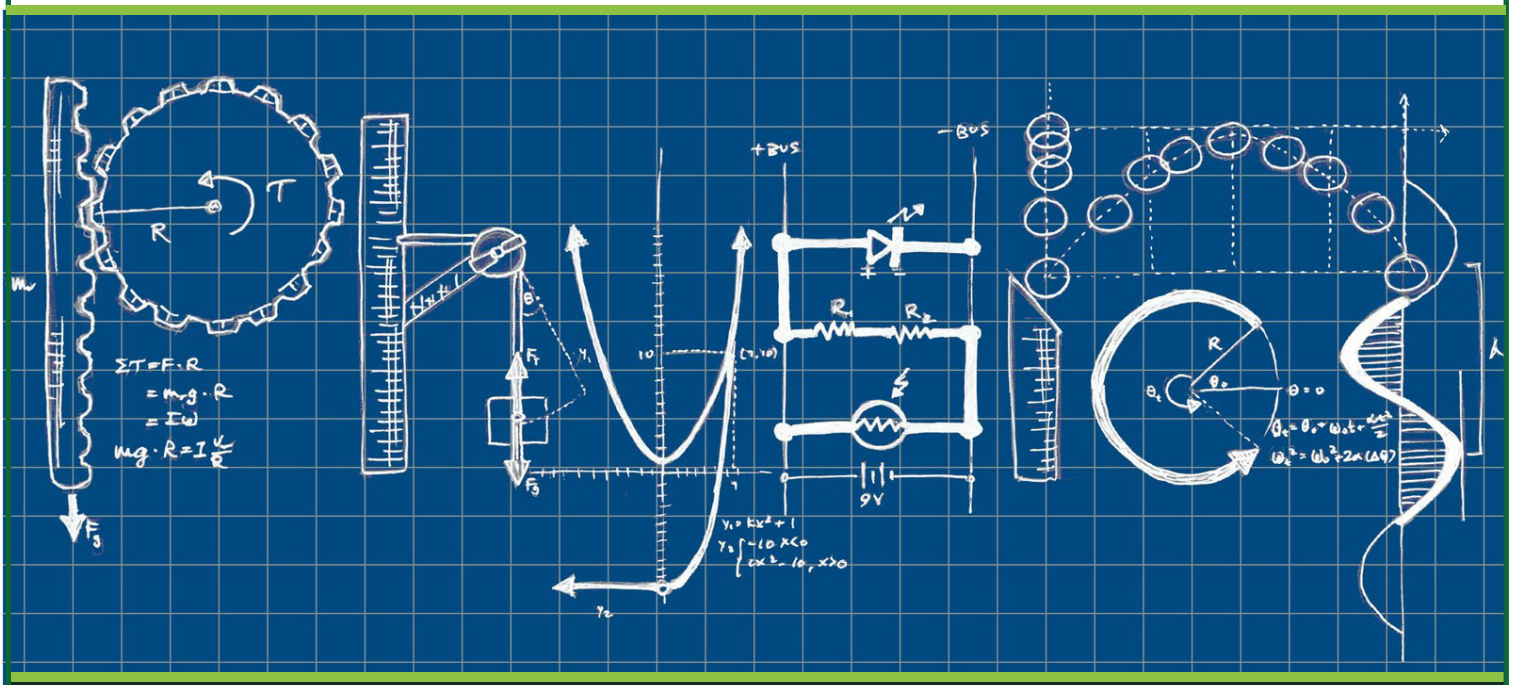
Bentley Wood
High School for Girls

Physics
Bridging work

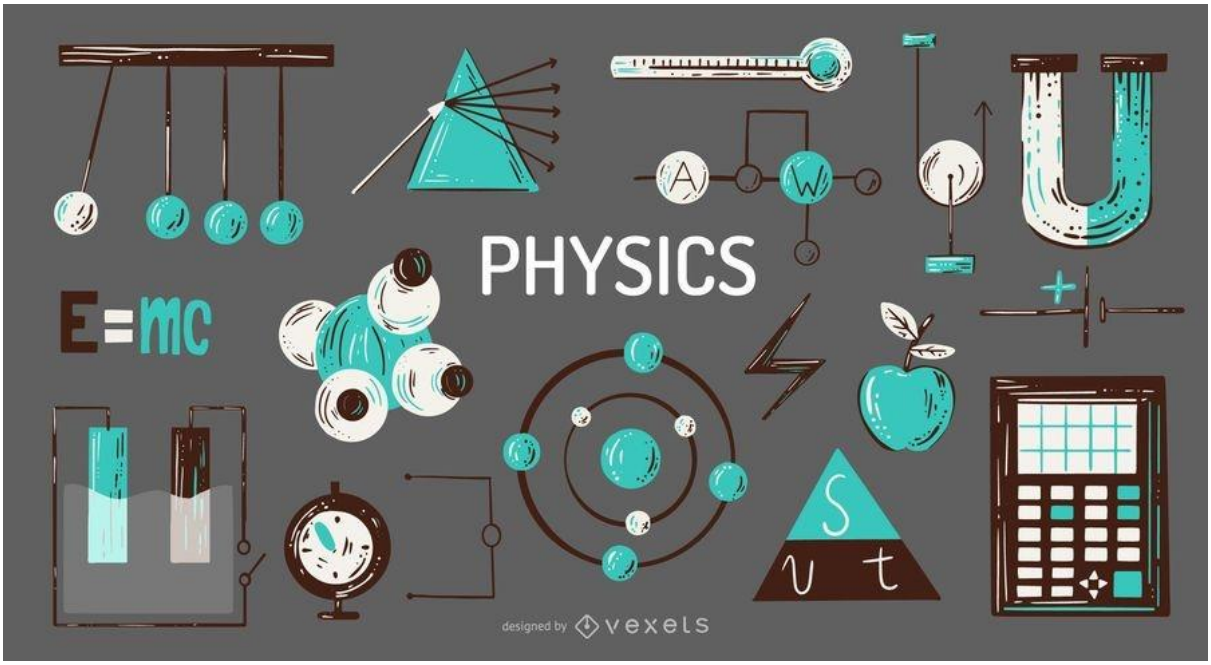
Year 10 into 11 for 2024/25



Name: _____

Tutor Group: _____

Teacher: _____



Yr10 to Yr11 Bridging work

1. Congratulations on completing your year 10 year and welcome to year 11, the year of your GCSE's.
2. The first mock will be at the end of your first half term back. This means that you need revise the year 9 and year 10 content over the summer.
3. This pack is your revision. You will need to show this fully completed to your first science lesson back.
4. This pack is divided into 3 sections:
    a. Required practical
    b. Exam question practice
    c. Content knowledge for forces
5. If you get stuck please use the resources available to you, including your textbook, youtube channels such as cognito and free science lessons and websites such as save my exams and bitesize.
6. Make sure you organise yourself to ensure that you also enjoy some time off and be ready to go in September.

Section 1: Required Practical

	Required practicals	Topic
14	**Determining specific heat capacity.** Determine the specific heat capacity of a metal block of known mass by measuring the energy transferred to the block and its temperature rise, and using the equation for specific heat capacity.	P2.2
15	**Investigating resistance.** Set up circuits and investigate the resistance of a wire, and of resistors in series and parallel.	P4.2 P4.5
16	**Investigating electrical components.** Correctly assemble a circuit and investigate the potential difference–current characteristics of circuit components.	P4.3
17	**Calculating densities.** Measure the mass and volume of objects and liquids and calculate their densities using the density equation.	P6.1
18	**Investigate the relationship between force and extension for a spring.** Hang weights of known mass from a spring and, using the correct apparatus, measure the resulting extension. Use the results to plot a force-extension graph.	P10.5
19	**Investigate the relationship between force and acceleration.** Using a newton-metre, investigate the effect on the acceleration of an object of varying the force on it and of varying its mass.	P10.1
20	**Investigating plane waves in a ripple tank and waves in a solid.** Determine which apparatus are the most suitable for measuring the frequency, speed, and wavelength of waves in a ripple tank, and investigate waves on a stretched string.	P11.4
21	**Investigating infrared radiation.** Determine how the properties of a surface affect the amount of infrared radiation absorbed or radiated by the surface.	P12.2

The following pages are designed to revise practicals 14, 16 and 19.

Practicals 20 and 21 will be completed in year 11.

