Name: **KEY**   Period: _____

Pre-AP Physics Spring 2014 Exam Review

Wavelength	Transverse Wave	Conduction	Impulse
Sound Pitch	Series	Momentum	Electrical Conductor
Refraction	Longitudinal Wave	Coulomb	Radiation
Moment of Inertia	Convection	Parallel	Electrical Insulator
Amplitude	Reflection	Red, Green, and Blue	Mechanical Wave
Cyan, Yellow, Magenta	Index of Refraction	Amperes (Amps)	Entropy
Constructive Interference	The Doppler Effect	Specific Heat Capacity	Evaporation
Buoyancy	Torque	Angular Acceleration	Bernoulli's Principle
Perfectly Inelastic Collision	Pressure	Resonance	Elastic Collision

Part I: Matching Definitions

Use the word bank above to match the words to each definition below.

1. The standard unit of electric charge. *Coulomb*

2. A ratio of the speed of light in a vacuum compared to the speed of light in a medium. *Index of Refraction*

3. Heat transfer through the circulation of fluid such as air or water. *Convection*

4. A type of circuit in which if one light bulb were burned out, all others would stay lit. *Parallel*

5. When a ray of light "bounces" off of a surface, such as a mirror. *Reflection*

6. A type of phase change where matter changes from a liquid to a gas. *Evaporation*

7. The standard unit of measure for electric current. *Ampere*

8. A material that does not allow electricity to flow through it easily. *Insulator*

9. A type of wave whose matter moves parallel to the direction of energy transfer. *Longitudinal*

10. The three primary colors of light. *Red, Green, Blue*

11. The force exerted over a certain area. *Pressure*

12. Resistance to change in rotational motion *Moment of Inertia*

13. The three secondary colors of light. *Cyan, Yellow, Magenta*

14. The change in observed frequency of a wave due to motion of the source or observer. *Doppler Effect*

15. A type of circuit in which if one light bulb were burned out, all others would go out. *Series*

16. The intensity of a wave described by its height. *Amplitude*

17. Heat transfer through electromagnetic waves. *Radiation*

18. The distance between successive identical parts of a wave. *Wavelength*

19. A material that allows electricity to flow through it easily. *Conductor*

20. The lowest possible temperature in nature. *Absolute Zero*

21. A type of wave that requires a medium to travel through. *Mechanical*

22. A device that transfers mechanical energy into electrical energy. *Generator*

23. The resistance to change in temperature of a material. *Specific Heat Capacity*

24. A "rotational force" that causes rotational motion to begin. Torque

25. Heat transfer between two objects that are in direct contact with one another. Conduction

26. The bending of light as is passes from one medium into another. Refraction

27. Determined by the frequency of a sound wave. Pitch

28. Product of the mass and velocity of an object. Momentum

29. A type of wave whose matter moves perpendicular to the direction of energy transfer. Transverse

30. The amount of disorder in a system. Entropy

31. A force exerted on an object placed in a fluid. Buoyancy

32. A collision in which the two objects "stick together". perfectly inelastic collision

Part II: Problems:

33. A rolling boulder with a mass of 150 kg has a momentum of 375 kgm/s. What is the velocity of the boulder?

$$p = mv \quad \Rightarrow \quad V = \frac{375}{150}$$

$$V = \frac{p}{m}$$

$$\boxed{V = 2.5 \, m/s}$$

34. Stuntmen in movies often jump from high places. Why is it less harmful if they land on a large soft airbag instead of the hard ground?

The airbag gives <u>more time</u> to stop, so the <u>force</u> applied to the person is <u>decreased</u>.

35. A 250 kg cannon is at rest when it fires a 0.5 kg projectile. If the projectile leaves the cannon with a velocity of 350 m/s, what is the recoil velocity of the cannon?

$$\Sigma p_i = \Sigma p_f$$

$$0 = m_1 v_1' + m_2 v_2'$$

$$V_1' = -\frac{m_2 v_2'}{m_1}$$

$$V_1' = -\frac{(.5)(350)}{250} = \boxed{-0.7 \, m/s}$$

36. What is the SI unit for Rotational Inertia?

$$\boxed{kg\,m^2}$$

37. When a solid disk and a metal hoop which have the same mass and radius are released from the top of a ramp, the disk will make it to the bottom of the ramp first. Explain why.

