Name _____ Date _____ Period _____

Physics Spring Final Review

CONCEPTUAL PHYSICS: FIRST & SECOND SEMESTER

Directions: *Answer the following questions based on in-class notes, worksheets, and your Physics book. Remember to show all of your work (4 steps) when answering word problems.*

Equations:

Average Speed: $v = \frac{d}{t}$ $d = v \cdot t$ $t = \frac{d}{v}$ Acceleration: $\bar{a} = \frac{\Delta v}{t}$

Free Fall equations: $v = v_0 + gt$ $t = \sqrt{\frac{2d}{g}}$ $d = \frac{1}{2}gt^2$

Newton's second law: $F = m \cdot a$ $a = \frac{F}{m}$ $m = \frac{F}{a}$

Kinetic Energy: $KE = \frac{1}{2}mv^2$

Gravitational Potential Energy: $PE = m \cdot g \cdot h$

Work: $W = F \cdot d$ Power: $P = \frac{W}{t}$

Momentum: $p = m \cdot v$ $m = \frac{p}{v}$ $v = \frac{p}{m}$

Ohms Law: $I = \frac{V}{R}$ $R = \frac{V}{I}$ $V = IR$

Power $P = IV$

Wave speed: $v = \lambda f$ $f = \frac{v}{\lambda}$ $\lambda = \frac{v}{f}$

PART 1: PHYSICS CONCEPTS AND VOCABULARY

Important "Laws" to know:

- Conservation of Energy
- Conservation of Momentum
- Conservation of Charge
- Newton's Laws (1^{st}, 2^{nd}, 3^{rd})
- Coulomb's Law
- Ohm's Law

1. Define the following terms:
    a. Force-

    b. Net Force-

    c. Friction-

    d. Average speed-

    e. Instantaneous speed-

    f. Acceleration-

    g. Vector-

    h. Terminal velocity-

    i. Newton's First Law-

    j. Newton's Second Law-

k. Newton’s Third Law-

l. Electromagnetic spectrum-

m. Transverse wave-

n. Longitudinal wave-

o. Doppler Effect-

p. Mass-

q. Weight (force of gravity)-

r. Equilibrium-

PART 2: UNITS

1. What are the units for the following**?**

a. Force-

b. Speed and velocity-

c. Distance-

d. Time-

e. Acceleration-

f. Mass-

g. Weight (Force of gravity)-

h. Momentum-

i. Kinetic energy-

j. Potential energy-

k. Work-

l. Current-

m. Voltage-

n. Resistance-

o. Power-

p. Wavelength-

q. Frequency-

r. Wave speed-

PART 3: PHYSICS CONCEPTS

1. Identify two situations in which an object can have a **net force = 0 Newtons**. Draw the Free Body Diagrams that go with both scenarios.

2. What is meant by "**free fall**"?

3. Which of the following will remain **constant** when an object is falling and there is no air resistance? (circle all that apply)

- Velocity
- Speed
- Acceleration

4. Explain what happens to both the **kinetic** and **potential energies** of an object when it is falling.

5. Forces always occur in _____.

6. An object will accelerate when it is affected by _____, _____ _____.

7. In the absence of air resistance, the angle at which a thrown ball will go the farthest is _____°.

8. When an object reaches terminal velocity its acceleration equals _____.
9. All waves are created by _____.

10. In circuits of metal wires, _____ are the flowing charged particles.

11. Draw a typical transverse wave and identify the following parts of a wave: **crest**, **trough**, **wavelength**, **amplitude, node, anti-node.**

12. Any path along which electrons can flow is called a _____ _____.

13. In most waves, the speed of the wave only depends on the waves _____.

14. What is the "**Law of Conservation of Energy**"?

15. Friction is a force that always acts _____ to an object's motion.

16. A ball is thrown straight upward at 5 m/s. Ideally (no air resistance), the ball will return to the thrower's hand with a speed of _____m/s.

17. If a freely falling object were somehow equipped with a speedometer, its speed reading would increase each second by _____ m/s.

