here's some information you could include. You don't have to use every bit of information! Level 5-8* *Complete this timeline worksheet. Here's some timeline information. You don't have to use every bit of information! There are also timeline dates and events included in the lapbook printout. Level 1-4* (Materials: two alligator clips, 9 volt battery, mini light bulb — like from Christmas decorations) Connect two alligator clips to a 9 volt battery, one to each terminal (part sticking out). Connect the other end of each wire to a little light bulb. This is a closed circuit. When you detach one wire, this is an open circuit. Can you make a circuit? *Complete this worksheet. Level 5-8* Lesson 82 Level 1-4* Level 5-8* Take a look at this website. Make sure you scroll down to the animated picture and see how the alternating current changes the poles so that the rotor is attracted to the north, then the south, and in that way keeps spinning. *Fill out this worksheet. Lesson 84 Level 1-4* *Look up definitions for the words and write them in the light bulbs. Level 5-8* *Look up definitions for the words and write them in the light bulbs. Level 1-4* (Materials: long iron nail, copper wire, 9 volt battery, paper clips, aluminum foil) Level 5-8* (Materials: 9-volt, copper wire, magnetic compass, metal thumbtacks, paper clips –it says lid of small cardboard box and block of wood but could be substituted–) Magnetism Lesson 86 Level 1-4* You created a magnet. Now let's learn some more about magnets and magnetism. We think of magnets as being what's on the refrigerator, but really magnets and electricity go together. Here's a website to get information. *Fill out this worksheet with things you've learned. Level 5-8* You saw in your last experiment how magnets and electricity go together. Now let's learn more about magnetism. Here's a website to get information. *Today do the magnet vocabulary. You may search online for the definitions or use a dictionary. Lesson 88 Level 1-4* Read about electric motors. *Complete this worksheet. (Answers) Level 5-8* You can see what grippers are, using magnets for lifting. Below you can see robot grippers. How would making them magnetic help? The force is the strength of the magnet–the stronger the magnetic force, the more weight it could lift. "Industrial" use means in factories and things like that. Here are magnetic gripper videos. *Draw a gripper in action. Lesson 89 Level 1-4* Level 5-8* *Take notes on this page as you learn about the earth's magnetic field. You can use these two pages to learn about the earth's magnetic field: one two. Lesson 90   Level 1-4 (Materials: 7-9 in. balloon, yard/meter stick, large spoon–tablespoon works) Read this page and try the experiment. The video on the page isn't working, but here it is from YouTube. Explain how electrons and magnets can work to make things rotate. Level 5-8 (Materials: three of the same magnets, optional: aluminum cookie sheet) Read this page and try the experiment. (The video is not working now. Can you design an experiment to answer the questions and observe what she's talking about?) Explain what you learned. Lesson 91 Level 1-4 Magnet activity Click on the activity on the right. Draw a picture that explains how magnets work. Level 5-8 Circuits Lesson 92   Level 1-4 (Materials: battery, mini light bulb, 3 alligator clip wires, aluminum foil, paper clip–plain metal; M+ motor, wires, batteries) Draw a circuit with a battery, a light bulb and two wires. (If you need a circuit review, play with this.) Make sure it is a closed circuit. Electricity has to flow. It can't just travel from the battery to the light bulb; it has to be able to flow back through the battery. Now create the circuit. Now draw a circuit with a battery, a light bulb, a switch and three wires. Build the circuit. You can use aluminum foil and paperclip for your switch. Fold a piece up into a small rectangle. Clip one end into one of the wires. Clip the paperclip into the other wire. What happens when you press down on the aluminum foil to touch it to the paperclip? It should turn on the light. If for some reason you can't build circuits, you can do use the circuit link for the next few days. You can do it just for fun too. Level 5-8 (Materials: battery, mini light bulb, 3 alligator clip wires, aluminum foil, paper clip–plain metal; M+ motor, wires, batteries) Draw a circuit with a source of electricity, a switch and at least two small things that use electricity, like a mini light bulb and motor or small LED clock. Make sure the electricity will go all the way around the circuit. If you need a circuit review, play with this. Build the circuit. Does it work? If not, change it. Does it need more power? Draw a circuit with two electrical objects, two sources of power and two switches, so that you can turn on and off each thing (like a light bulb). Build the circuit. Lesson 93 Level 1-4* (Materials: battery, mini light bulb) Build a simple circuit with one battery and one mini light bulb (or something similar). Add in an extra wire on one side to make the wire on one side extra long. Gather materials from around the house: ideas…piece of clothing, key, spoon, pencil, paper, piece of cheese…) Try each one in between the two wires on the long side of the circuit. *Fill out this experiment worksheet on which ones conduct or carry electricity. Water conducts electricity very well, which is why you have to get out of a pool during a lightening storm and why you should never be in the bath when there is an electrical item plugged in near you. Level 5-8* (Materials: battery, mini light bulb, 3 alligator clip wires, random items: key, clothing, spoon, paper) Build a circuit. Add in an extra wire so you can test conductors. You are going to experiment like this activity does. (You scroll down on the menu on the left for other conductors.) Gather up items to test. Get a variety. Try some foods. *Test each one and record the results. Which ones conduct (carry) electricity? Lesson 94 Level 1-4 Level 5-8 Read about series and parallel circuits. Draw a circuit of each kind. (Series: the electricity flows to one and then the other; Parallel: the electricity flows to both at the same time) Build them. Did they work? What's the difference in power levels between the two circuits? Lesson 95 Level 1-4 Watch this video on circuits and human conductors. Why