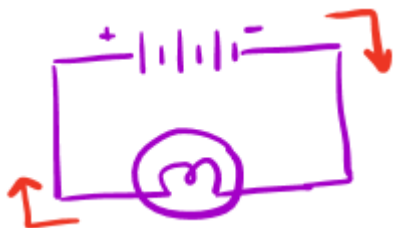


Physics

1. Draw a **circuit diagram** for the following circuits. Be sure to identify the **direction** that current is travelling for each scenario. Once you have drawn your diagram, build the circuit using the materials provided and use the voltmeter to measure voltage. Show your teacher once each question is complete

a. A circuit with a battery that turns on one lightbulb



Voltage across the lightbulb: _____

Teacher Check: _____

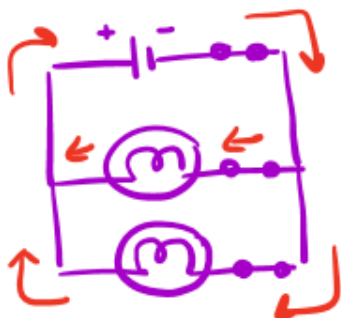
b. A circuit with a battery where an open switch has turned off two lights placed in series



Voltage across the battery: _____

Teacher Check: _____

c. A circuit with an electrochemical cell, a closed master switch, and two light bulbs all in parallel with each other. Each light bulb has its own switch that turns it on and off.



Voltage across the battery: _____

Teacher Check: _____

2. Complete the following table:

	Symbol	Unit
Current	I	Amperes (A)
Voltage	V	Volts (V)
Resistance	R	Ohms (Ω)

3. What is the resistance of a toaster if a current of 12.5 A flows through it when it is connected to 120 V?

$$R = \frac{V}{I}$$

V= 120V

$$R = \frac{120 V}{12.5 A}$$

I= 12.5 A

$$R = 9.6 \Omega$$

R= ?

4. A light bulb has a resistance of 90 Ω . What current flows through the bulb when it is connected to 120 V?

$$I = \frac{V}{R}$$

V= 120 V

$$I = \frac{120 V}{90 \Omega}$$

I= ?

$$I = 1.33 A$$

R= 90 Ω

5. The current through a load in a circuit is 2.5 A. If the voltage is 75 V, what is the resistance of the load?

$$R = \frac{V}{I}$$

V= 75 V

$$R = \frac{75 V}{2.5 A}$$

I= 2.5 A

$$R = 30 \Omega$$

R= ?

6. How much electrical potential difference is necessary to generate 9.5 A in a circuit with 2.0 Ω ?

$$V = IR$$

V= ?

$$V = (9.5A)(2.0\Omega)$$

I= 9.5 A

$$V = 190V$$

R= 2.0 Ω

7. Complete the following table:

	Series Circuit	Parallel Circuit
The effect on current	Stays the same	Separates at each junction
The effect on voltage	Shared between loads	Not shared between loads

8. Identify the type of energy associated with each of the following sources:

- a. The Sun Solar
- b. River flow Mechanical
- c. A battery Chemical
- d. Uranium Nuclear
- e. Food Chemical

	ORIGINAL ENERGY FORM	FINAL ENERGY FORM
Wind turbine	Mechanical	Electrical
Riding a bike	Chemical	Mechanical
Firework	Chemical	Light/Sound/Thermal

9. Describe the process of generating electrical energy using:

- a. River flow Water flows in a river (has kinetic energy) and when it reaches a turbine, the water is able to turn the turbine which is attached to a shaft and a generator system to create electrical energy
- b. Fossil fuels Fossil fuels are burned and the heat is able to heat up a tank of water, which makes the water turn into steam. The steam is able to travel through a series of pipes and the pressure created is able to turn a turbine, which is attached to a shaft and generator to create electrical energy. The steam then turns back into liquid water and returns to the water tank to repeat the process.
- c. Nuclear reactions A nuclear reaction is created (usually through the splitting of uranium atoms) and the energy that is produced is able to boil a tank of water. The water turns into steam and the pressure created is able to turn a turbine, shaft, and generator system to create electrical energy. The steam cools and turns back into liquid and connects back to the original water tank.

