

Final Exam Review

Waves – Chapters 14-16

1. Define:

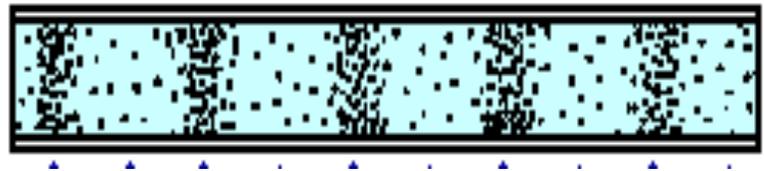
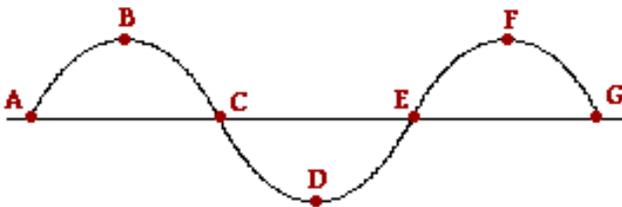
- Vibration
- Wave
- Period
- Crest
- Trough
- Amplitude
- Wavelength
- Frequency
- Hertz

2. What is a transverse wave and how is it different from a longitudinal wave?

3. The period of a pendulum depends upon what two factors?

- a. _____
- b. _____

4. Label **ALL** of the parts (ignore the letters)



5. Define:

- a. Node
- b. Anti node
- c. Pitch
- d. Compression
- e. Rarefaction
- f. Resonance

6. What causes a wave? What causes a sound wave?

7. Why does sound travel faster in solids than in gases?

8. What is the Doppler effect and give me an example of it?

9. What is constructive interference and how does it differ from destructive interference?

10. The speed of sound depends on what factors?
11. A hummingbird beats its wings up and down with a frequency of 80.0 Hz. What is the period of the hummingbird's flaps?
12. Danielle is pushing her twin Daniel on a swing that hangs from a tree branch by 2.0 m long ropes. With what frequency will Danielle have to push Daniel as he swings?
13. A wrecking ball used to demolish buildings swings from a 10.0 m long cable. What is the period of the wrecking ball as it swings?
14. A crow attempts to land on a small bird feeder, causing it to swing back and forth with a frequency of 0.350 Hz. How long is the wire from which the feeder hangs?
15. Find the wavelength of the ultrasonic wave emitted by a bat if it has a frequency of 4.0×10^4 Hz.
16. In California, Clay is surfing on a wave that propels him toward the beach with a speed of 5.0 m/s. The wave crests are each 20. m apart. A) What is the frequency of the water wave?
B) What is the period?
17. From his bedroom, Garth can hear the distant sound of a train horn as the train travels through the mountains on its way from Chattanooga to Nashville. The horn has a frequency of 800.0 Hz as the train rolls along at 20.00 m/s. What frequency does Garth hear the train travel away?
18. A sparrow chases a crow with a speed of 4.0 m/s, while chirping at a frequency of 850.0 Hz. What frequency of sound does the crow hear as he flies away from the sparrow with a speed of 3.0 m/s?
19. One foggy morning, Kenny is driving his speedboat toward a Brant Point lighthouse at a speed of 15.0 m/s as the fog horn blows with a frequency of 180.0 Hz. What frequency does Kenny hear as he moves?

Color and light – Chapters 20-22

1. Define:
 - White Light:
 - Primary Colors of light:
 - Complementary Colors:
2. Does light travel faster in air or water?

3. Define:

- Reflection
- Normal:
- Incident Ray:
- Reflected Ray:
- Angle of Reflection:
- Angle of Incident:
- Diffuse Reflection:
- Refraction

4. What is the Law of Reflection?

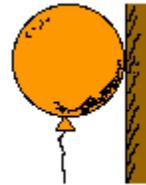
5. When a light is reflected, does the speed of light change?

6. When a ray of light refracts, the speed of light is reduced, does the frequency or the wavelength change?

Electrostatics –

1. Define:

- a. Electric Force –
- b. Conservation of Charge –
- c. Conductor –
- d. Insulator –
- e. Semiconductor –
- f. Superconductor –
- g. Charging by Friction –
- h. Charging by Induction –
- i. Electrostatics –
- j. Polarization-



2. Consider the electric force between a pair of charged particles a certain distance apart. By Coulomb's law:

- a. If the charge on one of the particles is doubled, the force is ____
- b. If, instead, the charge on both particles is doubled, the force is ____
- c. If instead the distance between the particles is halved, the force is ____
- d. If instead the distance between the particles is doubled, the force is ____

$$F = \frac{kq_1q_2}{d^2}$$

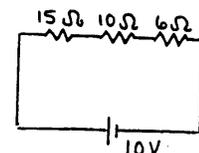
3. What is the electric field in side of a Van de Graff generator ?

