What is Physics?

Unit 1

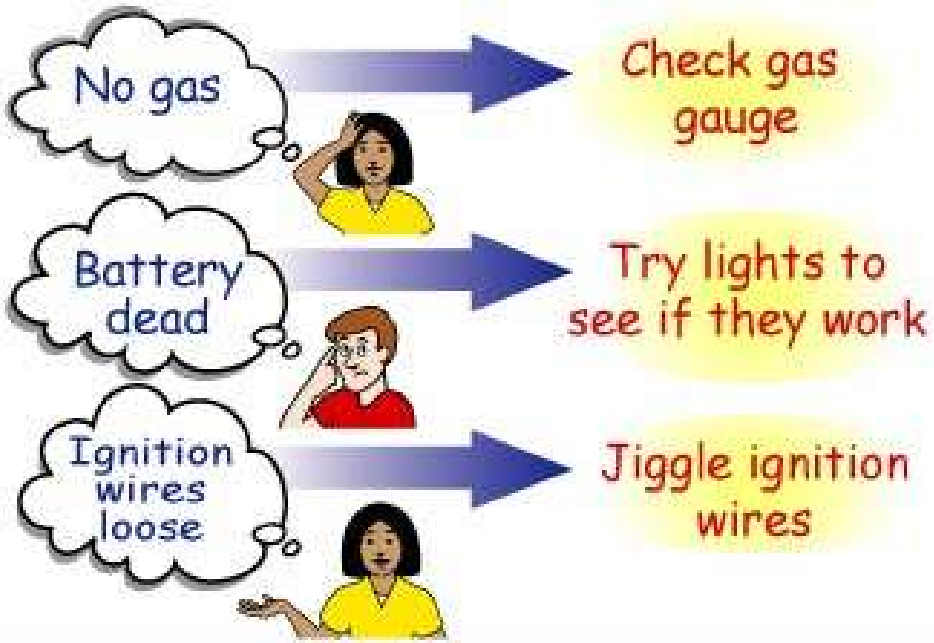
- Physics is the study of the physical world.
- Any problem that deals with temperature, size, motion, position, shape or color involves Physics.

- 7 Areas of physics include: **Mechanics, Thermodynamics, Waves, Optics, Electromagnetism, Relativity, and Quantum Mechanics**

Scientific Method

- Observe
- Create and Test Hypothesis
- Interpret Results of Test
- State Conclusions

Scientific Method



Steps in the scientific method

STEP	EXAMPLE
1. Ask a question.	1. Why doesn't the car start?
2. Formulate a hypothesis.	2. Maybe the battery is dead.
3. Design and conduct an experiment.	3. Turn the lights on to test the battery.
4. Collect and analyze data.	4. The lights go on.
5. Make a tentative conclusion.	5. Battery is OK.
6. Test conclusion, or if necessary, refine the question, and go through each step again.	6. Are the ignition wires loose or wet?

- **Model** – a replica or description designed to show the workings of an object or system.
- **Controlled Experiment** – an experiment used to test a hypothesis and that uses variables.

- **System** – a set of items considered separately
- **Scientific Hypothesis** – an explanation for observations

Measurements of Physics

- The description of what kind of physical quantity is represented by certain measurement is called **dimension or units**.