not try and make a circuit with you in it! If you can't, you could play a human circuit game. Have one person wear around their neck a battery sign. Have one person wear a light bulb sign with an on and off sign. Make different scenarios. When does the light bulb turn on? Level 5-8 You decide what to do. You could… Build some more circuits. Play some circuit games. Try another experiment. You can try them both or choose one. Level 1-4* (Materials: salt, pepper, cornstarch, flour, oil, juice/milk, a clear cup, spoon — just a small amount of each) Today you are going to test for ability to dissolve or disappear into a liquid. Take a clear cup and fill it halfway with cold water. Take a regular spoon and fill it with one of your test items. Dump it into the water and stir. Did it disappear into the water? Did it dissolve? *Mark it on your worksheet. We already know sugar dissolves in water because we stir it into our tea — hot and cold. Level 5-8* Read through this Chemistry Review page. (It's okay if some of it is new.) Click on the right arrow. Watch the salt and sugar dissolving videos linked at the end of the reading. *Write the definitions for all the words that are a different color. (Put your mouse on the words and a definition will pop up.) Fill in today's words and then save the page. Lesson 97   (salt, sugar, flour, cornstarch, small pot, spoon for stirring in pot, clear cup, spoon) Level 1-4* Today you are going to test to see if temperature affects the ability to dissolve. You already tested these items in cold water and saw them dissolve (except for sugar). Heat up one cup of water on the stove. Stir in a spoonful of one of your test substances. Did it dissolve? Did it dissolve more easily or with more difficulty than when in cold water? *Record your observations. Does it dissolve in hot water? Go ahead and mix sugar in cold water to compare the two. Write a sentence describing your conclusion about how temperature affects how things dissolve. Level 5-8 Read through this Chemistry Review page. Click on the right arrow. Write all the colored words' definitions on your saved page. Level 1-4 (Materials: at least 1/2 cup of salt on hand, small pot, measuring spoons) Today we are going to find the solubility of salt. That means we're going to see how much salt we can dissolve into a liquid before it just can't hold any more. Did salt dissolve better in hot or cold water? Put one cup of water in a small pot. Stir in salt one tablespoon at a time until it is dissolved. Keep track of how much you are putting in. When you can't get any more dissolved, the water is saturated; it can't hold any more. The salt water is called a saturated solution. What is the solubility of salt in water? It's the amount of salt you put in. How much? Now… Heat up the salt water in the small pot. Add in more salt a teaspoon at a time and stir until dissolved. Keep track of how much you are putting in. Stop when there are a few grains of salt in there that just won't dissolve. The quantity of salt you put in is its solubility in hot water. What is it? The water is now a supersaturated solution. It's completely full and will be too full when it cools. Soak a piece of cardboard in your supersaturated solution. Set it on a plate in a sunny place to dry. What happens? What happened to the salt water in your pot when it cooled? Tell someone all about saturated solutions. Level 5-8 Lesson 99 Level 1-4 Draw a picture of making a saturated solution with salt and water. Label the water with this word, solvent. Label the salt with this word, solute. The solute is what dissolves in the solvent to make a saturated solution. Level 5-8 Read through this Chemistry Review page. It's okay if there is new information. Write the definitions on your page. The words aren't colored this time. Level 1-4 Play your vocabulary game. (alternate) Level 5-8 (Materials: balloon, strip of plastic from grocery store plastic bag) Play the definition game. (alternate) We're going to do some more chemistry review. Let's go back and look at atoms again. Remember they have neutrons and protons in the nucleus and electrons in the outer shells. The electrons have a negative charge and the protons have a positive charge–like magnets and electricity. Read through these pages and click on the numbers on the pictures to see the different images. Click on the "Start" and "Play" buttons. The one with the faucet should have a play button–you don't need to download anything. Click on the arrows to turn the pages. Try rubbing the plastic bag between your fingers and the balloon on your hair and watch how you can see the electrons have moved, causing the attraction. Draw or write, explaining the attraction either between the water and balloon or between the plastic and your fingers. Lesson 102 Level 1-4* We're going to go back and look at atoms and molecules again. An atom is made up of three particles: protons +, electrons – and neutrons. The positively charged protons are attracted to the negatively charged electrons. The neutrons have no charge and are neutral. There is always the same number of electrons as protons in a stable, neutral element. The protons and neutrons are in the center of the atom, called the nucleus. The electrons spin around the nucleus in an orbit. Their opposite attraction (like magnets) keeps the atom together. Build atoms. You only have 5 minutes. Click on all the boxes to the right. Create different elements by adding protons, neutrons, and electrons, using the arrows on the left. Keep the number of the particles the same–same number of electrons and protons. *Label the drawing of an atom on page 1. Do you need a helping picture? Write the name of this atom — which has 2 electrons? What do you remember about atoms? (Answers) Level 5-8 Read these pages. All of the pictures with a science experiment are videos. There should be a play button. Draw a 2-D model of a sodium atom. Lesson 103 Level 1-4 Atoms make up everything in our world. When atoms come together and bond or attach to each other, they make molecules. H_2O is a water molecule made up of two hydrogen atoms and one oxygen atom. Build molecules. Use the model mode to attach atoms together or look at how atoms are linked in real molecules. Heat up the molecules to get them moving to turn the solid into a liquid and then a gas. Level 5-8 Read these pages about