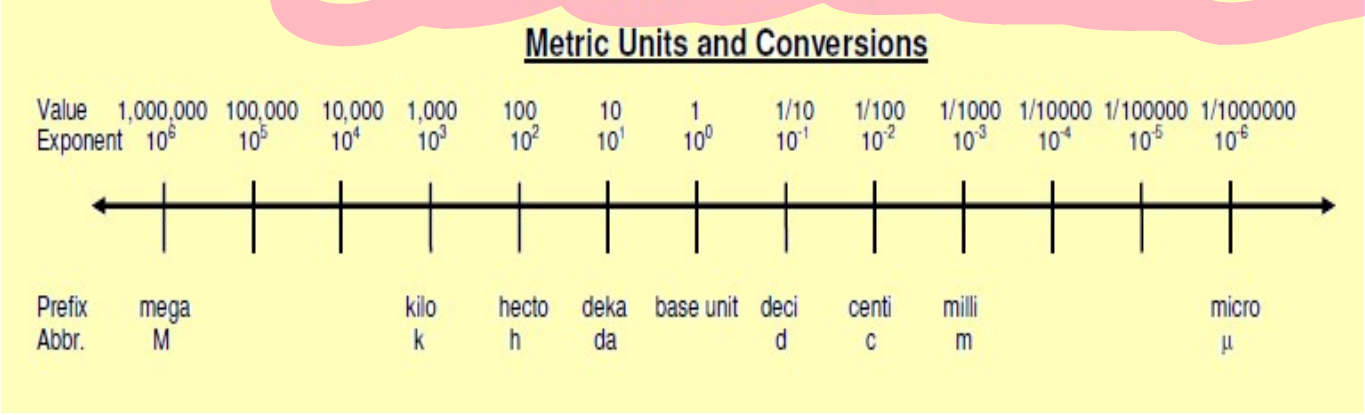
THE METRIC SYSTEM

IN THE METRIC SYSTEM OR THE INTERNATIONAL SYSTEM OF UNITS (S.I.) THERE ARE BASE UNITS WITH WHICH WE MAKE COMPARISONS.

1. LENGTH - metre
2. MASS - grams
3. TIME - seconds
4. TEMPERATURE - °C
5. VOLUME - litre

IN THIS SYSTEM, PREFIXES ARE USED TO INDICATE THE SIZE OF THE BASE UNIT. Mukhda base dcm μ



USE THIS **CONVERSION LINE** TO MOVE BETWEEN DIFFERENT UNITS.

1. 5000 cm = 50.00 m
2. 0.005 kg = 5 g
3. 8 mL = 8000 μL
4. 6 Ms = 600 000 das
5. 8.5 m = 8500 mm

Scientific Notation

For very large numbers and very small numbers scientific notation is used to avoid writing out many digits.

Ex. 455 000 000 kg can be written as 4.55×10^{8}

Ex. 0.000 26 m can be written as 2.6×10^{-4}

To convert standard notation to scientific notation:

1. Move the decimal so there is one non-zero digit in front of the decimal.
2. If the decimal was moved left the exponent is positive.
3. If the decimal was moved right the exponent is negative.
4. The number of movements is the exponent.

Examples:

1. 580 000

2. 245 000 000 000 2.45×10^{11}

3. 23 000 000 000 000 2.3×10^{13}

4. 0.000 000 053 5.3×10^{-8}

5. 0.0007

6. 0.000 0065

To convert from scientific notation to standard notation:

1. Move the decimal point to the right if the exponent is positive.
2. Move the decimal point to the left if the exponent is negative.

Examples:

1. 5.39×10^{6}
2. 9.8×10^{4} 98 000
3. 2.3×10^{9}
4. 2.25×10^{-5} 0.00000225
5. 5.5×10^{-8}
6. 9.3×10^{-12}

Rearranging Science Formulas

A knowledge of Math is important in order to study science. Rearranging simple science formulas is a vital skill.

For example:

$$D = \frac{m}{V}$$

$$m = DV$$

$$DV = m$$

$$V = \frac{m}{D}$$

$$y = mx + b$$

$$\frac{A}{B} = \frac{C}{D}$$

SNC 1D/1P
Making Observations

Observations:

To notice with your senses. Senses may be aided by instruments such as rulers, microscopes, balances etc.

Inferences:

To use reason and knowledge to make sense of your observations.

Ex. The street is wet. (observation)

It rained last night. (inference)

Ex. Fire alarm

Qualitative Observations vs. Quantitative Observations

Qualitative Observations:

Observations describing the nature of something using your senses. For example: colour, taste, texture etc. WORDY

DO NOT INVOLVE NUMBERS

Quantitative Observations:

Observations describing the amounts or measurements of something. For example: how fast, how hot, how much etc.