SI Base Units include

Length **Meters**m

Volume**Liters**L

Mass**Kilogram**kg

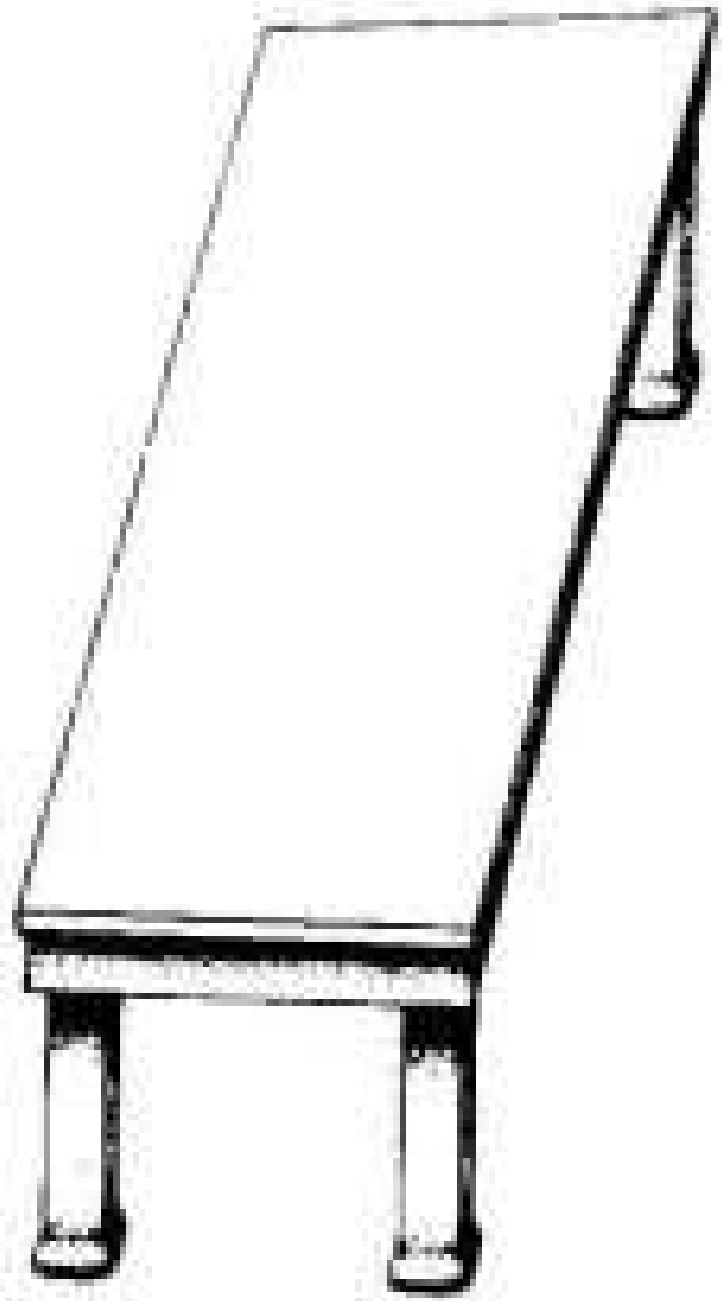
Time**Seconds**s

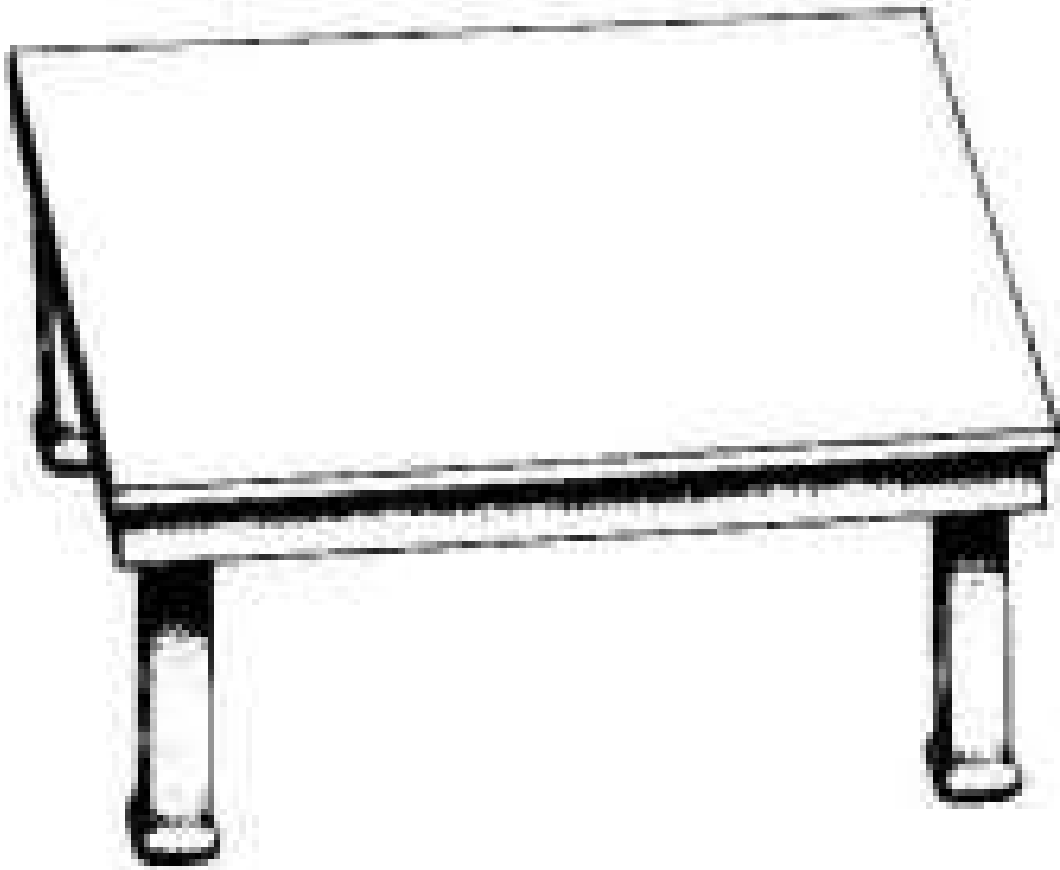
Temperature**Kelvin**K

Derived units are units that are formed by combining base units.

4 Types of Error

- Human Error – You screwed up!
- Method Error – Use a different method to measure each time so you get different results.
- Parallax Error – Line of Sight error
- Instrument Error – Your instrument is wrong.





Parallax Error

- Hold a pencil at arms length and look at it with one eye closed. Now close the open eye and open the other. Notice how the pencil appears to shift.
- This is an example of Parallax Error and can cause mistakes in measurements when reading meter sticks and other equipment.

- **Precision** refers to the degree of exactness with which a measurement is made – measured with same result 3 times.
- **Accuracy** describes how close a measured value is to the true value.

- **SI** is the standard measurement system used for science.

Derived Units

- All other units are **derived** from the base units.
- Speed is length / time = **meters/seconds**

SI prefixes

Factor	Name	Symbol
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10^{1}	deka	da

Factor	Name	Symbol
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n

Converting Metrics

- 1000 meters = 1 kilometer
- Kilo = 1000
- 100 centimeters = 1 meter
- Centi = .01

5 meters = ? kilometers

Converting English to Metrics

1. What do you know? –

List **knowns.**

50 miles

hour

2. What do I want? –

List **unknowns.**

*Want feet

seconds

3. Look at list of common **conversions**.

4. Start with the **easier** one (hours to seconds)

$$50\ \frac{\text{miles}}{\text{hour}}$$

5. Since hours is on bottom, write 1 hour on top and the conversion for one hour on bottom.

$$\frac{50 \text{ miles}}{\text{hour}} \times$$

6. The hour **cancels** out and you are left with minutes.

7. Change minutes by putting 1 minute on top and the conversion for one minute on bottom.

50 miles x

hour

8. The minutes **cancel** and you are left with seconds, which is want we wanted.

9. Now start over with the miles conversion. Since miles is on top, to convert we put 1 mile on bottom.

$$\frac{50\ \text{miles}\ x}{\text{hr}}$$

10. This causes the miles to **cancel** out and you are left with feet, which is what we wanted.

11.Finally, do the **math**.

