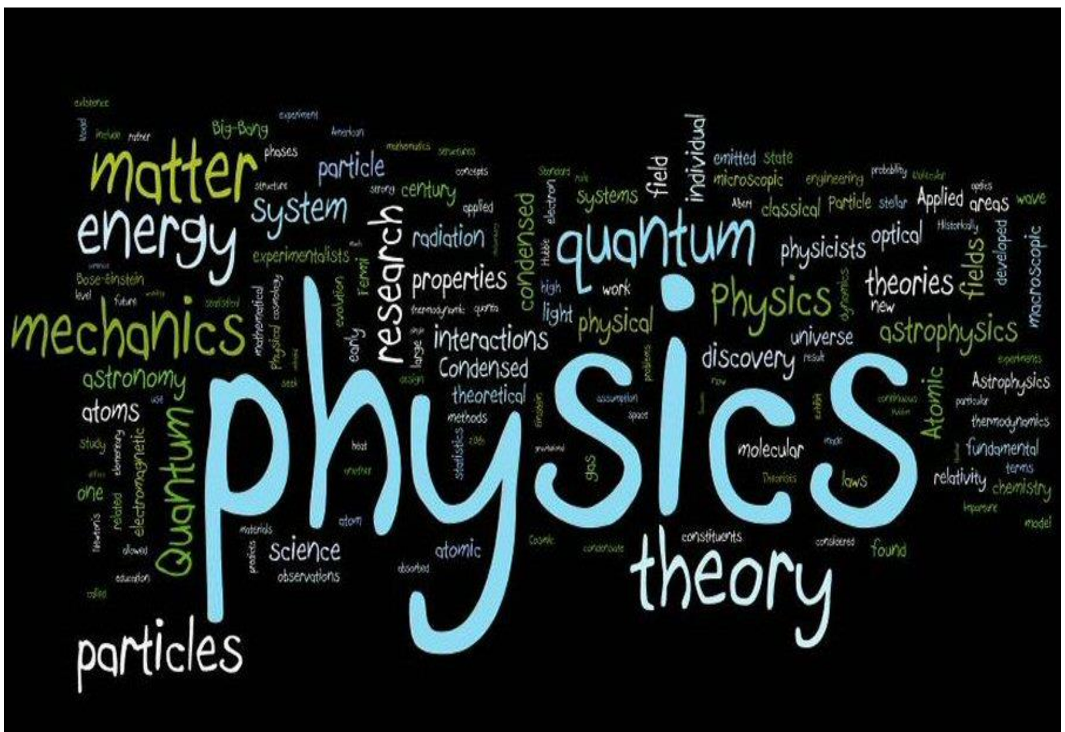
PHYSICS
O-Level

PHYSICS – 5054

5054/32



By:
Sir Hafiz

10 seconds check list

- Be interactive, whatever happen, be **ACTIVE!!!!**
- Not sure.... **Ask....**
- **Enjoy** what **YOU** learn this afternoon

MENU

Today's special

- *Appetizer:*

  About the practical papers

- *Main course:*

  Physics practical skills

  Graph

- *Desserts:*

  Q&A session

About the practical papers

- **20 %** of the marks for Cambridge O Level Physics are **for practical work**.

Paper number and type	How long and how many marks?	What's invovled?
Paper 3 Practical Test	2 hours (30 marks)	You do a practical exam which is supervised by a teacher

Paper 3 Practical Test

You will carry out four short experiments.

- Section A - **3** short questions (20 minutes each)
- Section B - **1** question (1 hour)

For Examiner's Use

2 *In this experiment, you will investigate the mixing of hot and cold water.*

You have been provided with

- an empty 250 cm^3 beaker labelled A,
- a 250 cm^3 beaker containing water at room temperature,
- a supply of hot water,
- a 100 cm^3 measuring cylinder,
- a thermometer,
- a plastic stirrer,
- a stand, boss and clamp to hold the thermometer.

(a) **(i)** Measure the temperature θ_1 of the water at room temperature.

θ_1 = ...

(ii) Pour 50 cm^3 of the water at room temperature into the measuring cylinder.

(iii) Place the thermometer in the clamp and carefully tighten the jaws. The bottom of the bulb of the thermometer should be about 1 cm above the bench.

(iv) Pour hot water into beaker A until the water level reaches the 100 cm^3 mark. Place the thermometer in the hot water as shown in Fig. 2.1.

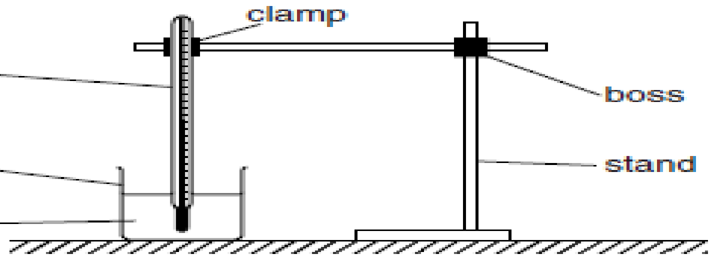


Fig. 2.1

Stir the water. Record the maximum temperature θ_2 shown on the thermometer before the temperature starts to fall.

