

# Electricity & Magnetism Study Guide

## Goal 1

1. When two objects with opposite charges meet, they will \_\_\_\_\_ **attract** \_\_\_\_\_.
2. When two objects with the same charges meet, they will \_\_\_\_\_ **repel** \_\_\_\_\_.
3. Describe what happens when magnets are placed near each other for scenarios A & B.

A.



**attract**

B.



**repel**

## Goal 2

4. What is static electricity? **the result of the transfer of electrons; the imbalance of positive and negative charges.**
5. Describe how a static charge builds up on an object. **When two objects come into contact or there is friction between two objects, the electrons transfer which builds up a charge.**
6. When you walk across carpet, your socks lose electrons. What charge is built up on you? **a positive charge**
7. When you brush your hair, your brush gains electrons that leave your hair. What charge does your brush now have?  
**a negative charge**
8. What is a static discharge? **the release of static electricity when two objects come into contact**
9. Once static discharge occurs, the objects are \_\_\_\_\_ **neutrally** \_\_\_\_\_ charged.
10. Give two examples of a static discharge: **shocking a friend when you get close, lightning, getting shocked when you touch metal**

### Goal 3

11. What is current electricity? **the constant flow electrons**

12. What is a circuit? Describe what is required for a light bulb to turn on.

**A complete, closed path through which electrons can flow.**

13. Describe how a switch works in a circuit. Include “opened” and “closed” in your explanation.

**A switch turns a light on and off by opening and closing (completing) a circuit.**

**Open = light off**

**Closed = light on**

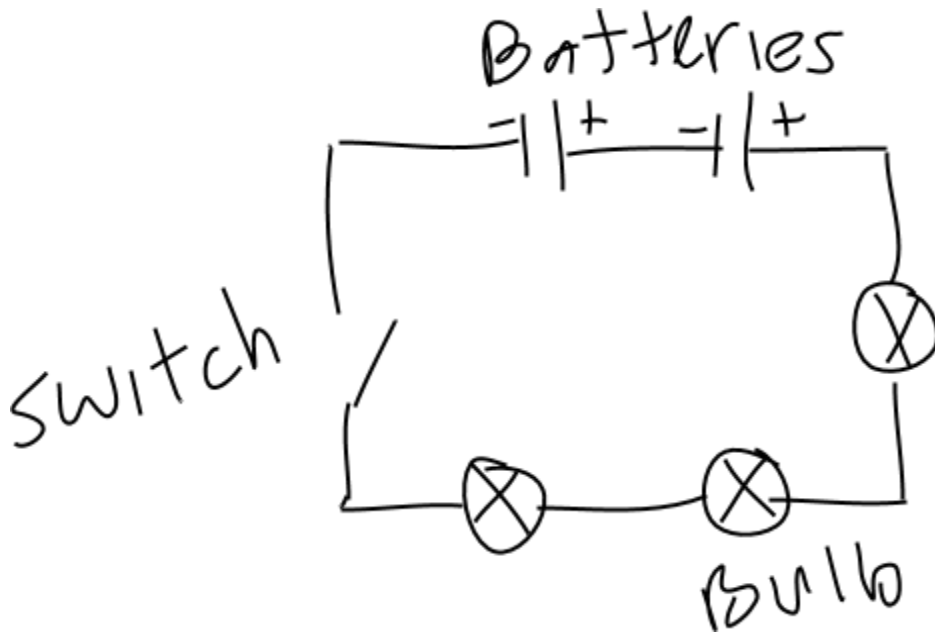
14. What does it mean for a material to be a conductor of electricity? Insulator of electricity?

**conductors - material that transfers electrons through it easily**

**insulators - material that does not transfer electrons through it easily**

15. Electricity is the energy of moving       **electrons**      .

16. Draw a diagram of a circuit with 2 batteries, 3 light bulbs, and 1 switch using scientific symbols for each item. Label the each item.



## Goal 4

17. Explain how filaments works in a light bulb. Include resistance in your explanation.

**A filament is a material with a very high melting point that resists the flow of electricity to the point the material begins to get hot and glow.**

18. What would happen to the brightness of the light bulbs if you add an additional battery to a series circuit? What if you add an additional light bulb?

- **If you add an additional battery to a circuit, the brightness of the light bulbs will increase.**
- **If you add an additional light bulb to a series circuit, the brightness of the light bulbs will decrease because there are more light bulbs to share a current.**

19. You have a simple electrical circuit. If you add a rubber band between two wires in the circuit, what will happen? Explain why this happens.

