

Some Review PSC-4011 : Electricity

1. A) Aluminum E) Plastic
 B) Copper F) Porcelain
 C) Germanium G) Silicon
 D) Nichrome H) Silver

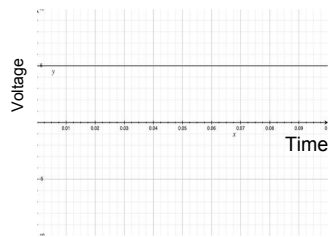


Of the above materials, name all those that could be used in each of the following applications. Give reasons for your answer.

- Kitchen stove heating elements:
- Lightening conductors:
- Insulators for high-tension transmission lines:
- Casings for electrical appliances with two-pronged plugs:
- Diodes and transistors:

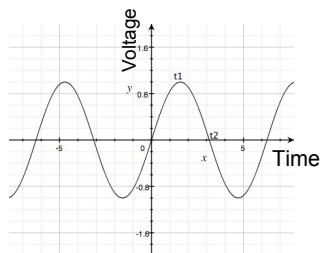
2. For each of the statements below, indicate whether it is referring to alternating current (AC) or direct current (DC):

a) The voltage of this type of current varies over time as follows:



Ans: _____

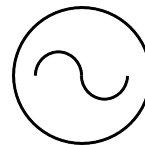
b) The voltage of this type of current varies over time as follows:



Ans: _____

- c) Its frequency is 60 hertz in the Hydro-Quebec system. Ans: _____
- d) It is used to operate ipods and certain toys. Ans: _____
- e) It is used to operate household appliances. Ans: _____
- f) The root mean square value of its intensity is used when calculations are involved.
Ans: _____
- g) Its current always travels in the same direction. Ans: _____
- h) Its current changes direction on a regular basis. Ans: _____
- i) The following symbol is used to represent this type of current:

Ans: _____



3. The following events occurred during the history of the development of knowledge about electricity, magnetism, and electromagnetism.

Place all of these events in chronological order.

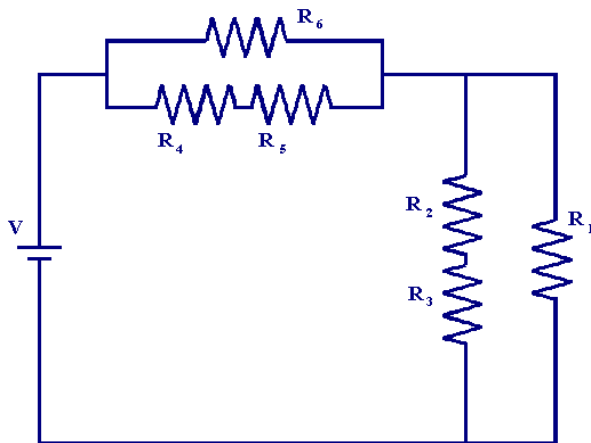
- A) Oersted discovered that current can be used to deflect a compass needle.
- B) Electrical current was first used to separate water molecules into hydrogen and oxygen gases (process of electrolysis).
- C) Gilbert performed experiments to show that many different substances can be electrified.
- D) Faraday observed that magnets can create electric currents.
- E) Maricourt identified the north and south poles of a magnet.
- F) Thales discovered that amber and silk will attract each other after they have been rubbed together.

Answer: _____

4. You want to measure the potential difference across the terminals of R_6 below.

a) What device will you use?

b) On the diagram below, indicate how the device is connected, using the appropriate symbol.

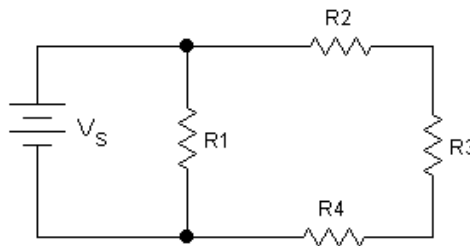


c) Is this device connected in series or in parallel with R_6 ? Explain your answer.

