Week of May 6

Lightning passage, drawing, and question ideas

Passage (268 words)

Most of us have seen lightning shoot through the sky, and been told to stay out of its path because of the danger of being hit by lightning. This is because the negatively charged part of a storm sends out electric currents along the top of the ground that can be deadly over 100 feet away. Lightning is attracted to four things 1) nearby or tall objects, 2) which are connected to the ground, 3) which can conduct electricity, and 4) which are positively charged.

This is why the highest objects nearby during a storm, such as a buildings, trees, golf clubs, and umbrellas are more likely to be hit by lightning. All of these are closer to the lightning because they are higher than the ground. All of these also conduct electricity because they are not made of insulators like glass, concrete, or rubber. Wood is an insulator, but tall wet trees are good conductors; the most common place to be hit by lightning is actually under a tree!

What can happen if you are struck by lightning? Strong electrical charges and high heat can cause serious burns and scarring, memory loss, nerve damage, and can stop your heart; however, most people do survive the massive electrical discharge if struck by lightning. Though water is highly conductive, the sweat and rainwater on our bodies provides an ultra-conductive path for the lightning that forces the electrical current around the body rather than passing through the body. If the electrical current passes around the body, this protects the brain and heart from the worst harm that lightning can do.

Drawing task (for ½ of students within each class) Draw a lightning safety poster with safer places to be and less safe places to be	Summary task (for ½ of students within each class) Write out the big ideas of lightning safety, including safer places to be and less safe places to be

Questions (to answer from the drawing/summary only, passage taken away/handed in)

1) Name one conductor--one type of material that conducts electricity very well
2) Name one insulator--one type of material that does not conducts electricity, or blocks electricity
3) Why is it unsafe under a tree in a lightning storm?
4) Why is it safer inside than outside in a lightning storm?

Magnetic fields passage, drawing, and question ideas

Passage (240 words)

When you think of a magnet, you probably think about a special kind of metal bar that pulls anything made of iron towards the magnet. This is called a permanent magnet because it will be magnetic forever. The ‘pull’ of the magnet on a piece of iron feels stronger close to the magnet, and the ‘pull’ of the magnet feels weaker on a piece of iron that is farther away. This is because the magnet creates a magnetic field. We can’t see this magnetic field, but we can see how strong the magnetic field is by putting a magnet near some tiny, lightweight pieces of iron called iron shavings.

One end of a magnet is always called North or N, and the other end is called South or S. The magnetic field goes from North to South and then back from South to north, in an oval shape around the magnet. In a rectangular magnet, this looks a bit like a football shape (in a horseshoe magnet it looks more like fireworks coming off the ends of the magnet). If you put a magnet down on a table with some iron shavings, the shavings will show the shape of the magnetic field around the magnet. The magnetic field is weakest close to the middle of the magnet—half-way between the North end and the South end—and the iron filings will be far away from the middle of the magnet.

Drawing task (for ½ of students within each class) Imagine that you could spin your magnet under the iron shavings. What pattern would the shavings look like with a spinning magnet under them? Draw the magnet and iron shavings when the magnet is lying still on a table and also draw the magnet and iron shavings when the magnet is spinning.	Summary task (for ½ of students within each class) Imagine that you could spin your magnet under the iron shavings. What pattern would the shavings look like with a spinning magnet under them? Write a description of what the magnet and iron shavings look like when the magnet is lying still on a table and also write a description of what the magnet and iron shavings look like when the magnet is spinning.

Questions (to answer from the drawing/summary only, passage taken away/handed in)

1) Why do we use iron instead of some other metal?
2) What does the ‘football’ shape show?
3) How does the shape of the magnetic field change when the magnet spins?
4) Why does the shape of the magnetic field change (use what you know about where the magnetic field is strongest)?