18. Touching a charged body to earth to eliminate excess charge is called _____.

19. According to Coulomb's law, as the distance between charged particles increases, the amount of force will _____.

20. According to Coulomb's law, as the magnitude of charge increases, the amount of force will _____.

21. Describe why a 0.001 kg feather falling at 1 m/s has more momentum than a 100,000,000 kg boat at rest at a dock.

22. How would doubling the voltage in a circuit affect the current? What about doubling the resistance?

23. Imagine there is a circuit that has 3 lightbulbs – would the brightness of the bulbs be greater if they are wired in parallel or series? Why?

24. Is it better to wire holiday lights in parallel or series? Why?

25. When talking about sound waves, what mean the same as **frequency** and **amplitude**?

26. Describe a scenario when an object has **constant speed** but not **constant velocity**.

PART 4: WORD PROBLEMS:

1. A 40 -N falling object encounters 5-N of air resistance. The magnitude of the **net force** on the object is? (*Draw a diagram and use vectors to answer*)

2. A bike travels at a constant speed of 20 m/s for 2 seconds. How **far** did it travel?

3. A bike travels at a constant speed of 100 meters in 10 seconds. What was the **average speed**?

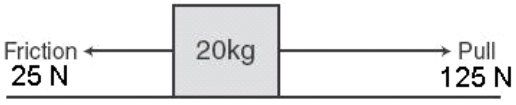
4. How much **time** will it take for a person to walk 400 meters at a constant speed of 5 m/s?

5. You drop a rock off of a tall building. It hits the ground in 3.0 seconds. What is the **final velocity**?

6. A ball is dropped from rest from a height 25.0 meters above the ground. The ball falls freely and reaches the ground 4.0 seconds later. What is the **average speed** of the ball?

7. You drop a rock off of the top of a 50 m tall building. How **long** does it take before it hits the ground?

8. The figure shows a block that is being pulled along the floor. According to the figure, what is the **acceleration** of the block?



9. Suppose a small plane can fly at 200km/h relative to the surrounding air. Suppose also that there is a 50km/h tailwind. How **fast** does the plane's shadow move across the ground? (draw vectors to solve)

10. A car travels 5 meters in the first second of travel, 5 meters again during the second second of travel, and 5 meters again during the third second. Its **acceleration** is?

11. You drop a rock off of a tall building. It takes 10 seconds to hit the ground. How **tall** is the building?

12. A truck has a mass of 1000 kg and accelerates at 2 meters per second squared. What is the magnitude of the **force** acting on the truck?

13. A tow truck exerts a force of 2000 N on a car, accelerating it a 1 m/s2. What is the **mass** of the car?

14. A hydraulic lift used at an automotive repair shop raises a 500-kilogram car 3 meters off of the ground. What is the **potential energy** given to the car?

15. A 3-kg brick falls to the ground from a 10-m-high roof. What is the approximate **kinetic energy** of the brick just before it touches the ground?

16. What is the **kinetic energy** of a wagon with a mass of 2.5 kilograms traveling at a speed of 4 meters per second? Assume no other forces act upon the object.

17. A sound wave traveling through a solid material has a frequency of 450 hertz. The wavelength of the sound wave is 1 meters. What is the **speed** of sound in the material?

18. If 15 N of force are applies to a cart to move it a distance of 5 m, how much **work** is done on the cart?

19. A sound wave has a frequency of 250 Hz and a wavelength measured at 2.00 m. What is the **speed** of the wave?

20. An object has an initial Gravitational Potential Energy of 5000 J and its initial Kinetic Energy is 0 J. If it's Gravitational Potential Energy after is 1000 J, what is its **Kinetic Energy** after?

21. A child is on a sled moving down a hill at 15.0 m/s. The combined mass of the sled and child is 50.0 kilograms. The **momentum** of the child and sled is?

22. A 100-watt light bulb is connected to a 120-V outlet. How much **current** is in the light bulb?

23. How much **power** is used by a 12 Volt battery that draws 2 A of current?

24. When a 12-V battery is connected to a resistor, 0.5 A of current flows in the resistor. What is the **resistor's** value?

25. A 20-ohm resistor has a 5-A current in it. What is the **voltage** across the resistor?