

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

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.

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}

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

$$2.5 \text{ h} \times \frac{60 \text{ min}}{1 \text{ h}} \times \frac{60 \text{ s}}{1 \text{ min}} = 9000 \text{ s}_3 \text{ or } 9.0 \times 10^3$$

b) 128 km into meters

$$128 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}} = 128000 \text{ m}$$

c) 55 km/hr into m/s

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

d) 12 m/s into km/hr

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

e) 1.3 hours into seconds

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

f) 1256 m into kilometers

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

g) 120 km/hr into m/s

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

h) 150 m/s into km/hr

$$540 \text{ km/h}$$