Mini-Challenge : Circuit Basics

In the space provided list which materials are able to light up the lightbulb and which ones aren't:

Conductor - materials that <u>will</u> let the electron travel freely.	**Insulator** - materials that <u>will not</u> let the electron travel freely.
• **Pots and Pans** • **Cutlery(Forks, Knives, Spoons)** • **Coins** • **Jewelry** • **Wires**	• **Plastics** • **Styrofoam** • **Paper** • **Rubber** • **Glass**

In the space provided which setups were are able to light up the lightbulb and which ones couldn't:

Set-ups that are able to light up the light bulb:	**Set-ups that are NOT able to light up the light bulb:**

Questions:

1. Does the material that connects the battery to the lightbulb matter? Why or why not?
   You would want a conductor to connect the battery to the lightbulb. This is because conductors can easily transfer the electrons and voltage from the battery to the light bulb easier.

2. Does it matter which part of the battery the materials used connect? Why or why not?
   The materials need to be connected to each end of the battery. Each end of the battery is known as a terminal, where one end has a positive charge, and the other end has a negative charge.

3. What is the common feature/aspect that all of the items that can light up the light bulb have? Why do you think that is?
   All of the items that light up the light bulb are conductors. Some commonalities are that some materials are mostly metallic. However, graphene is a non-metal and it is a very conductive material.

Play-doh Design Challenge

Guiding Questions:

1. Look at the materials needed to make the "Conducting" Play-Doh vs. the "Insulating" Play-Doh. What materials are different between the two dohs? Does this make a difference in their ability to light up the lightbulb?
   The main difference in materials is that the "Conducting" Play-Doh has salt, whereas the "Insulating" Play-Doh has sugar. This will make a difference because the "Conducting" Play-Doh will light up the light bulb, and the "Insulating" Play-Doh will not because the salt can be used to conduct electricity while sugar cannot.

2. Would changing the size of Play-Doh used for the experiment impact the amount of current going into the light bulb? Why or why not?
   Changing the diameter of the Play-Doh will reduce its resistance. However, making the Play-Doh longer will increase resistance.

3. What will we need to do to our circuit if we want to make the lightbulb dimmer? How about making it brighter? Why do you think that is?
   If we want to make our lightbulb dimmer, then we will need to add more resistance to our system. Therefore, we will need more "Insulating" Play-Doh, because Insulators have high resistance. If we want to make our lightbulb brighter, then we will need to have less resistance to our system. Therefore, we will need more "Conducting" Play-Doh because conductors are known for their low resistance.

Demo: Potato Battery

Questions:

1. Does the material for the wire matters? Why or why not?

The material for the wire has to be a good conductor, such as copper. This is because you want the electrons from the potato to transfer to the light bulb, and conductors are great at transferring electric current.

2. Do the potatoes need to be organized in a specific way? Does the placement of the penny and nail on the potato matter? Why or why not?

You would need to put the penny on one end of the potato, and the nail on the other end of the potato. They are supposed to represent the positive and negative sides of a battery(The copper is negative, whereas the zinc is positive). We do NOT want the materials to be touching each other, or even being near to each other, because it will impede the flow of electrons that are trying to come out of the potato. As for the potatoes, one of the alligator clip ends should connect to a zinc nail from one potato, and the other end should connect to a penny from another potato. This is because we want our potatoes to be in a simple series circuit, which only has one loop. If we were to use an alligator clip to connect two zinc nails from two different potatoes, then the flow of electrons will not transfer properly.

3. Would there be a change in our experiment if one alligator clip end was on the top of the lightbulb?

If one of the alligator clip ends was clipped on top of the lightbulb, then the lightbulb will NOT light up. This is because the top of the lightbulb is covered in glass, which is an insulator.

4. Remember Conservation of Energy from the last two experiments! Does it still apply in this experiment? If so, what form of energy is the electrical energy coming from?

Conservation of Energy is being applied in this experiment. The potato battery experiment takes Chemical potential energy from the potato, and convert it to Electrical Energy that lights up our bulb.

Three Important Aspects of Circuits (Ohm's Law):

Questions:

1. What would happen to the rate of sushi coming out of the kitchen if there were more chefs?
   If there were more chefs then food would come out of the kitchen faster.

2. What does this mean in term of the relationship between Voltage and Current?
   If you increase the Voltage then you increase the Current.

3. What would happen if there was a large family of diners ahead of you?
   If there was a large family ahead of you then there would be less plates of sushi reaching you, or the rate of sushi getting to you would be slower.

4. What does that mean in terms of the relationship between Resistance and Current?
   If you increase the resistance then you decrease the current.

5. Can electricity come JUST from a battery? If yes, list some other sources that can produce electricity.
   No, electricity can come from any source that can produce an appropriate amount of voltage. Some other sources that can produce electricity are potatoes, lemons, limes, and solar panels, water dams.