A-Day Due Wed., Apr 8
B-Day: Due Thurs., Apr 9

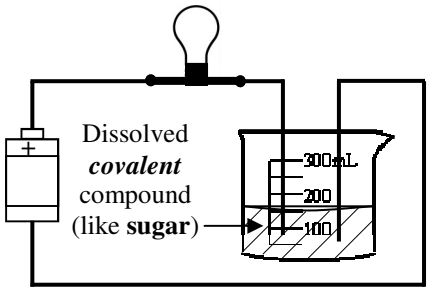
2009 PreAP Circuits 1

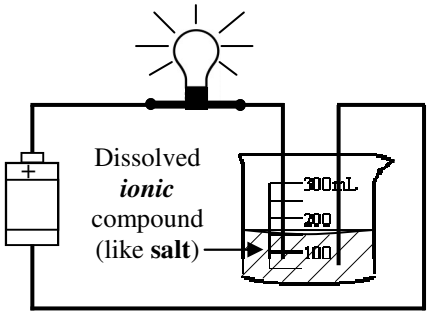
Just as with heat a conductor allows electricity to flow and insulators resist the flow of electricity.

1. Electrical conductor or insulator?

   A. ____ Rubber
   B. ____ A paperclip
   C. ____ Paper
   D. ____ Aluminum

2. As seen in the diagrams at the right, sugar and salt are dumped into water and disappear (called d_____).
   A. Can the salt or sugar be filtered out of the solution (can a filter be used to get them out)?
   B. Which type of compound is due to atoms sharing electrons: ionic or covalent?
   C. Which of two solutions is an electrical conductor?
   D. How do you know?
   E. If magnesium oxide where dissolved, would it be a conductor or insulator?





   Turns out that pure water is not a good conductor and salt water is.

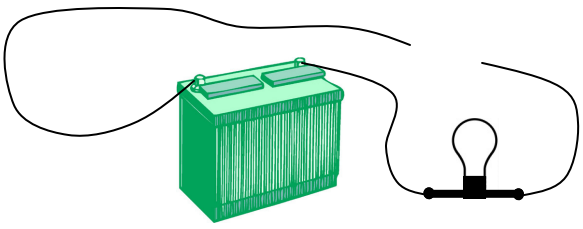
3. A jewel thief has two fish tanks in his house, neither of which have fish in them. Supposedly the thief hide his jewels in one of the tanks. As you look, you notice that both of the tanks have little treasure chests at the bottom. Just before you each in you notice electric wires laying in the water, so you quickly pull back. Upon closer inspection you see that the right tank has residue on the sides, which turns out to be salt. The left tank has no salt in it. Which tank probably has the jewels in it and why?

4. A 12 volt battery pushes against a 4 Ω resistor. How much current flows thru the circuit?

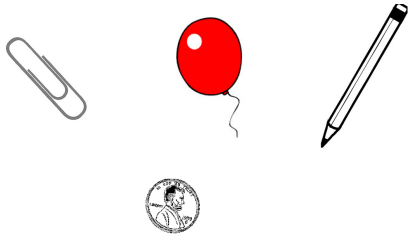
Current (in *amps [A]*) → $I = \frac{V}{R}$ ← Voltage (in *volts [V]*)
Resistance (in *ohms [Ω]*)

Current equals the voltage divided by the resistance.

5. How much resistance is in a circuit that has a 6 volt battery and 0.5 amps flowing?



Car battery

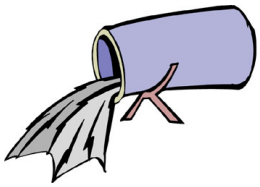


6. A. Will the light bulb light up or not?
   B. Why or why not?
   C. Is it an open or closed circuit?
   D. Which of the objects would complete the circuit?
   E. Will the light come on if you touch the two pieces of wire together?

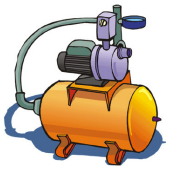
Electricity is like water. Voltage is the push from a pump. Current is how much water flows. Resistance is a restriction in the pipe (like kinking a water hose) or like a dam holding back water. You can't change the current directly, but current can respond to your changing the voltage or the resistance. You can have a lot of voltage and little current: think of a dentist's water pik—it shoots very hard, but would take a long time to fill a cup.

7. Imagine a large flexible bag filled with water. When would it give more voltage if you pushed on it with your hands or if you sat on it?

8. Compare the slow moving Mississippi river and a fire hose.
   A. Which one has more voltage (push)?
   B. Which one has more current (water flowing)?


M


N


O


P


Q


R

9. Use the pictures above to answer the following:

   A. ___ Which has more voltage, the water from the large bucket (M) or the hose (N)?
   B. ___ Which would fill a container first: M or N?
   C. ___ Which has more current: M or N?
   D. ___ Which would have more voltage: the air compressor (O) or the bike pump (P)?
   E. ___ If they were both hooked up to the same size hose, which would give more current: O or P?
   F. ___ Which has more resistance: Q or R?
   G. How could you get the same current thru Q as thru R?

10. Voltage (V), Current (I), or Resistance (R).

A. ___ Flowing electrons.	E. ____ Measured in A.	I. ____ Measured in V.
B. ___ Pushes electricity in circuits.	F. ____ How much water flows.	J. ____ 12 ohms
C. ___ Like a water pump.	G. ____ A battery gives this.	K. ____ 36 volts.
D. ___ Measured in Ω.	H. ____ Slows down current in a circuit.	L. ____ 5 amps.