Some useful video links:

Insulation - GCSE Science Required Practical (youtube.com)

GCSE Physics Revision "Required Practical 1: Specific Heat Capacity" (youtube.com)

All PHYSICS Required Practicals - GCSE Science (AQA) (youtube.com)

Specific Heat Capacity

1. Read the method used to measure the effects of different insulation:

• Connect the heater to a ammeter and power source in series and voltmeter in parallel.
• Measure and record the mass of the copper block in kg.
• Place the heater in the larger hole in the block.
• Put the thermometer in the smaller hole.
• Switch the power pack to 12 V. Switch it on.
• Record the ammeter and voltmeter readings (or Joule Meter Readings)
• Record the temperature every minute for 10 minutes.

2. Improvements:

Suggest ways in which you could improve these in experiment

Accuracy:

Precision:

Reliability:

3. Specific Heat Capacity can be measured using the equation

Energy = mass x Specific Heat Capacity x temperature change

Rearrange the formula to find:

Specific heat capacity =

What are the units for?

Energy:

Specific Heat Capacity:

Temperature change:

Mass:

4. Calculation

1. What is the specific heat capacity if the temperature rise is 5°C
of a 1Kg mass with 2000J of energy?

2. What is the specific heat capacity if the temperature rises from
27°C to 45°C of a 2Kg mass with 1000J of energy?

3. What is the energy needed to increase the temperature from
55°C to 100°C of a 2Kg mass and specific heat capacity?

5. Plan

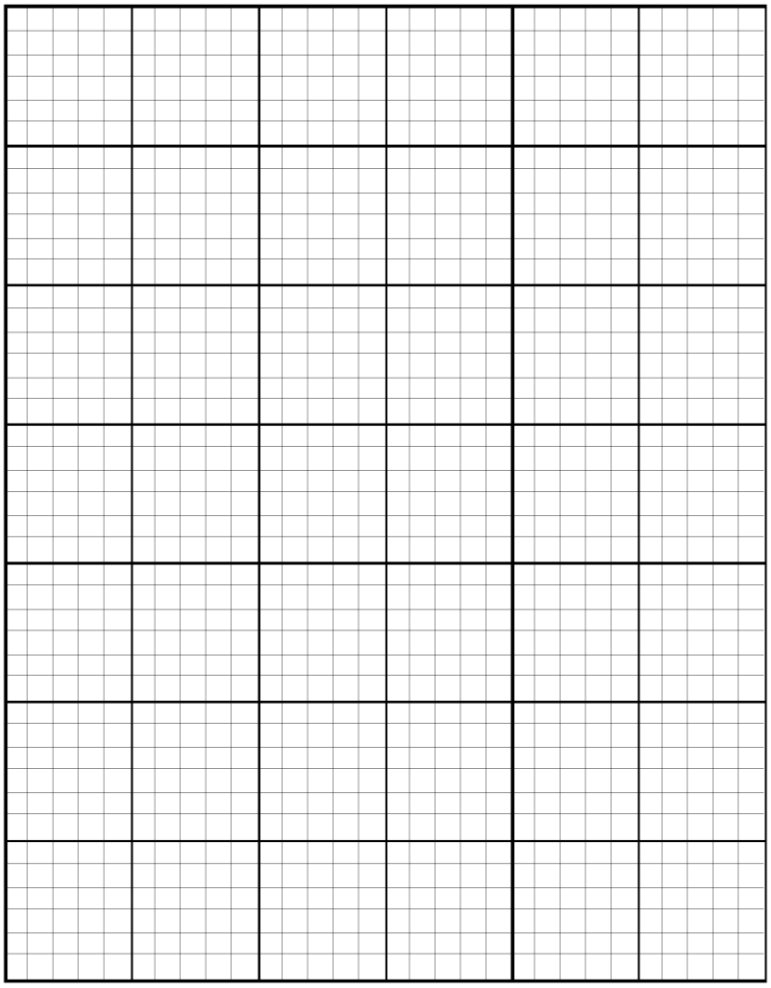
<u>Without turning over</u> write a step by step plan for measuring the specific heat capacity

7. Risk assessment

Write a risk assessment for this practical including what you would do to minimise these risks

6. Results

Use the results table to draw a graph of time on the x axis and temperature on the y axis



Time (min)	**Temperature (**°C)
1	35
2	35
3	37
4	40
5	42
6	44
7	45
8	47
9	49
10	52
11	54

