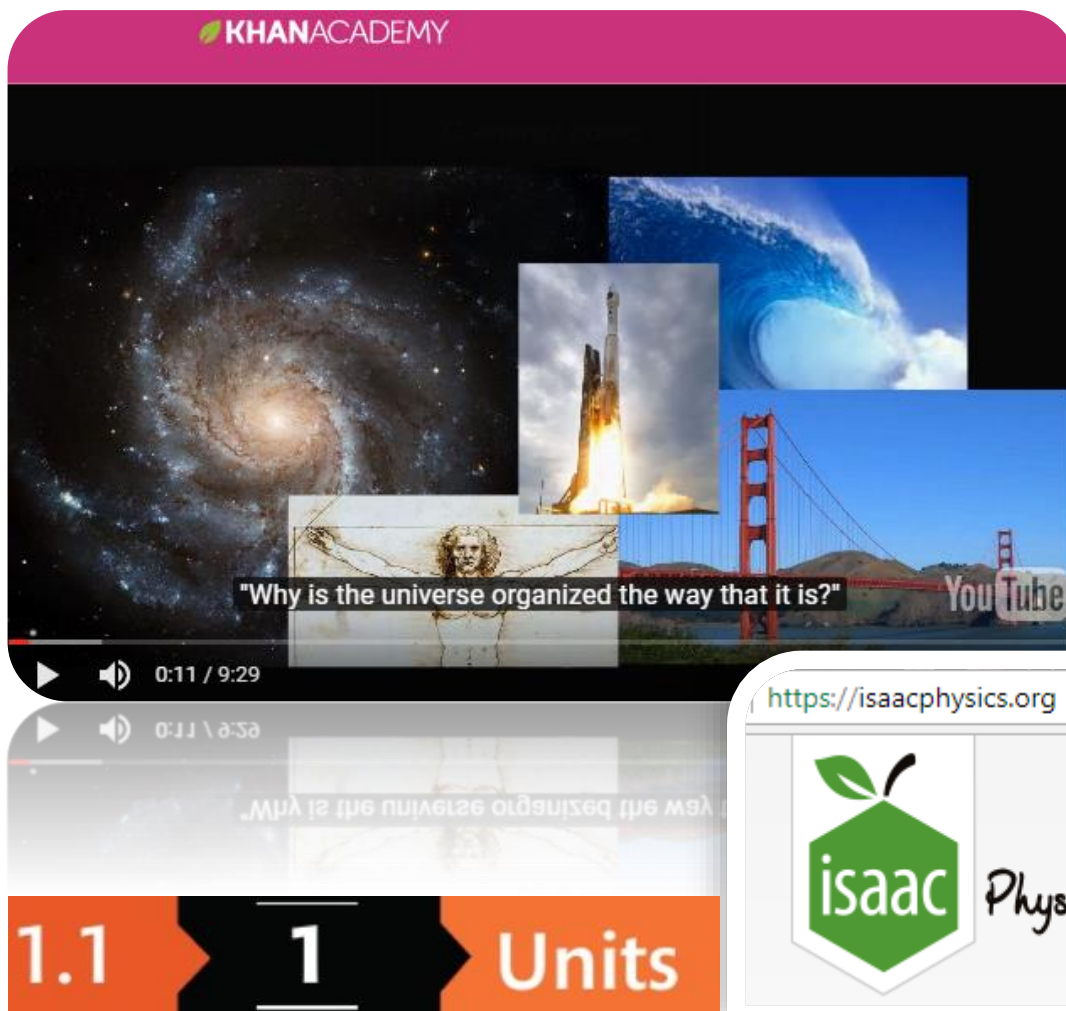


AS PHYSICS

Introductory Class Working as a Physicist & Summer Tasks 2025



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S.I. units (Système International d'unités)

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	<i>m</i>	kilogram	kg
length	<i>l</i>	metre	m
time	<i>t</i>	second	s
temperature	<i>T</i>	kelvin	K
luminous intensity	<i>I</i>	candela	cd
electric current	<i>I</i>	ampere	A
Quantity of matter	<i>n</i>	mole	mol
Luminous Intensity	<i>I_v</i>	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:

metre² (m²), the unit of area

newton (N), the unit of force,

where 1 newton = 1 kilogram metre / second²

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 $t = 5 \text{ s}$.

