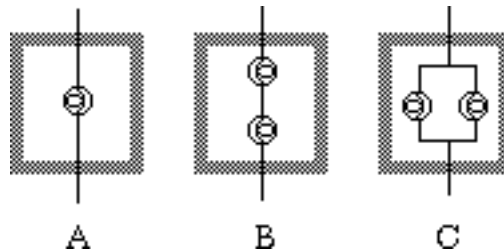


Name _____ Date _____

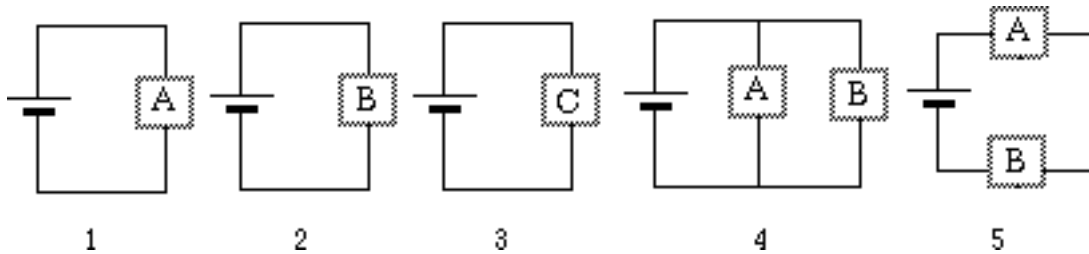
HOMEWORK FOR UNIT 22 #2

DIRECT CIRCUITS

1. Suppose you had three boxes, labeled A, B, and C, each having two terminals. We put the arrangement of bulbs in the boxes shown below



Consider the five circuits shown below in completing the following problems.



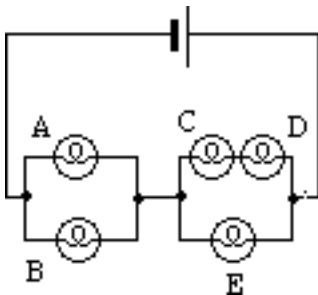
- a) For each of the circuits 1 through 5, sketch below a standard circuit diagram showing all the bulbs in the circuit. In each diagram number the bulbs and describe which bulbs or combination of bulbs are in series and parallel connections with each other.

a) (continued)

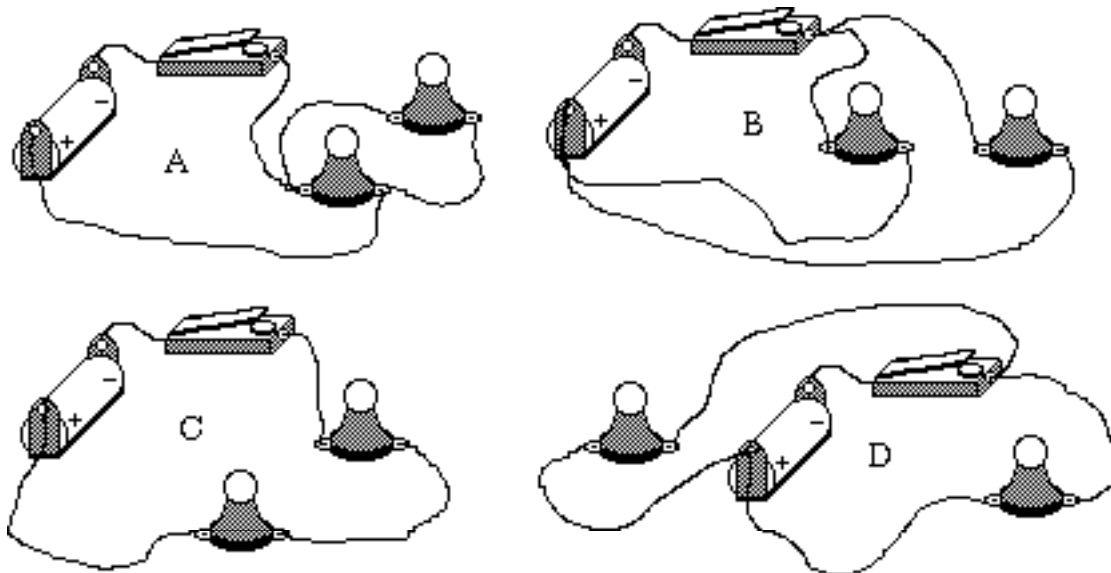
b) Rank the networks A, B, and C by their resistances. Which has the most resistance?
The least resistance?