ALWAYS INVOLVE THE USE OF NUMBERS

NUMBERS + UNITS

Describing matter

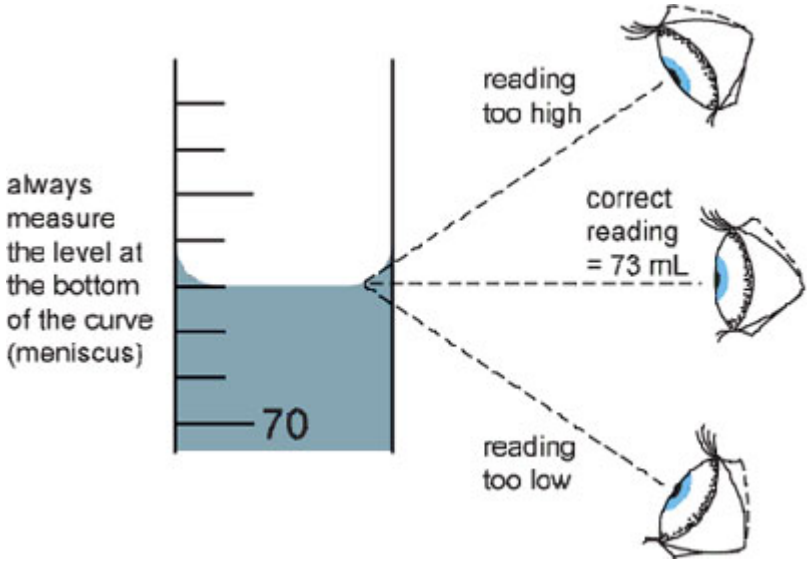
The properties that we can observe with our senses are called **physical properties.** The following list are some physical properties of matter that help us tell one thing from another.

Physical property	Explanation or meaning
Physical State	solid, liquid or gas
Colour	black, white, colourless, greenish-blue, yellow
Odour	odourless, spicy, sharp, flowery
Taste	sweet, sour, salty, bitter
Clarity (transmission of light)	1. clear (transparent) 2. cloudy (translucent) 3. opaque (no transmission)
Lustre	ability to reflect light (shiny → dull)
Form (shape)	1. crystalline (regular shape, ex. salt) 2. amorphous (irregular shape, ex. pepper)
Texture	feel - fine, coarse, smooth, gritty
Hardness	scale [1 (soft, baby powder) → 10 (very hard, diamond)]
Brittleness	ability to shatter easily (not flexible)
Malleability	Can it be hammered into a sheet?
Ductility	Can it be stretched into a wire?
Viscosity	The resistance of a liquid to flowing. Syrup is viscous water is not.

SNC 1D/1P
Taking Measurements

When taking measurements we should be aware of a few things:

Parallax: The change in position of an object when the angle of view is changed.



Accuracy: How close you are to a certain measurement.

Precision: How many times you can reapeat a measurement.

SNC 1D
Making Observations

Observations:

To notice with your senses. Senses may be aided by instruments such as rulers, microscopes, balances etc.

Inferences:

To use reason and knowledge to make sense of your observations.

Ex. The street is wet. (observation)

It rained last night. (inference)

Ex. Fire alarm

Qualitative Observations vs. Quantitative Observations

Qualitative Observations:

Observations describing the nature of something using your senses. For example: colour, taste, texture etc.

DO NOT INVOLVE NUMBERS

Quantitative Observations:

Observations describing the amounts or measurements of something. For example: how fast, how hot, how much etc.

ALWAYS INVOLVE THE USE OF NUMBERS

Describing matter

The properties that we can observe with our senses are called **physical properties.** The following list are some physical properties of matter that help us tell one thing from another.

Physical property	Explanation or meaning
Physical State	solid, liquid or gas
Colour	black, white, colourless, greenish-blue, yellow
Odour	odourless, spicy, sharp, flowery
Taste	sweet, sour, salty, bitter
Clarity (transmission of light)	1. clear (transparent) 2. cloudy (translucent) 3. opaque (no transmission)
Lustre	ability to reflect light (shiny → dull)
Form (shape)	1. crystalline (regular shape, ex. salt) 2. amorphous (irregular shape, ex. pepper)
Texture	feel - fine, coarse, smooth, gritty
Hardness	scale [1 (soft, baby powder) → 10 (very hard, diamond)]
Brittleness	ability to shatter easily (not flexible)
Malleability	Can it be hammered into a sheet?
Ductility	Can it be stretched into a wire?
Viscosity	The resistance of a liquid to flowing. Syrup is viscous water is not.