covalent bonds. Click on all the numbers and start and play buttons and arrows. Draw two oxygen atoms bonded. Write the type of bond and describe what is happening in the picture. Oxygen basically never exists alone. It is always found bound to another oxygen atom. Level 1-4 (Materials: two gummy candies of different color, toothpicks) Build water molecules with gummy candy and toothpicks. Two hydrogen (same color) and one oxygen (different color). Here's a picture. Now make 4 more water molecules. Now attach them all together. The hydrogen needs to attach to the oxygen. Here's a diagram–scroll down, 3rd picture from the bottom. This is how drops of water are formed and hold together. Level 5-8* (Materials: gummy candies of different color, toothpicks) Forces Lesson 106 Level 1-4 Remember these words – thrust, lift, drag, weight? Thrust pushes the plane forward. Drag is the air pushing back on the plane. Lift is the air pushing up on the plane. Weight is gravity pulling down on the plane. When thrust is greater than drag, the plane moves forward. When lift is greater than weight, the plane goes up. When all these forces pushing on the plane in every direction are equal, the plane is still. Put your hands together. Push harder with your right hand. What happens? Push harder with your left hand. What happens? Push the same with both hands. What happens? Describe to someone or draw a picture about how when forces are equal on an object, they stay the same, but when one is larger, the force moves the object. Level 5-8 Remember these words – thrust, lift, drag, weight? Thrust pushes the plane forward. Drag is the air pushing back on the plane. Lift is the air pushing up on the plane. Weight is gravity pulling down on the plane. When thrust is greater than drag, the plane moves forward. When lift is greater than weight, the plane goes up. When all these forces pushing on the plane in every direction are equal, the plane is still. Put your hands together. Push harder with your right hand. What happens? Push harder with your left hand. What happens? Push the same with both hands. What happens? You can play this little game again. It involves weight, drag, thrust. Lesson 107 Level 1-4 Play this cannonball game. You will consider weight (gravity pulling on an object's mass), thrust (how fast it gets going), and drag (air resistance). Hit the target. Try two different masses (choose two different objects). After you play the game, tell someone how to make the cannonball go farthest and how to make it go the shortest distance. Here's a little reminder about gravity. Level 5-8* Play this cannonball game. You will consider weight (gravity pulling on an object's mass), thrust (how fast it gets going), and drag (air resistance). Hit the target. Try two different masses (choose two different objects). Here's another forces activity. How much force do you need to apply to go as fast as possible without getting too hot and having the warning lights flash? Turn on and off friction and air drag to see their effect on the force answer. Read pages 1 and 3 of this PDF. *Complete this worksheet on force. (Answers) Lesson 108 Level 1-4 Watch the video on friction. What is friction? Try the activity. (alternate activity – the two activities at the bottom of this page) Level 5-8* Play this forces in action activity. (Skip the video at the top of the page.) Scroll down and click on the triangle on the bottom activity on the page. Makes sure to read the directions above the activity. If you don't see it, click on "show question." You can play with larger and smaller forces here. Leave it set to net forces. *Read and fill in these pages. You can do this. It's a diagram of your two hands pushing against each other. Your left hand pushes and your right hand pushes more. Which way do your hands move? Do they move more when you push harder? Yes. That's all these diagrams are showing. (Answers) Lesson 109 Level 1-4* *Fill in this worksheet on different things that cause friction. Friction helps us walk, but it makes moving heavy furniture across the room harder. List examples of friction and decide if it is helpful or not. Can you imagine a world without friction? What if you plopped yourself down on the couch and it slid across the room? What else would happen if there were no friction? Level 5-8 Watch the video on friction. Play with friction. Choose friction. In the box on the right add or remove friction. Write about how friction affects your life everyday. What would your world be like without friction? Lesson 110 Level 1-4 Read about potassium. Read more about where to find it. Fill in your potassium mini book. (Eat a potato or banana) Add it to your Alkali Metals Group lapbook page. Level 5-8 Laws of Motion Lesson 111 Level 1-4 (Materials: rubber band, pretty strong plastic spoon, balled up aluminum foil or mini marshmallows or something else little and light, 2 thumbtacks, base — small wood block or something firm and heavy) Read the first page on this site about Newton's First Law of Motion. Watch the first video, then build a catapult to demonstrate this law. Get permission before you stick thumbtacks into something. If for some reason you can't build that one, here's an alternative catapult with a different supply list. (You have to get on their email list.) Watch the second video and explain how it demonstrates Newton's First Law of Motion. Level 5-8 Read about motion and forces. Scroll down to the bottom of the page and take the Physics and Motion quizzes. Read about vectors. Write a word problem and solve it with vectors. Lesson 112 Level 1-4 Learn about Newton's Second Law of Motion. Demonstrate this law. Find two things of unequal weight. Push them the same speed across the floor. Which one did you need a greater force to push? The heavier one, because force equals the mass times acceleration. That means, the heavier the object is, the more work it will take to get it going. If you have chairs you can slide on a floor, push an empty chair and a chair with someone sitting in it. The one with the greater mass (the heavier one) will be harder to push. If you are really excited about this, figure out your acceleration by figuring out how many meters you go in 1 second. That's your acceleration. Acceleration is measured in meters per second (m/s). Weigh the object you pushed. That's the mass. Mass