Name: ____KEY________________________ Period: ______

Physics Spring 2016 Final Exam Review

The Physics Spring Final Exam covers all information since January 2016 or the start of the fourth six weeks: Remember that Physics builds on the skills you have already learned, so you will use all of the information from previous tests on this test. This is a review guide…none of these questions are on the test. You have to understand the skills necessary to answer these questions and apply those skills to the questions on the test. Practice! Take your time.

Fill in the following table:

Variable	Concept	Units
PE	Potential Energy	J
KE	Kinetic Energy	J
W	work	J
P	Power	watts
J	Impulse	
p	Momentum	Kg m/s or Ns
h	height	m
m	Mass	kg
T	temperature	°C
w	Work	J
F	Force	N
		Nm^2 / C^2
q	Charge	
r	radius	m
E		
Ω	resistance	ohms
A	Current	**Amps**
P	momentum	
E	Energy	J
V,s	**Velocity, speed**	m / s
	Angle of Incidence	degrees
f	Frequency	Hz

c	Speed of Light	3 x 10 ^{8}m/s
θr	Angle of reflection	
	wavelength	m
n	Index of refraction	--
	Critical Angle	degrees

Work and Energy

1. A force of 200 N is used to pull the handle of a wagon. If the wagon moves horizontally for 35 m, what work is done by the force on the wagon?
   F= 200 w= f x d
   D= 35 m w= 200 x 35
   W=? **w= 7000J**

2. An object with a mass of 25 kg is lifted at constant velocity to a height of 25 m. How much work is done lifting the object?
   M= 25 kg= 25000g w= f x d
   d= 25 m w= m x a x d
   w= (25)(9.8)(25000) **w= 6125000 J**

3. If the force and motion of an object are in opposite directions, the work done on the object by the force is positive / negative. (Circle one)

   There is no work in force and motion are not in the same direction.

4. A 7 kW motor is used to lift a 200 kg block of ice to a platform 20 m above the ground. How long does it take for the motor to raise one block of ice to the platform?
   T=? f= m x a w= f x d p=w/t
   P= 7000 200 x 9.8= 1960 w=1960 x20 p= 39200/7000
   M= 200 kg
   D= 20 m **5.6 seconds**

5. An airplane of mass 9000 kg climbs to an altitude of 9000 m. What is its potential energy at this altitude?
   M= 9000 kg pe= mgh
   H= 9000 m pe= (9000)(9.8)(9000)
   Pe=? **Pe= 7.49 x 10^{8} J**

6. A train has a kinetic energy of 3.2 x 10^{7} J and is traveling at 40 km/hr. What is the train's mass?
   M=? ke= ½ mv^{2}
   Ke= 3.2 x 10 ^{7} 3.2 x 10 ^{7}= ½ (m) (11.11)^{2}
   V= 40 km/h= 11.11 m/s 2(3.2 x 10 ^{7})= 2(1/2 (m) (11.11)^{2}
   6.4 E7= m 123,43
   6.4E7 / 123.43
   M= 2.59 x 10 ^{12} kg

7. A truck is moving down the highway at 65 km/hr. It has a mass of 22,000 kg.
a) What is the truck's kinetic energy?
V= 65 km/hr= 18.06 m/s
M= 22000 kg ke= ½ mv^2
Ke=? Ke= ½ (22000)(18.06)^2
<u>Ke= 3.59 x 10^6 J</u>

b) If the driver of the truck brakes until the truck comes to a complete stop, how much work do the brakes do while stopping the truck?
Vi= 18.06 m/s
Vf= 0 w= change KE
W=? w= ½ m(vf^2-vi^2)
W= ½ (22000)(0- 18.06^2)
<u>W= -3.59 x 10 ^{6} J</u>

8. A stocker at a grocery store lifts a 20 kg box of canned goods from the floor to a shelf 4.5 m above the floor.
a) What is the change in the potential energy of the box?
M= 20 kg
D= 4.5 m change PE= PE$_f$- PE$_i$ PE=mgh
Pe=? PE$_1$ 20x9x0 PE$_f$= 20x9.8x4.5
<u>882-0= 882 joules</u>

b) How much work did the stocker do in lifting the box to the shelf? W=F x d f=m x a
f=m x a w=f x D
20 x 9.8 w= 196 x 4.5 w=882

9. A worker drops a screwdriver down from a telephone pole. If the worker is 18 m above the ground, at what velocity does the screwdriver hit the ground?
D= 18 m
Vf= ? PE= KE
Vi= 0 mgh= ½ mv^2
A= 9.8 9.8= ½ (vf^2- 0^2)
9.8= ½ v^2
19.6= v^2
<u>Vf= 4.43 m/s</u>

10. A roller coaster with a 2000 kg mass descends through a drop which has a vertical height of 100 m. If the coaster starts at rest at the top, what will its velocity be at the bottom of the drop?
M= 2000 kg
H= 100 m PE=Ke
Vi= 0 mgh= ½ m(vf^2- vi^2)
Vf= ? (9.8)(100)= ½ (vf^2- 0)
980= ½ v^2
1960= v^2
<u>Vf= 44.27 m/s</u>

11. A ball rolling at 5 m/s rolls up an incline and reaches the top where its velocity is 2 m/s. What is the height of the incline?

