

# Physics Unit 5 Practice - Electricity and Magnetism

1. What is true of atoms in terms of being neutral, negatively charged, and positively charged is also true of objects. An object that is negatively charged must have \_\_\_\_\_ (more, less, the same number of) electrons compared to its protons. An object that is positively charged must have \_\_\_\_\_ (more, less, the same number of) electrons compared to its protons. An object that is electrically neutral must have \_\_\_\_\_ (more, less, the same number of) electrons compared to its protons.
2. When you pull a cotton sweater off your skin, electrons are transferred from the \_\_\_\_\_ (cotton, skin) to the \_\_\_\_\_ (cotton, skin). As a result, your body acquires a \_\_\_\_\_ (+, -) charge and the cotton sweater acquires a \_\_\_\_\_ (+, -) charge.
3. When you rub a glass rod with a silk cloth, electrons are transferred from the \_\_\_\_\_ (glass, silk) to the \_\_\_\_\_ (glass, silk). As a result, the glass rod acquires a \_\_\_\_\_ (+, -) charge and the silk cloth acquires a \_\_\_\_\_ (+, -) charge.
4. Suppose you rub a rubber rod with a silk cloth and a second rubber rod with a wool sweater. The silk cloth will acquire a \_\_\_\_\_ (+, -) charge; the wool sweater will acquire a \_\_\_\_\_ (+, -) charge. The sweater and the cloth will then be observed to \_\_\_\_\_ (attract, repel, not interact with) each other.
5. An uncharged metal pop can is attached to a Styrofoam cup (which acts as an insulating stand). A negatively charged balloon is brought near the pop can. While the balloon is held near, the can is touched. When the can is pulled away, the pop can is charged. This process is known as \_\_\_\_\_.

Triboelectric Series	
Celluloid	
Sulfur	
Rubber	
Copper, Brass	
Amber	
Wood	
Cotton	
Human Skin	
Silk	
Cat Fur	
Wool	
Glass	
Rabbit Fur	



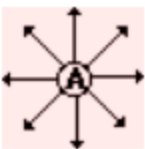
- a. charging by conduction
- b. charging by induction
- c. polarization
- d. grounding

## Using Coulomb's Law, answer the following.

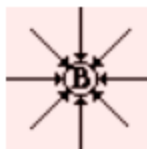
6. Two charged objects have a repulsive force of .080 N. If the charge of one of the objects is doubled, then what is the new force?
7. Two charged objects have a repulsive force of .080 N. If the charge of both of the objects is doubled, then what is the new force?
8. Two charged objects have a repulsive force of .080 N. If the distance separating the objects is doubled, then what is the new force?

9. Two charged objects have a repulsive force of .080 N. If the distance separating the objects is tripled, then what is the new force?
10. Two charged objects have a repulsive force of .080 N. If the distance separating the objects is halved, then what is the new force?
11. Two charged objects have a repulsive force of .080 N. If the charge of one of the objects is doubled, and the distance separating the objects is doubled, then what is the new force?
12. Two charged objects have an attractive force of .080 N. If the charge of one of the objects is tripled and the distance separating the objects is tripled, then what is the new force?
13. A balloon with a charge of  $4.0 \times 10^{-5}$  C is held a distance of 0.10 m from a second balloon having the same charge. Calculate the magnitude of the repulsive force.

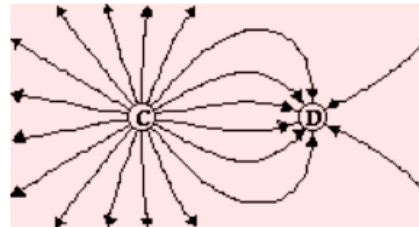
14. Use your understanding of electric field lines to identify the charges on the objects in the following configurations.



A: + or -



B: + or -



C: + or -      D: + or -

15. The following diagrams show an electric field and two points - labeled A and B - located within the electric field. A positive test charge is shown at point A. For each diagram, indicate whether work must be done upon the charge to move it from point A to point B. Finally, indicate the point (A or B) with the greatest electric potential energy and the greatest electric potential (PE/charge)

Work done on test charge?    Yes    or    No	Work done on test charge?    Yes    or    No
Potential energy is greatest at:    A    B	Potential energy is greatest at:    A    B
Electric potential is greatest at:    A    B	Electric potential is greatest at:    A    B
Work done on test charge?    Yes    or    No	Work done on test charge?    Yes    or    No
Potential energy is greatest at:    A    B	Potential energy is greatest at:    A    B
Electric potential is greatest at:    A    B	Electric potential is greatest at:    A    B

16. Which of the following statements are true about an electric potential or electric potential difference?

List all that apply.

- a. Electric potential can be expressed in units of volts.

- b. Electric potential can also be expressed in units of Joules.
- c. The electric potential of a charge at a given location provides a measure of the rate at which charge flows past that point.
- d. Work must be done on a + charge to move it against (i.e., in the opposite direction of) an electric field.
- e. As a + charge moves in the same direction as an electric field, it gains electric potential.
- f. The electric potential difference between two points is simply the difference in potential energy possessed by charge between those two points.
- g. If a unit of charge has a high electric potential at any given location, then that charge possesses a large amount of electric potential energy at that location.
- h. The + terminal of a battery is a location with a higher electric potential than the - terminal of a battery.
- i. Charge flowing through a battery will experience a gain in electric potential.
- j. A 6-Volt battery would provide 12 Joules of energy to 2 Coulombs of charge as it is moved from the - to the + terminal.

