Physics 2204

Course Overview

Unit 1 – Kinematics
- the study of "how" objects move

Unit 2 – Dynamics
- The why of motion, a study of forces

Unit 3 – Work, Power and Energy

Unit 4 – Wave Energy
- including Mechanical Waves, Sound and Light

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You are expected to know the following:

- rules for significant digits or figures
- rules for adding/subtracting and multiplying/dividing measurements
- Conversions within the metric system specifically
  km to m and vice versa
  m to cm and vice versa
  m to mm and vice versa

  you will be responsible for others as the year goes on.
- the difference between base units and derived units
- uniform vs non-uniform motion
- the difference between scalars and vector
- calculate speed given distance and time, calculate distance given speed and time, and calculate time given distance and speed.
- calculate velocity given displacement and time, calculate displacement given velocity and time, and calculate time given displacement and velocity.

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Section 1.1: Review

Definitions

Mechanics: A branch of physics that deals with the study of motion of objects and the forces that act on them.

Kinematics: A branch of Mechanics that deals with the description and analysis of motion.

Dynamics: A branch of Mechanics that studies why objects move as they do. It deals with the forces that act on moving objects.

Scalars: They are quantities that have magnitude (size) and units.
Distance, time, speed, temperature, energy and power.

Vectors: They are quantities that have magnitude (size), units and direction..
Displacement, velocity, acceleration, and force.

Distance: is the measure of the total travel of the object, regardless of direction.
The odometer of a car clicks off the distance travelled.
Symbol: d

Displacement: is defined as the net travel of an object as measured from its starting point to its end point in a straight line. Displacement requires direction.
Symbol: $\vec{d}$

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Position: is the displacement from a given point.

Speed: the rate of change of distance (scalar)

Formula: $v = \frac{d}{t}$

where 'd' is the distance in **m** or **km**
't' is the time in **s** or **h**
'v' is the speed in **m/s** or **km/h**

Velocity: is the rate of change of displacement.

Formula: $\vec{v} = \frac{\vec{d}}{t}$

where

$\vec{d}$ is the displacement in **m** or **km**

t is the time in **s** or **h**

$\vec{v}$ is the velocity in **m/s** or **km/h**

This formula is only used when the motion is uniform.

Uniform Motion: occurs when both the speed and the direction of an object remains the same. In other words, it is motion in a straight line at a constant speed.

Example: A car travels down a straight line at 50 km/h.

Non-Uniform Motion: It is movement that involves a change in speed **and/or** direction.

Example: A satellite orbits the earth. (Acceleration: change in direction.)

A pencil falls to the floor.
(Acceleration: change in speed.)

Review of Unit Analysis for Conversions

Video on Unit Analysis

http://www.youtube.com/watch?v=XKCZn5MLKvk

1. Convert the following.

a) 2.5 hours into seconds

$2.5\,h \times \frac{60\,min}{1\,h} \times \frac{60\,s}{1\,min} = 9000\,s$ or $9.0 \times 10^3 s$

b) 128 km into meters

$128\,km \times \frac{1000\,m}{1\,km} = 128\,000\,m$

c) 55 km/hr into m/s

$\frac{55\,km}{h} \times \frac{1000\,m}{1\,km} \times \frac{1\,h}{3600\,s} = 15\,m/s$

d) 12 m/s into km/hr

$\frac{12\,m}{s} \times \frac{1\,km}{1000\,m} \times \frac{3600\,s}{1\,h} = 43\,km/h$

e) 1.3 hours into seconds

$1.3\,h \times \frac{3600\,s}{1\,h} = 4680\,s = 4700\,s$

f) 1 256 m into kilometers

$1256\,m \times \frac{1\,km}{1000\,m} = 1.256\,km$

g) 120 km/hr into m/s

$\frac{120\,km}{h} \times \frac{1000\,m}{1\,km} \times \frac{1\,h}{3600\,s} = 33\,m/s$

h) 150 m/s into km/hr

$540\,km/h$