73.3 ft/sec =

50 miles/hr

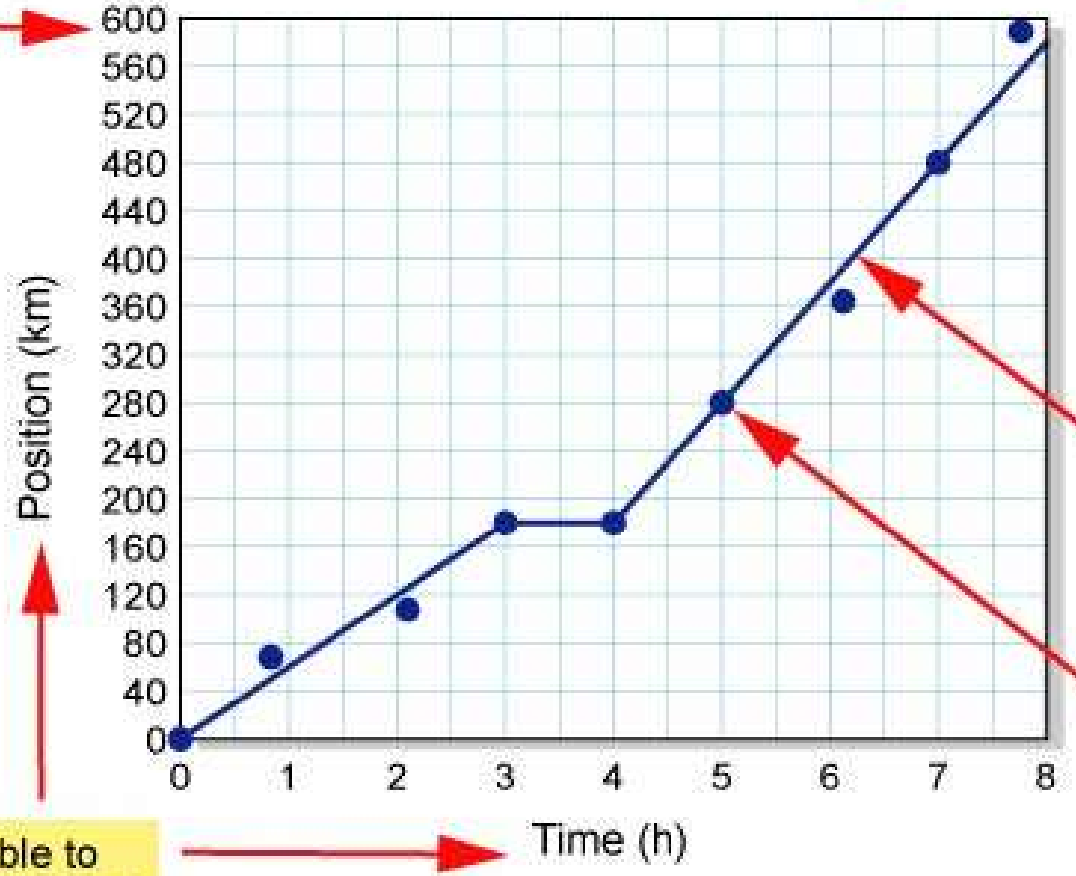
Common Conversions

- 1 pound = **16** ounces
- 1 pound = **4.45** newtons
- 1 kilogram = **1000** grams
- 1 kilogram weighs **2.2** lbs or **9.8** newtons

Convert 3 lb/ft to n/m

The Language of Physics

How to Make a Graph



Make a scale for each axis
x- axis:
each box = 40
y- axis:
each box = 0.5

Create a title for your graph

Draw a smooth curve that shows the pattern of the data points

Plot the data points

Decide which variable to put on the *x*-axis and which to put on the *y*- axis.

Greek Letters

- Δ - Delta – means “change in”
- Σ – Sigma –

Deriving Units

- $T = 2\pi\sqrt{L/g}$; If L is meters and gravity is m/s^2, what would T units be?