

N5 WORKSHOP

The Final Tips





N5 National Qualifications
SPECIMEN ONLY

S857/75/02

Physics
Section 1 — Questions

Date — Not applicable
Duration — 2 hours 30 minutes

Instructions for completion of Section 1 are given on page 02 of your question and answer booklet S857/75/01.
Record your answers on the answer grid on page 03 of your question and answer booklet.
Reference may be made to the Data Sheet on page 02 of this booklet and to the Relationships Sheet S857/75/11.
Before leaving the examination room you must give your question and answer booklet to the invigilator; if you do not, you may lose all the marks for this paper.



THE PAPERS

- Friday 13th may, 1pm in the afternoon
- 1 paper 2 sections:
- 2 hours 30 mins
- 25 m/c answer at start of answer booklet
- P2 data sheet

DATA SHEET

Speed of light in materials

Material	Speed in m s^{-1}
Air	3.0×10^8
Carbon dioxide	3.0×10^8
Diamond	1.2×10^8
Glass	2.0×10^8
Glycerol	2.1×10^8
Water	2.3×10^8

Speed of sound in materials

Material	Speed in m s^{-1}
Aluminium	5200
Air	340
Bone	4100
Carbon dioxide	270
Glycerol	1900
Muscle	1600
Steel	5200
Tissue	1500
Water	1500

Gravitational field strengths

	Gravitational field strength on the surface in N kg^{-1}
Earth	9.8
Jupiter	23
Mars	3.7
Mercury	3.7
Moon	1.6
Neptune	11
Saturn	9.0
Sun	270
Uranus	8.7
Venus	8.9

Specific heat capacity of materials

Material	Specific heat capacity in $\text{J kg}^{-1} \text{ } ^\circ\text{C}^{-1}$
Alcohol	2350
Aluminium	902
Copper	386
Glass	500
Ice	2100
Iron	480
Lead	128
Oil	2130
Water	4180

Specific latent heat of fusion of materials

Material	Specific latent heat of fusion in J kg^{-1}
Alcohol	0.99×10^5
Aluminium	3.95×10^5
Carbon Dioxide	1.80×10^5
Copper	2.05×10^5
Iron	2.67×10^5
Lead	0.25×10^5
Water	3.34×10^5

Melting and boiling points of materials

Material	Melting point in $^\circ\text{C}$	Boiling point in $^\circ\text{C}$
Alcohol	-98	65
Aluminium	660	2470
Copper	1077	2567
Glycerol	18	290
Lead	328	1737
Iron	1537	2737

Specific latent heat of vaporisation of materials

Material	Specific latent heat of vaporisation in J kg^{-1}
Alcohol	11.2×10^5
Carbon Dioxide	3.77×10^5
Glycerol	8.30×10^5
Turpentine	2.90×10^5
Water	22.6×10^5

Radiation weighting factors

Type of radiation	Radiation weighting factor
alpha	20
beta	1
fast neutrons	10
gamma	1
slow neutrons	3
X-rays	1

ALWAYS USE THIS

- Use it to help you with units
- Mainly for constants, but it changes if new data is required for a question
- Get some hints for units too

$$d = vt$$

$$d = vT$$

$$s = vt$$

$$s = vT$$

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

**DYNAMICS
&
SPACE**

$$F = ma$$

$$W = mg$$

$$E_c = Fd$$

$$E_p = mgh$$

$$E_k = \frac{1}{2}mv^2$$

$$Q = It$$

$$V = IR$$

$$V_1 = \left(\frac{R_2}{R_1 + R_2} \right) V_s$$

$$\frac{V_1}{V_2} = \frac{R_1}{R_2}$$

$$R_T = R_1 + R_2 + \dots$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$

ELECTRICITY

$$P = \frac{E}{t}$$

$$P = IV$$

$$P = I^2R$$

$$P = \frac{V^2}{R}$$

$$E_c = cm\Delta T$$

$$E_c = ml$$

$$P = \frac{F}{A}$$

**PROPERTIES
OF
MATTER**

$$P_1V_1 = P_2V_2$$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{PV}{T} = \text{constant}$$

$$f = \frac{N}{t}$$

WAVES

$$v = f\lambda$$

$$T = \frac{1}{f}$$

$$A = \frac{N}{t}$$

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

RADIATION

$$H = Dw_s$$

$$\dot{H} = \frac{H}{t}$$

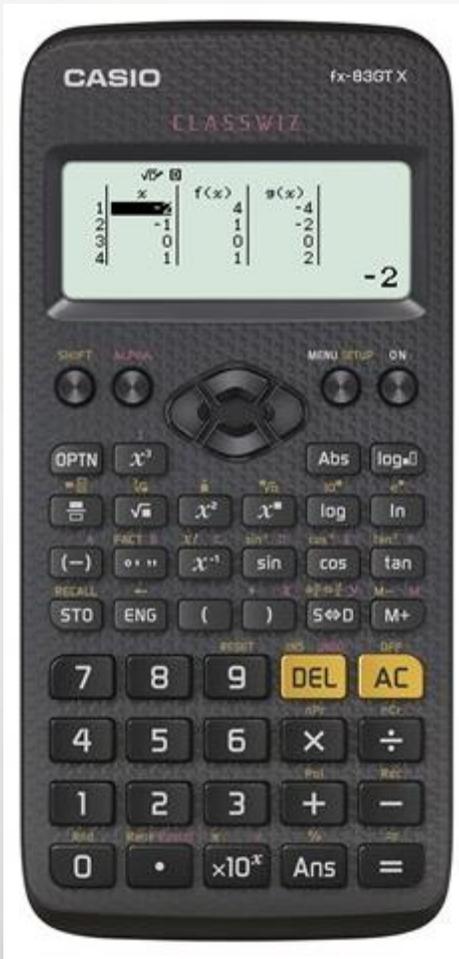
RELATIONSHIPS SHEET

- Do you know what each letter represents and the units?
- Get the annotated relationships sheet

What do you need?

- **Most important is YOU!**
- **Pen**
- **Pencil**
- **Ruler (Right or Left handed!)**
- **CALCULATOR, NOT PROGRAMMED, with new/working battery!**
- **PROTRACTOR or angle measurer**
- **Eraser**
- **Know your candidate number**





Your best friend the calculator!