How to Plot a Graph

Step #1
Use a sharp pencil when drawing on graph paper. Draw a vertical axis and a horizontal axis. Place the independent variable on the horizontal axis. Place the dependent variable on the vertical axis. Label the axes with the quantities to be plotted. Include appropriate units.

Step #2
Choose a scale so that:

a) All of the points you are plotting fit on the graph
b) The graph fits a large part of the page
c) The scale is easy to use

For the value of one square on your graph paper, it is best to use numbers in multiples of 1, 2, 5, 10 etc...

Step #3

Plot the points in pencil, making a sharp dot surrounded by a small circle.

Step #4
Once you have plotted all the points, draw the smoothest line possible through them. Very often, the line takes the form of a curve. If it is not possible to draw through all of the points with a single line, try to draw an average line. You do this by drawing a line that has equal number of points on-either side of it.

Step #5
Add a neatly printed title to the graph, along with your name and the date.

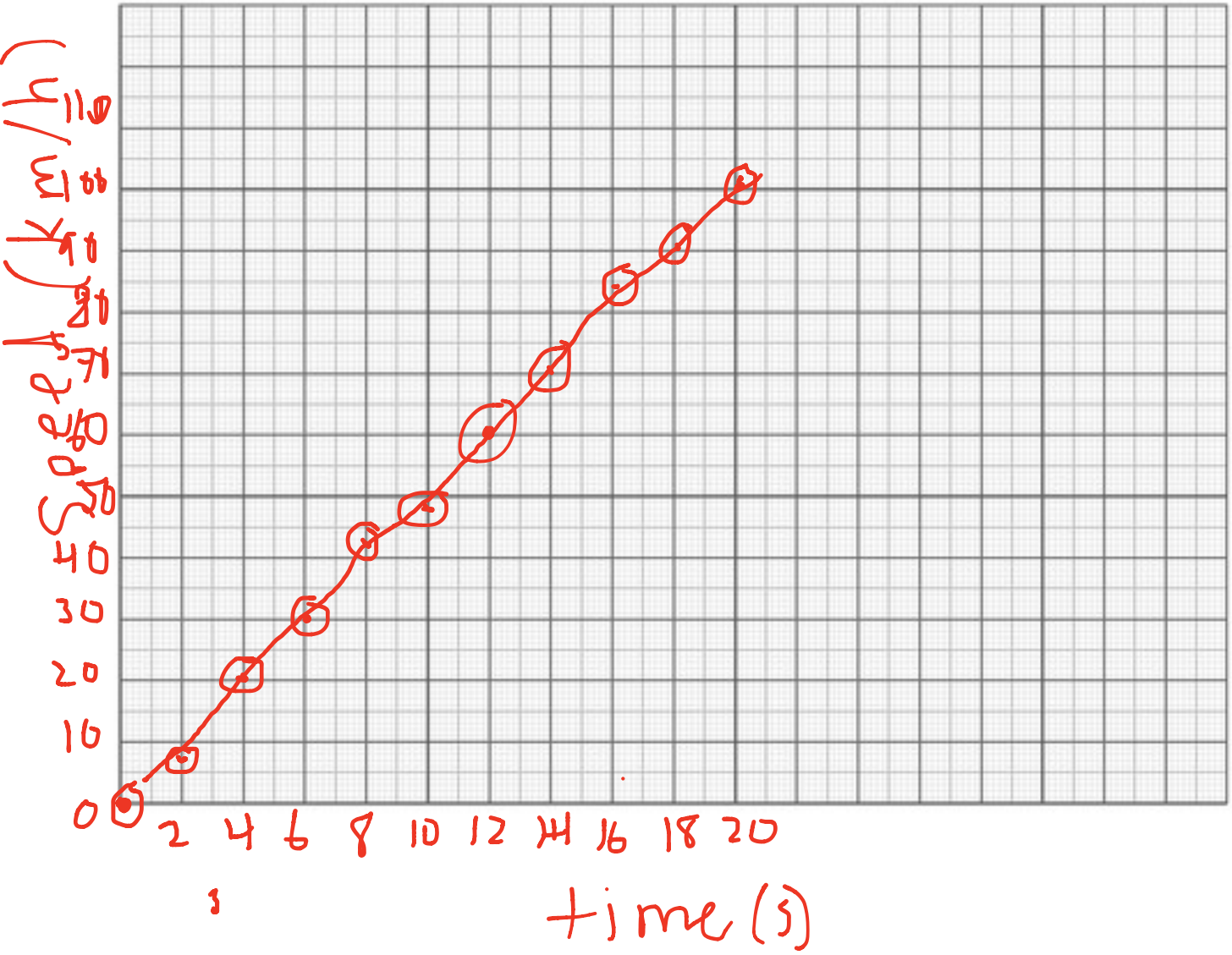
SNC 1D/1P
GRAPHING

1. Mr. Arthur decided to take his Porche Carrera out for a speed trial. He wants to see how fast it will go. He starts to drive and records the speed every two seconds. The results are below.