is measured in kilograms (kg). Use an online converter to figure out kilograms if you need to. Multiply the mass and acceleration (use a calculator) to find out the force you used. Force is measured in Newtons. Guess why they are called Newtons? Level 5-8* Lesson 113 Level 1-4 Learn about Newton's Third Law of Motion. Think of a way to demonstrate Newton's Third Law. Here is an example, and a second one. The video from Lesson 39 is also an example. Explain how each example shows Newton's Third Law of Motion. Level 5-8* Think of a way to demonstrate each of the three laws. (Example: When someone is not wearing a seat belt and the car is suddenly stopped, that person will keep moving forward, right through the windshield.) *Demonstrate each with objects in your home. Write about each demonstration on your Three Laws of Motion paper. Lesson 115 Level 1-4 Read about calcium. Cut out and fill in your calcium piece. Add it to you Alkali Earth Metals lapbook page. Play launchball. Level 5-8 Read about calcium. It will tell you what family it belongs to. Cut out and fill in your calcium piece. Play launchball. Level 1-4 (Materials: balloon, spill proof bottle cap from sports drink, old CD, super glue/tape) Build a hovercraft and demonstrate the three laws of motion. (You can use tape instead of super glue. Just seal it all the way around. No air can escape.) Demonstrate to your parents and show them each of the three laws of motion in action. Level 5-8 (Materials: box like shoe box lid, about seven index cards, masking tape, 2 marbles–after you read the directions you can figure how to make due with other materials/types of balls if you need to) Build a marble maze and demonstrate the three laws of motion. Demonstrate to your parents and show them each of the three laws of motion in action. Here's a really hard maze to make but only uses paper. Get permission before you choose this because it prints A LOT of pages. Lesson 118 Level 1-4 Design a roller coaster. Then click on "park map" and try the other rides. Level 5-8 Answer these forces questions. Say your answer out loud before you read on after each question mark. Lesson 119 Level 1-4 Keep your momentum to reach the goals. Level 5-8 Read about momentum. Take the quiz. I failed at building one of these momentum machines, but if you want to try, here are the instructions. Lesson 120 Level 1-4 Read about iron. Cut out and fill in your iron piece. Add it to your Transition Metals lapbook page. Level 5-8 Level 1-4* There are seven simple machines. These machines help us do our work. The work these machines help us do is moving a mass over a distance. What is something in your house that is too heavy for you to lift? These machines would help you move that item. The first one you are going to learn about is the inclined plane. Watch this video about the inclined plane. Look at this picture. Explain how this inclined plane makes the work of getting the cart up the hill easier? *Draw a picture of an inclined plane on this page. Save the page for the coming days. Level 5-8* (Materials: long rubber band, "heavy load" in small bag, meter or yard stick, books, regular ruler) Watch this experiment and try it at home. Where are some inclined planes in your world? Here's one example. *Draw a picture of an inclined plane on this page. Save the page for the coming days. Lesson 122 Level 1-4 The next simple machine we will learn about is the wedge. A wedge is like an inclined plane. It is slanted and comes to a point. The difference is that an inclined plane stays where it is put. The wedge does the moving. It is used to split things apart. Can you find the wedges in these pictures? Watch these two short videos which each give an example of a wedge: one two. Have your mother show you one of her big knives. Is it thin on the cutting edge and comes to a point? It's to wedge into whatever you need to cut. Draw a picture of a wedge on your simple machines paper. Level 5-8 The next simple machine we are going to learn about is the wedge. A wedge is like an inclined plane. It is slanted and comes to a point. The difference is that an inclined plane stays where it is put. The wedge does the moving. It is used to split things apart. How is a nail a wedge? Do you ever use your fingernail as a wedge? Where else can you find wedges in your world? Look at the wedges in these pictures. Where are the wedges in these objects? Draw a wedge or list examples of wedges on your simple machines graphic organizer. Lesson 123 Level 1-4 The next simple machine is the lever. Can you pick up another person as high as your head? You can with a lever. Watch the video to see how. Try pushing open a heavy door from the edge near the door knob and from the opposite edge. Which is easier? Why? Add a picture of a lever to your simple machines page. Level 5-8 Watch this video about levers. Add levers onto your graphic organizer. Lesson 124 Level 1-4 Today's simple machine is the screw. Watch this video and explain how the screw is like an inclined plane and how it helps her move the water. Add screw to your graphic organizer. Level 5-8 Lesson 125 Level 1-4 Read about nickel. Cut out and fill in the nickel piece. Add it to your Transition Metals lapbook page. Level 5-8 Level 1-4 (Materials: straw, thin cardboard/card stock, brass fastener) Today's simple machine is the wheel and axle. Think of different wheels in your world. Wheels don't just help carry things. Do you have a pizza cutter in your house? Watch this video demonstrating wheels and axles. Another tool built like a pizza cutter (but without the sharp edge) is a surveyor's wheel, measurement tool. Build a surveyor's wheel. Cut a circle out of thin cardboard or card stock. Attach it to a straw with a brass fastener. Mark a spot on the circle. Put the spot on the edge of a piece of paper. Turn the wheel around one time. Measure how far it traveled. A real surveyor's wheel would click each time it made one turn. If it traveled one meter each turn and clicked 25 times, then the surveyor would know that the distance was 25 meters. Why is that better than using a meter stick? The axle on your surveyor's wheel was very small. It was the brass fastener. Fill in the wheel and axle piece on your simple machines paper. Level 5-8 (Materials: 10 pencils, brick/heavy wood/big book) Today's simple machine is the wheel and axle. Look at