I-V Characteristics

1. Read the method used to measure the effects of different insulation:

• Swap the connections on the battery. Now the ammeter is connected to
the negative terminal and variable resistor to the positive terminal.
• Connect the Voltmeter in parallel across the Power Supply.
• Record the readings on the ammeter and voltmeter in a suitable table.
• Connect the resistor in the circuit as shown in the diagram.
• Continue to record pairs of readings of current and potential difference
with the battery reversed.
• Change the component from a resistor to a diode/lamp and repeat.
• Connect the Ammeter in series.
• Adjust the voltage of the Power Supply and record the new ammeter
and voltmeter readings. Repeat this to obtain several pairs of readings.
• The readings on the ammeter and voltmeter should now be negative.

2. Risk assessment:

Suggest what the risks are in this experiment. Describe what you should do to minimise the risks.

1.

2.

3.

3. What are the variables in this experiment?

Independent:

Dependent:

Control:

How would you control these variables to minimise their effect?

4. Convert

1mA = 0.001A

1. 500 mA = ... A

2. 25 mA = ... A

3. 770 mA = ... A

4. 5.8 mA = ... A

5. 900 mA = ... A

6. 1 mA = ... A

5. Plan

Without turning over write a step by step plan for draw a I-V graph for a bulb, include a circuit diagram

7. Conclusion

Explain the each of the graphs:

a) Diode

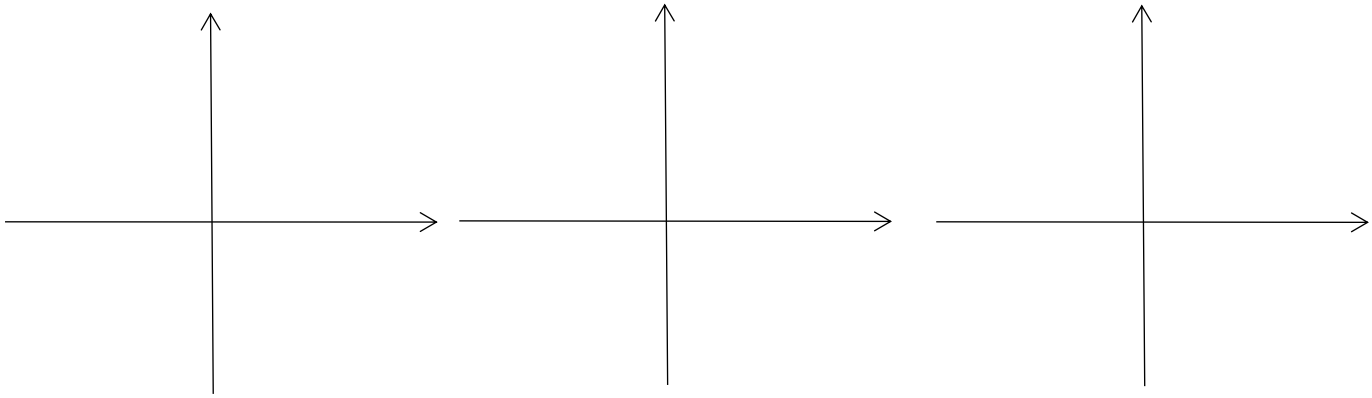
b) resistor

c) lamp

6. I-V graphs

Sketch a IV graph for:

a) diode b) fixed resistor c) lamp



Acceleration

1. Read the method used to obtain results on acceleration:

• Connect the light gates to the data logger, to measure the velocity of the trolley. Input the length of the card on the trolley.
• Set up a track on a slope (to account for friction).
• Tie a length of string to the trolley. Pass the string over the pulley and attach the mass stack to the other end of the string.
• Make sure the mass stack doesn't touch the floor before going through the light gate.
• Clamp the a light gate horizontally. Position them above the slope so that the card passes through them as the trolley moves.
• Let the trolley go. The trolley should accelerate through the light gate as the masses fall to the ground.
• Repeat the experiment changing the masses attached to the string and adding them to the trolley.

2. Risk assessment:

Suggest what the risks are in this experiment. Describe what you should do to minimise the risks.

1.

2.

3.

3. What are the variables in this experiment?

Independent:

Dependent:

Control:

How would you control these variables to minimise their effect?