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:

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

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	?	?	10^{-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 (Converting into the base unit) - Express:

1. 8 kilometres in metres

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

(This info can be found in the table on page 3)

$$8 \times 1,000 \text{ metres} = 8,000 \text{ m} \quad \text{or} \quad 8 \times 10^3$$

2. 2 milliseconds in seconds

3. 3 megajoules in joules

Exercise 2 - Express:

1. 15 000 m in **km**

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

$$15 \times 1,000 \text{ metres} = 15,000 \text{ m} \quad \text{or} \quad = 15 \times 10^3 \text{ m}$$

$$15 \text{ km} \quad \text{k is substituted for } \times 1,000 \text{ or ,000 or } \times 10^3$$

In this case, even though kilo multiplies by 1,000 we are required to divide by 1,000 in order to remove it from the number and place it as a metric prefix.

2. 320 000 W in MW

3. 0.57 m in cm

Utilising online teaching tools:

During the course, two online resources will be utilised extensively:

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

For your A-Level Physics course at Coulsdon College, for each topic of study you will be given a student learner pack. This should be completed as you move through the course with the learner pack sections having the same section reference as your textbook you will receive when you begin.

Khan Academy video links will be shown in red boxes next to topic headings or subheadings.

The box contains the following information:

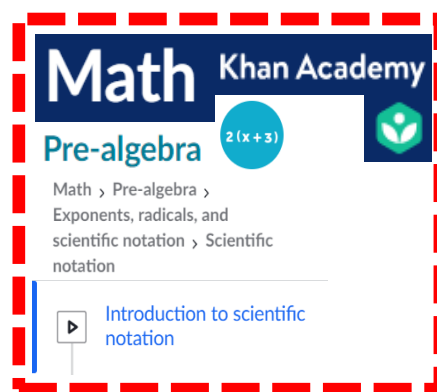


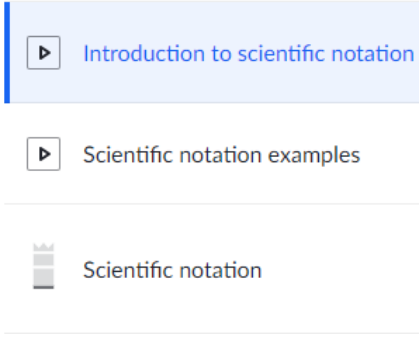


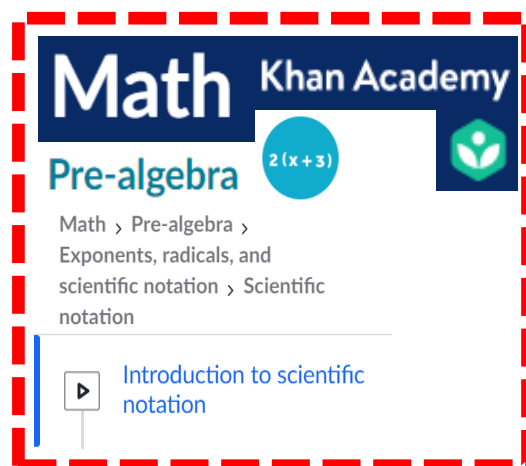
Image	Information
	Khan Academy (KA) logo so you know the source of the material.
	The course within KA In future this will usually be either Physics or AP Physics
	The sub course within the main course
 or 	The KA symbol for the sub course, look out for the AP symbol for the physics course. This can be found in the sciences section of KA.
	The full links to follow to find the video(s) on the KA system.
	<p>The name of the video(s) you are expected to watch, it may not be the first and within a sequence on KA you may not be required to view all of the videos.</p> <p>It is useful to be aware of the other videos in a KA sequence if you require additional info/resources on another topic.</p>

An example of this is on the right.

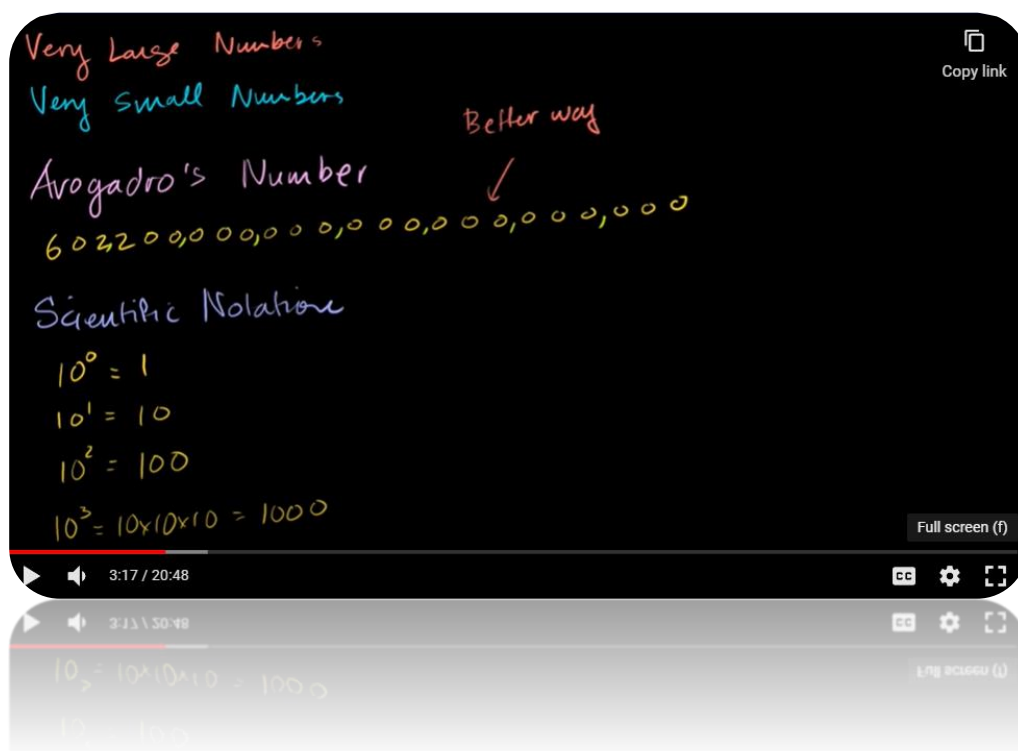
Either; i) click on the link (HWK file given later)