11. Voltage (V), Current (I), or Resistance (R)?

A _____ If you increase resistance what decreases?	E. _____ If current increased what decreased?
B. _____ If you increases voltage what increases?	F. _____ If resistance is decreased, what increases?
C. _____ If the current decreased what increased?	G. _____ More batteries will increase these two quantities.
D. _____ If current increased what increased?	H. _____ More light bulbs will increase this.

Now turn to p.694 in your book. Just so you know: a "cross-sectional area" means the area you get when you cut a solid object. When you cut a cylindrical wire, the cross-sectional area you get is a circle.

12. More or less current?
   A. ___ The amount of charges flowing increases.
   B. ___ The fewer electrons flow per second.
   C. ___ The same number of charges flow, but it takes more time.

13. A. How much charge flows in 1minute with a 3.4 amp current?

   B. How many electrons is that?

14. How long does it take 12 coulombs to pass a point if there is 200 mA of current (convert to amps).

15. What moves thru metal solids?

16. Give two examples of positives moving.

17. What is conventional current?

18. A. Are wires empty of electrons, or are the electrons already in the wires?
    B. When one electron is pushed against a chain of electrons, what happens?
    C. So, why do you not have to wait for the electricity to get from the switch to a light bulb when you turn on a light bulb?

19. How long does it take an electron in a copper wire to move 1 m?

20. Where do batteries get their energy?

21. What is and is not used up when a battery is worn out?

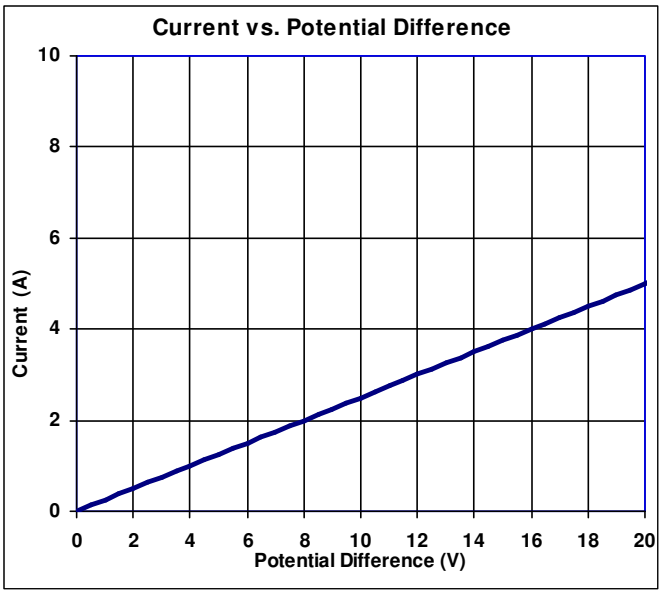
22. Fill in the following table about types of current.

Type	Abbreviation	What provides it	Defined	Graph of current
Alternating				
Direct				

23. What is the difference between an ohmic and non-ohmic material?

24. A. Is the material shown on the graph ohmic?
    B. Calculate its resistance.

    D. There is a very good reason why the current is graphed on the y-axis. Why?



25. Give the four things that affect the resistance of a wire.

Use the notes below to answer the following.

26. Without this organelle the cell would be unable to repair itself or continue to grow.

27. Without this organelle, if a plant cell lost water, it would shrink.

28. Celery is hard to bend partly because of this organelle.

29. A. What color is a chloroplast?
    B. Why?

30. The nucleus from Cell A is removed and replaced by the nucleus from Cell B. Afterwards, which cell's characteristics will Cell A have?

31. A cell needs certain molecules to function. These come from outside the cell.
    A. What organelle will allow or disallow these molecules to get in?
    B. Which organelle moves these molecules around the cell.
    C. Which organelle will make these molecules into proteins?
    D. Where the plans for making the proteins is stored (and comes from)?
    E. Which organelle makes energy for these molecules to be used?
    F. Which organelle will then moves the finished proteins around the cell?
    G. Which organelle will break up these materials when the cell is done with them?

32. Plants actually have two organelles that make energy. Which ones?

33. If this organelle is removed, a cell loses its ability to function.

Major Cell Organelles

	Where found				
Organelle	**Plants**	**Animals**	**Analogy**	**Function**	**Looks like**
Nucleus	x	x	brain	holds DNA (blueprint)	The big blob in the middle
Ribosomes	x	x	factory	makes proteins from mRNA's blueprint	little dots (chocolate chips)
Mitochondria	x	x	energy plant	makes ATP (energy) for cell	hot dog with mustard
chloroplast	x		green house	performs photosynthesis	stacked M&M's in a bubble
cell membrane	x	x	skin	protects cell and allows passing of materials into cell	at the edge of the cell
cell wall	x		walls of a room	like skeleton - gives rigidity - holds up a plant cell	very edge of a plant cell
lysosomes	x	x	clean up crew	breaks down left over and worn out material	
vacuoles	x		toilet	holds waste products; maintains water pressure in cell.	
Golgi apparatus (or complex)	x	x	post office	redistributes materials to rest of cell	Stack of pancakes
Endoplasmic reticulum	x	x	Conveyor belt for assembly line	moves materials from ribosomes to golgi	Folded fruit roll up