4. Calculation

$$\boldsymbol{Acceleration} = \frac{\boldsymbol{change\ of\ velocity}}{\boldsymbol{time}}$$

Complete the following calculations:
1. A mass accelerates from rest to 4 m/s in 8 seconds. What is the acceleration?

2. A mass accelerates from 2m/s to 8 m/s in 2 seconds. What is the acceleration?

3. A mass decelerates from 100 m/s to 50 m/s in 10 seconds. What is the deceleration?

5. Plan

<u>Without turning over</u> write a step by step plan for measuring the acceleration of a trolley.

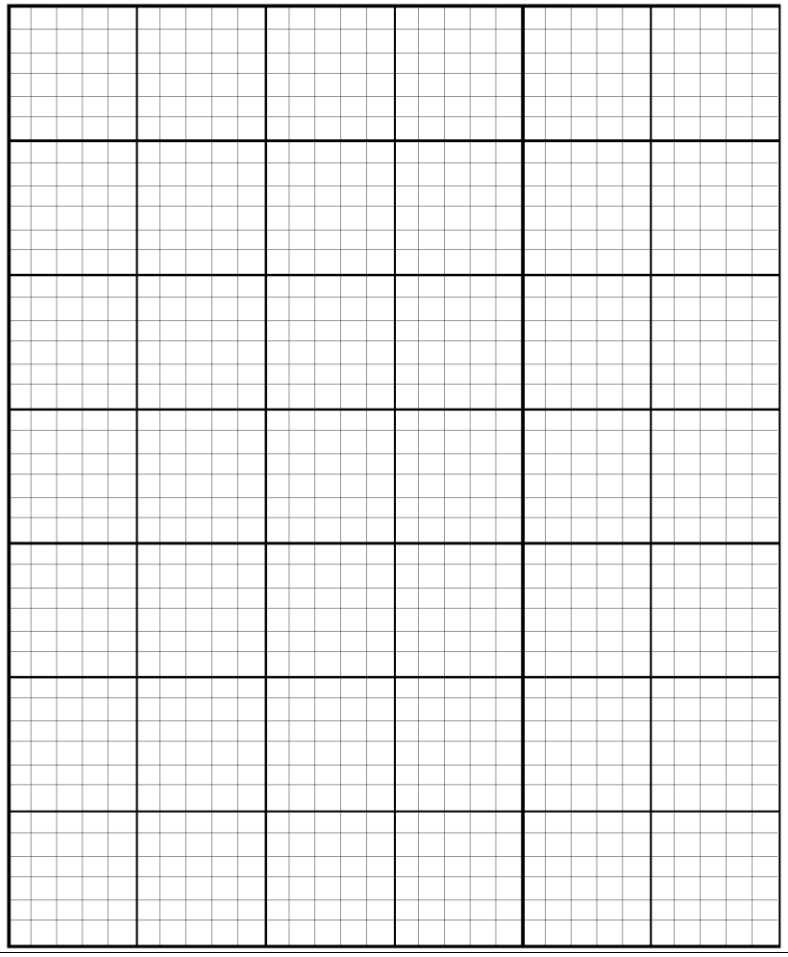
7. Correlation

As the force increases… Is the graph proportional?

What does this mean?

How would you use the graph to find the mass of the trolley and masses?

6. Results



Force (N)	Acceleration (m/s/s)
0.2 N	0.8 m/s/s
0.4 N	1.6 m/s/s
0.6 N	2.4 m/s/s
0.8 N	3.2 m/s/s
1 N	4.0 m/s/s

Use the results table to draw a graph with the force on the x axis and acceleration on the y axis.

Section 2: Exam Questions

Q1.

A student investigated how the current in a circuit varied with the number of lamps connected in parallel in the circuit.

Figure 1 shows the circuit with three identical lamps connected in parallel.