ii) follow the URL:

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



iii) Click on the hyperlinked video image (HWK file)



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 as they may utilise an alternative word for the same topic.

Isaac Physics:

Isaac Physics has been produced in collaboration between the University of Cambridge Physics Department and the Department for Education.



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

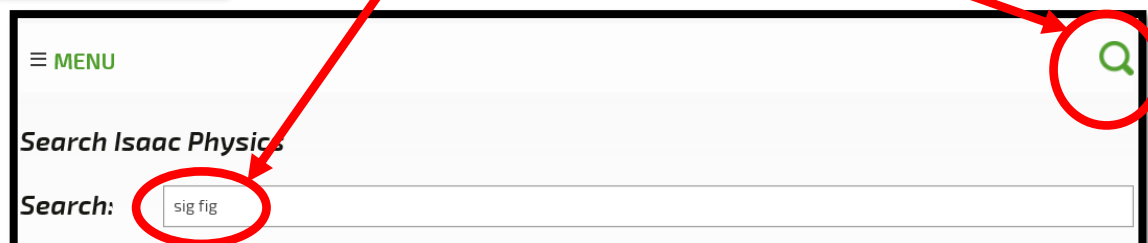
To begin with you must get used to how the Isaac Physics system operates.

Always ensure you sign in before beginning work so your progress can be tracked.

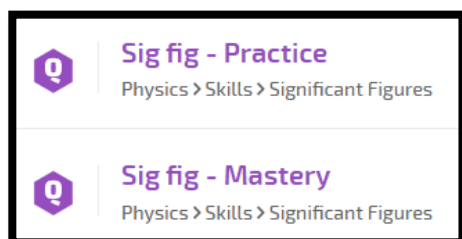
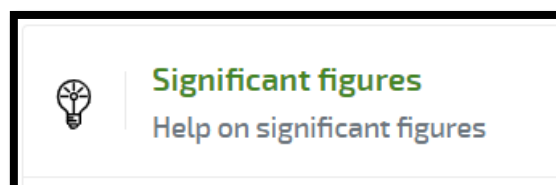
Before we begin the book and online version we must learn how Isaac Physics wants us to form our responses, exactly the same system is utilised in you're A-Level Physics examination.



Use the '**search function**' as shown below to find two tasks related to 'sig fig'. (Practice and mastery).



The 'HELP' link will give you guidance on how to complete the next two tasks, if you are unsure of the topic content.



Complete the two tasks from your search on sig fig; Practice and mastery.

When you choose to answer a question, the question always appears first.

Useful information can be unhidden in the '**Hints**' tab as shown below if you are stuck or your answer is incorrect.

In this case, Hint 1, is an explanation of what you the student are expected to do to complete this task.

Please read through this and then complete the two tasks.

The screenshot shows a question titled 'Q: Sig fig - practice' in purple. In the top right corner, there are icons for sharing and printing. Below the title bar, there is a section labeled 'Part A' and 'Sig fig 1'. Underneath, there are two tabs: 'Answer Now' and 'Hint 1'. The 'Hint 1' tab is selected, displaying the following text: 'When the question only involves multiplication and/or division of values, the number of significant figures in the answer is the same as the smallest number of significant figures of any data **used** in the question.'

Sig fig rules are always applied to all Isaac questions and Edexcel Physics exams and must be followed.