how a doorknob works. Make a conveyor belt of pencils. The pencils are your wheels. Choose something heavy to push. (Because books are usually smooth, choose a really heavy one or a stack of a few.) How different is it pushing something heavy across a rug and pushing something across your pencil conveyor belt? How is your conveyor belt make your work (your work of pushing your heavy object) easier? If you take one of those pencils and poke it through two bottle caps, you have created an axle. Look at these examples of wheels and axles. Add wheel and axle to your simple machines graphic organizer. Level 1-4 (Materials: spool of thread, string, pencil) Today's simple machine is the pulley. Watch this video on pulleys. It has some big words, but you will see how pulleys work. Make a pulley. Add a picture of a pulley to your simple machines paper. Ask a parent to put your simple machines paper in your portfolio. Level 5-8 Watch this video on pulleys. See examples of pulleys. Make a pulley system. Here's an example with a milk jug, rope, and a broom, but you can do it any way you like. Add pulleys to your simple machines graphic organizer. Lesson 128 Level 1-4 We're going to look at one more simple machine, even though your paper is full. This is not always listed as a separate simple machine. It is a type of wheel. It's the gear. Find a gear in your house to look at–a bike, an egg beater, a toy car… Gears have teeth that interlock. The big gear turns a smaller gear. You turn the big gear around once, and it turns the little wheel lots of times. Watch this video on gears. Level 5-8 We're going to look at one more simple machine, even though your paper is full. This is not always listed as a separate simple machine. It's a type of wheel. It's the gear. Find a gear in your house to look at–a bike, an egg beater, a toy car… Gears have teeth that interlock. The big gear turns a smaller gear. You turn the big gear around once, and it turns the little wheel lots of times. Like the inclined plane, pulley and others, it spreads out your effort to do your work. Read about gears. Lesson 130 Level 1-4 Read about copper. Cut out and fill in your lapbook piece. Add it to your Transition Metals lapbook page. Level 5-8 Lesson 131 Level 1-4 Level 5-8 Practice identifying simple machines. Learn about compound machines. Login with easypeasy and allin1homeschool . This login is just for Easy Peasy students to do their assignments. Lesson 132 Level 1-4 Design a machine. Draw it. Describe what it does and how it works. Can you build it? Put your paper(s) into your binder when you are done. Level 5-8 Design a compound machine. Draw it. Describe what it does and how it works. Can you build it? Put your paper(s) into your binder when you are done. Lesson 133 Level 1-4 Design a device that puts a marble into a cup. It must use at least 10 steps. Here is an example. Here's a really fancy example of this type of device. Level 5-8 Design a device that puts a marble into a cup. It must use at least 10 steps. Here is an example. Here's a really fancy example of this type of device. Lesson 135 Level 1-4 Read about zinc. Cut out and fill in your lapbook piece. Add it to your Transition Metals lapbook page. Level 5-8 Lesson 136 We're going to be engineers. Engineers design and build everything man-made in your world. They don't just design airplanes and cars; they also design things like the cabinets in your kitchen. Design a cell phone. Lesson 137 Now let's look at building big! First, let's look at bridges. Read about different types of bridges. Play with different forces on the bridges. Click on Stress Analysis. Click on the middle of the bridge and pull down. If you want to do more after it tells you that you need to log in, reload the page. Complete the online bridge challenge. Look at how important it is to build your bridge right! Here's a physics failure bridge! Lesson 138 Level 1-4 Today let's build our own bridges. You can use this resource for ideas to build a file-folder bridge. (source) OR You can build your own out of balsa wood and wood glue or any other materials. (Don't destroy your bridge after you are done. Make sure you do tomorrow's lesson before it's damaged.) You should try to build a physical bridge, but you could also try one on the computer if you are allowed to play it. Level 5-8 Today let's build our own bridges. You can use this resource for ideas to build a file-folder bridge. (source) OR You can build your own out of balsa wood and wood glue or any other materials. (Don't destroy your bridge after you are done. Make sure you do tomorrow's lesson before it's damaged.) You should try to build a physical bridge, but you could also try one on the computer if you are allowed to play it. Lesson 139 Level 1-4* Test your bridge's strength. Create and conduct an experiment to see how much weight it will hold. Record all of your observations and results. Write up your experiment. *Experiment worksheet Level 5-8* Test your bridge's strength. Create and conduct an experiment to see how much weight it will hold. Record all of your observations and results. Write up your experiment. *Experiment worksheet Lesson 140 Level 1-4 Read about silver. Cut out and fill in your lapbook piece. Add it to your Transition Metals lapbook page. Level 5-8 Lesson 142   Level 1-4 (Materials: either newspapers and tape or gumdrops and toothpicks) Build a dome. Use either newspapers or gumdrops and toothpicks. Here's a YouTube video of a newspaper dome; get permission before you watch a YouTube video. Note: The directions on the YouTube video are a little off. It should be 71 cm and 63 cm. Level 5-8 (Materials: either newspapers and tape or gumdrops and toothpicks) Build a dome. Use either newspapers or gumdrops and toothpicks. Here's a YouTube video of a newspaper dome; get permission before you watch a YouTube video. Note: The directions on the YouTube video are a little off. It should be 71 cm and 63 cm. Lesson 144 Level 1-4 (Materials: paper clips and straws) Do this straw activity and then build a skyscraper out of straws. Level 5-8 (Materials: paper clips and straws) Do this straw activity and then build a skyscraper out of straws. Lesson 145 Level 1-4 Read about iodine. Cut out and fill in your lapbook piece. Add it to your Halogens lapbook page. Level 5-8 Lesson 146 Read about dams. Take the dam challenge. Stop