Figure 1

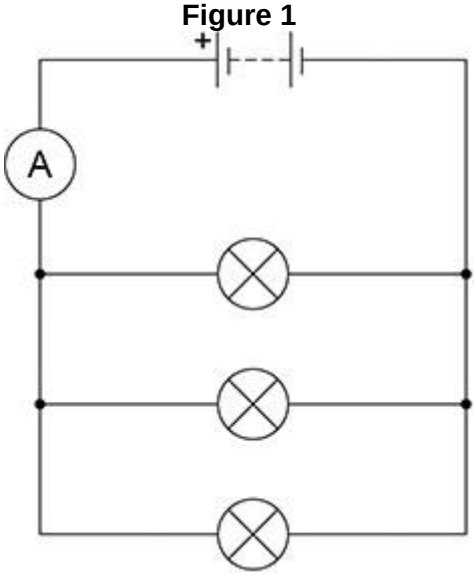
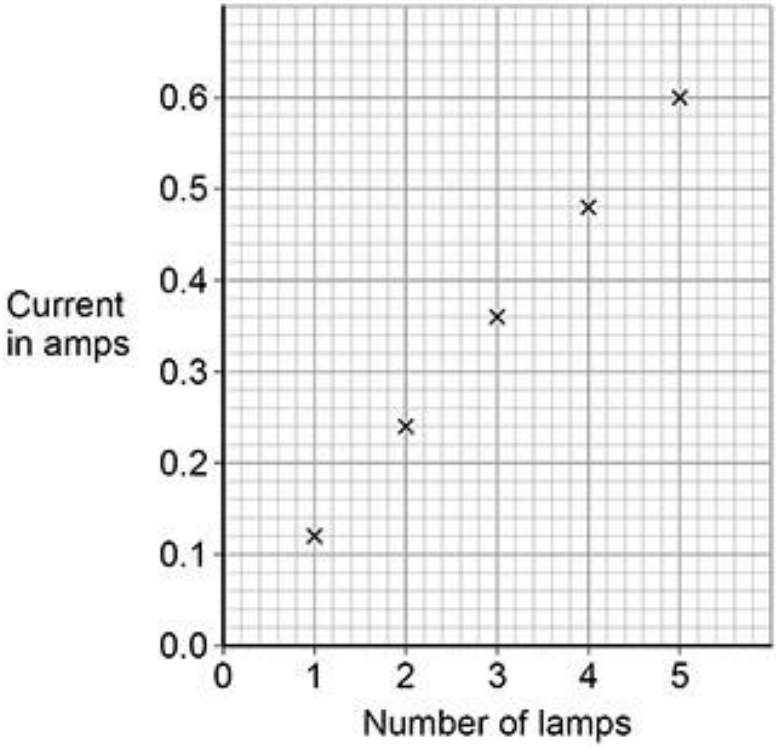


Figure 2 shows the results**.**

Figure 2



(a) Complete the sentences.
Choose answers from the box.
Each answer can be used once, more than once or not at all.

decreased	stayed the same	increased

As the number of lamps increased, the current _____.
As the number of lamps increased, the total resistance of the circuit _____ .
As the number of lamps increased, the potential difference across the battery _____ .

(3)

(b) When there were three lamps in the circuit the ammeter reading kept changing between 0.35 A and 0.36 A.
What type of error would this lead to?
Tick (✓) **one** box.

Random error ☐

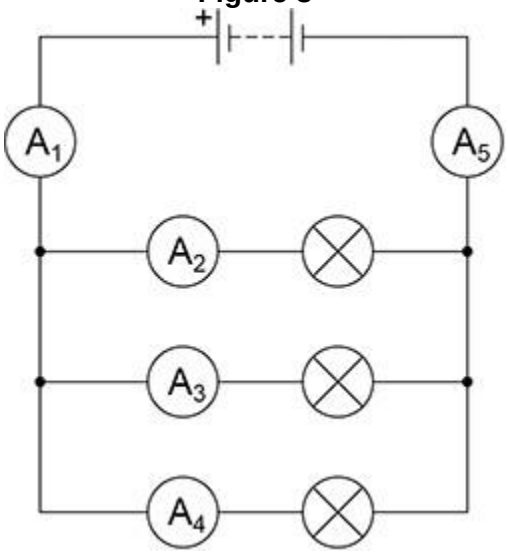
Systematic error ☐

Zero error ☐

(1)

Figure 3 shows a circuit with five ammeters and three identical lamps.

Figure 3



(c) Complete the table below to show the readings on ammeters A_2 and A_5.