For incorrect answers:

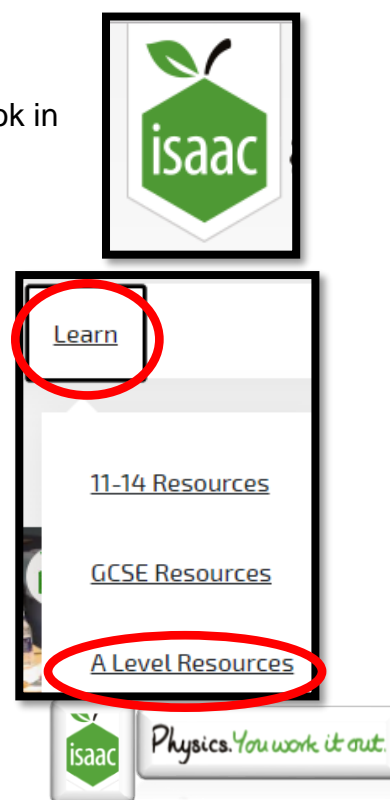
It should be noted now that during our course some of the values Isaac wants you to use may differ from those supplied by Edexcel for your exams, if your answers, having applied the rules of sig fig, are still incorrect it is worth checking the Hints tabs to see if Isaac is asking you to utilise a slightly different value.

It may also be incorrect due to an error, check your working to see if you have made a mistake. When using the Isaac system, always use a pen and paper so you can check for mistakes, remember, in the exams you will only have a pen and paper to communicate with the examiner and you won't know if your answer is correct or not straight away. Always prepare yourself for how you are going to work in the exam.

For the next task we will be using the book (or online book in this case).


Click on the Apple to return to the main menu, you can always click on the apple from any page to return to the home screen.

From the 'Learn' Tab, follow the link, for **A-Level** learning as shown on the right.



Choose the, Essential Physics Skills Book link shown on the right.

Essential Physics Skills Book



Interactive questions from our Essential Pre-University Physics book.

Scroll down to see all the available AS Physics course tasks:

AS-Level (or equivalent)

A General Questions

B Mechanics

C Electric Circuits

D Waves

E Uncertainties

We advise students to use the online version (mobile phones work excellently in addition to your pen and paper) but a hard copy is available for students who wish to order one/use one in class.

We are now going to complete task A3, Standard Form and Prefixes.

Select: A General Questions

AS-Level (or equivalent)

A General Questions

Select: A3

A3

Standard Form and Prefixes

[View page](#) | [Assign](#)

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

Physicists utilise a lot of mathematical skills within their field of study and work. It is vital that all applicants on a Physics A-Level course have the required algebraic level in order to succeed.

Isaac tasks in your A-Level Physics Learner Packs will have the following layout including a screenshot of the most useful image from the guidance video available as 'hint' from the question page (it is always the last hint).

If you cannot instantly understand the image shown, then watch the whole video (these are usually 2 mins long and provide tutorial style help on the topic):



Complete Isaac Physics:

A3 Standard form and Prefixes

Prefix	Symbol	Power of 10
Peta	P	10^{15}
Tera	T	10^{12}
Giga	G	10^9
Mega	M	10^6
Kilo	k	10^3
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}

Calculation example: $e = 1.602 \times 10^{-19} \text{ C}$
 $= 1.602 \times 10^{-16} \text{ m C}$
 $= 1.602 \times 10^{-13} \times 10^{-6} \text{ C}$

If you are stuck, always ensure you have watched the last hint video before you come to class to ask for help as your teacher is always available but you may not require me.



A3 & A1 on Isaac Physics are the last online based tasks to complete.



Complete Isaac Physics:

A1 Using, and Rearranging Equations

Once on the course and connected to your Coulsdon College group, any Isaac tasks to be completed will be accompanied with an email from the Isaac system and automatically assigned to you.

Equations shown:

$$\frac{Q}{t} = \frac{I}{t}$$

$$I = \frac{Q}{t}$$

$$a = \frac{v-u}{t}$$

$$u = v - at$$


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.

Include one extra slide on which topic, you believe will be your strong area and your weak area and which you are looking forward to studying the most and why.

Completion Checklist (*Tick box when complete*):

- | | |
|--------------------------|--|
| <input type="checkbox"/> | 1. Exercise 1 & 2 on metric prefixes in pack |
| <input type="checkbox"/> | 2. Watch Khan Academy video 'Introduction to scientific notation' |
| <input type="checkbox"/> | 3. Register with Isaac Physics |
| <input type="checkbox"/> | 4. Sig fig on Isaac (2 tasks) |
| <input type="checkbox"/> | 5. A3 'Standard form and Prefixes' on Isaac Physics |
| <input type="checkbox"/> | 6. A1 'Using, and Rearranging Equations' on Isaac Physics |
| <input type="checkbox"/> | 7. 5 Powerpoint slides on AS Physics and your relation to the course |