

BCI SCIENCE
SNC 1D

Electricity Review

A. Fill in the blanks (use the following list)

- | | | | |
|---------------------------|---------------------------|-------------------------|---------------------|
| alternating current | ammeter | ampere | charging by contact |
| charging by friction | charging by induction | conductor | current electricity |
| electrical resistance | electroscope | energy source | grounding |
| induced charge separation | insulator | law of electric charges | load |
| negatively charged object | neutral object | ohm | Ohm's law |
| parallel circuit | positively charged object | potential difference | series circuit |
| static electricity | switch | volt | voltmeter |

- Charging by friction causes electrons in a neutral object to move.
- A(n) insulator is a material that prevents the flow of current.
- In a series circuit, a light bulb is referred to as the load.
- The opposite of static electricity is current electricity.
- The name of the instrument used to measure static electricity is a(n) electroscope.
- Lightning is created by induced charge separation.
- Charged objects attract neutral objects, opposite charges attract, and same charges repel are the three postulates of the law of electric charges.
- To measure the amount of electrons moving past a point in a circuit you would need to use a(n) ammeter.
- Potential difference is measured using a(n) voltmeter in units of volts.
- Connecting wire, a load, an energy source and a(n) switch are the four components of a circuit.

B. True or False (If the statement is false, rewrite the statement to make it true)

- Tap water is a good insulator of electricity because it contains dissolved salts and charged particles.
F. Tap water is a good conductor b/c "
- In charging by induction, electrons are transferred between the objects,
F. In charging by contact "
- Static electricity refers to the movement of electrons in a closed path.
F. Current electricity "
- When the thickness of a wire increases, the resistance of the wire decreases.
T
- An ammeter must be connected in parallel with a circuit to take accurate readings.
F. A voltmeter "
- When you add loads to a series circuit, the total resistance in the circuit remains the same.
F. When you add loads to a parallel circuit, "
- The wires in the heating element of a hair dryer have relatively high resistance.
T

C. Similarities/Differences (describe similarities/differences between each pair)

- static electricity, current electricity
 - Both involve electrons
 - static electricity is an imbalance of charge @ rest.
 - current electricity is the movement of e⁻ in a circuit
- insulator, conductor
 - both are used to affect the flow of e⁻
 - insulators restrict the flow of e⁻
 - conductors allow e⁻ to flow
- series circuit, parallel circuit
 - Both are pathways that involve flow of e⁻
 - series has only 1 path for e⁻
 - parallel has 2 or more paths
- ammeter, voltmeter
 - both are used to measure e⁻ in a circuit
 - ammeter measures current in Amps & is connected in series
 - voltmeter measures potential difference in Volts & is connected in parallel
- charging by contact, induction
 - Both are methods to charge objects
 - contact creates a permanent charge
 - induction creates a temporary charge
- lightning, grounding
 - lightning is created by an induced charge separation it strikes the ground where the charge is grounded (neutralized)

D. Multiple choice (Choose the best answer)

24. Which of the following materials would make the best insulator?

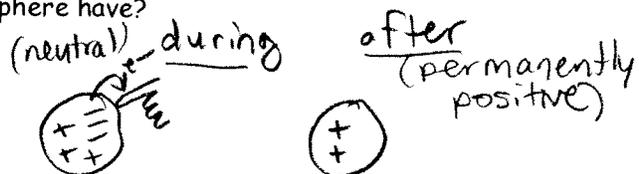
- a) pure water
- B** b) wooden peg
- c) iron nail
- d) copper wire

25. Which of the following is an example of charging by induction?

- a) static cling on clothes
- B** b) attracting paper with a charged rod
- c) rubbing a balloon on a sweater
- d) charging an electroscope by touching it

26. A positively charged rod is brought close to a neutral sphere. If you touch the sphere with your finger before pulling the rod away, what type of charge will the sphere have?

- a) temporarily positive
- B** b) permanently positive
- c) temporarily negative
- d) permanently negative



27. Neutral objects can become charged by

- a) gaining or losing neutrons
- b) gaining or losing protons
- C** c) gaining or losing electrons
- d) gaining or losing protons, neutrons, or electrons

28. Which factor best explains why lightning strikes the ground?

- a) metals conduct the current electricity to the ground
- b) friction between the cloud and the ground
- C** c) electrostatic discharge between cloud and Earth
- d) charging by friction and direct contact

29. Which of the following refers to the path along which electrons can flow?

- A** a) circuit
- b) current
- c) potential difference
- d) resistance

30. Which device is used to measure the potential difference across a load?

- a) ammeter
- b) ohmmeter
- C** c) voltmeter
- d) circuit breaker

31. Which of the following units is used to measure current?

- A** a) amperes
- b) volts
- c) watts
- d) joules

E. Diagrams

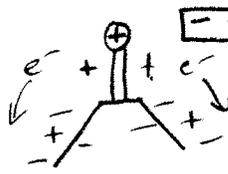
- rub fur w rod.
- rod gains e^- from fur becoming negatively charged

32. With use of a diagram, draw and explain how you can create an induced charge in a neutral electroscope by using a piece of fur and ebonite rod.