- **IT IS VITAL THAT YOUR CALCULATORS ARE ON YOUR SIDE**
- **they will be the only "friend" you have**
- **so set it up right!**
- **PUT IT IN DEGREES (not rads or grads)**

<u>Prefix</u>	<u>Symbol</u>	<u>Multiple</u>	<u>Multiple in full</u>
Tera	T	$\times 10^{12}$	x1 000 000 000 000
Giga	G	$\times 10^9$	x1 000 000 000
Mega	M	$\times 10^6$	x1 000 000
Kilo	k	$\times 10^3$	x1 000
Centi	c	$\times 10^{-2}$	÷100
Milli	m	$\times 10^{-3}$	÷1 000
Micro	μ	$\times 10^{-6}$	÷1 000 000
Nano	n	$\times 10^{-9}$	÷1 000 000 000
Pico	p	$\times 10^{-12}$	÷1 000 000 000 000

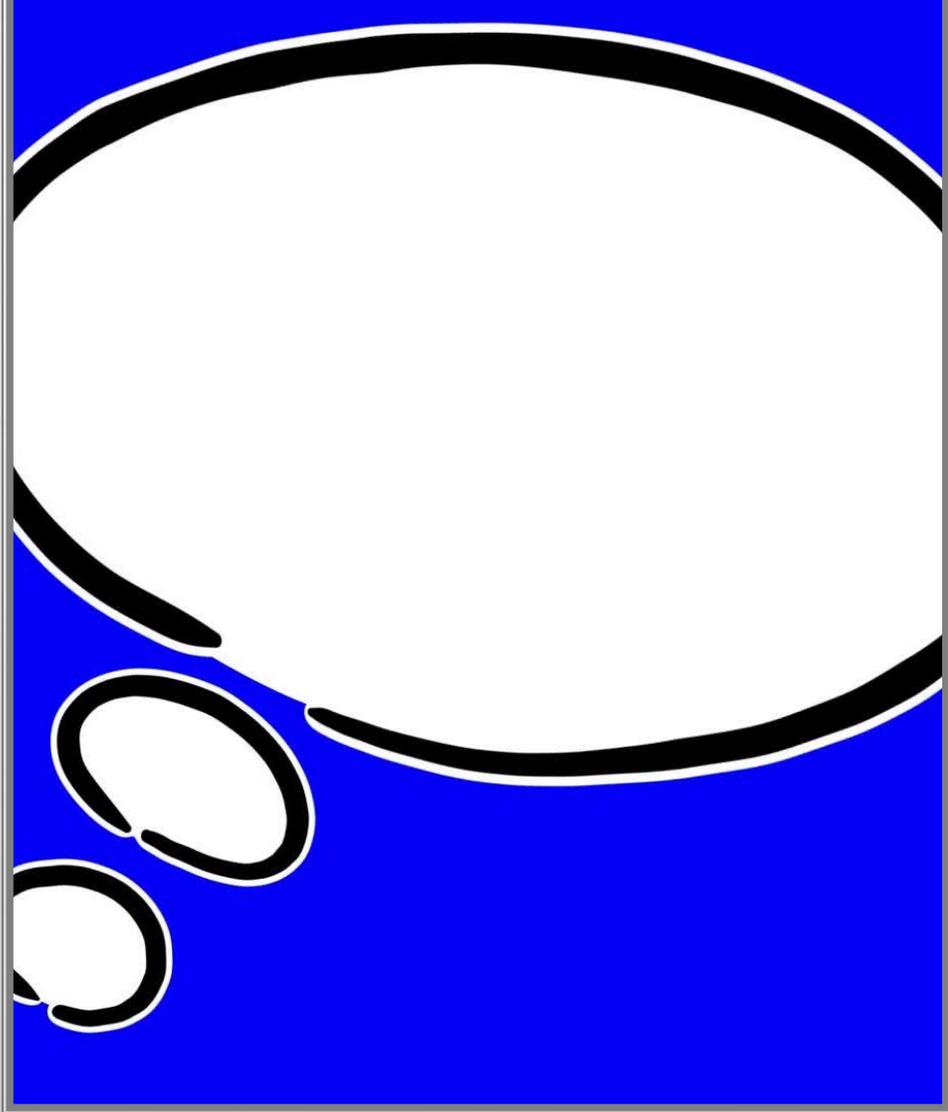
Things to be aware of

- Be careful about your writing.
- Some pupils letters & numbers can be confused e.g *49*
5 5
- Include units on all answers except.....
- Redshift, n,
- Don't give more answers than needed, you could start to lose marks

Significant figures

- You will start to lose marks for your answer if you give too many or too few significant figures.
 - +3 too many
 - -2 too few
- You lose the mark for your answer

This is the big one, make this count!



- If you can't do a question then put any number into the box and include the correct unit.
- Don't miss out any question. Give it a go. You have worked (most of you!) for 1 or 2 years so you might as well give it a go. **GUESS!**
- But remember you will follow a normal distribution curve to your exam so start with something you can do

I believe in you, so go and show what you can do!