θ_2 = ...

(v) Immediately pour the 50 cm^3 of water from the measuring cylinder into beaker A. Stir the mixture. The reading on the thermometer will fall quickly at first and then at a slower rate. As soon as it starts to fall at the slower rate, record the temperature θ_3 of the mixture.

θ_3 = ...

[3]

Paper 3 Practical Test

You are given instructions to carry out the experiments.

(c) Lift stand A off the knife-edge and move the stand a few centimetres to the right. Replace stand A on the knife-edge. The right-hand end of the stand will move towards the bench.

Slide one of the loops of the spring on to the end of the rod and hold the other loop in the clamp. Adjust the height of the clamp until the rod is horizontal. The arrangement is shown in Fig. 1.3. Make the extension of the spring as large as possible by moving stand A further to the right. Adjust the height of the clamp so that the rod is horizontal and move stand B so that the spring is vertical.

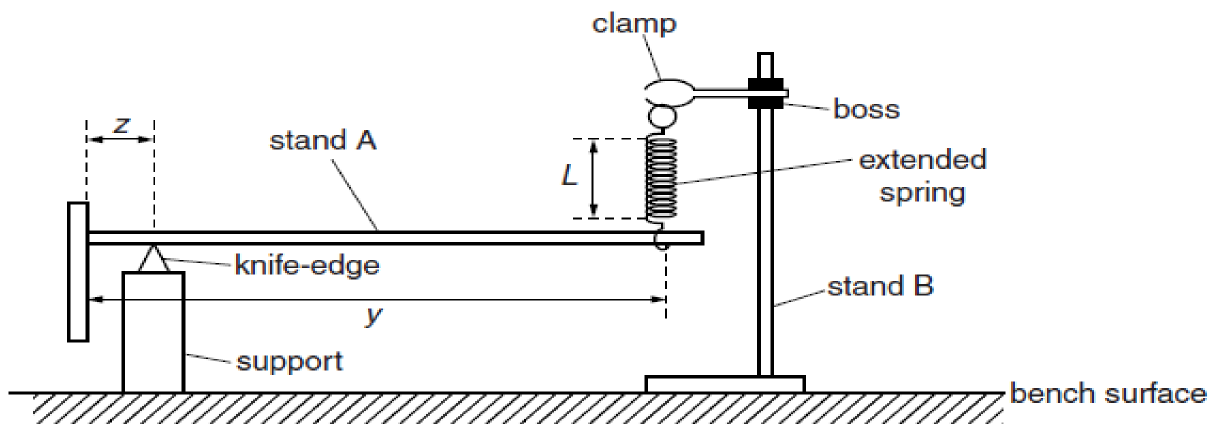


Fig. 1.3

Measure

(i) the distance *y* from the top of the base of stand A to the spring,

$y =$ ....

(ii) the distance *z* from the top of the base of stand A to the knife-edge,

$z =$ ....

3 *In this experiment, you will investigate the resistance of a filament lamp.*

You have been provided with

- a 3V power supply,
- a switch,
- a 3.3 Ω resistor,
- a 33 Ω resistor,
- a filament lamp in a holder,
- an ammeter,
- a voltmeter with two connecting leads,
- two further connecting leads.

The Supervisor has set up the circuit shown in Fig. 3.1.

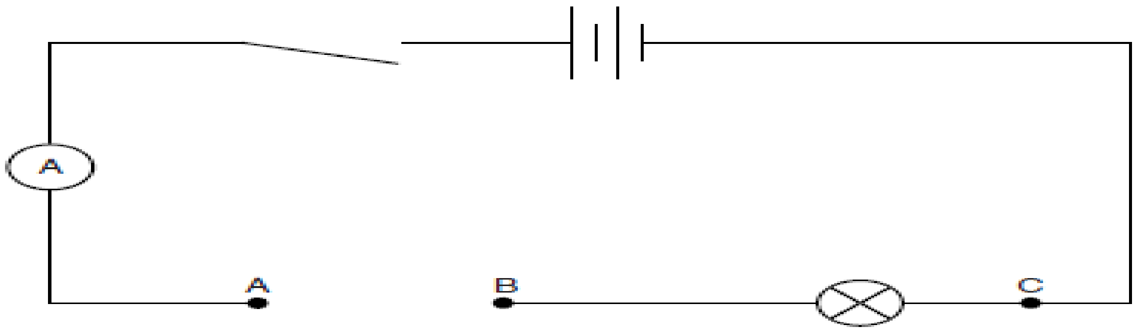


Fig. 3.1

(a) Using the two spare leads, connect the 3.3 Ω resistor between A and B. Connect the voltmeter between points B and C. Close the switch and record the potential difference (voltage) V_1 across the lamp and the current I_1 in the circuit. Open the switch.

V_1 = ...

