

Name: \_\_\_\_\_

Hour: \_\_\_\_\_

## Semester 2 Physics Final

### Unit 6 – Work & Energy

Define the following terms and identify their units (when appropriate):

Work

Power

Energy

Potential Energy

Kinetic Energy

Conservation of Energy

Heat

Specific Heat

- 1) Why isn't someone carrying a book horizontally doing any work on the book?
- 2) What are two ways that you could increase the power generated by lifting a book?
- 3) List and define 3 kinds of potential energy. Give an example of each.
- 4) Describe the relationship between work and energy. Be specific!
- 5) What is the relationship between heat and temperature?
- 6) What is an example of an object with a high specific heat? Low specific heat?
- 7) Draw a picture of a pendulum and identify the positions for the maximum GPE, KE, and speed.
- 8) On a roller coaster ride, where would you have the greatest GPE, KE, and speed?
- 9) If energy is never lost, then why do objects traveling in a straight line lose speed (and hence, KE)?
- 10) For each of the following examples, determine which kind of energy is being discussed.
  - a. Coal can burn to create heat because it has \_\_\_\_\_.
  - b. When there is friction between two surfaces, \_\_\_\_\_ energy is transferred. This is called \_\_\_\_\_ and causes a change in temperature.
  - c. The greater an object's height, the greater its \_\_\_\_\_.
  - d. Thermal energy is a form of \_\_\_\_\_, caused by the vibration of atoms/molecules.
- 11) If you tripled the height of an object, its GPE would...
- 12) If you tripled the velocity of an object, its KE would...
- 13) If you quadrupled the heat gain of an object, its temperature change would...
- 14) A system with low efficiency loses a lot of \_\_\_\_\_.

### Unit 7 – Electrostatics & Magnetism

Define the following terms and identify their units:

- Electrostatic Force
- Electric Field
- Charge
- Potential Difference
- Current
- Resistance

- 15) Which elementary particles can transfer between objects during electrostatic interactions?
- 16) What makes an object negatively charged, positively charged, or neutral?
- 17) What is the difference between charging by friction, charging by conduction, and charging by grounding?
- 18) Define electron affinity and use it to explain why a plastic rod becomes negatively charged if you rub it with rabbit fur. How does this relate to the conservation of charge?
- 19) What is electrostatic polarization? When do objects become polarized? Are polarized objects positive, negative, or neutral?
- 20) What is the difference between a conductor and an insulator? When would you want to use an insulator? When would you want to use a conductor?
- 21) Write the equation for Coulomb's Law and use it to explain the laws of electrostatic attraction and repulsion.
- 22) What is an electric field? How is it related to electrostatic force? What are the rules for drawing electric field lines?
- 23) What is a circuit?
- 24) What is Ohm's Law and how does it relate to circuits?
- 25) How do you find the total resistance of resistors in series? Is the total resistance greater or lesser than any one individual resistor in the circuit?
- 26) How do you find the total resistance of resistors in parallel? Is the total resistance greater or lesser than any one individual resistor in the circuit?
- 27) How do magnetic poles interact with each other? (North with north, north with south, etc...)
- 28) Draw the magnetic field lines of a bar magnet and a horseshoe magnet.
- 29) Use the domain theory to explain ferromagnetic material, and how to turn a ferromagnetic material into a permanent magnet.
- 30) If the Earth were a bar magnet, where would the north and south poles be? Why does a compass point north?
- 31) What is Faraday's law, and how does it demonstrate the relationship between electricity and magnetism?

## Unit 8 – Waves & Sound

- 32) Define Simple Harmonic Motion and list two examples of it.
- 33) What is Hooke's Law (spring force)?
- 34) What is the equilibrium position of a spring and how does it relate to Hooke's Law?
- 35) What is the spring constant? What does it mean for a spring to have a high spring constant?
- 36) What does the period of an oscillating mass on a spring depend on? What does the period of a pendulum depend on?
- 37) Draw a transverse wave and label and define the following wave parts: amplitude, crest, trough, wavelength.
- 38) What is the difference between frequency and period? How are they related?
- 39) What is the difference between a transverse and a longitudinal wave?
- 40) What two things do all mechanical waves have in common?
- 41) What is a standing wave and how can you create one on a string?
- 42) Describe a sound wave in terms of pressure. What are the high and low pressure regions called?
- 43) How can you create a sound wave?
- 44) What is the relationship between wavelength and frequency for a wave on a spring? What is the relationship between tension and wave speed?
- 45) What is the rule regarding placement of nodes and antinodes for standing waves in closed/open tubes?
- 46) Draw the fundamental standing wave and the 1<sup>st</sup> and 2<sup>nd</sup> overtone for a string, an open tube, and a closed tube. What is the wavelength (related to the length) for each?
- 47) Define resonance and explain how it can be used to break a wine glass.
- 48) Explain how resonance and standing waves relate to musical instruments.
- 49) What two ways can you change frequency/pitch for a clarinet (or other woodwind instrument)? How does this relate to standing waves and the constant speed of sound in air?
- 50) Define the Doppler Effect and explain how it relates to sound waves.
- 51) What is a shock wave and how is it created? What is a sonic boom and how is it created?

## Unit 9 – Light & Color

- 52) Explain how light behaves as both a wave and a particle.
- 53) What is an electromagnetic wave? How is it different than a mechanical wave?
- 54) What is the electromagnetic spectrum?
- 55) What are the three different ways that light can interact with matter?
- 56) Why would an opaque object appear white? Why would a translucent object appear black?
- 57) What are the three primary colors of light addition and what colors are created when you add them?
- 58) What is the difference between luminous flux and illuminance? What are their units?
- 59) What is the difference between polarized and unpolarized light? What happens when light hits a polaroid (polarization filter)?
- 60) What is the speed of light in a vacuum? How does it relate to the wavelength, frequency, and energy of light?
- 61) Why is the sky blue? Why does the sun appear to be yellow? Why are sunsets red?

## Unit 10 – Reflection & Refraction

- 62) What is the difference between specular and diffuse reflection? What kind of materials make good specular reflectors?
- 63) What is the law of reflection and when does it apply?
- 64) What is a ray diagram? Sketch an example ray diagram for a plane mirror.
- 65) What are five characteristics that are always true for plane mirror images?
- 66) What is the difference between a real and a virtual image?
- 67) What is the difference between a concave and a convex mirror? Where is the focal point for each?
- 68) What is the difference between an upright and an inverted image?
- 69) What are the two rules of reflection for curved mirrors? How are they related to ray diagrams?
- 70) Define refraction. When does refraction occur?
- 71) What is the equation for the index of refraction? What is the index of refraction of a vacuum? Of air?
- 72) Which way does light bend when it enters a slower medium? A faster medium?
- 73) Define "critical angle". What happens to light incident upon a faster medium when it hits the boundary at an angle lesser than the critical angle? Equal to the critical angle? Greater than the critical angle?
- 74) What is total internal reflection?
- 75) What is dispersion? How/when does it happen?
- 76) Because the index of refraction varies for different colors/frequencies of light, red light and violet light are different speeds in glass. Which color travels faster? Bends more? Has the higher index of refraction? How do you know?
- 77) What three conditions are necessary in order for a rainbow to be visible?