**Second Semester Review**

Electrostatics:

$$F = \frac{Kq_1q_2}{d^2} \quad K = 9.0 \; x \; 10^9$$

1. Briefly describe each method of charging. Be able to tell the difference between them, the circumstances in which each occurs and the end result of each.
   a. friction

   b. contact

   c. polarization.

2. If a negative charge repels an object, then the object must be _____. However if the same

   negative charged object attracts another object, then that object can be either _____ or _____.

3. What is the electrostatic force between a 0.03 Coulomb charge and a 0.05 Coulomb charge if the distance between them is 9.0 m?

4. Two charges, q_1 and q_2, at a certain distance, d, exert a 100 N force on each other. What would the force be if:
   a. q_1 is doubled.

   b. q_1 is halved and q_2 is tripled.

   c. distance is halved.

   d. q_1 is cut into 1/3, q_2 is doubled and d is doubled.

5. Two charges, q_1 and q_2, at a certain distance, d, exert force on each other. Draw a graphical representation of the following relationships:
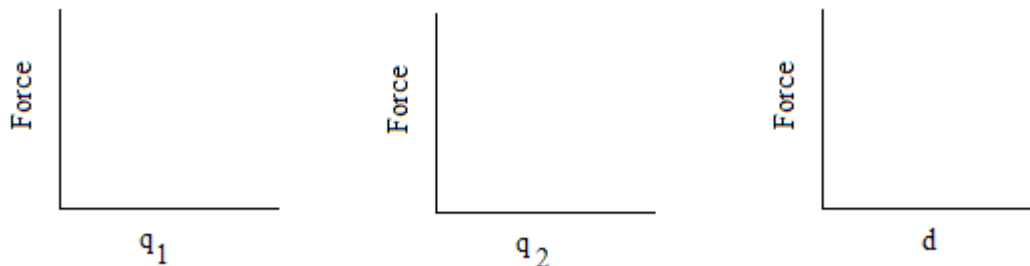

Circuits:

$$V = I \cdot R \qquad P = I \cdot V \qquad R_s = R_1 + R_1 + \ ...\ R_n \qquad \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots \frac{1}{R_n}$$

6. What power is required to run 9.0 A of current through a hair dryer connected to 120 V?

7. The current through a lamp connected to a 120 V source is 0.32 A. What is the resistance of the lamp?

7a. A radio operates at 6 volts and has a resistance of 360 Ohms, how much power does it draw?

8. As resistors are added to a series circuit, the current in the circuit _____.

9. Current is the same throughout in a _____ circuit.

10. Voltage drop in each branch is the same in a_____ circuit.

11. The total resistance is equal to the sum of the individual resistors in a_____ circuit.

12. The sum of the voltage drops across the individual resistors is equal to the total voltage in a _____ circuit.

13. The total resistance in a _____ circuit is less than the smallest resistor.

14. If you have three identical individual resistors in parallel and one is removed, the current in each of the remaining resistors_____ While the total current in the circuit _____.

15. If you unscrew a bulb in a series circuit of several light bulbs, what happens to the remaining bulbs?

16. If you unscrew a bulb in a parallel circuit of several light bulbs, what happens to the remaining bulbs?

17. Is your house is wired in parallel or series? How do you know?

18. What changes could you make in order to increase the current in a series circuit?

19. A 20 Ω resistor, a 30 Ω resistor, and a 40 Ω resistor are connected in series to a 120V source.
    a. What is the effective (total) resistance?

    b. What is the current in the circuit?

20. A 20 Ω resistor, a 30 Ω resistor, and a 40 Ω resistor are connected in parallel to a 120 V source.
    a. What is the effective resistance?

    b. What is the current in the circuit?