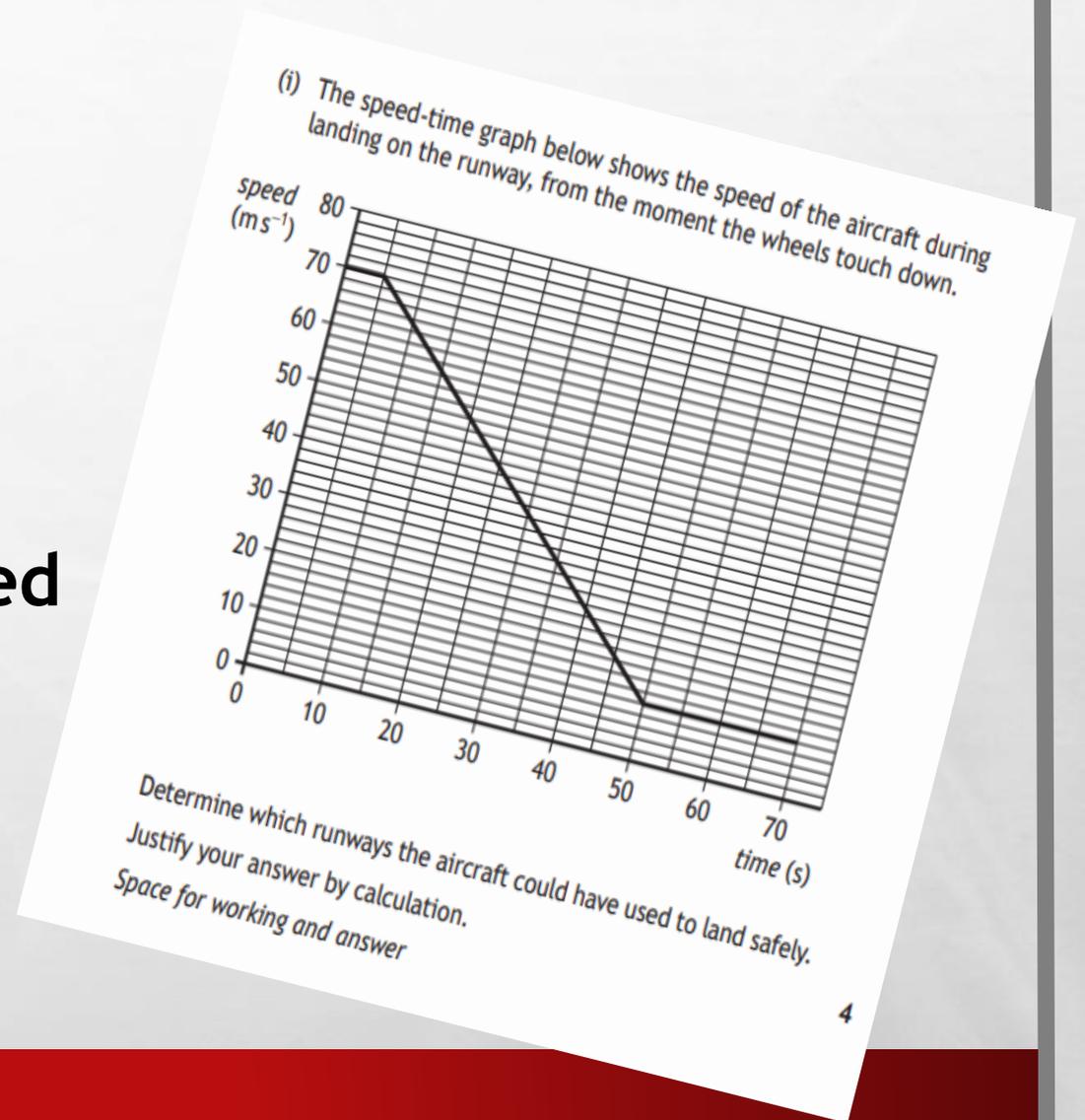


- If you can't do part a) etc and your answer is needed for the next part then don't miss it out.
- **MAKE UP AN ANSWER** and write “___ = ___ (units)”
- Use your made up answer to the first part to answer the question. If this part is correct you won't lose any marks.
- You don't **HAVE** to start with the m/c
- Tackle the hard stuff about half way through

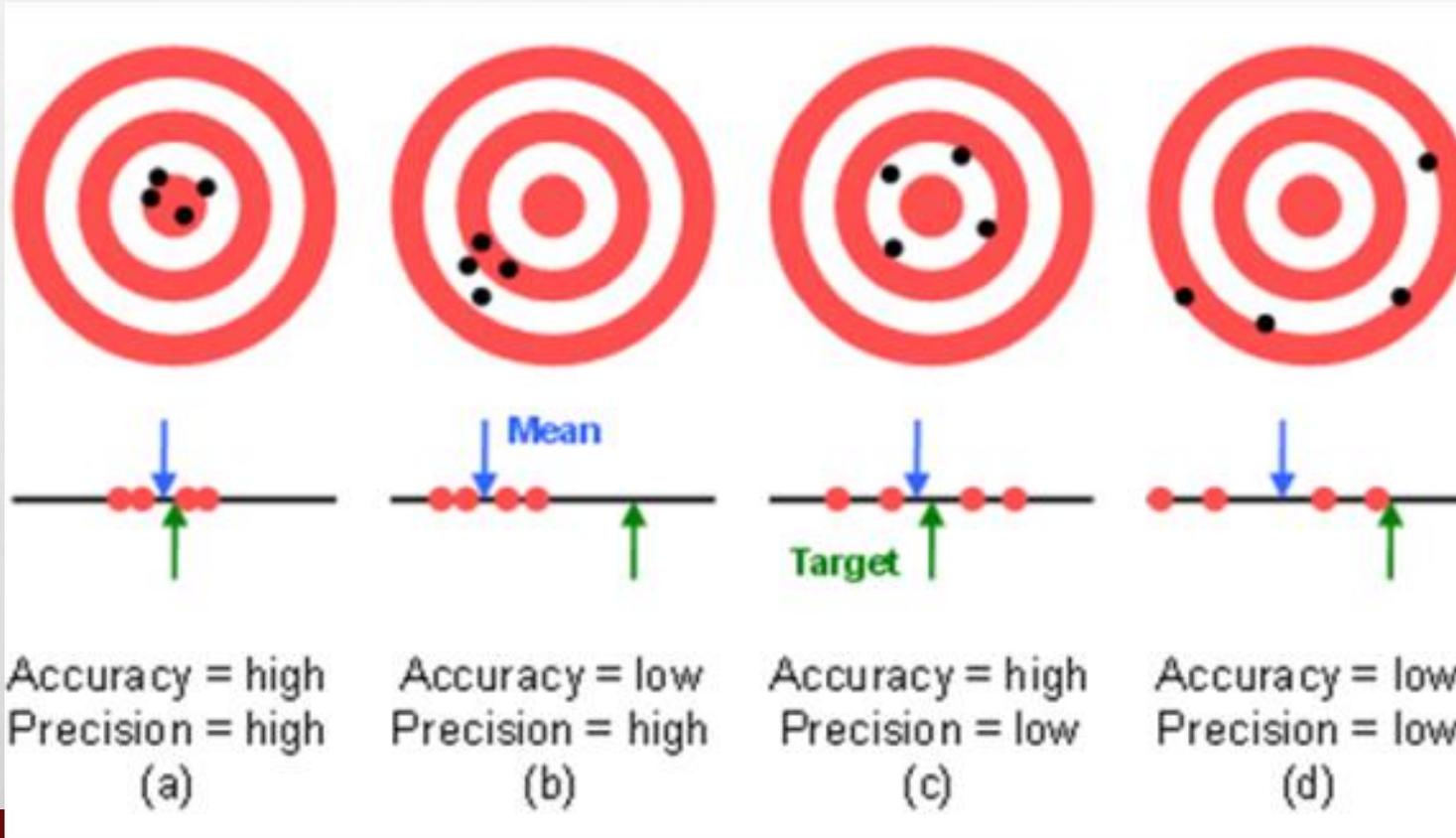
I believe in you, so go and show what you can do!