5. You want to measure the intensity of the current flowing through resistor R_4 in the circuit below.

a) What device will you use?

b) On the diagram below, indicate how the device is connected, using the appropriate symbol.

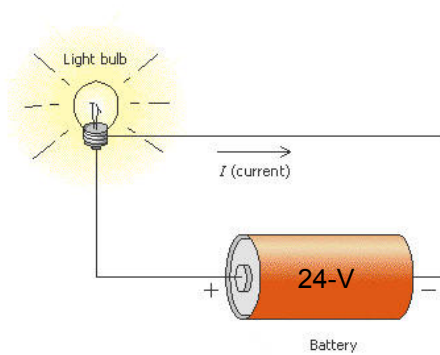


c) Is this measuring device connected in series or in parallel with resistor R_4 ? Explain your answer.

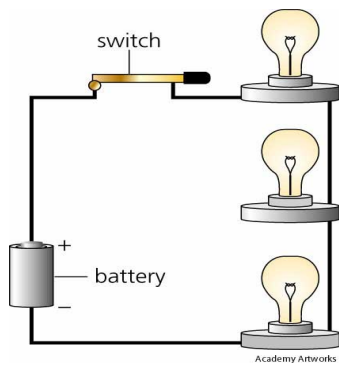
6. A motorcycle battery has 12 A·h of charge. When the bike is not in use the battery discharges at a rate of 0.04 A every hour. If the bike sits unused for 12 days (24 hours per day), will the owner be able to start the bike? Start-up requires 460 A of current for 3 seconds.



7. If the 24-V battery in the circuit below is replaced with a 15-V battery, then how will this affect the current intensity supplied to the bulb? Explain using the appropriate formula.



8. If one of the light bulbs is removed from the circuit below, then how will the current intensity in the circuit be affected? Explain using the appropriate formula.

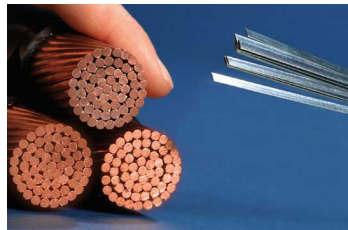


9. Household circuits typically carry 10 - 30 A of current. Industrial circuits can carry in the order of 200 000 A. Which of the wire gauges shown below would be most suitable for an industrial circuit? Explain your reasoning by referring to any relevant equations.

Wire A



Wire B

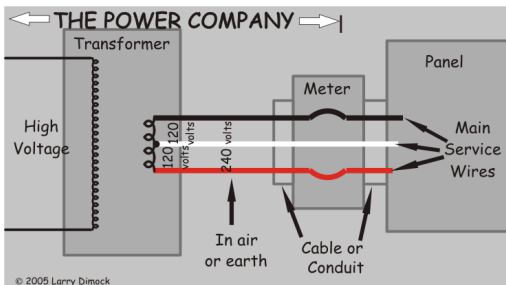


10. a) Jim (below) bought a new electric snowblower in the hopes of saving himself some money by not having to pay a snow-removal company. The distance from the outlet (outside Jim's front door) to the end of his driveway is 64 feet. At the hardware store, Jim has the choice of buying a 50-foot , 100-foot, or 200-foot extension cord. Which should Jim buy? Explain using any relevant equations.



- b) Should the extension cord that Jim buys have two prongs or three prongs? Explain.

11. An oven operates at 240 V and draws 17 A of current.
a) What is the power dissipated by the oven?



- b) Which of the three transformer wires (red, black, and/or white) are connected to the oven?