The mass of the disk is distributed farther from the center. This gives it a greater moment of inertia, so it will accelerate slower and take longer to reach the bottom.
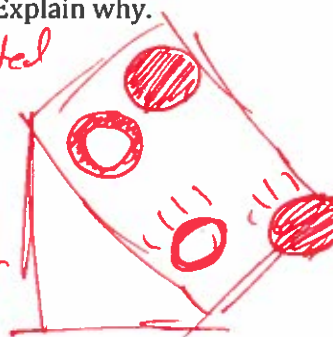
38. A force of 50 N is applied to a wrench 0.5 meters from the axis of rotation. How much torque is exerted on the wrench?

$$\tau = rF$$
$$\tau = (.5)(50)$$

$$\boxed{T = 25 \, Nm}$$

39. How much thermal energy must be added to raise 5 kg of water from a temperature of 30ºC to 60ºC? (c_{water} = 4100 J/kgºC)

$$Q = mc_s \Delta T$$
$$Q = (5)(4100)(60-30)$$

$$\boxed{Q = 615,000 \, J}$$

40. Convert 235ºF into Celsius and Kelvins.

$$T_c = \frac{5}{9}(T_F - 32) = \frac{5}{9}(235-32)$$

$$\boxed{T_c = 112.8 °C}$$

$$T_K = T_c + 273 = 112.8 + 273$$

$$\boxed{T_K = 385.8 k}$$

41. A simple circuit includes a 9-Volt battery and an 18-Ohm resistor. How much current is in the circuit?

$$V = IR$$
$$I = \frac{V}{R}$$

$$I = \frac{9}{18}$$

$$\boxed{I = 0.5 A}$$

42. Frank rubbed a balloon against his hair several times putting a charge of -12.0 uC on the balloon. He held the balloon 0.40 m from his hair (which now had a +12.0 uC charge). How much force is exerted between his hair and the balloon?
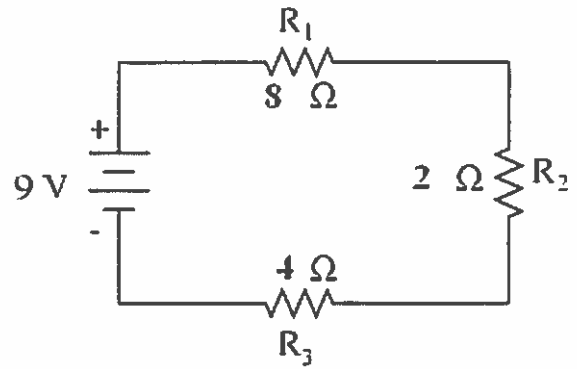(1uC = 1x10⁻⁶ C)

$$F_E = \frac{kq_1 q_2}{r^2} = \frac{(9 \times 10^9)(12 \times 10^{-6})(12 \times 10^{-6})}{.4^2} = \boxed{8.1 N}$$

43. (True/False) Electric currents produce magnetic fields.

44. An atom has 8 electrons and 5 protons. What is the net electric charge on the atom?

8 electrons: -8
5 protons: +5

$$\boxed{-3}$$

45. 2A circuit is set up as shown in the diagram.
    a. What type of circuit is this? (series or parallel)

    b. What is the total equivalent resistance of the circuit?

$$R_S = R_1 + R_2 + R_3$$

$$R_S = 8 + 2 + 4 = \boxed{14\,\Omega}$$

    c. How much total current is in the circuit?

$$V = IR$$
$$I = \frac{V}{R}$$
$$I = \frac{9}{14} = \boxed{0.64\,A}$$

    d. What is the electrical power usage of R_3?

$$P = IV = (.64)(9)$$

$$\boxed{P = 5.8\,Watts}$$

46. Heat always flows from...
    a. hot to cold
    b. cold to hot
    c. warm to hot
    d. big to small

47. Like charges _____ and opposite charges _____.
    a. attract, repel
    b. repel, attract
    c. energize, recognize
    d. fight, love

48. Chad rubs his socks on the carpet, causing him to gain a negative charge. This is because the carpet ___lost___ (gained/lost) ___electrons___ (electrons/protons), and Chad ___gained___ (gained/lost) ___electrons___ (electrons/protons).