Look out for:

- The Number of Marks
- Most calculations are worth 3 marks if they are more complicated they could be worth more.
- You don't get 4 or 5 marks for nothing! There must be a catch!



ACCURACY V PRECISION



**Accuracy is how close your answer is to the true value.
Precision is how repeatable a measurement is.**

you can do this!



BIG RESISTOR V SMALL RESISTOR

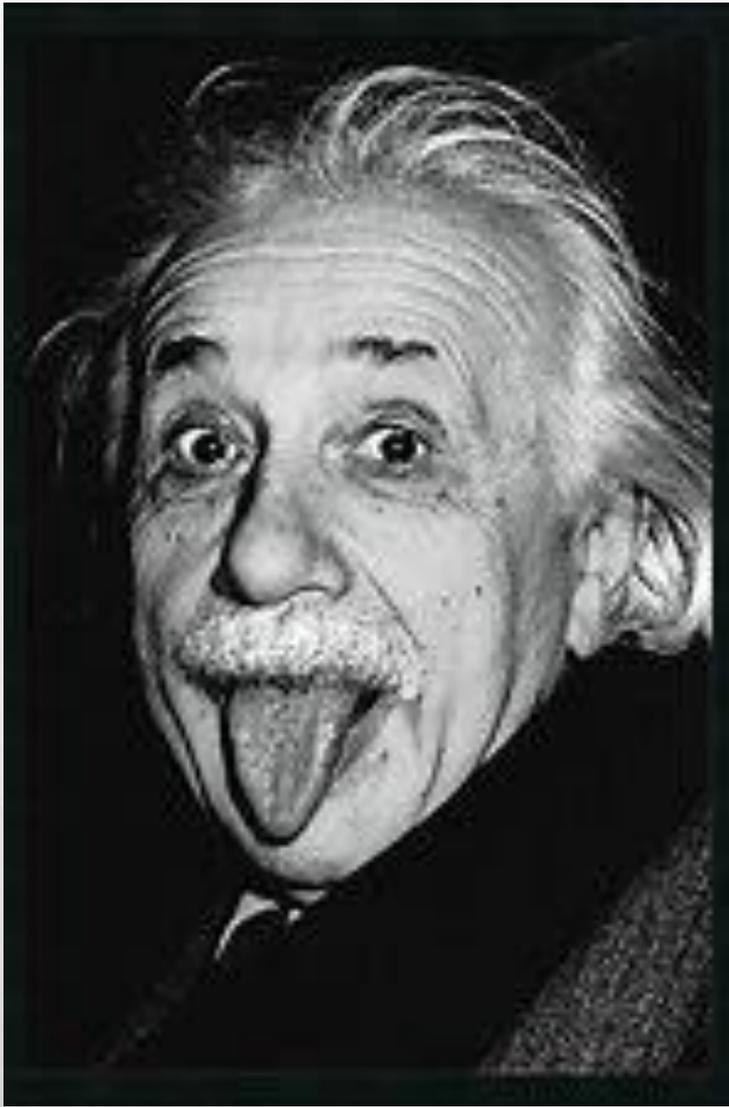


LOWER V HIGHER



SO USE

**LESS THAN, GREATER THAN, INCREASE,
DECREASE**



QUICKER TIME

If you talk about quicker time you are talking about relativity!

