**Physics B Concept Review** 06/06/14 **Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Graphing, Variables and Constants

1. Two students wanted to determine the relationship between the number of cups of coffee consumed and pulse rate. They had volunteers drink 1, 2, 3 and 4 cups of coffee and recorded their pulse rate 10 minutes after each cup of coffee.
   1. Name the independent variable \_cups of coffee
   2. Name the dependent variable \_\_\_pulse rate\_\_\_\_
   3. Which variable goes on the x-axis? \_\_\_ cups of coffee \_\_\_\_\_
   4. Which variable goes on the y-axis? \_\_\_ pulse rate \_\_\_\_\_\_\_\_\_
   5. What type of graph, line or scatter, should they make?\_\_\_\_\_scatter\_\_\_
2. Joe and Bob conduct an experiment to determine the relationship between the amount of voltage in a circuit and the current. They increase the voltage used in each trial by 5V and measure the current each time. They use the same voltage source, and run the current through the same switches and wires and other circuit elements. Once they have made their graph they notice that as the voltage increases, the current in the circuit also increases.
   1. Name the independent variable \_voltage\_\_\_\_\_\_\_\_
   2. Name the dependent variable \_\_current\_\_\_\_\_\_\_\_\_\_\_\_
   3. List all of the constants in the experiment\_\_voltage supply, wires, switches, resistors\_\_\_
   4. Which line on the graph below best represents their data? \_C\_\_\_\_\_

Voltage (Volts)

Current (Amps)

**Current vs. Voltage**

B

A

C

1. Solve the formula P=V2/R for V and for R.

1. An incomplete graph is shown below. It is for an experiment that shows that as time increases, the temperature decreases. Time was measured in hours and temperature was measured in degrees Fahrenheit. What is missing from this graph? Add all of the missing items to the graph below.

Add axis labels, title, and best fit line

**Sound and Waves**

1. Draw a diagram of 3 wavelengths of a transverse wave.

**Label the following:**

Trough

Crest

Wavelength

Amplitude

Equilibrium

2. How do you measure wavelength?

Distance from any part of a wave to the next identical part.

3. What is a longitudinal wave?

Wave composed of alternating compressions and rarefactions. Particle motion parallel to wave velocity. Must have a material medium to travel through.

4. An example of a longitudinal wave is \_\_\_\_sound\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

5. What is a transverse wave?

Particle motion (or field oscillations) are perpendicular to wave velocity.

6. An example of a transverse wave is \_\_\_light, s-shaped wave on spring\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

7. What is a compression?

Area of greatest particle density, squeezed together

8. What is a rarefaction?

Area of least particle density, spread apart

9. Explain how amplitude and intensity (loudness) of a sound wave are related.

Intensity is amount of energy per second passing through given area. Energy is proportional to

10. Explain how frequency and pitch of a sound wave are related.

Pitch, the note you hear, depends on frequency. Higher f, higher pitch.

11. What is The Doppler Effect?

Shift in measured frequency, caused by relative motion of source and observer. If source and observer are approaching, the measured frequency will be higher than the frequency actually sent out by source. The measured wavelength will be smaller.

12. When an object is forced to vibrate at its natural frequency, it causes the \_\_\_amplitude\_\_\_\_ to grow. This phenomenon is called \_\_resonance\_\_\_\_\_\_\_.

14. Explain why we are unable to hear sounds in space (in a vacuum).

In space, there are no particles to undergo compression and rarefaction. No medium, no longitudinal waves, no sound.

15. What is a beat?

Alternating loud and soft sound (“wa-wa-wa”) caused by alternating constructive and destructive interference between two waves of different frequencies. Ex: Two guitar strings slightly out of tune.

16. Put water, air, and steel in order, from fastest to slowest, according to the speed at which sound travels through them. Roughly corresponds to hardness and strength of material. Solids >> gases

1st \_\_steel\_\_\_\_ 2nd \_water\_\_\_\_\_ 3rd \_\_\_air\_\_\_\_

17. When you increase the volume of your voice, you are changing the \_\_amplitude\_\_\_\_\_of the sound wave you are making. (Could also put intensity)

18. In general, sound travels faster through materials that are more \_\_\_dense\_\_\_\_\_\_\_\_\_.

19. The superposition of two waves occurs when they:

Pass through the same point at the same time.

The shape of the resulting wave is the \_\_sum\_\_ of the two waves.

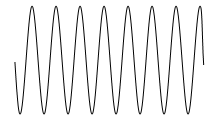
20. What is constructive interference?

Two crests or two troughs or two of same type of wave adding together and reinforcing, increasing amplitude.

21. What is destructive interference?

Two of opposite type of wave adding together and canceling, decreasing amplitude.