(c) Rank each of the circuits according to the total current through the battery. Explain your reasoning!

2. Predict the relative brightness of each of the bulbs shown in the following figure. Explain the reasons for your rankings.



3. One of the most confusing things about wiring circuits and figuring out what you've done is that many arrangements are electrically equivalent. Unless you have unusual powers of visualization it is often hard to recognize this. For example, three of the circuits shown below are electrically equivalent and one is not.



(a) Which circuit is not like the others? Explain why it's different.

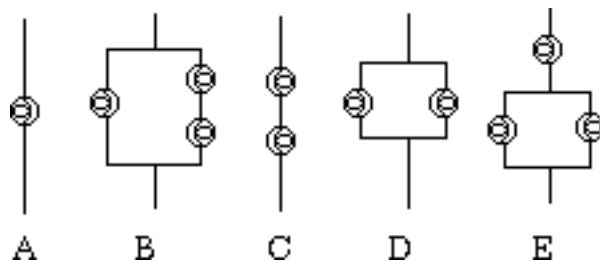
(b) Which circuits represent parallel arrangements for the bulbs? Which represent series arrangements?

(c) Draw circuit diagrams for each of the arrangements below.

A	B
C	D

(d) Examine your diagrams. Is it possible for neat circuit diagrams which look superficially different to represent the same set of electrical connections?

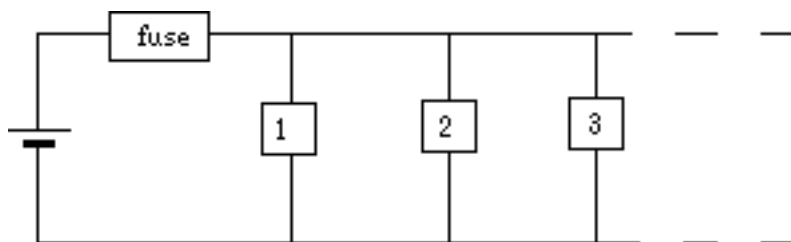
4. Use the model for electric current to rank the networks shown below in order by resistance. Explain your reasoning.



5. If a battery were connected to each of the circuits in Problem 4, in which case would the current through the battery be the largest? The smallest? Explain your reasoning.

6. The diagram below shows a typical household circuit. The appliances (lights, television, toaster, etc.) are represented by boxes labeling 1, 2, 3, and so on. The fuse, or circuit breaker, shown in the diagram is a switch intended to shut off the circuit automatically if the wires become too hot because too much current is flowing in the circuit.

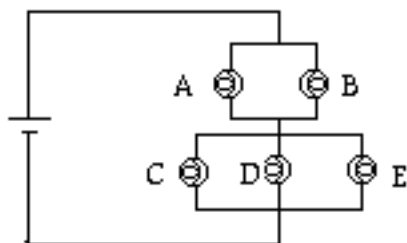
Note: Although houses in Canada use alternating current which differs in some ways from the direct current we have been studying, you can use the model you developed for this problem.



- a. What happens to the current through the fuse when more appliances are added to the circuit?
- b. Does the current through element #1 change when elements #2 and #3 are added to the circuit?
- c. Is this model consistent with your observations of everyday household electricity? For example, what happens to the brightness of a light bulb in a room when a second one is turned on?

d. What may happen to the fuse if too many appliances are added to the circuit? Why?

7. Are the bulbs C, D and E in the circuit below connected in series, parallel, or neither?



8. Rank the bulbs in the circuit above in order of brightness. Use the symbols "=", "<" and ">". Explain your ranking.

9. How will the brightness of bulbs A and B change if bulb C is unscrewed? Will the result be different if bulb D or E is unscrewed instead? Explain.

10. Rank the brightness of the bulbs in the circuit below. Use the symbols "=", "<" and ">". Explain your ranking.

