1. MEASUREMENT

In this first unit, we look at some of the different ways of expressing the function of ***measurement****. Why start with measurement? As Lord Kelvin[1] wrote in 1890, "without quantification there is no scientific subject", and it is true to say that the history of scientific progress has run parallel to, and been dependent on, the ever-increasing precision in measurement.*

Functions & Grammar

KEY POINTS – MEASUREMENT

1. Adjectives

deep ≠ shallow · far ≠ near · fast ≠ slow · heavy ≠ light · high ≠ low · long ≠ short · odd ≠ even · thick ≠ thin · wide / broad ≠ narrow

➢ *All prime numbers are* ***odd*** *numbers.*

accurate ≠ inaccurate · average / mean · standard ≠ sub-standard

➢ *The* ***mean*** *density of Mercury is similar to that of the Earth.*

2. Nouns

amount · extent · measurement · range · size · span · speed

accuracy · average · level · mean · rate · scale · stage · step

➢ *The* ***rate*** *of acceleration is expressed in metres per second per second.*

check · study · survey

area · circumference · cross-section · diameter · radius

➢ *The* ***cross-section*** *of the wire is 0.22 mm^2. (nought point two two square millimetres)*

▮ *Rules for noun formation – suffixes*

ADJ / VERB + -th / -t (+ VOWEL CHANGE)

dep**th** · heig**ht** · long / leng**th** · weig**ht** · wid**th**

ADJ + -ness

hard**ness** · heavy / heavi**ness** · near**ness** · thick**ness**

VERB + -ment

to develop / develop**ment** · measure**ment** · move**ment**

3. Verbs

▮ *Rules for forming verbs*

NOUN/ADJ + Ø (NO CHANGE)

to narrow ≠ to thin · to range / to span / to extend[G. Notes 1] / to reach · to rate / to check / to monitor · to record / to plot

➢ *The trajectory of the missile was **plotted** on a graph.*

*NOUN/ADJ + **-en***

to deep**en** · to length**en** · to short**en** · to thick**en** · to wid**en**

➢ *The river **widens** when it leaves the canyon.*

*NOUN/ADJ + **adv particle***

to check **up** · to level **off** · to slow **down** ≠ to speed **up** · to step **up** · to work **out**

➢ *The speed of the neutrons is **slowed down** by the beryllium moderator.*

4-Structures

Dimensions can be expressed by 4 different structures.

- It is 56 m in height(width, depth, diameter);
- It is 56 m high (wide, long, thick);
- It has a diameter of 10 m(length, weight);
- Its radius is 5 m(length, cross-section, circumference).

5.Other measurements

- **Area**

To obtain the area you **multiply** the length **by** the width**.**

The area of a rectangle is its height **times** its width.

It measures 10 cm **by** 10 cm. The area is 100 cm^2 (a hundred **square** cm).
πr^2 (**pi r squared**)[G. Notes 2] · $\sqrt{x}$ (the **square root** of x)

▮ *Volume*

The volume is 1,000 cm^3 (a thousand **cubic centimetres**).
x^3 (x **cubed**) · $\sqrt[3]{y}$ (the **cube root** of y)

▮ *Power*

x^9 (x **to the power** nine / x **to the** ninth)
x^{-9} (x to the **power minus** nine / x to the **minus ninth**)

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6. Approximate measurements

These can be expressed by means of **adverbial modifiers**

It is **approximately** 5 cm long.

It is **about / roughly** 5 cm long.

It is 5 cm long, **more or less** / It's 500 kilos, **more or less**/ more or less symmetrical.

It is **almost** 5 cm long/ It is **nearly** 5 cm long.

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7. Questions

Note the question forms.

It weighs 10 kg → **How heavy** is it? / **How much** does it **weigh**?
What does it **weigh**?

It is 5 km away → **How far** (away) is it? / **How many** kilometres **away** is it?
What is the **distance**?

8.checkpoints

- **Simple definitions:** the simplest way of defining a word is by using the verb **"to be".**

Example: a woman

A woman **is** an adult, female human being.

The following words are the most used in Microbiology, define them: Bacterium (plural: Bacteria); fungus (plural: funguses, fungi). Virus (plural: viruses).

- **Asking questions:** are you sure you **never** make a mistake?

Write a question about the words in ***bold****.*

1. It became extinct about **8 million years ago**.
2. An emu weighs slightly more than **50 kg**.
3. Specialists examined **the bones**.
4. **An ostrich** runs very fast.