22. Compare the second wave to the first. Second wave has longer wavelength and lower amplitude.



23. A surfer sits by the ocean and watches 28 waves pass by in 60 seconds.

a. What is the frequency of the waves?

f = waves/sec = 28 waves/60s = 0.47 Hz

b. What is the period of the ocean wave?

T = 1/f = 2.14 seconds

24. If the period of a wave is 19 s what is the frequency?

f = 1/T = 1/19s = .053 Hz

25. Calculate the speed of a wave with a frequency of 150 Hz if the wavelength is 2.5 m.

v = λf = (2.5m)(150Hz) = 375 m/s

26. Calculate the wavelength of a wave with a frequency of 68 Hz and a wavespeed of 170 m/s.

λ = v/f = (170 m/s)÷(68 Hz) = 2.5 m

27. Calculate the frequency of a wave with a wavelength of 9.0 m and a wavespeed of 343 m/s.

f = v/λ = (343 m/s)÷(9.0 m) = 38 Hz

**Light**

1. What is the speed of light? \_c = 3.00 x 108 m/s\_\_\_\_

2. All waves from the electromagnetic spectrum are what type of wave?\_\_transverse\_\_\_\_

3. What is the difference between visible light and the rest of the electromagnetic spectrum?

We can see it! (It has frequencies that stimulate cells in our retinas.)

4. Compare gamma waves and microwaves as they travel through outer space, in terms of

a) speed SAME

b) frequency Gamma has much higher frequency

c) energy Gamma has much higher energy

d) wavelength Gamma has much shorter wavelength

5. As the frequency of a wave increases, its wavelength \_\_\_\_decreases\_\_\_

6. What causes electromagnetic waves to form?

Oscillating or accelerating charges.

7. What are the types of waves in the electromagnetic spectrum that have a frequency just higher and just lower than visible light?

f lower than red: infrared f higher than violet: ultraviolet

8. A ray of light strikes a polished mirror at an angle of 37 degrees from the surface of the mirror. What is the angle of incidence, and what will be the angle of reflection?

Angle of incidence measured from normal equals 90° -37° = 53°. Angle of reflection equals angle of incidence.

9. Draw the refracted light rays below. (What does a dotted line represent?) Dotted line = NORMAL to surface

Fast Slow

Slow Fast

10. Explain why refraction occurs. Refraction occurs as waves pass from one medium to another, at an angle from the normal, and bend as they change speed.

11. As light travels across a boundary from air to water, what happens to its

a) speed DECREASES b) frequency STAYS SAME c) wavelength DECREASES d) color STAYS SAME

12. The three primary colors of light are \_\_\_red\_\_\_\_, \_\_green\_\_\_\_\_ and \_\_blue\_\_\_\_\_.

13. The three secondary colors of light are \_\_yellow\_\_\_\_, \_\_\_cyan\_\_ and \_\_magenta\_\_\_\_\_.

14. Blue + Green Light = \_\_\_cyan\_\_ light Red + Green + Blue Light = \_\_\_white\_\_\_\_ light

Blue + Red Light = \_\_\_\_magenta\_\_\_\_ light Red + Green Light = \_\_\_yellow\_\_\_\_\_ light

15. A white object \_\_reflects\_\_ all light to an observer’s eyes.

16. A black object \_\_\_absorbs\_\_\_ all light that is shined upon it.

17. If a t-shirt looks red is it because it absorbs the color red and reflects all other colors or because it only reflects red and absorbs all other colors? Is it emitting red light?

It reflects red light (from a light or the sun) and absorbs other colors. It does not emit red light, unless it is on fire. Do not wear shirts which are on fire.

18. Explain how Young's double slit experiment proved that light behaves as a wave.

It showed that light can interfere with itself. Waves interfere, but particles do not.

19. Give an example of diffraction.

Sound waves which pass through a doorway and spread out, so you can hear a person even though you can’t see them.

20. Joe looks at Frank’s shirt in the sunlight, and sees that it is a green color. Draw and describe a diagram explaining why Frank’s shirt appears green to Joe.

Diagram should show green light ray reflecting off shirt, while other colors are absorbed.

21. Light bulbs are measured not just by the power they use, but by the amount of light they emit. LED light bulbs use very little power, but emit a lot of visible light. What unit is used to measure the amount of light emitted each second?

Lumens

22. Give two examples of a luminous source and two examples of illuminated objects.

Luminous source: light bulb, sun, fire Illuminated objects: Anything light shines on that we see.

23. Define the following and provide one example of each:

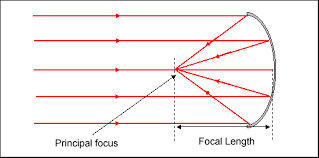
Opaque – light does not pass through. (A log.)