5 WORDS TO SPELL CORRECTLY

FUSION

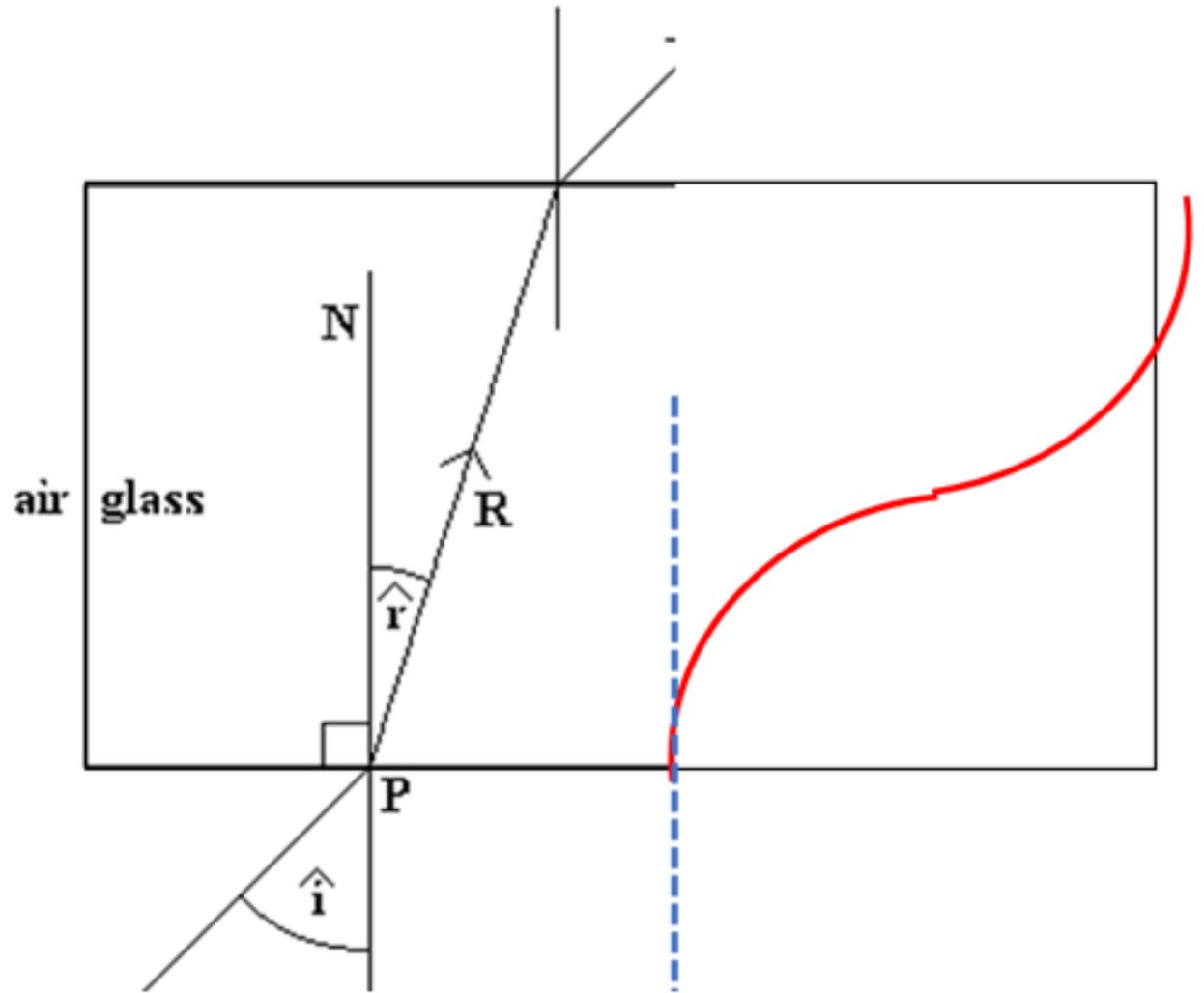
FISSION

REFRACTION

DIFFRACTION

REFLECTION

Never say
Refraction is
the bending
x

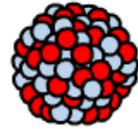


FISSION V
FUS

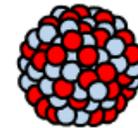
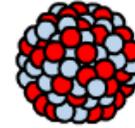
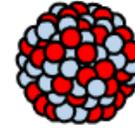
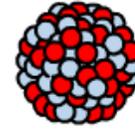
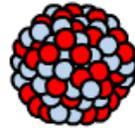
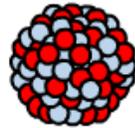
FUSION

ION

Uranium Chain Reaction



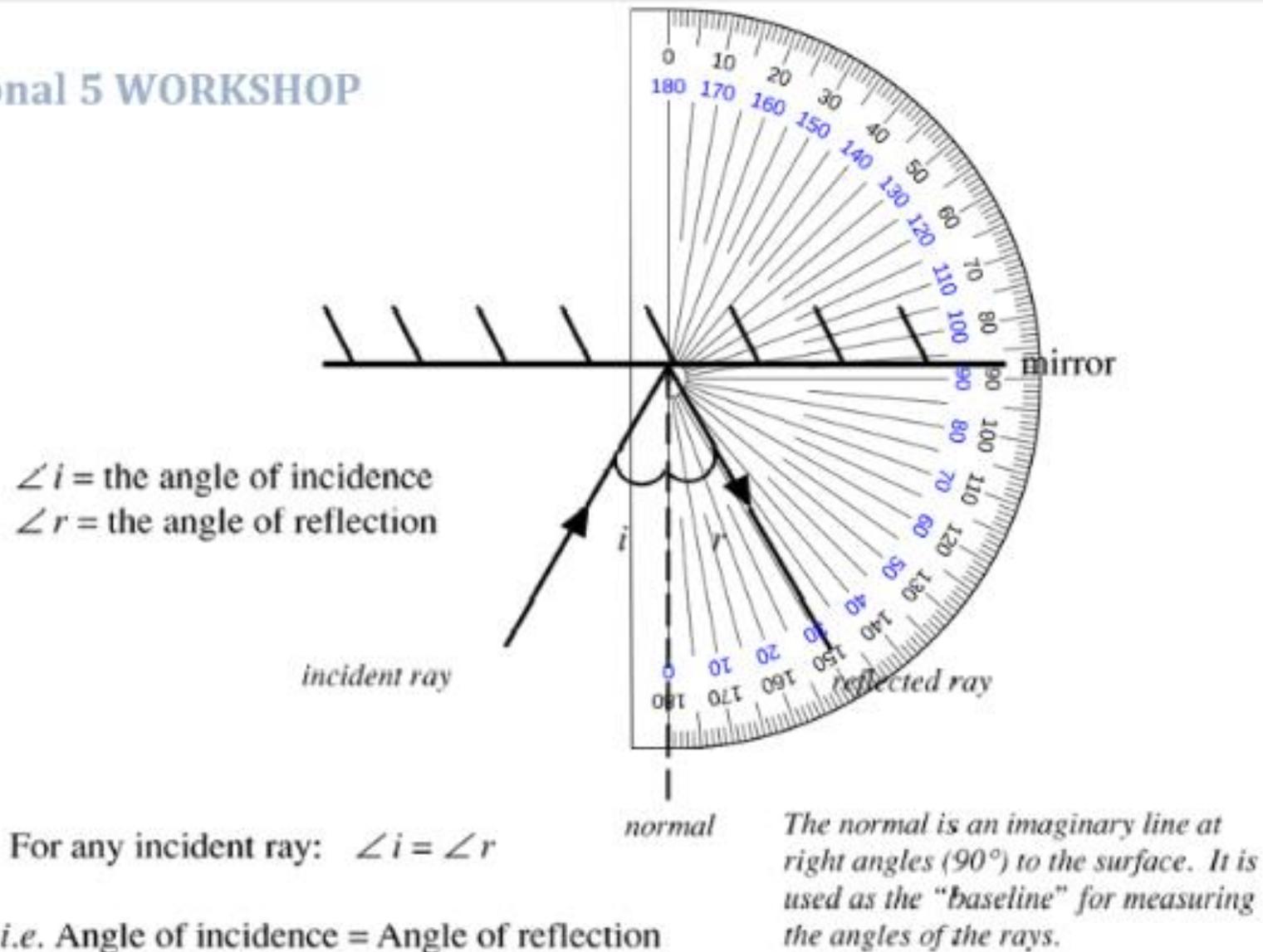
FISSION



GIVE YOURSELF A CHANCE!

- 1.(Information)- Summarise the question.**
- 2.Change any units that are not standard.**
- 3.(Equation) -Write out the formula.**
- 4.(Substitution) -Put the numbers in.**
- 5.*Use the magic triangle to rearrange the formula, only if you must!***
- 6.(Solution)- Work out the answer.**
- 7.Write out the answer, but not to too many sig fig.**
- 8. (Units) -Add units to your answer.**
- 9.(Underline) Underline the answer**

National 5 WORKSHOP



GAS LAWS

- What causes pressure? Pressure is caused by the force of particles on the walls of the container, ie F/A
- For a FIXED MASS OF GAS at CONSTANT TEMPERATURE pressure is inversely proportional to the volume $P_1V_1 = k$
- For a FIXED MASS OF GAS at CONSTANT PRESSURE temperature (kelvin) is proportional to the volume $V_1 / T(K)_1 = k$
- For a FIXED MASS OF GAS at CONSTANT VOLUME temperature (kelvin) is proportional to the pressure $P_1 / T(K)_1 = k$
- KINETIC THEORY All particles are moving. Pressure is caused when the particles collide with the container walls The higher the temperature the faster the particles move, the faster they move the more often and more violent the collisions with the walls, greater impulse therefore greater force.
- If the volume is less they will collide more often as there is a shorter distance between the container walls

A CHANGE IN TEMP!