I_1 = ... **[1]**

(b) Calculate the resistance R_1 of the lamp using the equation

$$R_1 = \frac{V_1}{I_1}.$$

R_1 = ... **[1]**

Section B

4 *In this experiment, you will investigate the equilibrium of a mass suspended by two springs.*

You have been provided with

- a rod to which two springs are attached,
- a stand, boss and clamp to hold the rod,
- a spring identical to the other springs,
- a 100 g mass hanger and five 100 g slotted masses,
- a 30 cm ruler.

(a) Fig. 4.1 shows the single spring.

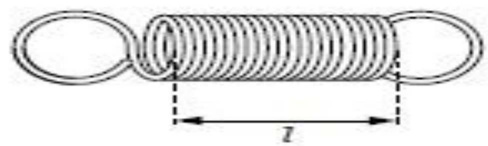


Fig. 4.1

Measure the length l of the unstretched coil of the spring, as shown in Fig. 4.1.

l = ... [1]

(b) The two-spring system has been set up as shown in Fig. 4.2.

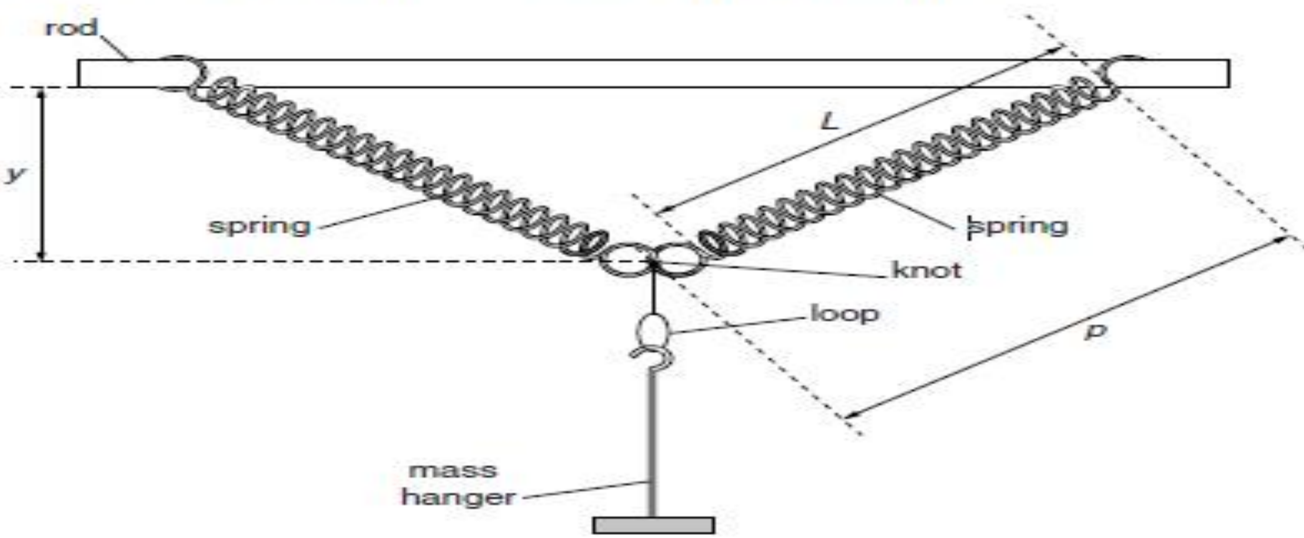


Fig. 4.2

Paper 3 Practical Test

- You will take **readings** and record them in a **table in question 4**.
- You need to use a sensible number of figures and give the unit in the heading.

Measured quanitity Units According to precision of instruments

V/V	I/A	R/Ω
3.05	0.55	
4.10	0.76	
4.65	0.81	

Paper 3 Practical Test

How can we improve the table data?

Mass (g)	Extension 1 (mm)	Extension 2 (mm)	Average Extension (mm)
0	0	1	0.5
100	5	6	5.5
200	9	9	9
300	15	15	15
400	20	21	20.5
500	24	25	24.5
600	30	31	30.5

- You will usually draw a graph and make some conclusions, commenting upon accuracy and on how to improve the experiment.

Paper 3 Practical Test

You may be asked to use the following techniques, amongst others:

- **recording current and potential difference + drawing circuit diagrams**
- **ray tracing + drawing ray diagrams**
- **measuring temperature**
- **balancing (Centre of mass and moments)**
- **stretching of springs**
- **timing of oscillations**

Your experience of practical work during Practical lesson should enable you to handle the apparatus.

Your teacher will be able to give you more examples and explain how to take readings and analyse the data.

PHYSICS PRACTICAL SKILLS

GRAPH

Graphs

Plotting graphs can be tested in Papers 2, 3.

When drawing graphs, you should:

- Remember to label the axes with both **quantity** and **unit**.

e.g. **distance/metres** or **d/m**.

