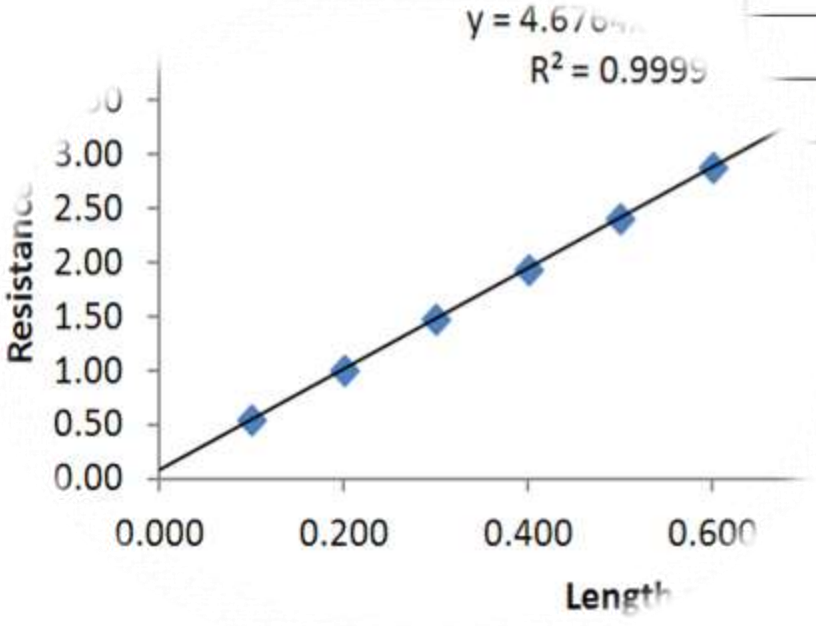
ISA's

Where did I go wrong.....

/m	Voltage/ V	Re
.100	0.27	0.54
0.200	0.50	1.00
0.300	0.74	1.48
0.400	0.97	1.94
0.500	1.20	2.40
0.600	1.44	2.88
0.700	1.68	3.36
0.800	1.91	3.82
.900	2.15	4.30
	2.36	



ISA GRAPHS

Students lost marks….

By creating a poor best-fit line. either 'zig-zagged' their line or for failing to get an equal spread of points on either side of the best-fit line.

Failure to give units for the gradient, or, failure to convert the units of the x and y axes to give the value of the gradient in the units the question requires.

By not using the gradient from the graph. In most ISAs the gradient of the graph will be used to give the required value. Some students have calculated the required value from individual values substituted into a formula. This procedure is incorrect.

By failing to plot points on a graph correctly, or, first of all, by failing to calculate a mean value correctly.

The fitting of $y = mx + c$ is often done poorly, as is the explanation of the expression 'directly proportional to'. The latter means the line is straight **and** goes through the origin.

Failure to describe a relationship properly from a graph. The usual relationship (if a straight line has been created) is 'y is directly proportional to x' (but this only applies if the line is straight **and** passes through the origin).

TABLES

Students lost marks….

By failing to repeat readings when required.

By giving the incorrect number of decimal places for a value. Sometimes too few figures were given, sometimes too many were given.

A mean value must have the **same** number of decimal places as the original readings,

A calculated value should have the same number of decimal places as the numbers that have made up that calculated number.

At the top of the table is where you place a heading then unit in the format…

Displacement s/m

You might also put an eror indicating precision of the equipment i.e.

Time /s ± 0.01s

The values which create the most difficulty for students are those of distance when a ruler has been used, that is ± 1 mm, ± 0.1 cm, ± 0.001 m.

Methods

Students lost marks….by failing to hit the marking points when an experimental description is needed. The following procedure might help:

Do **not** write prose, use only bullet points.

Always exaggerate the number of repeat readings (at least 3 repeats) – after all your will never have to do the experiment!

State what graph you will draw (x and y axes' values), what the gradient represents and what you will do with the readings you take from the graph. A graph will be required in many experimental descriptions; merely substituting individual values into an equation will be a rare activity.

State **how many** readings to take, at **what intervals** and over **what range**, and with which **measuring instruments**. (Exaggerate the number of readings.)

Introduce a few innovative ideas to improve the experiment.

State the obvious steps that you would take; don't assume the examiner will know what you are describing.

Be clear on how you would improve the **reliability**, the **precision** and the **accuracy** of the results.

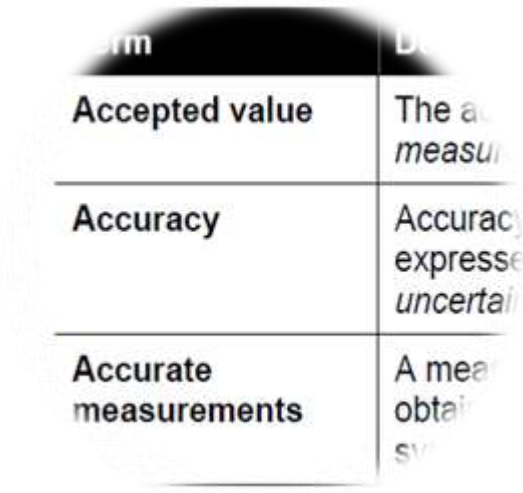
Key Terms

Many students failed to notice that 2 (or more) marks can be given for a question. Providing one part to the answer will not gain both marks. Very often, such questions start with the word 'explain'. The answer must include **what** is happening and **how** do you know or **why** it is happening.

If asked for the **range** of a series of values, it is insufficient to give the smallest number to the largest number, the range has to be worked out from the subtraction of the smallest from the largest.

Whereas the expressions 'positive correlation' and 'negative correlation' may be used in mathematics lessons, they are not used in physics. Stating that the line had a '**positive gradient**' or '**negative gradient**' would be what is used in physics.

You need to learn and regurgitate the key ISA glossary terms.



Accepted value	The a… *measu…*
Accuracy	Accurac… expresse… *uncertai…*
Accurate measurements	A mea… obta… s…

Mathematical

Students lost marks….

By using fractions. Fractions must **not** be used anywhere in physics, as the number of decimal places implied could be infinite e.g. 1/3 is 0.33333333333333333333 3 etc. Similarly, 0.3* must not be used, for the same reason.

By mixing up uncertainties and percentage uncertainties. Again, highlighting the question should help eliminate this problem. Students should remember that uncertainties have units, whilst percentage uncertainties have none.

By failing to recognise which error they were being asked to discuss. Sometimes the question asks about the error / uncertainty brought about the **precision** of the instrument (where ± the smallest division is needed). Sometimes the error is to do with the **range** of the repeated readings (where ± half the range is required).

With regard to uncertainties, students failed to read properly the instruction 'give the uncertainty in your **largest** values..'. This requires an answer of + / - **half** the range of the largest values. If the repeated values are all identical, the uncertainty is + / - the instrument uncertainty.