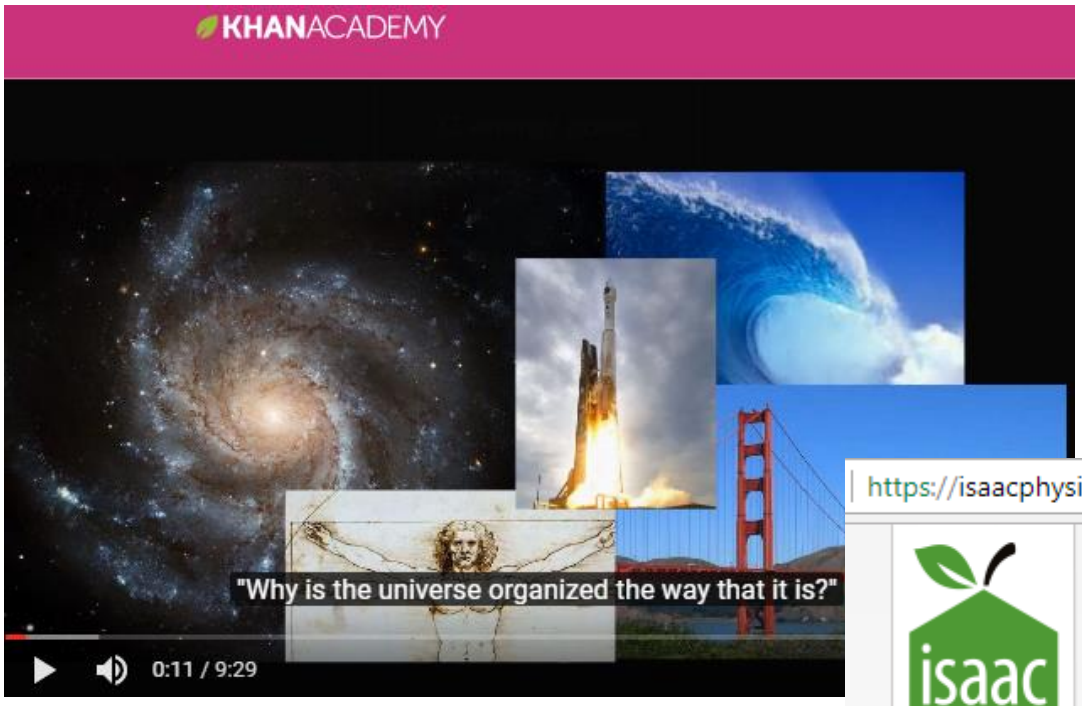
AS PHYSICS

Introductory Class
Working as a Physicist &
Summer Tasks 2019



STUDENT NAME: ……..

TUTOR NAME: ……..

S.I. units (systeme international d'unites)

This is the system of "metric" units used in most scientific work. When a quantity such as length is measured the value is given a unit, in this case the unit being the metre. Remember that the value is meaningless unless the unit is shown. The name of each unit also has a standard symbol of no more than three letters, so for example the abbreviation for metre is m.

Base units and derived units

The S.I. system of units is based on seven **base units**, which are:

Quantity		**Unit**	
Name	**Symbol**	**Name**	**Symbol**
mass	*m*	kilogram	kg
length	*l*	metre	m
time	*t*	second	s
temperature	*T*	kelvin	K
luminous intensity	*I*	candela	cd
electric current	*I*	ampere	A
Quantity of matter	*n*	mole	mol
Luminous Intensity	I_v	candela	cd

All other units are **derived units** and can be expressed as a combination of base units, even when the unit is given its own name.

Examples of derived units are:

metre^2 (m^2), the unit of area
newton (N), the unit of force,
where 1 newton = 1 kilogram metre / second^2

Points to remember:

1. Symbols for units are always written in the singular. This is because s is the symbol for second e.g. 5 ms means 5 milliseconds, not 5 metres.

2. You must be careful to distinguish between upper and lower case letters (i.e. capital and small letters) because the same letter can mean different things depending on whether it is upper or lower case. For example the prefix M, standing for mega, multiplies a unit by 1 000 000 whereas the prefix m, standing for milli, multiplies a unit by 0.001.

3. When the name of a unit is written in full it nearly always starts with a lower case letter, even if the unit is named after a person e.g. the newton which is named after Sir Isaac Newton.

4. Quantities also have symbols. To distinguish between the symbols for quantities and the units that they are measured in, it is normal in printed text to write the symbols for quantities in italic (*sloping*) print and the symbols for units

in normal upright print e.g. the symbol for the quantity time is *t* and the unit of time is the second with the symbol s,

so that time = 5 seconds is written as $t = 5$ s.

Obviously it is not possible to do this in hand written text, but it is usually obvious from its context. An equation relating several symbols together will usually involve quantities:

e.g. $s = \frac{d}{t}$ meaning speed $= \frac{\text{distance}}{\text{time}}$

whereas a symbol following a number will be the unit of the number e.g. in 8 kg, kg is the symbol for the unit kilogram.

The use of standard prefixes with S.I. units

Larger and smaller units are (with a few exceptions) obtained by placing one of the standard prefixes given below before the unit (a fuller set of prefixes is given on a separate sheet). For example, the prefix kilo with the symbol k gives a unit 1000 times larger than the basic unit, no matter what the unit is

e.g. 1 kilogram = 1,000 gram 1 kilometre = 1,000 metre.