Ammeter	**A_1**	**A_2**	**A_3**	**A_4**	**A_5**
Current in amps	0.36		0.12	0.12	

(2)

(d) The resistance of one lamp is 15 Ω.
The current in the lamp is 0.12 A.
Calculate the power output of the lamp.
Use the equation:

power = (current)^2 × resistance

_____

_____

_____

Power = _____ W

(2)

(Total 8 marks)

Q2.

A student investigated the density of different fruits.
The table below shows the results.

Fruit	Density in g/cm^3
Apple	0.68
Kiwi	1.03
Lemon	0.95
Lime	1.05

(a) The student determined the volume of each fruit using a displacement can and a measuring cylinder.
What other piece of equipment would the student need to determine the density of each fruit?

_____

(1)

(b) Write down the equation which links density (ρ), mass (m) and volume (V).

_____

(1)

(c) The mass of the apple was 85 g.
The density of the apple was 0.68 g/cm^3.
Calculate the volume of the apple.
Give your answer in cm^3.

_____
_____
_____
_____
_____

Volume = _____ cm^3

(3)

(d) The student only measured the volume of each fruit once.
The volume measurements **cannot** be used to show that the method to measure volume gives precise readings.
Give the reason why.

_____
_____
_____

(1)

(Total 6 marks)

Section 3: Maths on forces

Vectors

Although this isn't actually mentioned in the maths skills, it is part of the specification. You need to know:

What a vector is

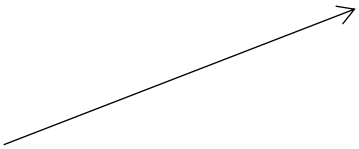
A vector is a quantity that has both size (magnitude) AND direction. Velocity is a vector – you have to say '3 m/s to the right', for example. If you just said '3 m/s', you haven't fully said what the velocity is – the direction is very important. On its own, '3 m/s' is just a speed – which is scalar NOT a vector. To illustrate this, you know that when something accelerates, its velocity changes (acceleration = change in velocity/time). You also know that a resultant force is required to cause the acceleration (F = ma, remember?). Now, since velocity is a vector, if the direction has changed, so has the velocity (3 m/s to the left and 3 m/s to the right are NOT the same). If you didn't state the direction, the fact that the object had completely turned around would be missed and you would not realise that a resultant force has been acting to make this happen.

How to describe vectors

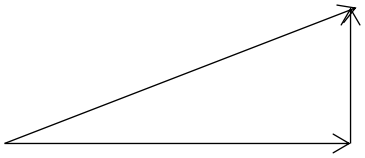
The description must include BOTH the size AND the direction. So a distance (scalar quantity) might be 22 m.
A displacement (vector) version would be '22 m north'.

How to take any vector and break it up (resolve it) into two vectors at right angles to each other (You only need to know how to do this at Higher tier.)

For example, here's a vector, representing a force, which makes an angle of 20° to the horizontal:



You can see that it has an effect horizontally to the right and also has an effect vertically upwards. So, we could achieve the same effect with two forces – one horizontally to the right and the other vertically upwards. These three forces form a triangle:



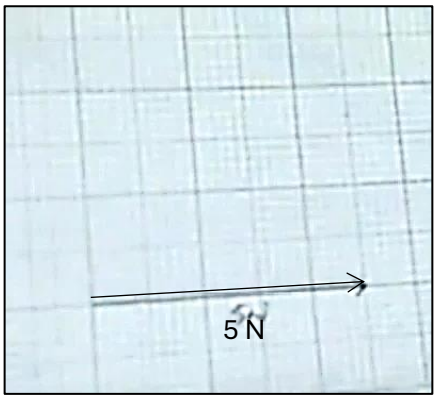
This process of breaking down a vector into two parts (**components**) which are at 90° to each other is called **resolution**. We have resolved this force at 20° into its horizontal and vertical components.

How to add vectors together, using scale drawing (this is finding the resultant) (You only need to know how to do this at Higher tier.)