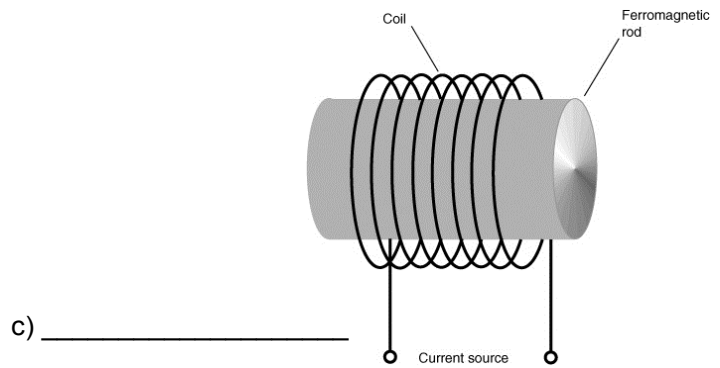
12. Identify the following:



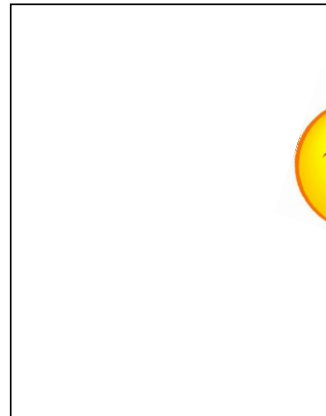
a) _____



b) _____



13.

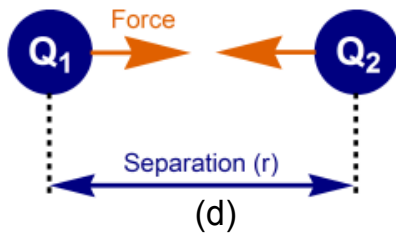


The power lines above are carrying electricity to a city which is 150 km away. These power lines are carrying a very high tension (700 000 V). Explain, using appropriate formulas, why the electricity is carried at such a high tension for long distances.

14. Explain the following:



15. Consider the two charges below.

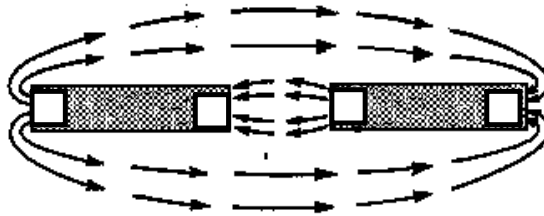


- a) If one of the charges is tripled then how will the force between the charges be affected?
- b) If the distance between the charges is increased from 6cm to 12cm then how will the force between the charges be affected?

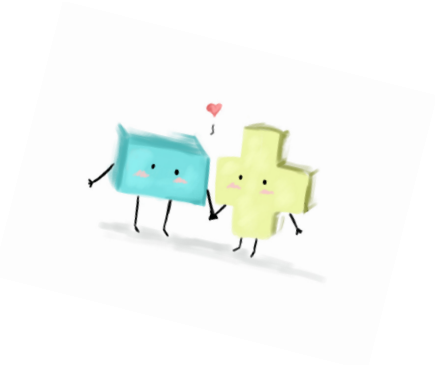
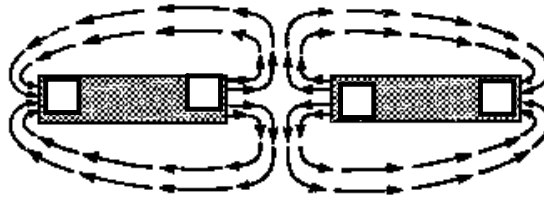
16. a) Label the poles on the bar magnets below.