Symbol	Prefix	Multiplies unit by	or	or
M (upper case)	Mega	1 000 000		10^{6}
k	kilo	1 000		10^{3}
d	deci	1/10	0.1	10^{-1}
c	centi	1/100	0.01	10^{-2}
m (lower case)	milli	1/1 000	0.001	10^{-3}
μ (Greek "mu")	micro	1/1 000 000	0.000001	10^{-6}
n	nano	1/1 000 000 000	0.000000001	10^{-9}
p	pico	?	?	12^{-12}

The problems that follow use these common units:

Quantity	Unit	Symbol
mass	kilogram	kg
length	metre	m
time	second	s
volume	litre	l
energy	joule	J
power	watt	W
voltage	volt	V

Exercise 1 - Express:

1. 8 kilometres in metres

Worked Example: 8 kilo metres, where kilo (k) multiplies by 1,000

8 × 1,000 metres = 8,000 m or 8×10^3

2. 2 milliseconds in seconds

3. 3 megajoules in joules

4. 6 centimetres in metres

5. 5 decilitres in litres

6. 55 microvolts in volts

7. 800 nanoseconds in seconds

8. 25 kilograms in grams

9. 0.75 MW in W

10. 482 cs in s

11. 40 μg in g

12. 125 dm in m

13. 5.92 mJ in J

14. 9 640 nm in m

Exercise 2 - Express:

1. 15 000 m in km

Worked Example: 15,000 metres, where kilo (k) multiplies by 1,000

15 × 1,000 metres = 15,000 m or = 15×10^3 m

15 km k is substituted for × 1,000 or ,000 or $\times 10^3$

2. 0.57 m in cm

3. 320 000 W in MW

4. 0.048 g in mg

5. 1.82 l in dl

6. 0.000 004 s in μs

7. 0.000 000 004 m in nm

8. 64 000 000 J in MJ

9. 0.7 l in cl

10.. 0.000 08 m in μm

11. 0.000 5 V in mV

12. 0.42 m in dm

13. 132 000 V in kV

14. 0.000 000 62 s in ns

Utilising online teaching tools:

During the course, two online resources will prove to be particularly useful:

1. https://www.khanacademy.org
2. https://isaacphysics.org/

Watch the video on Khan Academy covering standard form:

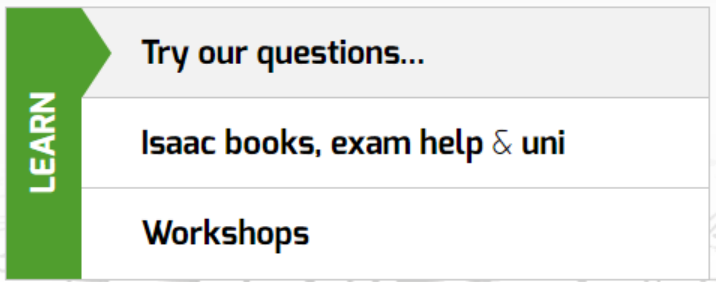
https://www.khanacademy.org/math/pre-algebra/pre-algebra-exponents-radicals/pre-algebra-scientific-notation/v/scientific-notation-old

Notice how it is referred to as scientific notation and not standard form as in the UK, if using Khan Academy and you can't find additional resources please ask for advice.

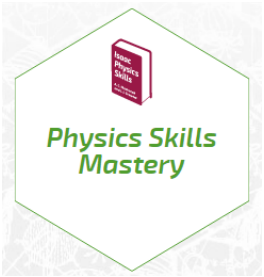
Create an account with Isaac Physics using the above link. When you return I will link your account to the College so I can view your responses.

On the homepage, you can click on the apple from any page to return to the home screen.

Follow the link, for Isaac books as below.



Choose the, Physics Skills Mastery link.



Select exercise A3, in the General Questions section.

This should be completed for your return, please ensure you are logged in in order to save your responses and access them.

Standard Form and Prefixes

View page | Assign

Now go back to exercise 1 & 2 and convert each of your answers to standard form without any metric prefixes

The Topic List for the AS Physics course is as follows:

TOPIC 2:	Mechanics
TOPIC 3:	Electric Circuits
TOPIC 4:	Materials
TOPIC 5:	Waves and the Particle Nature of Light

For each of these topics, create a power-point slide (4 slides in total) on what sub topics will be covered in each of these headings.
You may use any format you believe appropriate (Spider diagram, bullet points, flow chart, experiments list, famous names or breakthroughs in the field of physics etc.) but you must include at least one image for each slide.

Outline which, you believe will be your strong area and your weak area and which you are looking forward to the most and why.

Completion Checklist *(Tick box when complete)*:

- [ ] 1. Exercise 1 & 2 on metric prefixes in pack
- [ ] 2. Watch Khan Academy video
- [ ] 3. Register with Isaac Physics
- [ ] 4. Complete exercise A3 on Issac Physics
- [ ] 5. Exercise 1 & 2 in standard form
- [ ] 6. 4 Powerpoint slides on AS Physics and your relation to the course