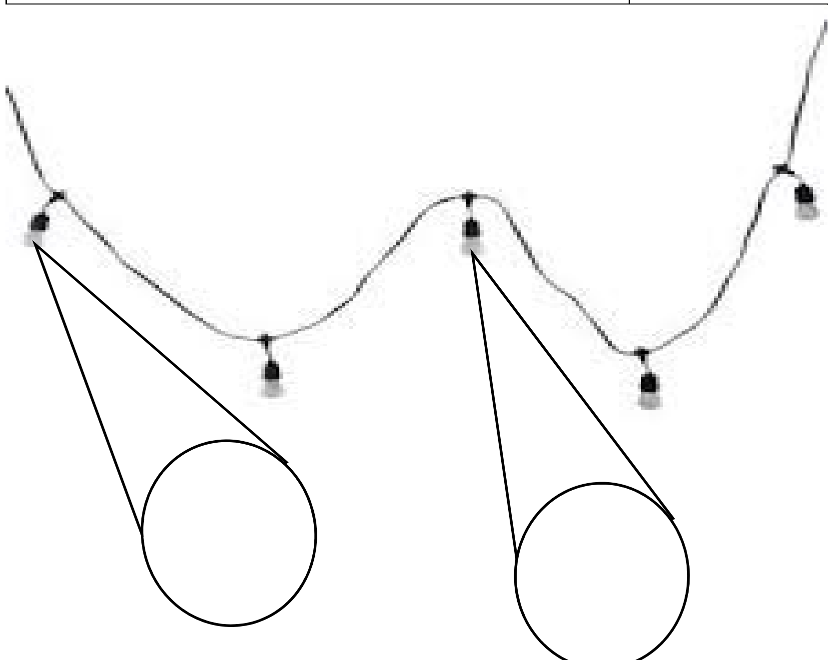
Electric circuits passage, drawing, and question ideas

Passage (218 words)

Flashing lights can be a fun house decoration, but how do they get the lights to flash? One way to make a string of lights flash is with a tiny metal strip between the base of one bulb and the wires; the metal strip acts like a switch between the bulb and the wires. This special metal strip is called bimetallic ("two metals") because is made of copper and steel. This same strip of metal is what is used inside your thermostats at home, and it serves as the switch that turns your heat heat on and off. When the temperature in your house drops below the temperature that you set, this causes the metal strip inside the thermostat to bend until it connects with the thermostat wires. The metal strip touching the wires turns on the heat, and this process is repeated as the temperature in the house changes.

In the case of a light bulb, the copper strip heats up from the light bulb and bends away from the wire, disconnecting from the wire and switching the light off for a moment. Then the copper cools down, bends toward the wire, connects to the wire, and turns the light back on. This cycle repeats over and over again, turning the string of lights on and off.

Drawing task (for ½ of students within each class)	Summary task (for ½ of students within each class)
In the circles below, 1) draw the flashing light circuit in the off position and 2) draw the flashing light circuit in the on position.	Write a description of the flashing light circuit in the off position, and also write a description of the flashing light circuit in the on position.



Questions (to answer from the drawing/summary only, passage taken away/handed in)

1) Name the 4 parts of this circuit (including the wire as one of the 4 parts).
2) What is a bimetallic strip?
3) Why do we need the bimetallic strip in this circuit? What purpose does it serve?
4) Explain how the string of lights is able to flash in this circuit.

Electromagnetism passage, drawing, and question ideas

Passage (295 words)

Why is it that the more wire you wind on an electromagnet, the stronger the magnet is? The answer to this question is simpler than you might think. First, picture the straight piece of wire that your magnet is made of before it's wrapped up in coils and attached to a battery. Now, if you run a current from a battery through it, is it a magnet? The answer is "Yes." This is because any electric charge in motion creates a magnetic field. The magnetic field lines go in circles around the wire. You can prove this to yourself by connecting a length of wire to a small battery, and placing a compass near the wire. The amount of magnetic field generated by the wire can be calculated if you know the length of wire and the current.

Now if you wind this wire around a piece of wood to make a solenoid—a wire coil—you are changing the direction of the magnetic field lines. Let's say you use 2 cm of wire for each time you wind the wire around the wood for your solenoid. With each turn of wire on your solenoid, you add the magnetic force associated with 2 cm "worth" of the straight wire. You can add more coils of wire on top of the first row of your solenoid, and this just makes the magnet stronger. You can make a metal fidget spinner spin by putting it close to--but not touching--a battery-powered solenoid like this. You can add more coils of wire on top of the first row of your solenoid, and this just makes the magnet stronger. More turns of wire around the wood will make the fidget spinner move faster with the exact same battery.

Drawing task (for ½ of students within each class) Draw a metal fidget spinner spinning slower with a smaller (fewer turns of wire) solenoid, Draw a metal fidget spinner spinning faster with a larger (more turns of wire) solenoid.	Summary task (for ½ of students within each class) Write a description of a metal fidget spinner spinning slower with a smaller (fewer turns of wire) solenoid, and write a description of a metal fidget spinner spinning faster with a larger (more turns of wire) solenoid.

Questions (to answer from the drawing/summary only, passage taken away/handed in)

1) Why does the fidget spinner in this setup need to be made of metal?
2) Why do we need the battery in this setup to make the fidget spinner spin?
3) Why does the setup with more turns of wire make the fidget spinner go faster than the setup with fewer turns of wire?
4) In this experiment, why do we use the same size battery for the setup with fewer turns of wire and the setup with more turns of wire?