29.1.1.4

Unlike poles attract

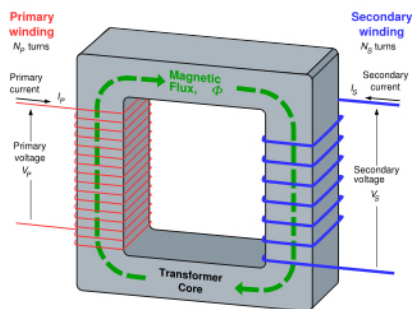


Like poles repel



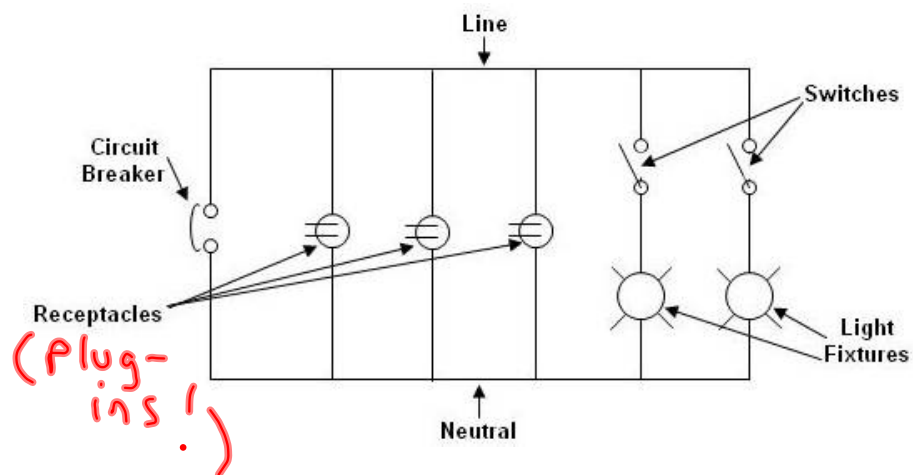
b) Indicate whether each pair of bar magnets are attracting or repelling each other.

17.



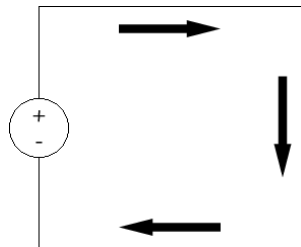
- Is this a step-up or step-down transformer? How do you know?
- Is the current intensity at the input of the transformer greater than, less than, or equal to the current intensity at the output of the transformer.
- Is the potential difference at the input of the transformer greater than, less than, or equal to the potential difference at the output of the transformer?
- Give an example of where such a transformer might be found.

18. Consider the household circuit below. If you were to plug in your hairdryer to one of the receptacles, would electricity be able to flow into the hairdryer? Explain.



19. Indicate whether each of the statements below is true or false.

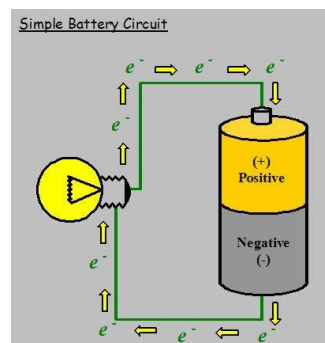
a) The diagram below is showing the direction of conventional current:



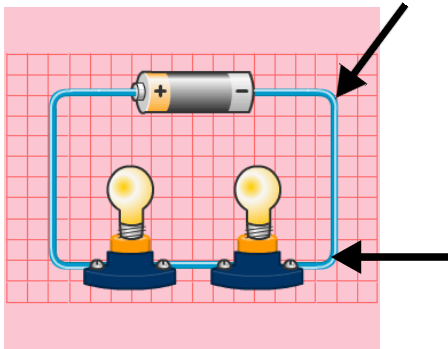
Ans: _____

b) The diagram to the right shows the direction that electrons flow in a circuit:

Ans: _____



- c) The voltage between the two points indicated by the arrows below is equal to one-half the \mathcal{E} of the power supply.



Ans: _____

- d) In the picture to the right the switch in an electrical circuit is being opened.

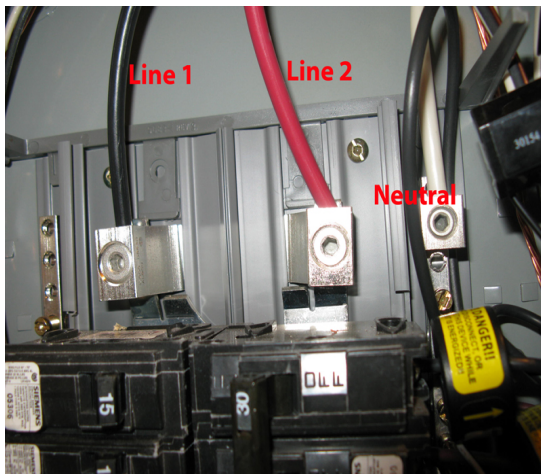
Ans: _____



- e) If the \mathcal{E} powering an air conditioner is increased, the current intensity flowing through the resistor will also increase.