by the shapes lab. Lesson 147 Read these Hoover Dam facts. Design a dam. Where is it going to be? How big does it need to be? Label the height, width, and depth on your diagram. Lesson 149 Design a tunnel. Where is it going to be? How long does it need to be? What kind of forces will effect it? Lesson 150 Level 1-4 Read about gold. Cut out and fill in your lapbook piece. Add it to your Transitions Metals lapbook page. Level 5-8 Level 1-4 (Materials: At least two 6 foot (183 cm) sections of 1-1/2 in (about 4 cm) diameter foam pipe insulation, another option: toilet and paper towel rolls marble) Our last physics topic for this year is energy. Energy is what enables us to do our work. A roller coaster needs a certain amount of energy to do its work of pulling the weight of the cars from the beginning to the end. Build a roller coaster. Click through the tabs. Look at the pictures. Read the questions. Play around and make observations. Another option is a toilet paper roll marble run. Try to make your marble go up a little at some point. Tell your observations to your parents. Play this roller coaster game if you can't build one. Level 5-8 (Materials: At least two 6 foot (183 cm) sections of 1-1/2 in (about 4 cm) diameter foam pipe insulation, another option: toilet and paper towel rolls marble) Our last physics topic for this year is energy. Energy is what enables us to do our work. A roller coaster needs a certain amount of energy to do its work of pulling the weight of the cars from the beginning to the end. Read about energy. Build a roller coaster. Click through the tabs. Look at the pictures. Read the questions. Play around and make observations. Another option is a toilet paper roll marble run. Try to make your marble go up a little at some point. Explain your observations to your parents. Play this roller coaster game if you can't build one. Lesson 152 Level 1-4 Draw a diagram of your (a) roller coaster. Put numbers on your diagram to show where the roller coaster was fastest and slowest. Write a 10 for the fastest and 1 for the slowest. Mark other places with 5, etc. How did the fast places help in the slow places? Explain to a parent how the speed and height of your roller coaster affected how your roller coaster worked. Level 5-8 There is potential energy and kinetic energy. In what you read, it was explained as energy stored and energy used. Look at the picture toward the top of this page and read the caption about the ball and arrow. Kinetic energy is the energy of an object in motion–the ball swinging or the arrow flying through the air. There is a formula to figure out the kinetic energy of an object. Physicists use this to figure out if their roller coaster will work. The formula is kinetic energy equals one half of the mass of the object times its speed squared. The equation looks likes this: $KE = 1/2 mv^2$ (.5 times mass times speed times speed). Go to this page and try problems 1 and 2 at the bottom. You can use a calculator. Level 1-4 (Materials: two glass jars, white paper, black paper) Energy comes in lots of different forms. One form is heat. Watch this video on heat and temperature. Watch this video on heat energy. Put two jars (or glasses) of water out in the sun. Make sure they have the same temperature of water in them. If you have a thermometer, measure the temperature of the water and record it. Wrap one jar in white paper. Wrap one jar in black paper. In half an hour, feel the water in each jar. Which is hotter? (Measure the temperature if you can.) Where did the heat come from? Look at the picture below. It's of a room in my house. Behind the curtains are windows that go across the whole room. In the morning, the sun comes right in those windows. I have a white curtain and a dark colored curtain. In the summer I have the curtains one way and in the winter I reverse them with the other on the outside next to the window. In this picture the white curtain is on the outside by the window and the colored curtain is on the inside. Think about the experiment. Why would I put the colored curtain on the outside by the window? In what season would I put the colored curtain by

the window? Is it summer or winter when this picture was taken? Why? (answer: It is summer. In the winter the dark curtain is on the outside by the window to absorb the heat of the sun and bring that heat into the room. In the summer we don’t want extra heat, so we put the white curtain on the outside to reflect the light and keep it cooler inside.) Level 5-8 (Materials: thermometer, marshmallow, candle) Watch this video on heat and temperature. Now it’s your turn. Check your supplies list above. Light your candle. Measure the air temperature about 10 cm. above the candle. With the candle lit, hold the marshmallow where you recorded the temperature. Watch and observe the marshmallow. Then record the temperature again in that same place. What were your observations? How did the heat from the flame effect the marshmallow without touching it? Explain your observations. Lesson 154 Watch these videos on radiation. Heat Radiation Heat Spectrum The sun’s heat got into the water through radiation. Draw a diagram that shows something on earth heating up due to radiation from the sun. Lesson 155 Level 1-4 One interesting energy fact is that energy can’t be created. All of the energy in the universe existed from the beginning of time. Our sun produces enough energy every second to meet the whole world’s energy needs for 500,000 years. And our sun is small compared to other stars giving off even more energy. People guess there are about 10000000000000000000000000 stars, all of which give off energy. That’s an incredible amount of energy that all came into existence in an instant! Read about lead Cut out and fill in your lapbook piece. Level 5-8 One interesting energy fact is that energy can’t be created. All of the energy in the universe existed from the beginning of time. Our sun produces enough energy every second to meet the whole world’s energy needs for 500,000 years. And our sun is small compared to other stars giving off even more energy. People guess there are about 10000000000000000000000000 stars, all of which give off energy. That’s an incredible amount of energy that all came into existence in an instant! Read about lead. Watch a video about lead. Cut out and fill in your lapbook