- A **change in temperature** of 20°C is a change in temp of 20 K
- But 20°C is not 20 K
- It might be advisable to ALWAYS convert TEMPERATURE into KELVIN
- $^{\circ}\text{C} = \text{K} + 273$ $\text{K} = ^{\circ}\text{C} - 273$ There is NO SUCH THING AS -K
- Water is heated from 20°C to 80°C , state the temperature change in Kelvin. A $\Delta 1^{\circ}\text{C} = \Delta 1\text{K}$

- Average or Instantaneous Speed, MEASURE DISTANCE, USING TAPE MEASURE (or ruler), MEASURE TIME, USING A STOPWATCH (or light gates and a fast timer), USE THE FORMULA $SPEED = DISTANCE / TIME$
- INSTANTANEOUS SPEED This is your average speed over a VERY SMALL DISTANCE, $v = l/t$
- SCALARS & VECTORS Scalars - size/magnitude only, Vectors - size/magnitude and direction
- Vectors - Force, Displacement, Velocity, Acceleration, momentum, field strength, CHECK IF YOU NEED CLARIFICATION ON THIS
- A FORCE can cause a change in: SHAPE, SPEED (really velocity), & DIRECTION, of an object
- MASS v WEIGHT Mass is a measure of the amount of matter in an object, Weight is the FORCE of gravity on an object, Mass is measured in Kilograms, weight is measured in Newtons
- $FORCE = mass \times acceleration$
- If F is constant and m is increased, then a DECREASES. If m is constant and F is increased then a INCREASED
- ONE NEWTON is the force that is needed to accelerate a mass of 1 kilogram at one metre per second squared.

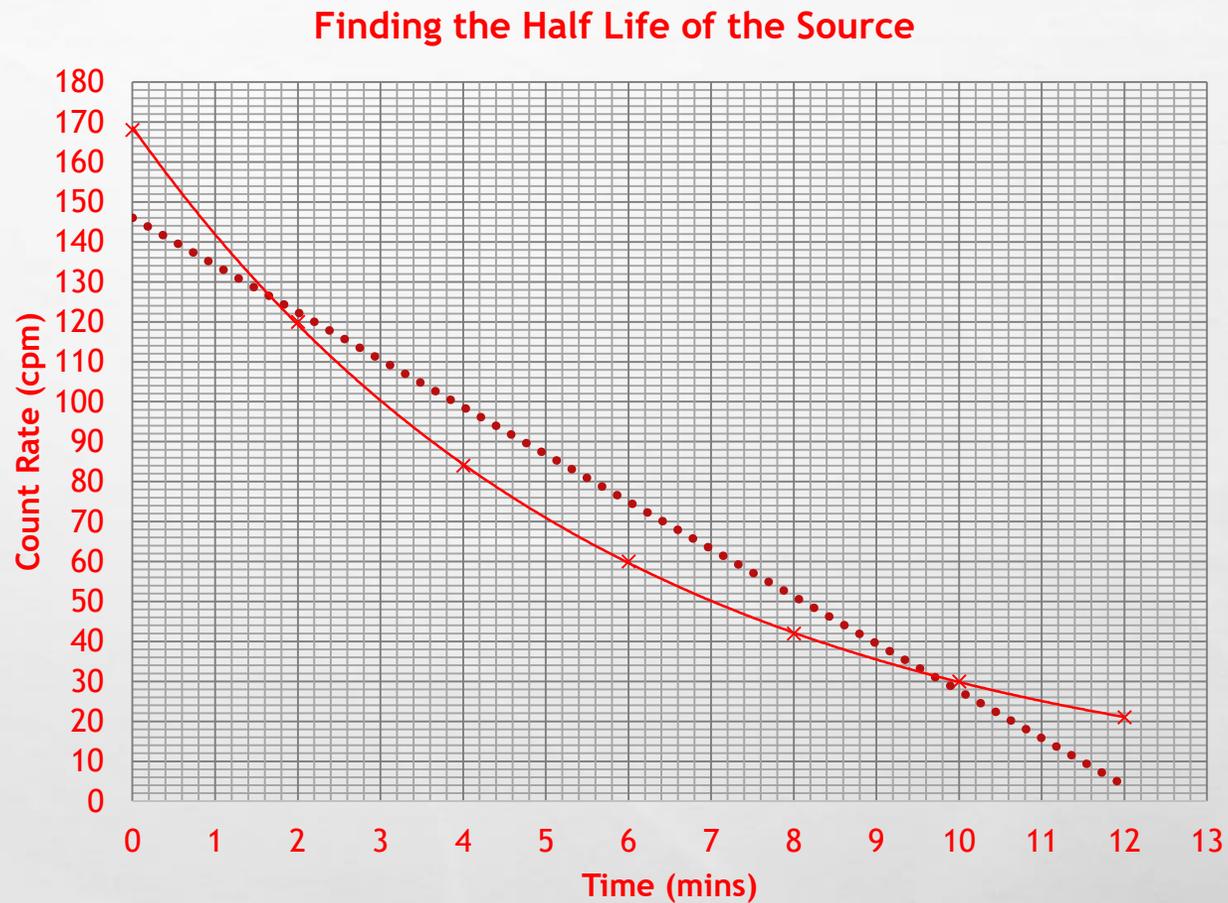
Equal but opposite forces
are called
BALANCED FORCES

Energy is lost to the surroundings as

PROJECTILES

- PROJECTILES, 2 MOTIONS, Horizontally the speed is constant, Vertically the object accelerates at 9.8 ms^{-2}
- Why does a satellite remain in orbit? Satellite's weight prevents it escaping/(Satellite has a) horizontal velocity large enough:to maintain its altitude. OR To allow its trajectory to match the curvature of the Earth.
- Don't get caught out! Separate out the horizontal and vertical component of velocity. Always use the subscript H and V to distinguish Don't forget an angle Don't put them back together UNLESS they ask for the resultant!
RESULTANT IS THE COMPONENTS TOGETHER AGAIN