17. A current is said to exist whenever \_\_\_\_\_.

- a. a wire is charged
- b. a battery is present
- c. electric charges are unbalanced
- d. electric charges move in a loop

18. Fill in the following table:

Quantity	Unit	Symbol
Current		
Resistance		
Electric Potential		

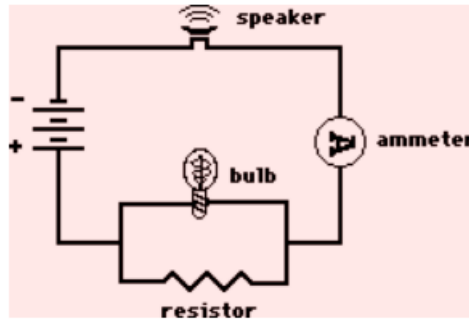
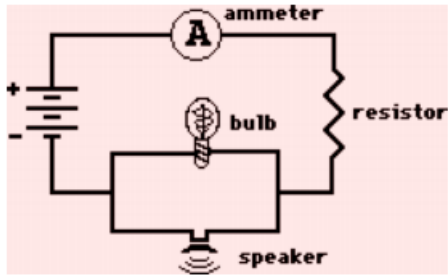
19. A circuit is set up such that it has a current of 8.0 amps. What would be the new current if ....

- a. ... the resistance (R) is increased by a factor of 2?
- b. ... the resistance (R) is increased by a factor of 4?
- c. ... the resistance (R) is decreased by a factor of 3?
- d. ... the battery voltage ( $\Delta V$ ) is increased by a factor of 3?
- e. ... the battery voltage ( $\Delta V$ ) is decreased by a factor of 2?
- f. ... the resistance (R) is increased by a factor of 2 and the battery voltage ( $\Delta V$ ) is decreased by a factor of 2?
- g. ... the resistance (R) is decreased by a factor of 4 and the battery voltage ( $\Delta V$ ) is increased by a factor of 3?

20. Fill in the table below to indicate the manner in which series and parallel circuits differ.

	Series Circuit	Parallel Circuit
a. <b>Definition:</b> The pathway by which charge loops around the circuit is characterized by _____ pathway(s).		
b. <b>Observation:</b> If one light bulb goes out, the other light bulbs _____.		
c. <b>Observation:</b> As the number of resistors is increased, the overall current _____.		
d. <b>Observation:</b> As the number of resistors is increased, the overall resistance _____.		

21. Two electric circuits are diagrammed below. For each circuit, indicate which two devices are connected in series and which two devices are connected in parallel.

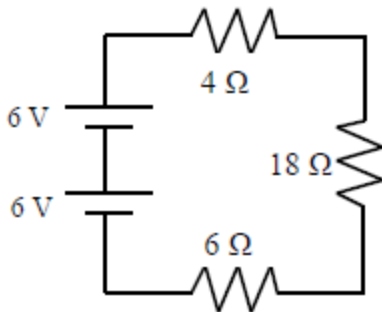


Series \_\_\_\_\_

Series \_\_\_\_\_

Parallel \_\_\_\_\_

Parallel \_\_\_\_\_



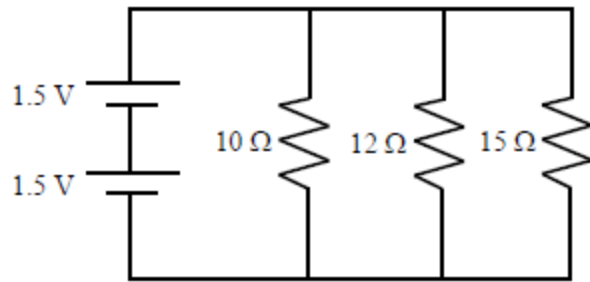
22. Type of circuit?

23. Total resistance?

24. Total voltage?

25. Current moving through the circuit?

26. Which resistor uses the most voltage? How much does it use?



27. Type of circuit?

28. Which branch will have the most current flowing through it and why?

29. Total resistance?

30. Label each resistor with how much current is flowing through it.

R1=

R2=

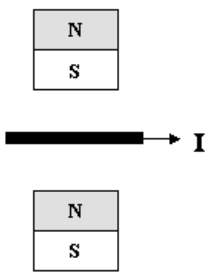
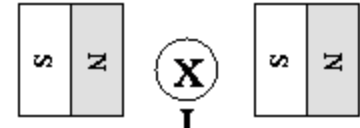
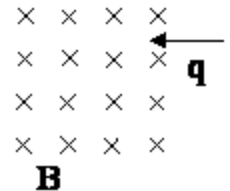
R3=

31. How much voltage is there in this circuit?

32. The magnitude of the current in a wire is (directly/indirectly) proportional to the magnetic field around the wire.

33. Increasing the number of loops in an electromagnet causes the magnetic field strength to?

34. Using the right-hand rule, find the direction of the missing information in each diagram.  
 a. up      b. down      c. left      d. right      e. into page      f. out of page

Scenario	Direction
<p>A wire is pushed between two magnets. The magnetic field causes a current in the moving wire as shown. Which direction was the wire moved?</p> 	
<p>A wire is moved between two magnets. A current then moves thru the wire due to B. Find the direction the wire was moved.</p> 	
<p>Find the force on the moving charge.</p> 	
<p>A wire is pushed into a magnetic field. If the induced current from B moves as shown, which direction was the wire pushed?</p> 