(f) Using the grid opposite, plot a graph of sin *i* against sin *r*. Draw a straight line of best fit through your points. [4]

(g) Determine the gradient of the line of best fit.

gradient = ... [2]

Graphs

- Make sure the **axes** are the **correct way round**.

for example: Plot distance on the x-axis => x is horizontal axis!

- Make the scales go up in sensible amounts,

i.e. **0, 5, 10…** or **0, 2, 4**… **but not 0, 3, 6**… or **0, 7, 14**…

- All plotted points must fill more than half the graph paper.

Graphs

Check if you have been told to start the scales from the origin. If not, then think carefully about where to start the axes.

- When you are told to start the axes from a certain point (e.g. $x = 1$, $y = 20$) you must do so. Different point = lose a mark
- Use a **sharp pencil** to plot the points and draw the line.

Graphs

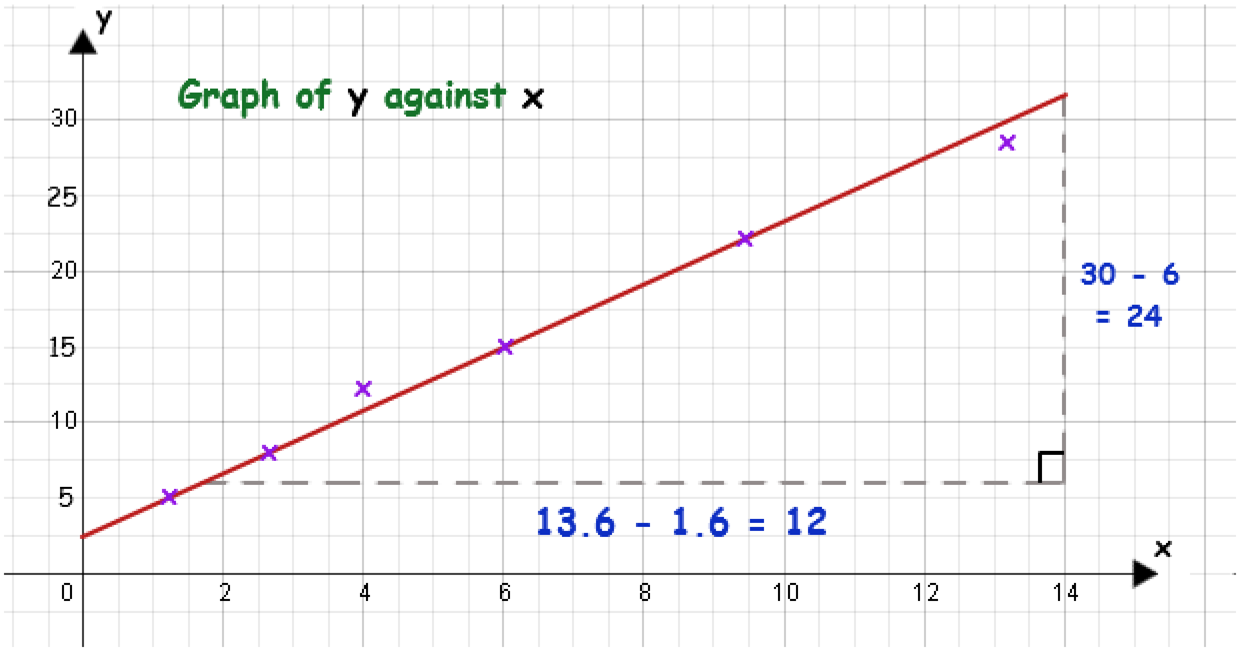
- **Plot the points carefully**. It is best to use small neat crosses.

Every point will be checked by the examiner, and you will lose the mark if any are wrongly plotted.

- Draw either a straight line or a smooth curve. In physics we never join the dots!

Graphs

- Your line may not go through all the points – especially in the practical papers.
- Remember that a best fit line (curve or straight) should have some points above and some points below the line.