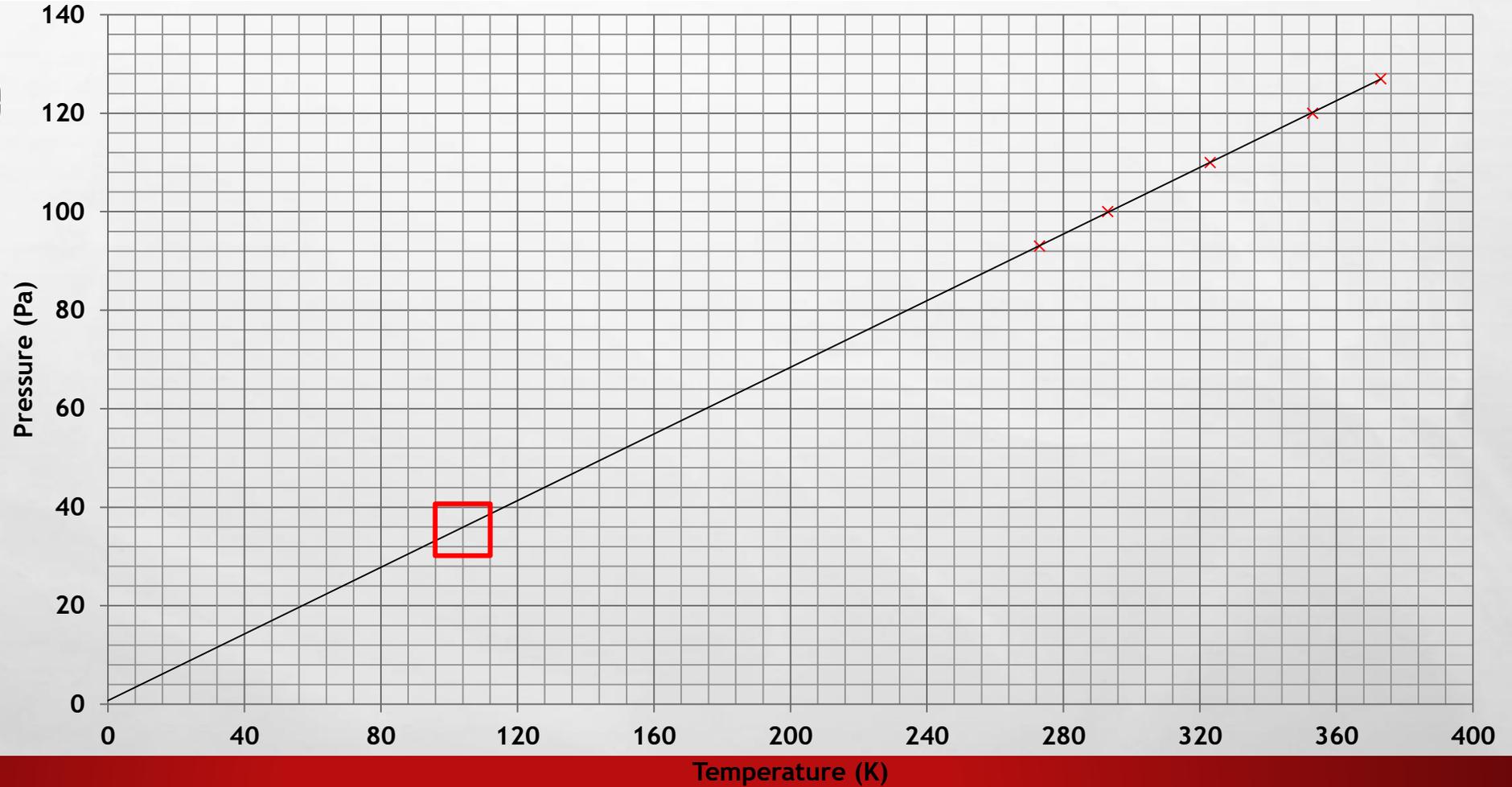
**THE BEST
LINE OF FIT
CAN BE A
CURVE!**



Leave time to check your answers, I've warned you about silly mistakes !

Temperature (°C)	0	20	50	80	100
Temperature (K)	273	293	323	353	373
Pressure (kPa)	93	100	110	120	127

**Don't use
the
points in
the table
Use the
line**



Never force a line through the origin, but if it does go through that's fine!

Temperature (°C)	0	20	50	80	100
Temperature (K)	273	293	323	353	373
Pressure (kPa)	93	100	110	120	127

Use all the data to show a relationship

$\frac{P}{T(K)} = \text{constant}$		$\frac{110}{323} = 0.3406$	0.34
$\frac{93}{273} = 0.3407$	0.34	$\frac{120}{353} = 0.3399$	0.34
$\frac{100}{293} = 0.3412$	0.34	$\frac{127}{373} = 0.3405$	0.34

P/T(K) is a constant value therefore P is directly proportional to T(K)

GMP

Have you checked out the
General Marking Principles?

Its all here, so you put it down on paper !



