**Final Exam Review Distributed December 20th/21st. Due January 17th, 2019**

**Instructions**: Using a *separate sheet of paper* and all your resources, complete the following exercises. Turn this document in the day you take your final exam (no later than Jan. 17th). NOTE: you will have 4.5 hours of in-class time and 3+ weeks of out-of-class time to complete this. Show all work, calculations, and units.

**Resources**: NOTE: our class website will have everything you need to complete this review. You are also encouraged to use the online book, PDF book (download the PDF book at school if you don’t have internet access), and any other legitimate resource you find helpful.

* Class Website: [**www.nsdscience.weebly.com**](http://www.nsdscience.weebly.com) (PowerPoints & video tutorials found here will be helpful)
  + Download the PowerPoints at school if you don’t have internet access)
* Online Book: [**https://www.ck12.org/c/physical-science/**](https://www.ck12.org/c/physical-science/)
* PDF Book: [**https://tinyurl.com/y6vmws5v**](https://tinyurl.com/y6vmws5v) (download this version at school if you don’t have internet access)
* [**www.thephysicsclassroom.com**](http://www.thephysicsclassroom.com)

**Vocabulary**: speed, velocity, acceleration, independent variable, dependent variable, control group, experimental group, hypothesis, scientific theory, scientific law, vector, scalar, force, friction, gravity, weight, inertia, net force, balanced force, unbalanced force, energy, work, power, law of conservation of energy, thermal energy, kinetic energy, potential energy, convection, conduction, radiation, insulation, frequency, amplitude, wavelength, period, constructive interference, destructive interference, reflection, refraction, diffraction, absorption, longitudinal (compression) wave, transverse wave, magnitude, mechanical energy.

* **Quizlet Vocabulary Review**: **https://quizlet.com/\_5tsfja**

**Learning Target 1.1** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. List and describe the steps of the scientific method.
2. How is a scientific law different from a scientific theory?
3. How is a “controlled experiment” conducted? (what does it mean for an experiment to be controlled?)

**Learning Target 1.2** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. Convert the following metric conversions using any method.
   1. 4.364 L = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mL
   2. 49,352.4 g = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_kg
2. Convert the following scientific numbers to standard notation and the standard notation to scientific numbers.
   1. 4.38 × 103 =
   2. 314.159 =
   3. 9.34 × 10-2 =
   4. 0.000278 =

**Learning Target 1.3** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. What is the difference between speed and velocity? (use the terms scalar and vector in your answer)

**Learning Target 1.4** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. What are the three versions of the velocity (speed) equation? (include units)
   1. Use the velocity equation to solve the following problems.
      1. A person runs 100 meters in 10.37 seconds. What is this person’s velocity (speed)?
      2. How much time would it take you to drive 528.2 miles with a speed limit of 45 m/hr?
      3. What distance can you travel if you can move at 34.6 m/hr and you have 2 hours of time?
2. What is the equation for acceleration?
   1. Use the acceleration equation to solve the following problems.
      1. A cyclist accelerates from 12.1 m/sec to 17.2 m/sec in 4.8 seconds. What is the acceleration?
      2. A runner accelerates from 31.6 m/sec to 16.2 m/sec in 18.9 seconds. What is the acceleration?
   2. Is it possible to accelerate without changing speed?
      1. If so describe how and why.

**Learning Target 1.5** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. Create a distance (position) vs. time graph using the following data. Be sure to include a title and labels for each axis. Label the four data points on your graph (A, B, C, & D). Then answer the questions using your graph. (place Distance on the Y-axis and Time on the X-axis)
   1. Which graph section (AB, BC, CD) shows the object moving the fastest? How do you know?
   2. What does section (BC) on your graph say about the motion of the object?
   3. What is the average velocity of the object between points A & D?

|  |  |  |
| --- | --- | --- |
|  | Time (seconds) | Distance (meters) |
| Point A | 0 | 0 |
| Point B | 10 | 200 |
| Point C | 30 | 200 |
| Point D | 60 | 500 |

1. Create a speed (velocity) vs. time graph using the following data. Be sure to include a title and labels for each axis. Label the four data points on your graph (A, B, C, D, E, F, G). Then answer the questions using your graph. (place Speed on the Y-axis and Time on the X-axis)
   1. Which section(s) (AB, BC, CD, DE, EF, FG) on the graph show the object is accelerating?
   2. Which section(s) (AB, BC, CD, DE, EF, FG) on the graph show the object at a constant speed?
   3. Which section(s) (AB, BC, CD, DE, EF, FG) on the graph show the object not moving at all?
   4. What is the acceleration of the object for section (AB)?