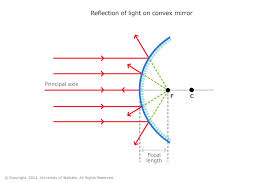
Transparent – Light passes through and images can be seen. (Lens, window)

Translucent - light passes through, but gets scattered (Frosted glass, waxed paper, )

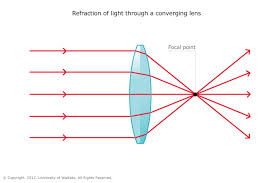
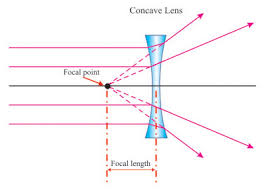
24. Write whether the following descriptions apply to concave or convex mirrors:

1. Curve Inward Concave mirror
2. Curve Outward Convex mirror
3. Always produce smaller images Convex mirror
4. Can produce images that are upside-down Concave mirror
5. Always produces images that are right side up Convex mirror
6. Provides viewers with a larger field of view Convex mirror
7. Can make images really big or really small Concave mirror

25. Draw a picture to represent a concave mirror. 26. Draw a picture to represent a convex mirror.



27. Draw parallel rays hitting a concave lens. 28. Draw a parallel rays hitting a convex lens

29. List two places where you might find a convex lens. 30. List two places where you might find a convex mirror.

Your eyeball. Microscope, telescope, magnifying glass. Side mirror on car. Gas station security mirror.

**Electricity**

1. What is electricity?

Flow of electrons through conductor

2. What is a conductor? 3. An example of a conductor is \_\_metals, ionic solutions\_\_\_\_\_.

Material through which electrons flow easily.

4. What is an insulator? 5. An example of an insulator is \_rubber, glass, plastic\_\_\_.

Materials with high resistance to flow of electrons.

6. What is resistance?

Ratio of voltage to current. Tendency to prevent electrons from flowing.

7. Explain how resistance would differ in a thick wire and a thin wire.

Resistance is higher in a thin wire.

8. What are the differences between AC and DC? Batteries supply \_\_\_\_\_ and wall outlets supply \_\_\_\_\_.

Alternating current pushes electrons back and forth as positive and negative directions alternate. Direct current flows in one direction, from higher voltage to lower, or from positive to negative. Batteries supply DC and standard wall outlets are AC.

9. Wall outlets are wired in parallel so that

a) Every device gets the same voltage.

b) Every device can be turned on or shut off independent of the others.

10. The difference between a fuse and a circuit breaker is:

Both switch off a circuit when a set amount of current is exceeded, but fuses actually burn through and need to be replaced, like light bulbs do. Circuit breakers just need to be turned back on, like a switch.

11. What causes the charge in a circuit to move? A potential difference, or voltage, exerts a force on charges.

12. Draw a circuit, using schematic symbols, which contains a battery, wires, and 3 bulbs in series.

13. Draw a circuit, using schematic symbols, which contains a battery, wires, and 3 bulbs in parallel.

14. Of the two circuits you have drawn in problems 12 and 13, which would have brighter bulbs (assuming both circuits used identical bulbs)? Why?

The bulbs in the series circuit would share or split the voltage, while the bulbs in parallel would each get the full voltage. Therefore, the bulbs in parallel would be brighter.

15. What is the mathematical relationship between resistance and current in a circuit?

Current is inversely proportional to resistance.

16. What is the relationship between voltage and current in a circuit?

Current is directly proportional to voltage.

17. A certain light bulb has a resistance of 120 Ω. If a current of 1.2 A is going through it, calculate the voltage applied.

V = IR = (1.2A)(120Ω) = 144V

18. A voltage of 200 volts is applied to a 1000 kΩ resistor. Calculate the current through the resistor.

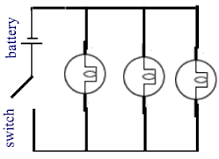
I = V/R = 200V / 1,000,000 Ω = 0.0002 Amperes = 2 x 10-4 A (Remember, k means kilo means thousand.)

19. A voltage of 9.0 volts is applied to a resistor and the current going through it is found to be 0.040 A. Calculate the resistance.

R = V/I = 9.0V /0.040A = 225 Ω

20. Three identical light bulbs are wired in series, and plugged into a 120 V outlet. All together they use 51 Watts.

a) Make a diagram of this circuit:



b) How much power does each bulb use?

Each bulb uses 1/3 of the 51 Watts, which

equals 17 Watts

c) How much voltage does each bulb get across it?

Each bulb gets 1/3 of the voltage, 40 V

d) How much current is going through each bulb?

I = P/V = (17 W)/ (40 V) = 0.425 A

e) What is the resistance of each bulb?

R = V/I = (40 V)/ (0.425 A) = 94 Ω

21. In a garage door opener, the current going through a 1500 Ω resistor is 0.165 A. Calculate the voltage across, and the power used by, the resistor.

V = IR = (0.165 A)(1500 Ω) = 247.5 V ≈ 250 V

P = I2R = (0.165A)2(1500Ω) = 41 Watts