21. Complete a chart for the following combination circuits.
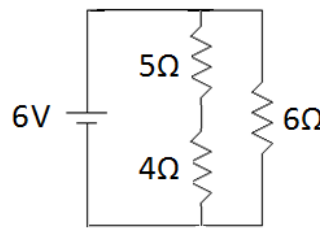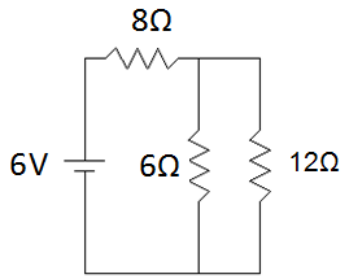

Magnetism:

1. The source of all magnetic fields is _____ _____. Explain why a wire with a current passing through it creates a magnetic field.

2. In the diagram below, the circles represent small compasses placed around a bar magnet. Draw an arrow inside each circle indicating the direction that each compass will point.
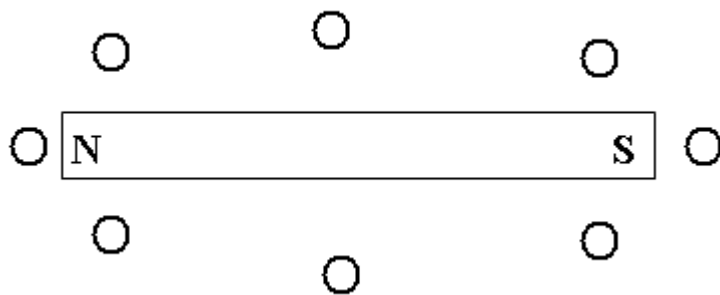
3. List the factors that affect the magnetic field strength of an electromagnet

4. If you break the magnet below in half what will happen / why? (Describe, in a complete sentence, and make a drawing indicating the poles on each half)

| N | | S |
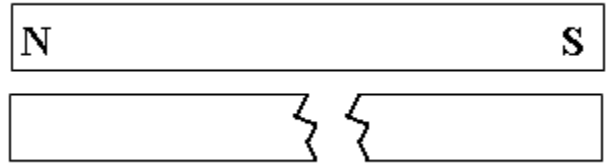
5. Graph the following relationships or the strength of the magnetic field created by an electromagnet.

Field Strength

Current

Field Strength

Distance

Field Strength

Number of loops
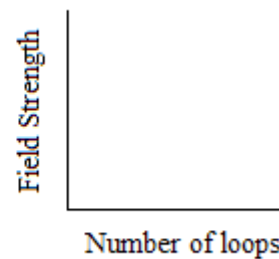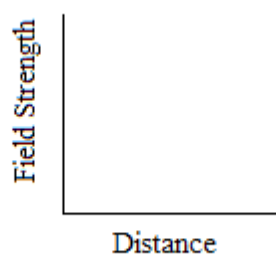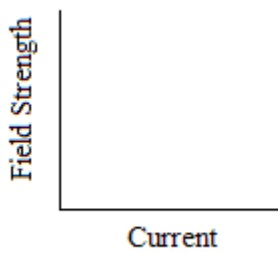
6. Both _____ and _____ convert mechanical energy into electrical energy, and

_____ and _____ convert electrical energy into mechanical energy.

7. In terms of physics, explain how each of the following works.
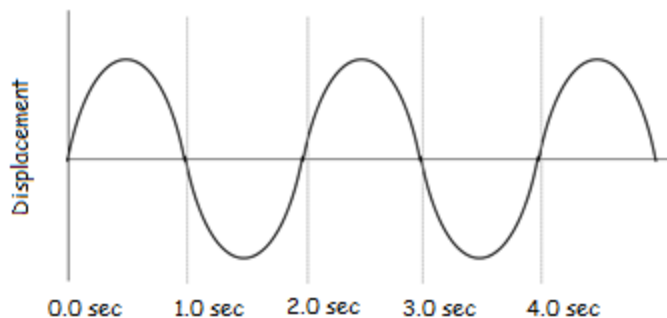
    a. An electric motor