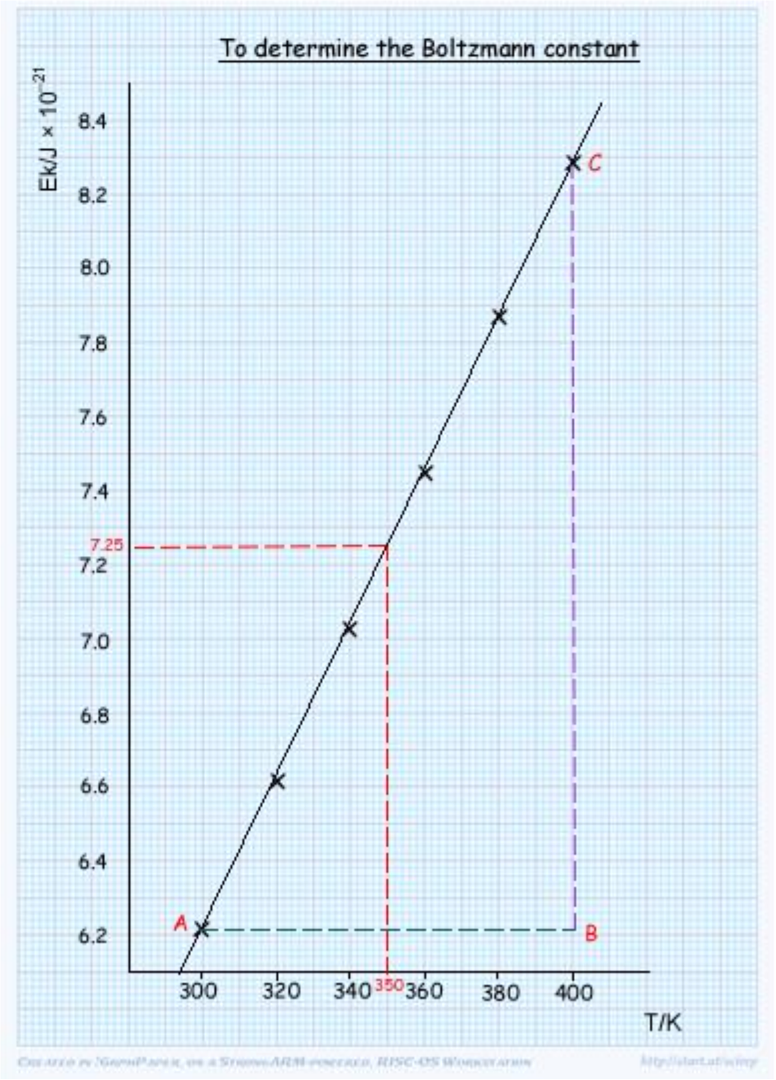
Graphs

When **taking readings** from a graph, you should:

- Draw a large triangle when measuring the gradient of a line. It must be at least half the length of the line.

Top tip: draw a triangle the full size of the graph!

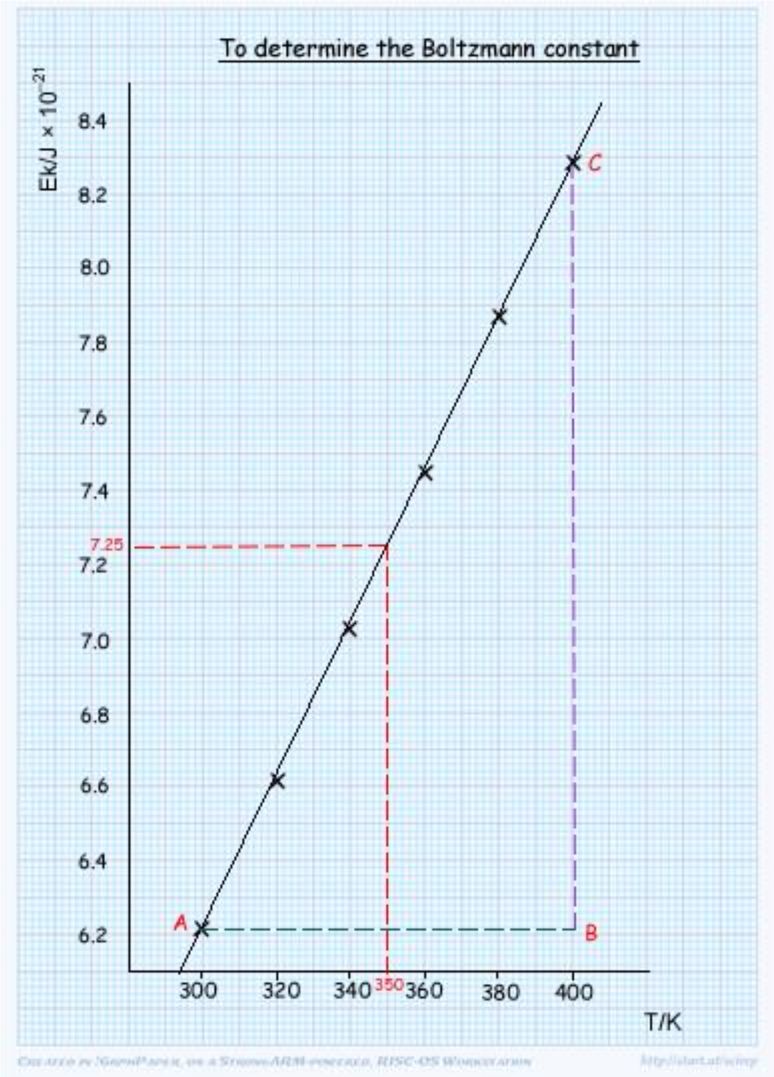
It is best to show the numbers on the sides of the triangle when finding the gradient.



Graphs

When **taking readings** from a graph, you should:

- Always use points on the line, not your plotted points, when calculating the gradient.