Vi= 5 m/s
Vf= 2 m/s
A= 9.8
h=?

KE= PE
½ m(vf^2- vi^2)= mgh
½ ($2^2 - 5^2$)= (9.8)(h)
-10.5= 9.8(h)
H= -10.5 / 9.8
H= -1.07 m

Momentum and Collisions

1. What change in momentum is experienced by a car going 5 m/s if it is accelerated to 12 m/s and has a mass of 980 kg?

Vi= 5 m/s
Vf= 12 m/s
P=?
M= 980 kg

change p= m*v

change p= mv_f-mv_i
p= (980)(12) – (980)(5)
p= 11760-4900
p= 6860

2. A car crashes into a wall with a force of 55,000 N. If the impulse of the crash is 9000 units, how much time elapsed during the crash as the car came to a rest?

F= 55000 N
J= 9000
Vf= 0
T= ?

change p= F*t
9000= (55000)(t)
t= 9000/55000
T= .16 sec

3. A boy strikes a tee-ball off a tee with a bat exerting a force of 400 N on the ball over a 0.3 s time period. If the ball has a mass of 0.35 kg, at what velocity does the ball fly off the tee?

F= 400 N
T= .3 sec
M= .35 kg
V=?

F*t= m*v
(400)(.3)= (.35)(v)
v= 342.86 m/s

4. A billiard ball moving at 3 m/s strikes a second billiard ball and stops. The second ball moves at what velocity if the collision was elastic?

Vi= 3 m/s vi= 0 mv + mv = mv + mv
Vf= 0 vf= ?

Momentum before= momentum after so Vf= 3 m/s

5. A railroad car with a mass of 10,000 kg is at rest. A second rail car with a 17,000 kg mass moving at 12 m/s rolls into (and couples up with) the first car. At what velocity do the two railroad cars roll together after the collision?

M1= 10000 kg v1= 0
M2= 17000 kg v2= 12 m/s

m1v1 + m2v2 = (m1 +m2) Vf
(10000)(0) + (17000)(12)= (10000 + 17000) Vf
0 + 204000= 27000 (Vf)
Vf= 204000/ 27000
Vf= 7.56 m/s

6. Two basketballs, each with a mass of 0.8 kg, are rolled toward one another. The first has a velocity of 3 m/s and the second 2 m/s. After they collide the first ball moves in the opposite direction at 1.5 m/s. At what velocity and direction does the second ball go after the collision?

M1= .8 kg	m2= .8 kg	m1vi + m2vi = (m1vf +m2Vf
Vi= 3 m/s	vi= 2 m/s	(.8)(3) + (.8)(2)= (.8)(1.5) + (.8)(vf)
Vf= 1.5 m/s	vf= ?	2.4 + 1.6= 1.2 + (.8)(vf)
		4= 1.2 + (.8)(vf)
		2.8=.8 (vf)
		2.8/.8= vf
		Vf= 3.5 m/s

Electricity

1. What happens when you rub a rubber rod with a cloth?
The rod becomes negatively charged. It takes the electrons off of the cloth and transfers to the rod.

2. Negative charge can be transferred as static electricity from a plastic rod to the gold leaves of an electroscope by the process of
a. conduction b. induction c. both

3. Insulators and conductors can both be charged by____conduction_____ but only conductors can be charged by __induction____.
a. conduction, induction b. induction, conduction

4. What is a conducting material? ___ electrons move freely ____Example: metals

What is an insulating material? ____electrons don't move freely______Example: glass

5. Charging by induction is a process that can be done by bringing a negatively charged rubber rod close to the knob of an electroscope. Charges on the ball separate (positive ones closer to the negative rod, negative charges farthest away from the rod). The gold foil leaves will repel due to the like negative charge on both of them. "Grounding" by touching the knob to remove excess negative charge to Earth. Finally, removing the rod will permanently leave the electroscope with an overall
a. charge the same as the rod (-) b. no charge at all c. charge opposite from the rod (+)

6. A stream of water is attracted to a charged balloon because
a. they are the same charge
c. they are different charges
b. water is polar
d. water is neutral

7. Attractive, repulsive, or both
a. electric field
b. gravitational field

8. Which is stronger an electric force or gravitational force?

9. Current is
a. the rate electric charges move through a given area of a conductor
b. is inversely related to voltage
c. gives up energy in the circuit
d. depends on electrical potential energy

10. Resistors are electrical devices that control the amount of ____current____in a circuit.

11. Which of the following have the greatest resistance?

a. long wire b. short wire c. high temperature d. low temperature e. thin wire

f. thick wire g. insulator h. conductor

12. Two identical conducting spheres are placed with their centers 0.30 m apart. One is given a charge of + 12 x 10^{-19} **C** and the other is given a charge of -18 x 10^{-9} C. Find the electric force exerted on one sphere by the other.

