Safety Smart®

Safety Science Crazy Quiz!

1. Knowing electricity travels 186,000 miles per second, if you had a lamp on the moon connected to a light switch in your house, how many seconds would it take for it to light up 238,857 miles away?
    a. 1.28 seconds
    b. 1005 seconds
    c. .0007 seconds
2. In 1978, only eight percent of U.S. households had microwave ovens. What percent have them today?
    a. 12 percent
    b. 99.99 percent
    c. 83 percent
3. Standby power is the electricity consumed by appliances while switched off or in a standby mode. Which appliance consumes standby power?
    a. a washing machine
    b. a battery charger for a cell phone with cell phone attached
    c. a kitchen light
4. Electricity is measured in units of power called
    a. quarks
    b. nanos
    c. watts
5. True or False. Birds don't get shocked when they sit on power lines because they only touch one wire.
6. Utility workers wear special rubber gloves, rubber sleeves and other protective gear that won't allow any electricity to pass through because, rubber is:
    a. a conductor
    b. an insulator
    c. a semiconductor
7. The temperature of a typical lightning bolt is hotter than the surface of the sun! One lightning strike can generate up to how many volts of electricity?
    a. 1 million
    b. 1 trillion
    c. 1 billion
8. Everyone knows that the electric eel produces electricity but do you know how many other kinds of fish also produce electricity?
    a. 500
    b. 1
    c. 3000

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Educator Note: Along with the answers you will find Safety Smart® Science "teaching opportunities." These focus on improving safety knowledge through understanding the science behind the safety.

1. a) 238,857 ÷ 186,000 = 1.28

Discuss the science behind using a Compact Fluorescent Light Bulb (CFL) versus using a standard incandescent bulb. CFLs are more energy-efficient than incandescent light bulbs because fluorescent technology does not use a metal filament to create light. Instead fluorescent technology uses gases that require less electricity to create the same amount of light. CFLs use 1/3 the energy and last up to 10 times longer than an incandescent light bulb. Only 10% of the electricity used by an incandescent light bulb is used for light, the other 90% escapes as heat. CFLs create the same amount of light, but generate about 70% less heat loss. By using a CFL you can use less energy.

Demonstrate this to your students by comparing the light and heat produced from each type of bulb. Note, a 60 watt incandescent bulb and a 13 watt CFL will generally produce equivalent light levels. Ask students to visually compare the light from each bulb. Measure the temperature from each bulb by holding a thermometer 4 – 6 inches above the lighted bulb for one minute. Compare results.

2. c) 83%

Ask your students if anyone knows why metal causes sparking and arcing in a microwave. Microwave energy is electrical energy. Think of it like lightning. When a storm approaches, the clouds have a positive electrical charge and the earth has a negative electrical charge. The electricity in the clouds wants to be neutral and so it is trying to get to the earth. The positive charge builds until it is strong enough to neutralize itself by flowing to the earth. When the charge neutralizes itself, you see lightning (arcs and sparks).

The same phenomenon is true in microwave ovens but in a little different way. The electrical energy (the positive charge) is "shot" from the magnetron's antenna within the microwave. If you have a metal object inside, the electrical field is disrupted and the electricity actually flows through the metal. The metal becomes charged until it can flow to the earth (through the microwave oven inside walls). If, for example, you have the metal spaced far from the walls, it needs to build a bigger charge before it will spark. If the metal is close to the walls, the arcing happens quicker.

Another way to explain it is when your house is dry and you rub your feet on the carpet. You actually become charged and when you touch something metal, the charge flows from your finger to earth to neutralize it. The size of the charge in your body determines how close you need to get to the metal to feel the "shock".

3. b) a battery charger for a cell phone with the cell phone attached
Standby power is the electricity consumed by appliances while switched off or in standby mode. For example, televisions continue to draw a little power after it has been switched off with the remote control. Even when they are turned off, many modern electronic devices are waiting for input from their remote controls. When they receive it, they turn themselves on, but that function of waiting for input requires electricity. Many electronic products with external power supplies, like laptops, also draw standby power even when turned off. There are many appliances in our homes that consume standby power some to consider are products that feature a digital clock like a microwave or coffee maker. The standby power of a household electronic product is typically very small, 0.5 – 10 watts, but the number of products within the household is great. A European, Japanese, Australian, or North American home often contains twenty devices constantly drawing standby power.

Engage your students in a classroom project to reduce standby power. Ask students to make a list of standby power consuming products they have in their homes, remind them that the battery charger for their remote control car and the battery charger for their cell phone is using standby power if it is plugged in and not charging the product. The easiest way to reduce wasted standby power is to unplug the unused device. Ask the students to identify which products from their list can they unplug when they are not using it, thus reducing standby power use. Remind students to never to unplug safety devices like smoke detectors.

4. c) watts
When you are referring to an electrical device that uses a tremendous amount of power, the commonly used measurement is the kilowatt. A kilowatt is 1,000 watts. Power plants measure the electricity they generate in kilowatt-hours (kWh). Kilowatt-hours are determined by multiplying the number of watts required by the number of hours of use, and then dividing by 1,000.

Test student math skills by asking them to figure out how much kWh of electrical energy would be used if a 60-watt light bulb was used for five hours a day for 30 days (60 watts multiplied by 150 hours divided by 1000 equals 9 kWh).

5. True
If the birds were to touch two wires at the same time it would electrocute them because the electricity would flow through their body (an excellent conductor) to complete the circuit. Share this interesting fact with your students - California wildlife experts are teaching endangered California condors to steer clear of power lines. With an extended wingspan of more than nine feet the birds can easily touch two power lines at the same time!

6. b) an insulator
An insulator is a material that resists the flow of electric current. When used in electrical equipment isulators are intended to support or separate electrical conductors without passing current through. By contrast an electrical conductor is a material or object that

conducts electricity. Electrical conductors allow charged particles (usually electrons) to move relatively free through the material; a voltage applied across the conductor therefore creates an electric current.
Ask students to identify conductors of electricity (metal, aluminum, water) and insulators (wood, rubber, air).

7. c)1 billion
There are thousands of lightning strikes every day. Scientists think that lightning hits somewhere on the earth about 100 times every second. More people are killed by lightning then by any other kind of storm, including hurricanes and tornadoes. In the whole world, lightning kills more than 1,000 people in a year.

Lightning can strike as far as 10 miles from the area where it is raining. That's about the distance you can hear thunder. If you can hear thunder, you are within striking distance. Seek safe shelter immediately in a house, building or car (not a convertible)**.** If you are in a car, be sure that the windows are rolled up.

When there is a storm, stay away from windows, water faucets, pipes and electrical outlets.

8. a) 500
Electric eels (*Electrophorus electricus*) are really fish, electric fish. Electric fish produce electricity by means of organs usually developed from modified muscle tissue. If a fish has the ability to generate electric fields it is said to be electrogenic. If a fish has the ability to detect electric fields, it is said to be electroreceptive. The electric eel is a South American freshwater fish related to the carp, and it is capable of producing from 450 to 600 volts of electricity—enough to light a neon light bulb.