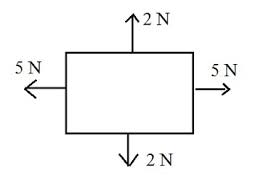
|  |  |  |
| --- | --- | --- |
|  | Time (seconds) | Speed (m/sec) |
| Point A | 0 | 0 |
| Point B | 5 | 10 |
| Point C | 10 | 10 |
| Point D | 13 | 0 |
| Point E | 16 | 0 |
| Point F | 21 | 5 |
| Point G | 25 | 5 |

**Learning Target 2.1** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

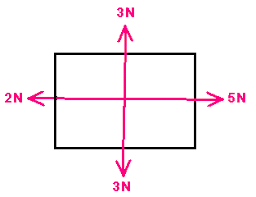
1. What does the First Law of Motion (Inertia) describe about the motion of objects?
   1. How are mass and inertia related?

**Learning Target 2.2** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. What is the definition of Net Force? How is it calculated?
2. Use the following images to complete the prompts.



* 1. Calculate the Net force acting on the rectangle above. Net Force =
  2. Are these forces Balanced or Unbalanced?
  3. Will these forces result in a change in motion? If so, describe where the object will move.



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**Learning Target 2.3** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. What two factors determine the acceleration of an object?
   1. How does force affect an object’s motion?
   2. How does mass affect an object’s motion?

**Learning Target 2.4** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. What is the difference between mass and weight?

**Learning Target 2.5** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. What is the equation for Newton’s Law of Gravitation? (include units)
2. What two factors determine the magnitude of gravity?
3. How could one increase the strength of gravity?
4. How could one decrease the strength of gravity?

**Learning Target 3.1** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. What is the definition of Energy?
   1. What is the difference between Potential Energy and Kinetic Energy

**Learning Target 3.2** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. What is the equation for Gravitational Potential Energy? (include units)
   1. Calculate the gravitational potential energy held by a 35.4 kg object resting at a height of 842.4 meters.
2. What is the equation for Kinetic Energy? (include units)
   1. Calculate the Kinetic Energy of a 59.3 kg bike rider who is moving at a velocity of 29 m/sec.

**Learning Target 3.3** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. State the Law of Conservation of Energy

**Learning Target 3.4** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. What is the definition of Thermal Energy?
   1. Describe how thermal energy moves through a solid (conduction).
   2. Describe how thermal energy moves through a fluid (convection).
   3. Describe how thermal energy is transferred in a vacuum (radiation).

**Learning Target 3.5** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. How is “work” defined in science? Include an equation, with units, in your answer.
   1. If a 498 N force moves an object a total of 392 meters how much work was done?
   2. If a 34 N force is applied to an object that does not move how much work was done?
2. What is the scientific definition of “power”? Include an equation in your answer.
   1. What is the power output for #25a if the work done was accomplished in 34 seconds?
   2. What is the difference between a machine capable of 20 watts of power vs. a machine capable of 40 watts of power?

**Learning Target 4.1** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

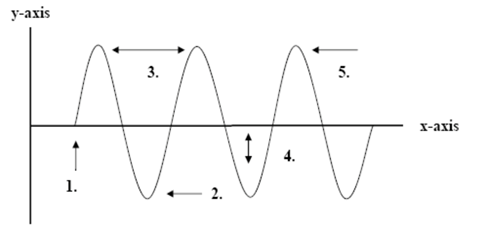
1. What is the definition of a wave in science?
   1. What do waves carry?
   2. What do waves NOT carry?
   3. What is meant by the term “medium” as it applies to waves?

**Learning Target 4.2** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. Define a “Transverse Wave”.
   1. Draw and Label a diagram of a Transverse Wave
2. Define a “Longitudinal Wave”
   1. Draw and Label a diagram of a Longitudinal Wave. What is a synonym for a longitudinal wave?

**Learning Target 4.3** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. Label the Parts of a Wave below (#1 should be labeled as “equilibrium”).



1. Define the terms “Frequency” & “Period” as they relate to waves.
   1. Consider the wave from #30. This wave completed the cycles depicted in exactly 2.0 seconds.
      1. Calculate the Frequency of this wave.
      2. Calculate the Period of this wave.
2. What is the formula to calculate the speed (velocity) of a wave? Include the units in your equation.
   1. How fast is a wave moving if it has a frequency of 87.3 hertz and a wavelength of 1.3 meters?

**Learning Target 4.4** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. Define the following wave interactions: Reflection, Refraction, Diffraction, Absorption.
   1. Draw & label a diagram depicting each interaction (reflection, refraction, diffraction, absorption)

**Learning Target 4.5** (see [www.nsdscience.weebly.com](http://www.nsdscience.weebly.com) for a full description of this learning target)

1. Define the following wave interference patterns: constructive interference & destructive interference
   1. Draw and label a diagram depicting each type of wave interference (constructive & destructive).