Graphs

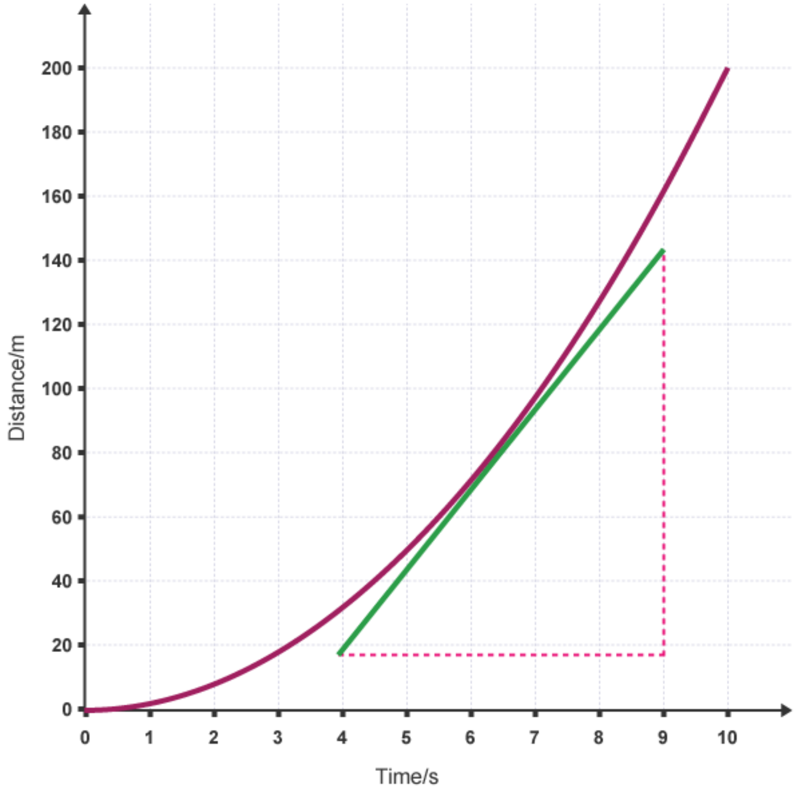
When **taking readings** from a graph, you should:

• Draw a tangent to find the gradient of a curve.

Make sure it is at the right place on the curve. Use a large triangle.

• Make sure you read the scales correctly when reading a value from a graph.

It may be that they are in mA rather than A or km rather than m.



Graphs

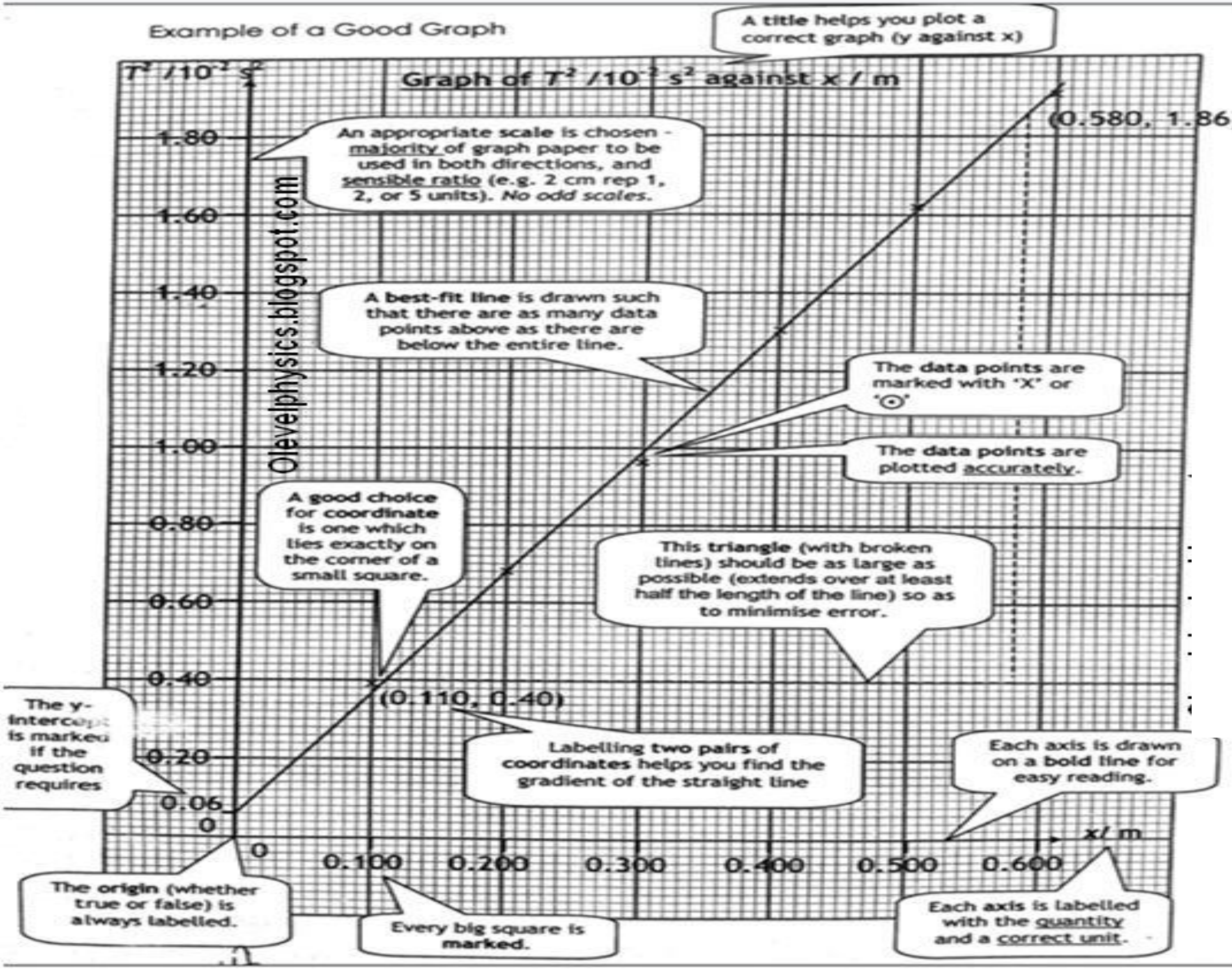
When **describing** the shape of a graph, remember that:

- **directly proportional** means a straight line through the origin.
- if the straight line does not go through the origin, then it is just called a **linear graph**

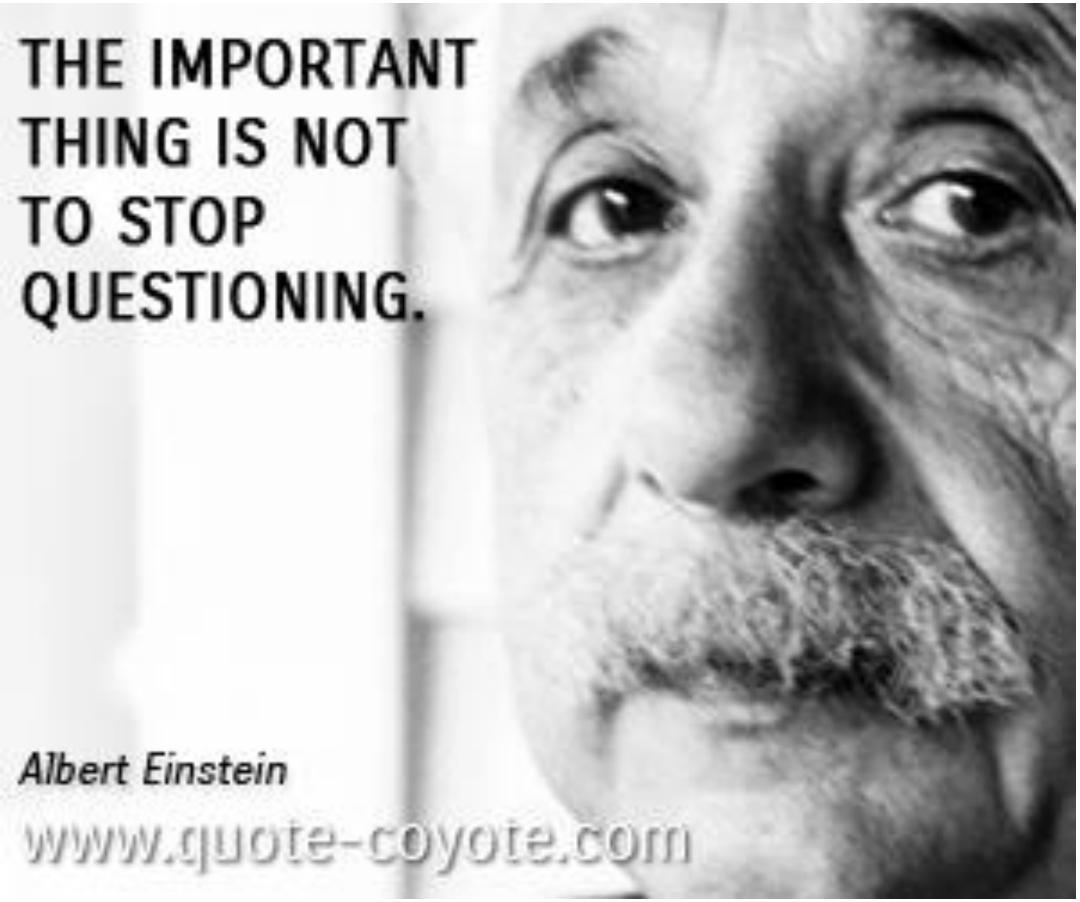
Graphs

Inverse relationship means increasing one quantity will cause the other to decrease