    b. An electric generator

8. Use the Right Hand Rule to determine the direction of force on the following moving charges.
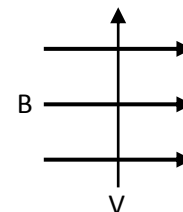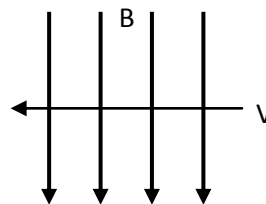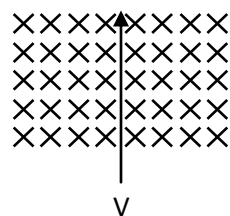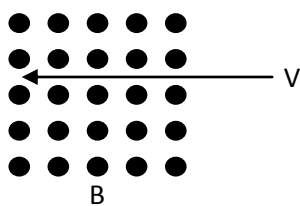
Vibrations, Waves, and Sound

$$v = \lambda \cdot f \qquad f = \frac{1}{T} \qquad f_B = |f_1 - f_2| \qquad T_{SHO} = 2\pi\sqrt{\frac{m}{K}} \qquad T_P = 2\pi\sqrt{\frac{l}{g}}$$

1. A sine curve that represents a transverse wave is drawn to the right. With a ruler, measure the wavelength and amplitude of the wave and find the period, frequency and speed.

    a. Wavelength =_____

    b. Amplitude = _____

    c. Period = _____

    d. Frequency = _____

    e. Speed = _____

2. A kid on a playground swing makes a complete to-and-fro swing each 4 seconds.

    a. The frequency of swing is _____

    b. and the period is _____

3. The annoying sound from a mosquito is produced when it beats its wings at the average rate of 800 wingbeats per second. (v = 332 m/s)

    a. What is the frequency of the sound wave?

    b. What is the wavelength?

4. A record spins at a rate of 33.3 revolutions per minute. Calculate the period and frequency of the record.

5. The source of all waves is _____

6. All waves transfer _____ from one point to another

7. Which of the following factors affect the period of a pendulum?

    Amplitude, Mass, String Length, Color, acceleration due to gravity

8. Which of the following factors affect the period of a spring oscillator?
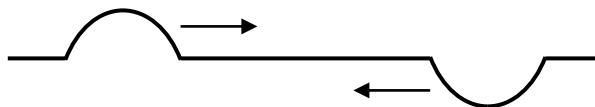
    Amplitude, Mass, spring constant, Color, acceleration due to gravity

9. Consider a wave generator that produces 10 pulses per second. The speed of the waves is 250 m/s.

   a. What is the wavelength of the waves? _____

   b. What happens to the wavelength if the frequency of pulses is increased?

10. When an automobile moves toward a listener…

a. the sound of its horn seems relatively (lower, normal, or higher) pitched

b. and when it moves away from the listener, its horn seems

   (lower, normal, or higher) pitched
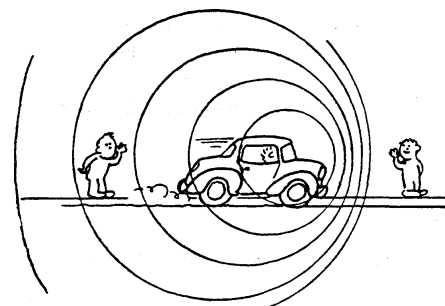
11. What type of interference would occur for the following diagram?
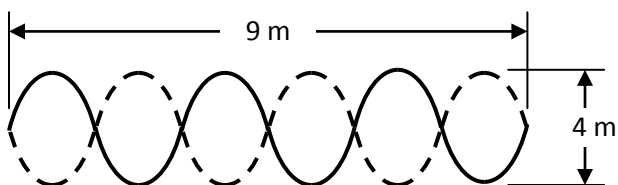   (Describe what would   happen to the
    amplitude)

12. What type of interference would occur for the following diagram? (Describe what would happen to
    the amplitude)

13. For the standing wave shown, determine the wavelength, amplitude, and the number of nodes.

14. If the frequency is 228 Hz, what is the speed of the wave?

15. A standing wave has a 5th harmonic of 190 Hz. Which of the following frequencies in the list below
    do not belong in the harmonic series for the standing wave?

    38 Hz, 76 Hz, 115 Hz, 152 Hz, 267Hz, 342 Hz

16. A piano note creates a beat frequency of 6 Hz when played with a tuning fork of 384 Hz. What are
    the possible frequencies of the piano note?