Time (s)	0	2	4	6	8	10	12	14	16	18	20
Speed (km/h)	0	9	20	30	41	49	60	70	82	90	100

Plot a graph of this data to show the relationship between speed and time.

Porche Speed Test



2. Mr. Arthur got his Porche Carrera tuned up and decided to try another speed trial. The results are below.

Time (s)	0	2	4	6	8	10	12	14
Speed (km/h)	0	15	30	41	55	70	85	100

Plot a speed-time graph for this set of results using the same method.

Answer these questions:

1. How fast was the car moving at: 5 seconds 25 km/h
   9 seconds 45 km/h
   11 seconds _____

2. At what time was the speed: 10 km/h 2.2 s
   35 km/h 35 s
   90 km/h 18 s

What is Science?

Science is a way of gaining knowledge and understanding our natural world.
Whenever we ask why or how something happens we are dealing with science.

Major divisions of science:

Chemistry
- The study of matter and the changes it undergoes.

Physics
- The study of the relationship between matter and energy.

Biology
- The study of living things.

Mathematics
- The study of shapes and numbers.

Astronomy
- The study of celestial bodies. (Space)

Earth Sciences (Geography)
- The study of the Earth's processes.

Social Sciences
- The study of human society.

The use of scientific knowledge to make products designed to improve the quality of our lives is called technology.

Why study science?

1. Science is everywhere!
   - new products are produced everyday
   - medicines/disease

2. Many jobs require a knowledge of science.

3. Recreation, sports and hobbies involve science.

4. Science helps you ask questions and provides information for better answers.

5. Curiosity!!

Cause and Effect Relationships

The primary goal of science is to explain the world in which we live. The knowledge gained is continually being used to create and develop technology. Cause-Effect relationships are very important in science and technology.

The key questions often asked when faced with a scientific problem:

"IF ONE VARIABLE IS CHANGED, HOW WILL THIS AFFECT ANOTHER VARIABLE?"

VARIABLE - something that can change (vary)

There are two types of variables:

1. **Independent variable:**
   This variable causes something to happen.
   The experimenter chooses the values.

2. **Dependent variable:**
   This factor is affected by the independent variable.
   This is the factor being studied.

Controlled Variables:
Factors that must remain the same throughout an experiment.

Examples:

For each questions or problems: Identify the independent variable, dependent variable and one controlled variable.

1. How does the number of hours of light a plant receive affect its height?

   Independent: __number of hours of light_____
   Dependent: __height of plant_____
   Controlled: amount of water each plant will receive must be the same

2. How does the shape of a snowball affect the time it takes to melt?

   Independent: __shape of snowball_____
   Dependent: __time to melt_____
   Controlled: __all snowballs must be made of the same snow__

3. How effective are different kinds of salt in melting winter ice?

   Independent: __different kinds of salt_____
   Dependent: __rate of melting of ice_____
   Controlled: __amount of salt used_____

4. Which brand of paper towel absorbs the most water?

   Independent: __different brands of paper towel_____
   Dependent: __absorption of water_____
   Controlled: __size of paper towel used_____

Steps of the Scientific Method

1. Pose a question.
   How does mass affect the time taken for a whirlybird to fall?

2. Collect information.
   - type of material
   - how to change mass
   - design of whirlybird

   independent
   dependent

3. Suggest a hypothesis. (Maybe . . .)
   1. **Maybe** as the mass increases the time to fall will decrease.
   2. **Maybe** as the mass increases the time to fall will increase.
   3. **Maybe** as the mass increases the time to fall will remain the same.

4. Make a prediction. (If . . . then . . .)
   If the mass of a whirlybird increases **then** the time to fall will decrease.

5. Design and conduct an experiment to test the hypothesis.

   All experiments are written in a specific format.

   Title
   Purpose
   Materials
   Procedure
   Observations
   Analysis

6. Conclusions: Did the experiment support your hypothesis?