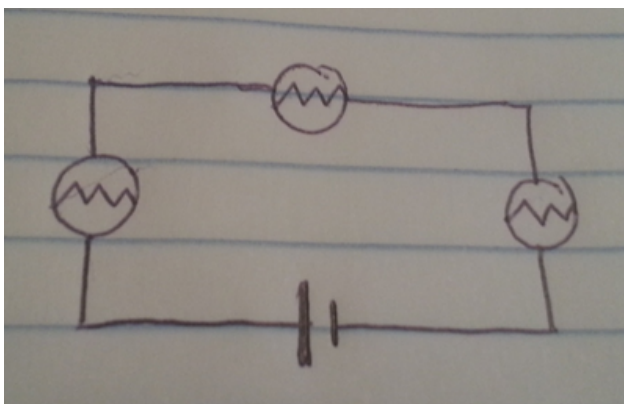
**The light bulbs will turn off because the electricity cannot pass through rubber, which is a insulator.**

20. If you have a circuit with two batteries, does it matter how you place them in the circuit? Why?

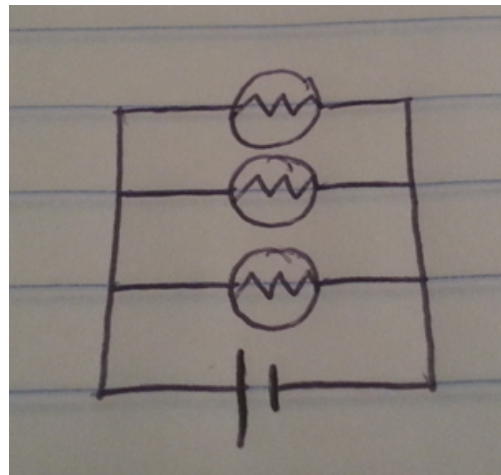
**YES! They must be placed facing the same direction, eg, the positive side needs to connect to the negative side, because the electrons only travel in one direction.**

## Goal 5

21. **Diagram** a series circuit with 3 bulbs using scientific symbols. **Label** the sources, bulbs, and wires.



22. **Diagram** a parallel circuit with 3 bulbs using scientific symbols. **Label** the sources, bulbs, and wires.



23. What happens if you unscrew a light bulb in a **series circuit**? What about in a **parallel circuit**? Why does this happen?

**if you unscrew a light bulb in a series circuit, all of the light bulbs will go out because there is only one path for the electricity to flow and it is broken by unscrewing the light bulb.**

- If you unscrew a light bulb in a parallel circuit, the other bulbs remain lit because each bulb is on a separate path to the battery.

24. Label the statements below as **series advantage (SA)**, **series disadvantage (SD)**, **parallel advantage (PA)**, or **parallel disadvantage (PD)**.

- Each bulb is usually brighter in this circuit because it has it's own path to the battery. PA
- This circuit uses more energy and is more expensive to operate, because the total current is higher. PD
- This circuit uses less energy. SA
- The light bulbs are usually dimmer because they share a current. SD
- This circuit uses less energy which is more energy efficient. SA

## Goal 6

25. The law of conservation of energy states energy cannot be created or destroyed. Energy changes from one form to another.

26. A heater transfers electrical energy into thermal energy.

27. How is energy transferred in a simple closed series circuit? Write the name of each form of energy used in the correct order.

chemical energy batteries -----> electrical energy wires -----> radiant (light)/thermal energy light bulb

28. During photosynthesis, energy from the sun is changed from radiant energy to chemical energy.

## Goal 7

29. Complete the table:

Type of light	Pros (name 2)	Cons (name 2)
Incandescent	<ul style="list-style-type: none"> <li>• turns on instantly</li> <li>• gives off a pleasant light</li> <li>• inexpensive</li> </ul>	<ul style="list-style-type: none"> <li>• Uses a lot more energy</li> <li>• Does not last as long</li> <li>• gives off a lot of energy as heat (not efficient)</li> </ul>
CFL	<ul style="list-style-type: none"> <li>• life span of 8,000 hours; longer life</li> <li>• more energy efficient than incandescent light bulbs</li> </ul>	<ul style="list-style-type: none"> <li>• contains mercury - a very toxic to your health &amp; the environment - must recycle, can't throw away</li> <li>• takes time to warm up and turn on</li> <li>• sensitive to humidity</li> </ul>

LED	<ul style="list-style-type: none"> <li>• lifespan of 50,000 hours; longest life</li> <li>• turns on instantly</li> <li>• saves the most energy</li> </ul>	<ul style="list-style-type: none"> <li>• the most expensive bulb</li> </ul>

## Goal 8

30. What is a magnetic field?

**Magnetic field – the space around a magnet where there is magnetic force.**

31. All magnets have two **poles**, or ends.

32. Opposite poles **attract**; the same poles **repel**.

33. What is the difference between a permanent and temporary magnet?

**Permanent magnet – will hold its magnetic properties over a long period of time. Usually made of iron alloys, nickel, or cobalt.**

**Temporary magnet – an object that has been magnetized by contact with a magnet (rubbing) will lose its magnetism quickly.**

**–Dropping or heating a magnet can cause it to lose its magnetism.**

34. Give an example of a temporary magnet. **paperclips that stick together after they are removed from a magnet**

35. Give an example of a permanent magnet. **refridgerator door**

36. Place the objects in the correct place in the chart below: **paperclip, zinc washer, rubber band, toothpick, aluminum foil, penny**. They may belong in one, both, or none of the columns.

Conducts Electricity	Magnetic
<ul style="list-style-type: none"> <li>• paper clip</li> <li>• zinc washer</li> <li>• aluminum foil</li> <li>• penny</li> </ul>	<ul style="list-style-type: none"> <li>• paper clip</li> </ul>