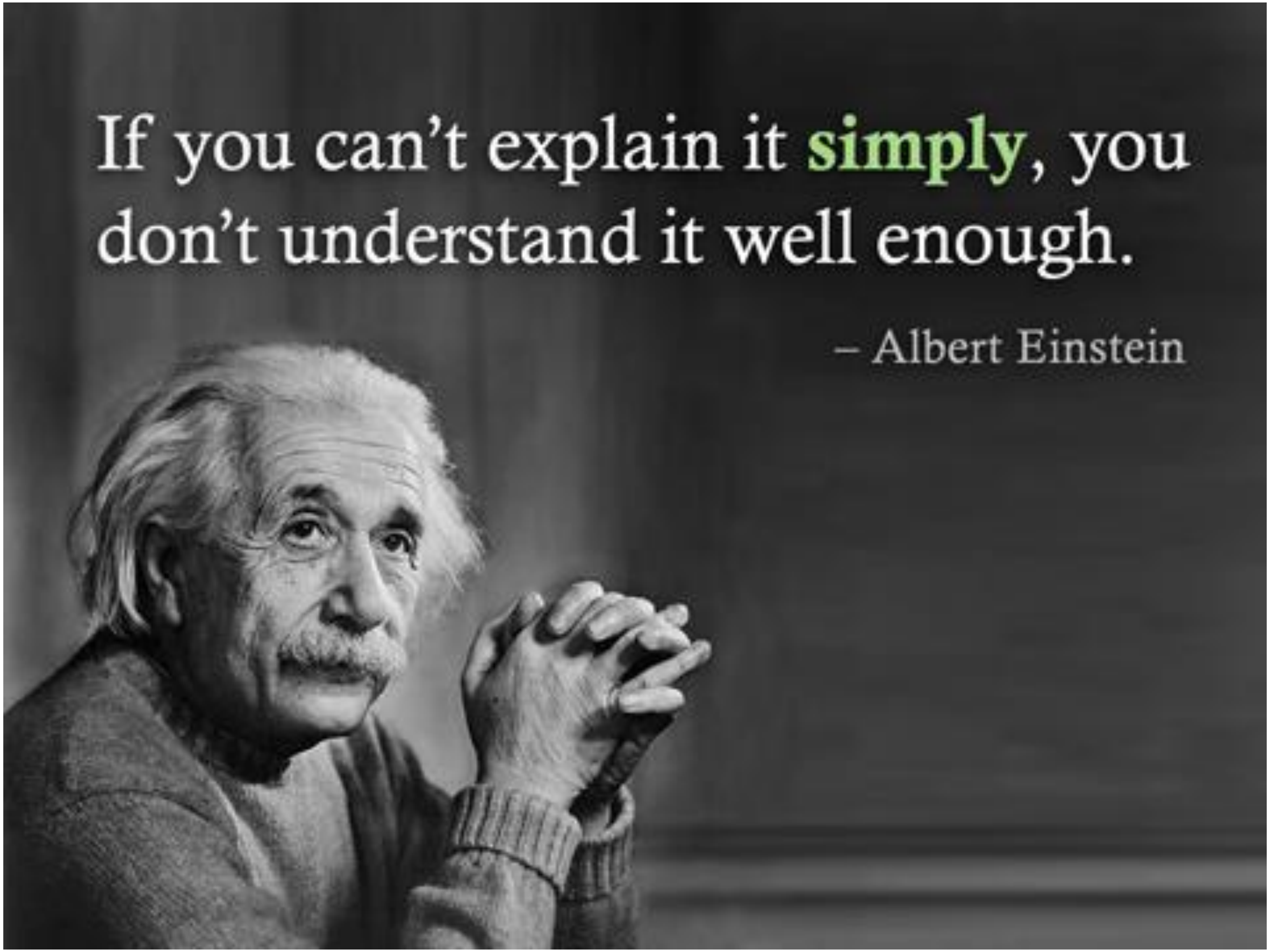
- if doubling one quantity causes the other to halve, then they are **inversely proportional**.



Example of a Good Graph
A title helps you plot a correct graph (y against x)
Graph of T^2 /10^{-2} s^2 against x / m
T^2 /10^{-2} s^2
An appropriate scale is chosen - majority of graph paper to be used in both directions, and sensible ratio (e.g. 2 cm rep 1, 2, or 5 units). No odd scales.
Olevelphysics.blogspot.com
A best-fit line is drawn such that there are as many data points above as there are below the entire line.
The data points are marked with 'X' or '⊙'
The data points are plotted accurately.
A good choice for coordinate is one which lies exactly on the corner of a small square.
This triangle (with broken lines) should be as large as possible (extends over at least half the length of the line) so as to minimise error.
(0.580, 1.86)
(0.110, 0.40)
Labelling two pairs of coordinates helps you find the gradient of the straight line
Each axis is drawn on a bold line for easy reading.
The y-intercept is marked if the question requires
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.06
0
0
0.100
0.200
0.300
0.400
0.500
0.600
x/ m
The origin (whether true or false) is always labelled.
Every big square is marked.
Each axis is labelled with the quantity and a correct unit.


THE IMPORTANT THING IS NOT TO STOP QUESTIONING.
Albert Einstein
www.quote-coyote.com

Q&A session


If you can't explain it simply, you don't understand it well enough.
– Albert Einstein

Thank you very much