49. An atom contains 52 Protons and 31 Electrons. What is the atom's net charge?

$$52\ protons: +52$$
$$31\ electrons: -31$$
$$+ \rightarrow \boxed{+21}$$

50. Two waves that are in-phase are travelling toward one another, as shown below. <u>Sketch</u> on the diagram the appearance of the resulting wave when the two waves coincide.
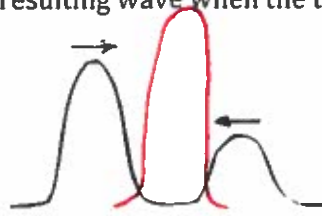
51. Can sound waves travel through empty space? (Yes or (no))

52. Draw a transverse wave and label its amplitude and wavelength.

53. The index of refraction of water is 1.33, and the index of refraction of glass is 1.5. In which medium does light travel faster?

water, it has a lower IOR.

54. A beam of light travels at a speed of 2.5×10^8 m/s in a block of acrylic. What is the index of refraction of acrylic?

$$n = \frac{c}{v} = \frac{3 \times 10^8}{2.5 \times 10^8} = \boxed{1.2}$$

55. Draw a sketch of each of the following:
    a. A concave mirror

    b. A convex mirror
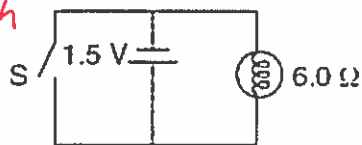
    c. A converging (convex) lens

    d. A diverging (concave) lens

56. Would the light bulb in the diagram below be lit if the switch was closed? Why or why not?

*No, charge would instead move through the wire b/c it would short circuit.*

S / 1.5 V ⎓   6.0 Ω

57. Sound is a _____ wave that is _____.
    a. Electromagnetic, transverse
    b. Mechanical, longitudinal *(circled)*
    c. Electromagnetic, longitudinal
    d. Mechanical, transverse

58. (True/False) A charge in motion, whether by itself or as current in a wire, generates a magnetic field. *(True circled)*

59. Determine the direction of the force exerted on each of the positive charges moving through the magnetic fields shown below.

X X X X X X X X
X X X X X X X X
X X X X X X X X
X X X X X X X X
X X X X X X X X
X X X X X X X X

$-x$ (left)

$-z$ (in)
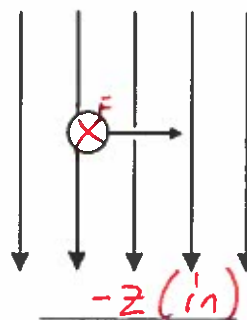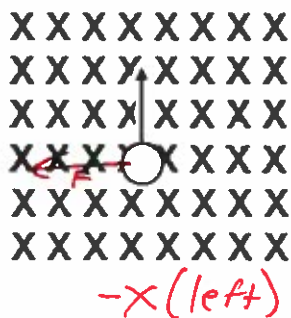
60. A proton (with a charge of 1.6×10^{-19} C) enters a magnetic field of unknown strength with a velocity of 7,450 m/s and experiences a force of 3.05×10^{-16} Newtons. What is the magnitude (in Tesla) of the magnetic field?

$$F_B = qvB$$

$$B = \frac{F_B}{qv}$$

$$B = \frac{3.05 \times 10^{-16}}{(1.6 \times 10^{-19})(7450)}$$

$$\boxed{B = 0.256 \, T}$$

61. How much force is exerted on a 0.75 meter section of wire carrying 2.5 Amps of current that is placed in a 0.3 Tesla magnetic field?

$$F_B = ILB$$

$$F_B = (2.5)(.75)(.3)$$

$$\boxed{F_B = 0.5625 \, N}$$

62. A metal cube with a total volume of 0.75 m³ is placed in a tank of salt water that has a density of 1,025 kg/m³. What is the buoyant force exerted on the cube?

$$F_B = \rho V g = (1025)(.75)(9.8) = \boxed{7534 \, N}$$