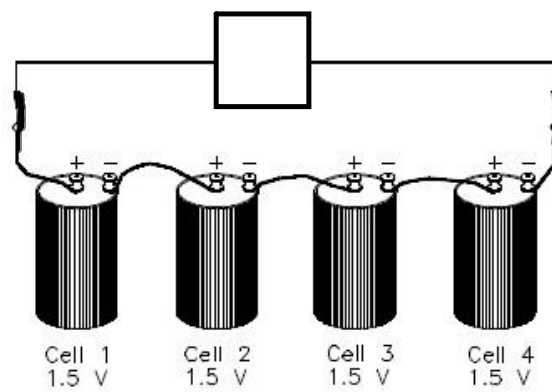
Ans: _____

- f) The wires below (black, red and white) are entering the distribution panel of a home. There is only one combination of these wires that can carry 120 V to a circuit.



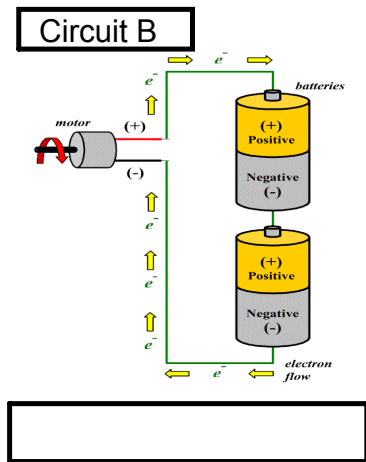
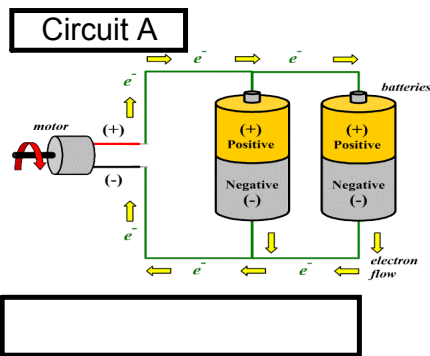
Ans: _____

20. Indicate the amount of the electromotive force being supplied to the component represented by the square below:



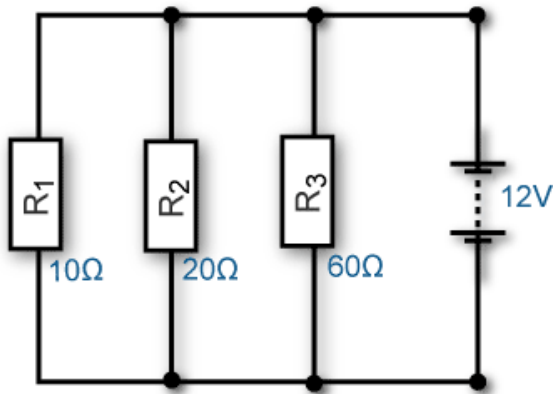
Explain your answer:

21. The batteries below are each 12 V batteries. One of the circuits below is supplying 24 V to a drill. The other circuit is supplying 12 V to fan. Place either the word "DRILL" or "FAN" in the box under each circuit drawing. Then, explain how you reached your decisions.

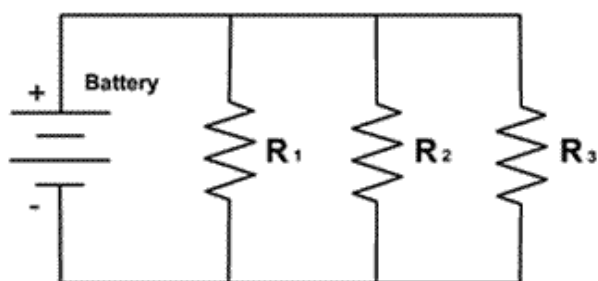


Explanation: _____

22. In the circuit diagram below, determine the value of I_t , the current supplied by the power supply. All formulas and calculations must be shown.