(neutral)
BEFORE

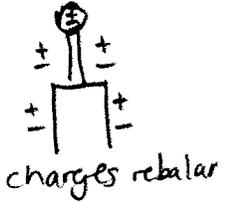


DURING



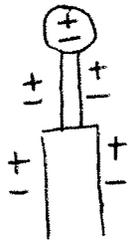
e^- have been pushed down electroscope inducing a negative charge (temporary)

(neutral)
AFTER

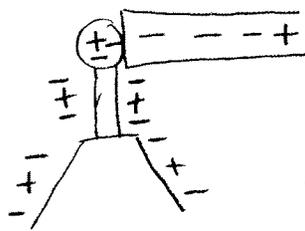


33. With use of a diagram, draw and explain how you can create a permanent charge in a neutral electroscope by using a piece of fur and ebonite rod.

(neutral)
BEFORE

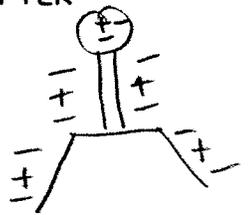


DURING



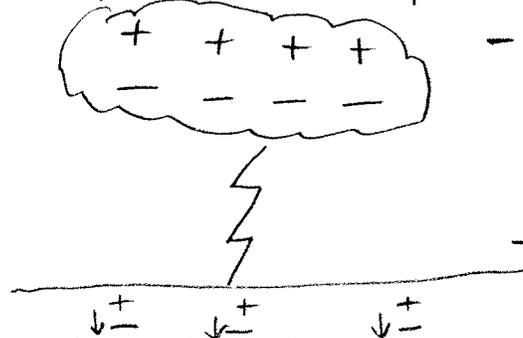
e^- transferred from rod to electroscope making a permanent negative charge

(negative)
AFTER



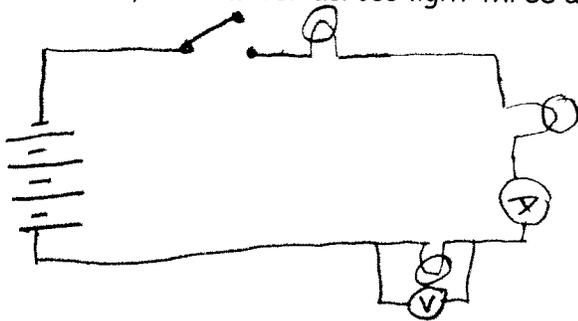
34. With use of a diagram, draw and explain how an induced separation charge forms and how a lightning bolt occurs.

- swirling dust & ice create charging by friction in cloud creating +ve & -ve areas of cloud

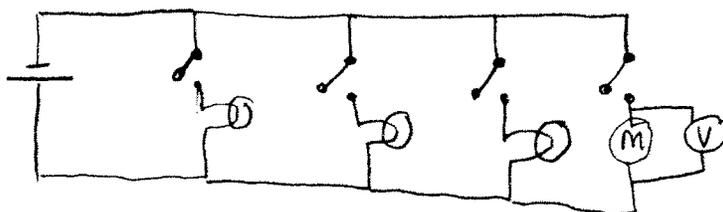


- negative area of cloud repels e^- closest to ground inducing a positive charge separation
- lightning (e^-) travel from cloud to ground

35. With use of a diagram, draw a series circuit that has 4, 1.5 V cells, 3 light bulbs, 1 ammeter between light 2 and 3, 1 voltmeter across light three and one switch.



36. With use of a diagram, draw a circuit that has 1, 1.5 V cell, 3 light bulbs and 1 motor in parallel, each with a switch that controls each item and a voltmeter that measures the potential difference of the motor.



F. Calculations. Make sure to use GRASP to answer the following questions.

37. A current of 0.50 A flows through a light bulb, when a potential difference of 120 V is placed across the light bulb. What is the resistance of the light bulb?

$$G: I = 0.50 \text{ A}, V = 120 \text{ V}$$

$$R: R = ?$$

$$A: R = \frac{V}{I}$$

$$S: R = \frac{(120 \text{ V})}{(0.50 \text{ A})} \\ = 240 \Omega$$

P: ∴ the resistance is 240Ω

38. A colour television has a resistance of 80Ω . How much current passes through the television when it is plugged in to a 120 V wall socket?

$$G: R = 80 \Omega, V = 120 \text{ V}$$

$$R: I = ?$$

$$A: I = \frac{V}{R}$$

$$S: I = \frac{(120 \text{ V})}{(80 \Omega)} \\ = 1.5 \text{ A}$$

P: ∴ 1.5 A of current passes through

39. A toaster connected to a 110 V power source has 6.0 A of current flowing through it. How much power is dissipated as heat?

$$G: V = 110 \text{ V}, I = 6.0 \text{ A}$$

$$R: P = ?$$

$$A: P = VI$$

$$S: P = (110 \text{ V})(6.0 \text{ A}) \\ = 660 \text{ W}$$

P: ∴ 660 W is dissipated as heat.

40. How much energy does the motor of a 615 W refrigerator use in one day, if it runs for 14 hours a day?

$$G: t = 14 \text{ hrs} \times 3600 \text{ s} = 50400 \text{ s}, P = 615 \text{ W}$$

$$R: E = ?$$

$$A: E = Pt$$

$$S: E = (615 \text{ W})(50400 \text{ s}) \\ = 30996000 \text{ J}$$

P: ∴ the fridge motor uses 30 996 000 J of energy.