4. What does it mean if an atom is electrically neutral?

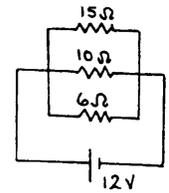
5. How are electrical forces different from gravitational forces?
6. Draw a diagram of 2 electric fields. One has a strong electric field from a positive source and the other has a weak electric field from a negative source. Label all parts.
7. Explain why it is inadvisable to intentionally become the short circuit for a household 110 volt outlet but yet we can safely touch an electrostatic generator which generates approximately 100000 volts.
8. Define:
 - a. Electric Potential
 - b. Electric Potential Energy
 - c. Electric Field
9. What does it mean to say an object is charged? What possible ways can an object become charged?
10. What are electric field lines? How are they drawn? What determines the direction an electric field line is drawn? What will happen to the electrical potential energy of a charged particle in an electric field when the particle is released and free to move?
11. A raindrop acquires a negative charge of $3.0 \times 10^{-18} \text{ C}$ as it falls. What is the force of attraction when the raindrop is 6.0 cm from the bulb on the end of a car antenna that holds a charge of $2.0 \times 10^{-6} \text{ C}$?
12. In a grain elevator on Farmer Judd's farm, pieces of grain become electrically charged while falling through the elevator. If one piece of grain is charged with $5.0 \times 10^{-16} \text{ C}$ while another holds $2.0 \times 10^{-16} \text{ C}$ of charge, what is the electrostatic force between them when they are separated by 0.50m?
13. In the human body, nerve cells work by pumping sodium ions out of a cell in order to maintain a potential difference across the cell wall. If a sodium ion carries a charge of $1.60 \times 10^{-19} \text{ C}$ as it is pumped with an electrical force of $2.0 \times 10^{-12} \text{ N}$, what is the electric field between the inside and outside of the nerve cell?
14. James recharges his dead 12.0 V car battery by sending 28000 C of charge through the terminals. How much electrical potential energy must James store in the car battery to make it fully charged? How much energy is released when 1.0 C of charge is allowed to flow between points separated by a potential difference of 115 V?
15. How much energy is stored when 7.2 C of charge is moved through a potential difference of 1.5 V?
16. How much charge is driven through a circuit by a 9.0 V battery delivering 3.0 J of energy?

Current and Circuits – Chapter 17

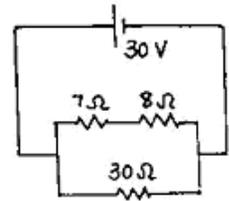
- Define:
 - series circuit
 - parallel circuit
- As more and more resistors are added in parallel to a circuit, the total resistance of the circuit _____ and the total current of the circuit _____.
- Define:
 - ❖ Potential difference:
 - ❖ Electric Current:
 - ❖ Electric Power:
 - ❖ Direct current:
 - ❖ Alternating current:
 - ❖ Resistance:
- What three conditions determine the resistance of a conductor?
- When you touch a door knob and get shocked, where do the electrons flow from?
- At what frequency is the current delivered to our homes in N. America? What does that mean?
- Which has more resistance
 - a thick wire or a thin wire? _____
 - a long wire or a short wire? _____
- A bird can stand harmlessly on one wire of high potential, but had better not reach over and grab a neighboring wire! Why not?
- What is required to build an electric circuit?
- Officer Moynihan is patrolling his beat with a 4.5 V flashlight whose light bulb has a resistance of $12\ \Omega$. How much current does the flashlight draw?
- Celeste's air conditioner uses 2160 W of power as a current of 9.0 A passes through it. A) What is the voltage drop when the air conditioner is running? B) How does the compare to the usual household voltage? C) What would happen if Celeste tried to connecting her air conditioner to a usual 120 V line?
- Camille takes her pocket calculator out of her book bag as she gets ready to do her physics homework. In the calculator, a 0.160 C charge encounters $19.0\ \Omega$ of resistance every 2.00 seconds. What is the potential difference of the battery?
- Find A) the total resistance in the circuit. B) Find the total current through the circuit.



14. Find A) the total resistance in the circuit. B) Find the total current through the circuit.



15. Find A) the total resistance in the circuit. B) Find the total current through the circuit.



Magnetism – Chapters 18 and 19

1. What causes something to become magnetized?
2. What happens to a magnet if you break it in half?
3. What kind of field surrounds a stationary electric charge?
4. What kind of field surrounds a moving electric charge?
5. Where is the magnetic field strength the greatest?
6. How can you induce a charge in a wire?
7. Explain how a motor is different from a generator.
8. In 1964, a magnet at the Francis Bitter National Magnet Laboratory created a magnetic field with a magnitude of 22.5 T. Ten megawatts of power was required to generate this field. If a wire that is 12 cm long and that carries a current of 8.4×10^{-2} A is placed in this field, what is the force acting on it?
9. In the giant CERN particle accelerator in Switzerland, protons are accelerated to speeds of 2.0×10^8 m/s through a magnetic field of 3.5 T and then collided with a fixed target. What is the magnitude of the magnetic force experienced by the protons as they are accelerated around the giant ring?

10. At Sandia National Laboratories, in Albuquerque, New Mexico, an interesting project has been developed. Engineers have proposed a train that will roll on existing rails and use existing wheels but be propelled by magnetic forces. Suppose such a train is pushed by a 5.0×10^5 N force and results from the interaction between a current in many wires and a magnetic field with a magnitude of 3.8 T that is oriented perpendicular to the wires. Find the total length of the wires if they carry a 2.00×10^2 A current.

11. A proton shot out of the sun at a speed of 6.0×10^6 m/s during a "sunspot maximum" travels through the strong magnetic field of the sun. What is the maximum magnetic force experienced by the proton at a point where the sun's magnetic field is 0.090 T?