10. What is the difference between a renewable and non-renewable energy source? Provide at least 2 examples for each.

Renewable energy sources are sources that can be naturally replenished within our lifetimes (from renewable sources). These tend to be available on a continuous basis.

- Sunlight
- Water
- Wind

Non-renewable energy sources are sources that cannot be naturally replenished within our lifetimes (from non-renewable energy sources)

- Fossil fuels (coal, gasoline)

11. What is electrical power and how is it measured?

Electrical power is the rate in which electrical energy is being used by a load. It is measured in watts, kilowatts, or kilowatt-hours.

12. If a light bulb is marked with 100 W. What does this mark tell a consumer about the lightbulb?

That means that in order for the light bulb to work, it has to use 100 W of power in order for it to turn on

13. What information does a smart meter relay to the utility company?

A smart meter measures how energy use changes in a building over the course of a day

14. If a family goes away on vacation, why might electrical energy still be consumed in their home?

Due to phantom loads that could be in the home. Phantom loads are devices that will still draw energy even when they are not turned 'on'.

15. Compare the information on an EnergyGuide label with the information on an Energy Star® label.

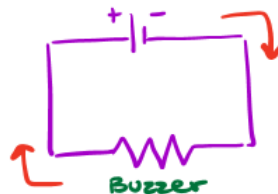
EnergyGuide tells you how much energy a particular load uses in one year of regular use. Energy Star® tells you if a product is meeting or exceeding standards of energy efficiency

16. Why is a parallel circuit that has too many electrical devices connect to it not safe?

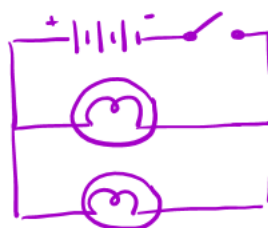
If a parallel circuit has too many electrical devices connected to it, there is a lot of current that will be flowing through the wires. This can cause overheating and may result in a fire.

17. Draw a circuit diagrams for the following circuits. Be sure to identify the direction that current is travelling for each scenario.

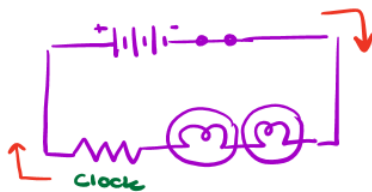
a. A circuit with a cell that runs a buzzer.



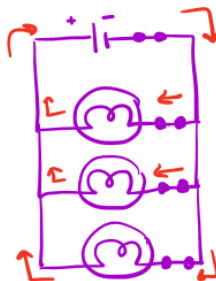
b. A circuit with a battery where an open switch has turned off two lights placed in parallel to each other.



- c. A circuit with a battery, a closed switch, two light bulbs, and a clock all in series with each other.



- d. A circuit with an electrochemical cell, a closed master switch, and three light bulbs all in parallel with each other. Each light bulb has its own switch that turns it on and off.



18. Two items of clothing are made of different materials. They were put into a clothes dryer and the items stick together when they are removed from the dryer.

- a. Name the process that has just taken place

Law of electrostatic charge (static electricity)

- b. Explain how this process could cause the clothing items to stick together.

Friction causes the electrons from one object to be transferred to another object which causes oppositely charged objects. As these objects are oppositely charged, they are attracted to each other

19. Photovoltaic cells are commonly used to provide electrical energy for satellites. Suggest an advantage that photovoltaic cells might have in space, compared with similar cells on Earth.

Photovoltaic cells require energy from the Sun in order for it to create electrical energy. If they are in space, there is a higher likelihood that these cells can receive more solar energy (or receive solar energy more consistently) and therefore transform solar energy into electrical energy.