$Fe= kq_1q_2 / r2$ $Fe= (9 \times 10^9) (12 \times 10^{-19}) (-18 \times 10^{-9}) / (.3)^2$

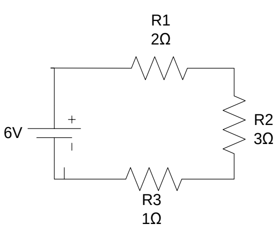
$Fe= (-1.94 \times 10^{-16}) / (.09)$

<u>Fe= 2.16 x 10^{-15} N (attracting because negative)</u>

Electric Circuits

1. For a series Circuit:
   a. What is the path?___one path____
   b. What happens when one light goes out?__________they all go out__________________
   c. Adding additional bulb results in _______dimmer lights. Increased resistance and decrease voltage__
   d. Current in each resistor is Constant______________________
   e. Total potential difference equals ________voltage____

2. For a parallel circuit.
   a. What is the path?__multiple branches___
   b. What happens when one light goes out?_____others stay on that can travel down another path. _____
   c. Adding additional bulb results in _____________less current ; lowers voltage resistance________
   d. Voltage in each resistor is _________same_______
   e. Total potential difference is also called___voltage



3. Find total voltage, total current, and total resistance of the above circuit. Solve for V_1, V_2, V_3, I_1, I_2, and I_3.

Vt= v1 + v2+ v3 Vt= 2 + 3 + 1= **<u>6v</u>**

Rt= r1 + r2 + r3 rt= 2 + 3 + 1= ***6 ohms***

V= I x r 6= I x 6= i= 6/6 **<u>i= 1 A</u>**

V1= 2*1=**<u>2v</u>**

V2= 3*1= **<u>3v</u>**

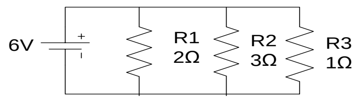
V3= 1*1=**<u>1v</u>**

4. Find total voltage, total current, and total resistance of the below circuit. Solve for V_1, V_2, V_3, I_1, I_2, and I_3.

Rt= 1/ r1 + 1/ r2+ 1/r3 1/rt= ½ +1/3 + 1/1= **.55 ohms total resistance**

V= i*r 6= I * 2 6/2= I **i= 3 A** **6= I * 3= 2** **6=I *6=1**

Vt= 6v



5. What is power? __p= voltage x current

6. An electric heater is operated by applying a potential difference of 50.0 V across a wire of total resistance 8.00 Ω.
   Find the current in the wire and the power rating of the heater.

Rt=8 v= i*r

V= 50 v 50= I * 8 p= v*I 50*6.25=312.5

I= 50/8

I= 6.25 A

7. How much current would a 10.2 Ω coffee pot draw when connected to a 120 V outlet?

V= I * r 120= I * 10.2

I= 120/10.2

I= 11.76 A

Magnetism

1. Earth's geographic North Pole is the same as the Earth's ___south___magnetic Pole.

2. Soft magnetic material (iron) is easily magnetized but __easily lose__their magnetism.

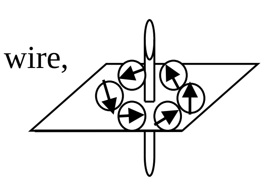
3. Hard magnetic materials (cobalt, nickel) are difficult to magnetize but tend to _retain___their magnetism.

4. The region or space around a particle or substance where a magnetic force can be detected is called a ___magnetic field__.

5. Where is the greatest magnetic field of a magnet? poles

6. What is the direction of the magnetic field of a magnet?
   Flow from north to south

7. If a compass was placed around a current carrying wire, what would it tell us about the shape of the magnetic field that exists around the wire?



Moves in a circular direction

8. If we make a stake of coils of current carrying wire, we call it a solenoid. The solenoid we made in class with a wire, nail and battery exhibited magnetism enough to pick up paper clips. is stacked coils of wire. Name three ways to increase its strength.
____more coils_____, ____thicker wire___, ___stronger battery_

9. Where is the magnitude of a solenoid's magnetic field the strongest?______at the poles___

10. A magnetic material is comprised of large groups called domains. The atoms in these domains have their electron spins a. aligned b. randomly oriented throughout the material

11. Two parallel wires carrying current exert magnetic force on each other. If the currents in the wires flow in opposite directions then the wires ________________each other a. attract b. repel
Likewise if the currents are in the same direction the wires will ___attract____each other.