23. In the circuit diagram below, determine the value of \mathcal{E} , the electromotive force.
All formulas and calculations must be shown.



$$R_1 = 10 \Omega$$

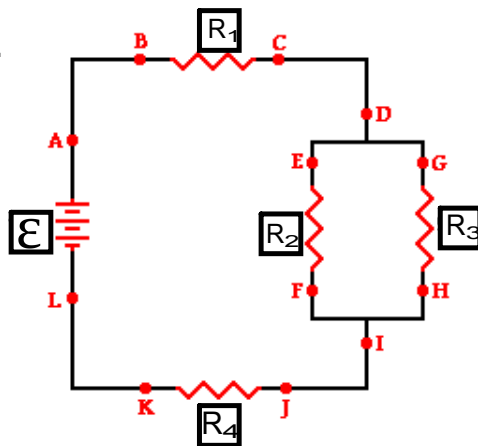
$$R_2 = 15 \Omega$$

$$R_3 = 20 \Omega$$

$$I_t = 13.3 \text{ A}$$

$$\mathcal{E} = ?$$

24.



$$V_1 = 30 \text{ V}$$

$$V_3 = 60 \text{ V}$$

$$V_4 = 15 \text{ V}$$

$$I_3 = 4 \text{ A}$$

$$I_4 = 12 \text{ A}$$

Without calculating, based only on your understanding of voltage and current laws, find the values below. Explain your answers.

a) $V_2 =$ _____ because: _____

b) $I_1 =$ _____ because: _____

c) $I_2 =$ _____ because: _____

d) $\mathcal{E} =$ _____ because: _____

25. For each of the battery types below, identify one advantage and one disadvantage. Also, cite one type of technological device for which each would be recommended to use.



advantage: _____

disadvantage: _____

device used in: _____



advantage: _____

disadvantage: _____

device used in: _____

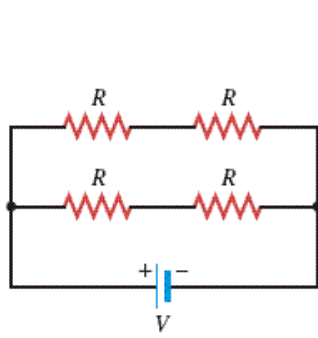
26. Explain why the plastic wrap sticks to the bowl!



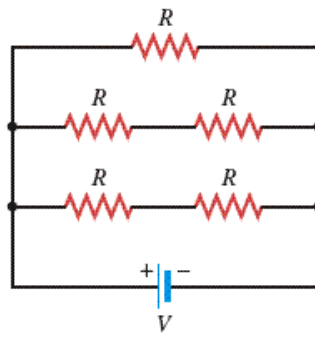
27. The following statements are related to electric motors and generators:
For each sentence, fill in the missing word (from the words below).
Some words will be used more than once.

1. The _____ is the mobile part of an electric motor.
2. The _____ is the stationary part of an electric generator.
3. A _____ converts electrical energy into mechanical rotational energy.
3. In a _____ the mechanical rotation of a conducting coil in a magnetic field produces an electromotive force in the coil.
4. The power of a _____ can be increased by adding turns to the electromagnet coil.
5. The power of an electric motor can be increased by increasing the _____ of the power supply.
6. A _____ uses electricity.
7. A _____ produces electricity.

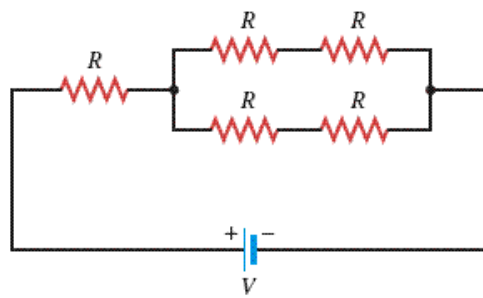
generator rotor voltage
motor stator



Circuit A



Circuit B



Circuit C