piece. Read about heat transfer — heat moving from one thing to another. How does heat transfer? (answer: from the hotter object to the cooler object) Draw a picture of an ice cube in a glass of water. Use arrows to show that the heat is leaving the water and going to the ice. That’s what is making the ice melt. The water cools down because its heat energy is leaving. Make sure you put your picture in your binder. Read about heat. Take the quiz. (Materials: butter or margarine; anything small to stick in it; wooden spoon, plastic spoon, metal spoon–just something with a handle) Yesterday you read about conduction, when heat transfers from one object to another object that it is touching. Try this conduction experiment. Click on the box in the bottom right corner to make it full screen. (Materials: butter or margarine; anything small to stick in it; wooden spoon, plastic spoon, metal spoon-something with a handle) (Materials: food coloring — make a colored ice cube for tomorrow) Read about conduction. Watch this video example of conduction. You can try it if you have permission. Read about convection, another way heat is transferred. Draw a diagram of convection heat. (You can cut out and glue on colored arrows if you like.) Read about convection. Try this convection experiment. Make it full screen to block out everything else. What’s happening? The cold liquid is denser and moving through the warm liquid. Describe how this is seen in convection air currents. Put on a science show about heat. Use your diagrams to teach your audience about the three different types of heat transfer. Quiz your audience to see if they learned what they were supposed to learn. Level 5-8 Review the three types of heat transfer. Put on a science demonstration. Teach your audience about the three different types of heat transfer. Demonstrate them with visuals or by acting out what happens. Be creative. Be informative. Quiz your audience afterwards to see if they learned what they were supposed to learn. (Materials: 1 large size pizza box oven, Several feet of aluminum foil, 1 sheet black construction paper, 2 1/2 feet of clear plastic wrap, 4 feet of masking tape, 2 feet of string) Cook pizza using the sun’s radiating heat. You can’t really cook dough, but you can melt cheese, so you could make a pizza on an English muffin or Naan bread, etc. You can use this idea using whatever box you have at home. (Materials: 1 large size pizza box oven, Several feet of aluminum foil, 1 sheet black construction paper, 2 1/2 feet of clear plastic wrap, 4 feet of masking tape, 2 feet of string) Read over this experiment, cook using the sun’s radiating heat. Either do this experiment or design your own oven and cook your own food. (Cook something that you can eat raw safely, like hot dog, pizza, s’mores.) The other day we used the sun as energy to cook. The earth is full of natural energy. People have been working to use this natural energy. One way that’s been around for a long time is the water wheel. It uses the power of the water to do the work. Instead of burning coal to create steam to turn a magnet to create electricity, you can use a river’s water to turn a water wheel, which can turn a magnet to generate electricity. Watch the video. We can also use the power of waves and wind. Here is a little games to play just for fun to teach you about the different types of energy resources. “Renewable” means they can be used again. The wind and water never go away. “Non-renewable” means they get used up and are gone. Coal is non-renewable. Save the world with renewable energy. There are three types of renewable energy. Use them all! Where do they each work best (make the most energy)? Watch this video on energy. Learn about why renewable energy is important. Do these elements flashcards. Choose more options. Choose 20 questions and select all of the elements you know about. Do these elements flashcards. Choose more options. Choose 20 questions and select all of the elements you know about. *Print out these elements cards. Play Go Fish. You only need 3 of each to get a set. Ask for the name, the symbol or any other info on the card to help you learn more about them. Level 5-8* *Print out these elements cards. Play Go Fish. You only need 3 of each to get a set. Ask for the name, the symbol or any other info on the card to help you learn more about them. Choose an element from this set to learn more about. Choose one that you don’t know anything about. You can learn more about it here and here. Teach your family all about it when you are done. Who discovered it? When? What does it look like? What is its symbol? What is it used for? What’s interesting about it? Choose an element from this set to learn more about. Choose one that you don’t know anything about. You can learn more about it here and here. Teach your family all about it when you are done. Who discovered it? When? What does it look like? What is its symbol? What is it used for? What’s interesting about it? Take this atom review quiz. Make a quiz game for radiation, convection, conduction, energy, gear, wheel and axle, inclined plane, screw, wedge, pulley, lever. Give it a title. Follow the directions. Use these words for your ANSWERS. Use their definitions or descriptions for your “questions.” You don’t have to write questions. Example: necessary to do work*energy SAVE by clicking the little computer disk in the bottom right corner (the first picture on the left). Wait. Then open the webpage. Then save the webpage address by bookmarking it. That’s the only way you’ll find your way back to it. Play your game. Take this atom review quiz. Make a quiz game for radiation, convection, conduction, energy, gear, wheel and axle, inclined plane, screw, wedge, pulley, lever. Give it a title. Follow the directions. Use these words for your ANSWERS. Use their definitions or descriptions for your “questions.” You don’t have to write questions. Example: necessary to do work*energy SAVE by clicking the little computer disk in the bottom right corner (the first picture on the left). Wait. Then open the webpage. Then save the webpage address by bookmarking it. That’s the only way you’ll find your way back to it. Play your game. Your job for the last fifteen days of school is to make a science project. I recommend you pick a topic that you can use for your history project as well, and