8th Grade Physics BASIS Peoria Pre-Comprehensive Exam Prep

The Long List of Things to Memorize

How to use this guide

- This is a list of items that must be memorized in order to have success on the pre-comprehensive exam in 8th grade physics.
- You must be able to recite any of these definitions or equations instantaneously.
- For any item which you are not 100% confident that you have memorized, you should make a flashcard where the left hand column is the front side of the flashcard and the right hand column is the back of the flashcard.
- To effectively use flashcards, you must go over them every single day. This means 7 days a week from now until the pre-comprehensive examination, or until you are 100% confident that you have memorized the concept and will have it memorized forever.
    - 10 minutes a day or less, EVERY DAY
- To use flashcards: start with a single pile of cards. Go through them one at a time. Any that you do not get correct goes into a "review" pile, any that you do get correct goes into a "completed" pile. Once you have gone through the initial pile, pick up the review pile only try it again. Continue to sort those into "complete" and "review" piles. Any word you get correct the second time goes into the "complete" pile, any you are still uncertain of goes into the "review" pile again. Go through the review pile 4 times.
- Any card which ends up in the "review" pile after 4 times is something you need to study. Read the front of the flashcard out loud, turn it over and read the back of it out loud. Repeat this process for a total of 5 times.
- Repeat the entire process tomorrow.
- Any card which goes into the "complete" pile on the first time through the pile every day for a week should be removed from your pile of flashcards and you should consider it memorized.
- We will not have class time to review vocabulary terms in class; you must spend time studying your vocabulary terms on your own.

Scientific Measurement and graphing

Qualitative measurement	o Answers questions other than "how many" o Describes an object
Quantitative measurement	o Answers the question "how many" or "how much" o Includes a number
Metric units of length	o meters (m)
Metric units of mass	o kilogram (kg)
Metric units of weight	o Newton (N)
Metric units of time	o second (s)
Metric units of volume	o meters cubed (m^3) or liters (L)
Metric units of temperature	o Kelvin (K)
Metric prefix for 10^9	o Giga (G-)
Metric prefix for 10^6	o Mega (M-)
Metric prefix for 10^3	o kilo (k-)
Metric prefix for 10^2	o hecto (h-)
Metric prefix for 10^1	o deka (da-)
Metric prefix for 10^{-1}	o deci (d-)
Metric prefix for 10^{-2}	o centi (c-)
Metric prefix for 10^{-3}	o milli (m-)
Metric prefix for 10^{-6}	o micro (μ-)
Metric prefix for 10^{-9}	o nano (n-)
Equation for slope of a graph	o $m = \frac{rise}{run} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$
Units for slope	o Units on the y axis divided by units on the x axis
How to make a graph	o Vertical axis is dependent variable o Horizontal axis is independent variable o Both axes need even scales
Equation for the Area of a rectangle	o $A = bh$
Equation for the area of a triangle	o $A = \frac{1}{2}bh$

Position, Velocity, and Acceleration

definition of reference point	o a stationary point from which another object's position is measured o typically used to determine if the second object is in motion
definition of position	o the vector quantity describing the location, both distance and direction, from a reference point to an object

definition of motion	o when the position of one object is changing when measured from a reference point
definition of speed	o how fast an object is moving
units for speed	o m/s
Instantaneous speed	o Speed at any one instant in time o Found using speedometer o Time interval is shorter than anything "interesting"
Average speed	o Total distance travelled divided by total time that passed while travelling
Equation for average speed	o $s = d/\Delta t$ o May only be used when $a = 0m/s^2$
Definition of velocity	o Change in displacement in a time interval o Speed in a specific direction
Constant velocity	o Acceleration is 0 m/s^2 o Object has constant speed o Object does not change direction
Definition of acceleration	o Change in velocity
Positive Acceleration	o Acceleration in the positive direction
Negative Acceleration	o Acceleration in the negative direction
units for acceleration	o m/s^2
Equation with acceleration, initial velocity, final velocity, and time interval	o $a = (v_f - v_i)/\Delta t$ o $v_f = v_i + a\Delta t$
Equation with acceleration, displacement, initial velocity, and time interval	o $\Delta x = \ v_i\Delta t + \frac{1}{2}a(\Delta t)^2$
Definition of resultant velocity	o The net total of velocities
velocity from a position time graph	o Velocity is the slope of a position time graph
Acceleration from a velocity time graph	o Acceleration is the slope of a velocity time graph
Position from a velocity time graph	o Position is the area under the curve of a velocity time graph
Velocity from an acceleration time graph	o Velocity is the area under the curve of an acceleration time graph

