

## M.1 Physical quantities, units and prefixes

Look at the following information:

*“The **current** around the circuit is 3 **amperes**.”*

**Current** is a ‘physical quantity’. It is something that can be measured or calculated. **Ampere** is a ‘unit’. It is what we measure current in.



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*✎ 1) What is the physical quantity and unit in the following statement?  
“A force of 100 newtons is used to push a shopping trolley.”*

Here is a table of some other physical quantities and units used in GCSE Physics:

physical quantity	unit
<i>force (F)</i>	<i>newton (N)</i>
<i>distance (s)</i>	<i>metre (m)</i>
<i>wavelength (<math>\lambda</math>)</i>	<i>metre (m)</i>
<i>charge (Q)</i>	<i>coulomb (C)</i>
<i>current (I)</i>	<i>ampere (A)</i>
<i>speed (v)</i>	<i>metre per second (m/s)</i>
<i>pressure (P)</i>	<i>pascal (Pa)</i>
<i>mass (m)</i>	<i>kilogram (kg)</i>

*✎ 2) What is charge measured in?*

*✎ 3) What physical quantity is measured in newtons?*

You can see from the table that there is a symbol that can represent each physical quantity and each unit. The symbol is a shorthand way of writing the physical quantity or unit. It is important that you use the correct uppercase or lowercase symbol. For example, *F* is used for force and *f* is used for frequency.

*✎ 4) Research to find out the symbols used for the following physical quantities and their units:*

physical quantity	unit
<i>frequency ( )</i>	
<i>voltage ( )</i>	
<i>work ( )</i>	
<i>resistance ( )</i>	
<i>acceleration ( )</i>	
<i>momentum ( )</i>	

## Prefixes

When dealing with large or small numbers, prefixes are often used in front of the unit.

For example, *kilometres (km)*. The 'kilo' tells us that the number must be multiplied by 1000 ( $1 \text{ km} = 1 \times 1000 \text{ m} = 1000 \text{ m}$ ).

Here is a table of other common prefixes that are used:

prefix	multiply by	multiply by
<i>Giga (G)</i>	<i>1 000 000 000</i>	$10^9$
<i>Mega (M)</i>	<i>1 000 000</i>	$10^6$
<i>Kilo (k)</i>	<i>1 000</i>	$10^3$
<i>Centi (c)</i>	<i>0.01</i>	$10^{-2}$
<i>Milli (m)</i>	<i>0.001</i>	$10^{-3}$
<i>Micro (<math>\mu</math>)</i>	<i>0.000 001</i>	$10^{-6}$
<i>Nano (n)</i>	<i>0.000 000 001</i>	$10^{-9}$

*✎ 5) Work out the following in metres: i) 3.2 km, ii) 4.0 Mm, iii) 32 cm, iv) 140 mm.*

*✎ 6) Work out the following in kilometres (km): i) 3520 m, ii) 104 m, iii) 0.47 m, iv) 3000000 m*

*(Hint: Remember that 'kilo' is a substitute for multiplying by 1000, so divide the value in metres by 1000.)*

*✎ 7) Convert the following to kilojoules (kJ): i) 7620 J, ii) 32 000 J, iii) 345 000 J, iv) 0.034 J*

*✎ 8) These ones are more difficult.*

*i) 1000 km = \_\_\_\_\_ Mm*

*ii) 12 Gm = \_\_\_\_\_ km*

*iii) 35 mm = \_\_\_\_\_  $\mu$ m*

*iv) 346 nm = \_\_\_\_\_ mm*