even English. That way you’ll become an expert on the subject. The Panama Canal is one suggested topic. You could build a working model of a canal. On the history page on Lesson 166 I listed some other ideas. You are going to learn about the science and history of your topic. You are going to make a 3D project to explain or demonstrate your topic. If you want to make a poster about it, it has to contain 3D elements. On Lesson 180 you will present your project. You will show it to your family and/or friends and will tell them all about it, explain all about it and demonstrate it. *You also have to conduct at least one experiment related to your topic. If you can, do the experiment in front of the group. If you can’t, explain the experiment and results. Here is an experiment worksheet you could use. Today choose a topic and do some research about what experiment you could do. Level 5-8* Your job for the last fifteen days of school is to make a science project. I recommend you pick a topic that you can use for your history project as well, and even English. That way you’ll become an expert on the subject. The Panama Canal is one suggested topic. You could build a working model of a canal. On the history page on Lesson 166 I listed some other ideas. You are going to learn about the science and history of your topic. You are going to make a 3D project to explain or demonstrate your topic. If you want to make a poster about it, it has to contain 3D elements. On Lesson 180 you will present your project. You will show it to your family and/or friends and will tell them all about it, explain all about it and demonstrate it. *You also have to conduct at least one experiment related to your topic. If you can, do the experiment in front of the group. If you can’t, explain the experiment and results. Here is an experiment worksheet you could use. Today choose a topic and do some research about what experiment you could do. *Do some research and learn about the science aspects of your topic. How does it work? Here are Research Note Taker sheets. Level 5-8* *Do some research and learn about the science aspects of your topic. How does it work? Here are Research Note Taker sheets. Continue your research. If you think you are done, go explain to a parent how the science of your topic works. If you can’t, learn some more. Continue your research. If you think you are done, go explain to a parent how the science of your topic works. If you can’t, learn some more. Lesson 169 Continue your research. Is there any expert in the field that you could email and ask questions? That would be a great source of information! When you are done your research, decide on what experiment or experiments you are going to do. Also, you need to decide how you are going to present what you learned. It’s gotta be 3D! What can you build to demonstrate your topic? Continue your research. Is there any expert in the field that you could email and ask questions? That would be a great source of information! When you are done your research, decide on what experiment or experiments you are going to do. Also, you need to decide how you are going to present what you learned. It’s gotta be 3D! What can you build to demonstrate your topic? Keep working on your project. Your assignment has four parts: research, 3D project, experiment (written up), demonstration. Keep working on your project. Your assignment has four parts: research, 3D project, experiment (written up), demonstration. *Keep working on your project. Print out this End of the Year Project checklist to make sure you are thinking about everything that needs to be done. Level 5-8* *Keep working on your project. Print out this End of the Year Project checklist to make sure you are thinking about everything that needs to be done. Keep working on your project. Use your checklist. Keep working on your project. Use your checklist. Keep working on your project. Use your checklist. Keep working on your project. Use your checklist. Keep working on your project. Use your checklist. Keep working on your project. Use your checklist. Keep working. Make sure you have an experiment. Do you have all the things you need for it? Keep working. Make sure you have an experiment. Do you have all the things you need for it? Keep working. You should finish your project tomorrow. Do your experiment. Keep working. You should finish your project tomorrow. Do your experiment. Lesson 177 Finish your project. Write down your experiment. You can use the worksheet or book or type it up. It needs to be displayed with your project. Make it look good! Finish your project. Write down your experiment. You can use the worksheet or book or type it up. It needs to be displayed with your project. Make it look good! Lesson 178 Use the checklist to make sure you did everything you are supposed to do. On Lesson 179 you will write your bibliography. On Lesson 180 you will present. Today practice what you will say to explain your project. Write it down if that helps you. Practice saying it out loud. Read over this grading sheet for presenting a project. You would want to score a 4 for every category. The last one is only if you are working together with siblings. Use the checklist to make sure you did everything you are supposed to do. On Lesson 179 you will write your bibliography. On Lesson 180 you will present. Today practice what you will say to explain your project. Write it down if that helps you. Practice saying it out loud. Read over this grading sheet for presenting a project. You would want to score a 4 for every category. The last one is only if you are working together with siblings. Lesson 180 Present your project and demonstrate your experiment. Here is some Edisonian inspiration to keep trying and learning new things! Present your project and demonstrate your experiment. Here is some Edisonian inspiration to keep trying and learning new things! Congratulations, You’re done! Donate/Say Thanks Lots of variety of designs and products Kinderleicht Lernen Using EP for Spanish speakers The assignments, the collection of links, the structure of the curriculum and the files created by this site all belong to this blog owner and may not be copied and published to another site or used for any commercial benefit. Copyright 2022 Lee Giles All Rights Reserved

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