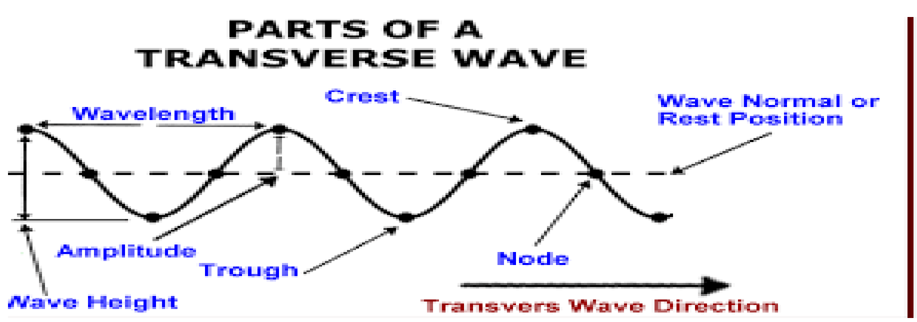
12. Can you induce current in a wire by moving the wire into a magnetic field?___yes____
What happens if you stop moving the wire? ___no current______
Can you induce current in the wire by holding the wire still and moving the field around it?_yes___

Waves

1. When there is a disturbance in a medium the medium's particles interact with each other and then return to their original position. This is known as the
a. particle principle b. superposition principle c. energy transport phenomenon d. harmonic motion

2 What does pitch refer to?
a. the number of cycles per second
b. the time to reach the maximum magnitude
c. the number of waves to pass a given point in a certain amount of time
d. how high we perceive a sound

3. Illustrate a transverse and longitudinal wave. Label the line of rest, crest, trough, compression, rarefaction, amplitude, wavelength.



4. A ___transverse____is a wave type that cannot travel through a vacuum.

5. A fixed-end wave reflects off the boundary on the same side or opposite side as the original wave pulse.

6. A free-end wave reflects off a boundary on the same side or the opposite side as the original wave pulse?

7. The phenomenon that occurs when an object has the same natural frequency as and vibrates in response to a nearby vibrating object is called
   a. rarefaction   b. reflection   c. resonance   d. sympathetic vibrations

8 What happens when a wave undergoes constructive interference?
   a. passing waves produce larger amplitudes
   b. passing waves always cancel out completely
   c. passing waves produce smaller waves or cancel
   d. approaching waves bounce back off each other

9. Compare the frequency, amplitude, and speed of standing waves.

   V= f * lamda

10. Volume doubles each time the decibel level increases by 10. Find how much louder traffic noise seems if the traffic in the street goes from 40 to 60dB.____20 dB= 10 * 10= 100 intensity____

11. What is meant by the natural frequency? ______frequency that an object vibrates_____

12. Define the following terms:

pitch	frequency
energy	amplitude

13. Define: reflection____bouncing back of an image_____ example: ____looking in a mirror__
Refraction____bending of a wave through a lens_____ example:_pencil in a cup of water looks bent___
Diffraction____spreading out of a wave through a passage way_____
example: __light waves around a door____

14. A woman stands on a street corner as an ambulance responding to an emergency goes by with its siren on. The woman hears the siren as it approaches as a
   a. high pitch   b. low pitch   c. no change in pitch

15. All waves travel at the same speed. Why? (consider the formula $v = f\lambda$ If frequency of a wave increases, what happens to its wavelength)
Increase frequency= decrease in wavelength
Decrease frequency= increase in wavelength

16. What is the Law of Reflection?

17. The angle of incidence θ_i and angle of refraction, θ_r are measured between the incident ray or refracted ray and the ___normal line_______.

18. Find the angle of refraction if the incident ray is going from air to glass. Index of refraction (n) for water is 1.33, index of refraction (n) for air is 1.00. $n_1 \sin \theta_i = n_2 \sin \theta_r$
1 sin angle of incident= 1.33 sin (angle of refraction)

1 sin 90= 1.33 sin (angle of refraction)

19. What is the speed of light when it passes through a diamond? n = 2.419

$N = c / v$ $2.419 = 3 \times 10^8 / v$

$V = 3 \times 10^8 / 2.419$

$V = 1.24 \times 10^8$ m/s

20. What has occurred when light reflects back into the medium from which it came?
Total internal relfection

21. Light Rays bend toward or away from the normal line when going from a less dense medium into a more dense medium?
From a more dense to a less dense medium?____away___

22. What is diffraction?
Spreading of waves around a barrier

23. Total internal reflection occurs when light goes from a more dense medium into a less dense medium ONLY.
True or False?