Physics: general marking principles

National 3—Advanced Higher

Publication code: BA7377

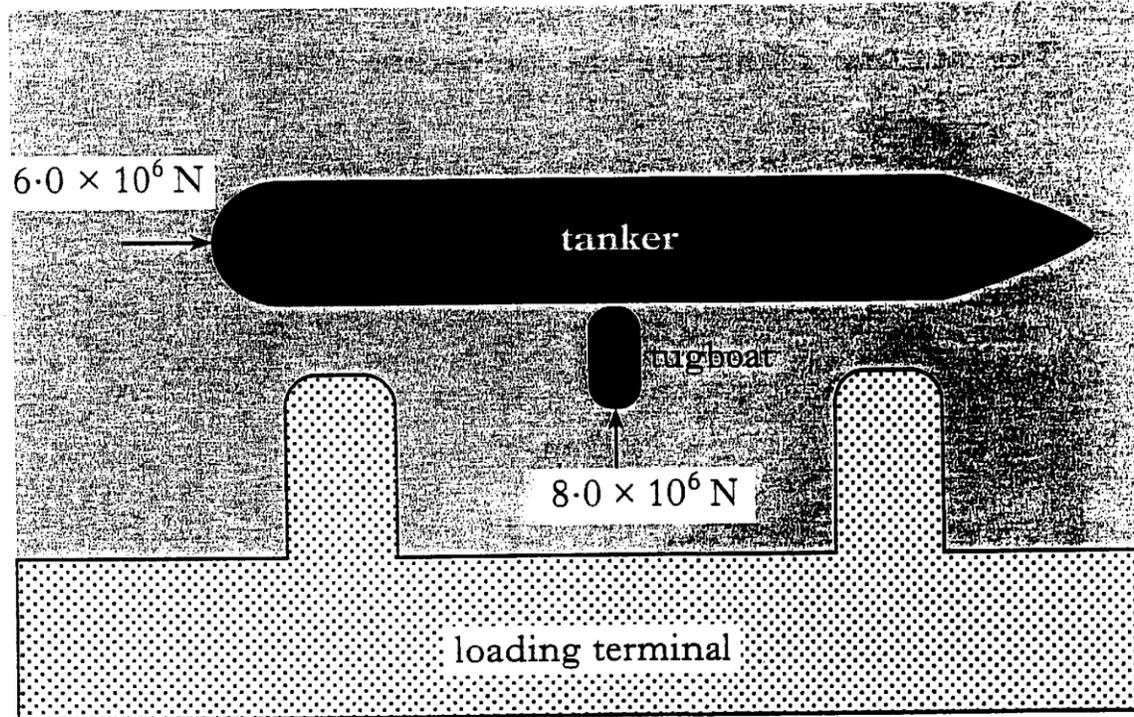
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22. A fully laden oil tanker of mass 7.5×10^8 kg leaves a loading terminal.

Its engine and propellers produce a forward force of 6.0×10^6 N. A tugboat pushes against one side of the tanker as shown. The tug applies a pushing force of 8.0×10^6 N.



- (a) Using a scale diagram or otherwise, find the size of the resultant of these two forces.
- (b) Calculate the initial acceleration of the tanker.

22. (a) $F^2 = (8 \times 10^6)^2 + (6 \times 10^6)^2$ (1/2)

$F = \sqrt{(1.0 \times 10^{14})}$ (1/2)

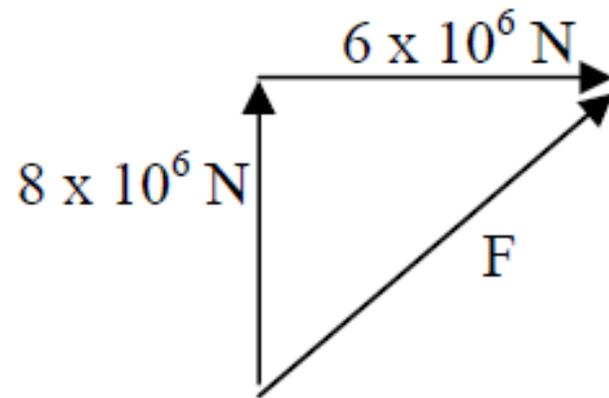
$= 1.0 \times 10^7 \text{ N}$ (1)

OR by scale diagram

diagram (1)

all vectors accurate to
the same scale (1/2)

evidence of measurement
of resultant and scaling to
answer (1/2)



$$\begin{aligned} \text{(b)} \quad & F = m a && \text{(1/2)} \\ & 1.0 \times 10^7 = 7.5 \times 10^8 \times a && \text{(1/2)} \\ & a = 0.013 \text{ m/s}^2 && \text{(1)} \end{aligned}$$

(range of significant figures is from 0.01 to 0.01333)

TAKE THE VALUE OF “g” ON THE EARTH
AS

$$9.8 \text{ m s}^{-2}$$

$$9.8 \text{ N kg}^{-1}$$

Unless otherwise stated,!

We've been an awesome team, so now show them just how awesome!

- **This slide is intentionally blank!**

Do you know one thing? Two? Three? Enough!

FREQUENCY REMAINS UNCHANGED

- On refraction
 - On interference
- The higher the frequency of the em radiation the greater the energy it possess.

I believe in you, so go and show what you can do!

Here is National 5 Physics SQA Command Words May 2018

describe

you must provide a statement or structure of characteristics and/or features;

determine or calculate

you must determine a number from given facts, figures or information; You should use numbers given in the question to work out the answer. Show your working, as it. Always give the units as the final mark is for the answer and unit.

estimate

you must determine an approximate value for something;

explain

you must relate cause and effect and/or make relationships between things clear. state the reasons for something happening. The answer should not be a simple list of reasons. This means that points in the answer must be linked coherently and logically. All of the stages/steps in an explanation must be included to gain full marks.

Don't be the one that uses the $\frac{1}{2}$ equation for anything but capacitance

identify, name, give, or state	you need only name or present in brief form. Only a short answer is required, not an explanation or a description. Often it can be answered with a single word, phrase or sentence. Negative marking so don't add more than required..
justify	you must give reasons to support your suggestions or conclusions, eg this might be by identifying an appropriate relationship and the effect of changing variables;
predict	you must suggest what may happen based on available information;
show that	you must use the appropriate formula to prove something e.g. a given value - All steps, including the stated answer and units, must be shown;
suggest	you must apply knowledge and understanding of physics to a new situation. A number of responses are acceptable: marks will be awarded for any suggestions that are supported by knowledge and understanding of physics.

Don't be the one that uses the $\frac{1}{2}$ equation for anything but capacitance

use your knowledge of physics or aspect of physics to comment on

you must apply your skills, knowledge and understanding to respond appropriately to the problem/situation presented (for example by making a statement of principle(s) involved and/or a relationship or equation, and applying these to respond to the problem/situation). you will be rewarded for the breadth and/or depth of their conceptual understanding.

Use the information in the passage/ diagram/ graph/ table to...

The answer must be based on the information given in the question. Unless the information given in the question is used, no marks can be given.

compare

This requires you to describe the similarities and/or differences between things, not just write about one. If you are asked to 'compare x with y', you need to write down something about x compared to y, using comparative words such as 'better', 'more than', 'less than', 'quicker', 'more expensive', 'on the other hand.'

And lastly.....

I WISH YOU ALL THE

BEST!

SOCK IT TO 'EM!

Me and thee do synergy- so now you just need to write it down

SO LONG AND THANKS FOR ALL THE FISH

- And all the best, you've been so good to teach this year thank you!
- <https://www.mrsphysics.co.uk/HIGHER/>



Leaving it blank is definitely zero, but writing something could gain you marks