Forces and Newton's 1st and 2nd Laws of Motion

Statement of Newton's 1st law of motion	o An object in motion will remain in motion and an object at rest will remain at rest unless acted upon by an unbalanced force.
Definition of inertia	o A measurement of the mass of an object

Inertia determined by mass	o Only the amount of mass changes the amount of inertia
Equation for weight	o $F_{grav} = mg$
Definition of weight	o The force of gravity on an object
Mass vs. weight	o mass does not change with gravity changes, but weight depends on the force of gravity
Free Body Diagram	o Drawing depicting all of the forces which act on an object
Newton's 2nd law in equation form	o $\overrightarrow{F_{net}} = m\vec{a}$
Direct proportionality	o One value increases as another increases
inverse proportionality	o one value increases when another decreases
Definition of force	o a push or a pull on an object
Unit of force	o Newton (N)
mathematical derivation of Newton	o 1N = 1kg*(1m/s^2)=1kgm/s^2
Definition of net force	o The result with all the (vector) forces that act on an object are added together
Vector quantities	o quantities with a magnitude and a direction
scalar quantities	o quantities with only a magnitude
Definition of equilibrium	o When the net force on an object is 0N whether it is moving or stationary
Balanced forces	o when the forces add up to 0N
unbalanced forces	o When the forces do not add up to 0N
Definition of normal force	o force caused by a surface which is perpendicular to the surface
Definition of tension force	o force caused by a rope
Definition of friction force	o force cause by surface which is parallel to the surface
Coefficient of friction	o μ, the measure of how rough a surface is o It has no units
Cause of friction	o friction occurs because surfaces are not perfectly smooth
Equation for Hooke's law	o $F_{spring} = -kx$
Spring constant	o k (in hooke's law) o a measure of how easily stretched the spring is o units are N/m

Newton's 3rd Law of Motion

Statement of Newton's 3rd law of motion	o every action (force) has a reaction (corresponding force) that is equal in magnitude and opposite in direction
properties of action and reaction forces	o they occur at exactly the same time o they are always the same size o they act between the same two objects o they each act on separate objects

Energy

Statement of the conservation of energy law	o Energy cannot be created nor destroyed, it can only be transformed from one type to another
Equation for Pegrav	o $PE_{grav}=mgh$
Equation for KE	o $KE = ½ mv^2$
Equation for PEspring	o $PE_{spring} = ½ kx^2$
Equation for Conservation of Energy	o $TE_i = TE_f$
Calculating total mechanical energy of a system	o $TME = KE + PE_{grav} + PE_{spring}$
Definition of Energy	o The ability to do work
Units for Energy	o Joules (J)
Definition of Kinetic Energy	o The energy of motion
Definition of Potential Energy	o Energy that is stored to be turned into motion later
Definition of gravitational potential energy	o Energy an object possesses because of its position in a gravitational field
Definition of spring (elastic) potential energy	o Energy which is stored in a stretched or compressed spring
Definition of Work	o When a force causes a displacement
Equation for Work (universal)	o $W = Fcos(\theta)\Delta x$
Units for work	o Joules (J) o Nm
Work Energy Theorem	o $\Delta KE = W$