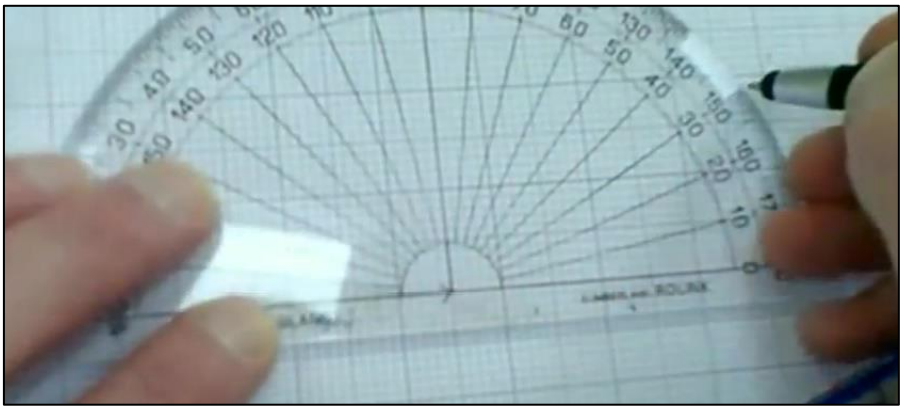
Let's look at adding two forces together to get the resultant. One is 5 N horizontally to the right, the other 3 N at an angle of 30° to the horizontal and acting upwards.

So, the first step is to choose a scale for our diagram – 1 cm to each newton works well here. If we had a force of 500 N, we would probably say 100 N to each cm.

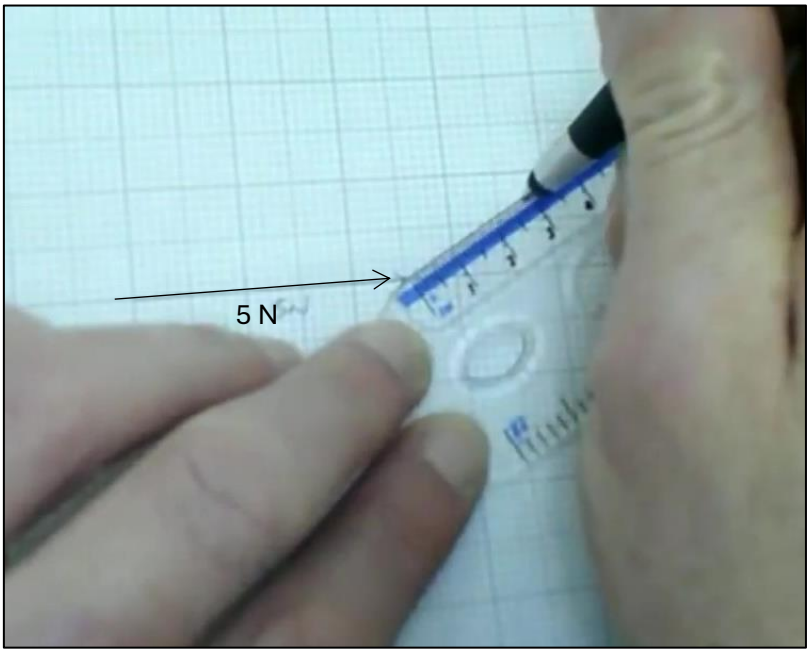
Then draw our 5 N vector – a horizontal line 5 cm long:



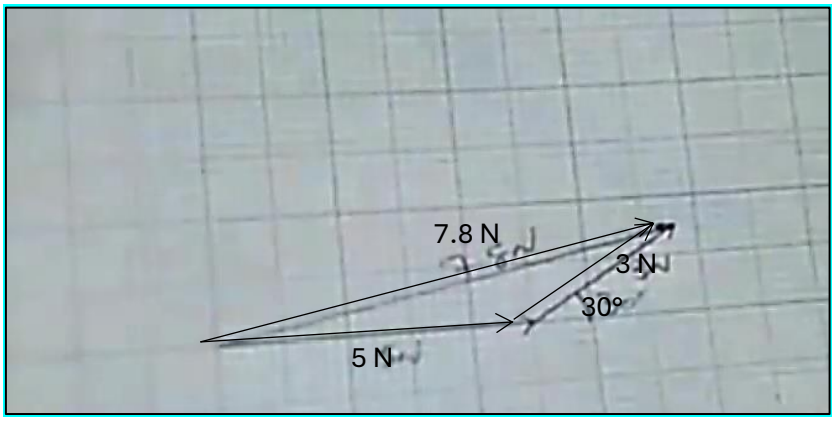
Now we add our 3 N force vector, but first we have to measure the 30° angle we will draw it at:



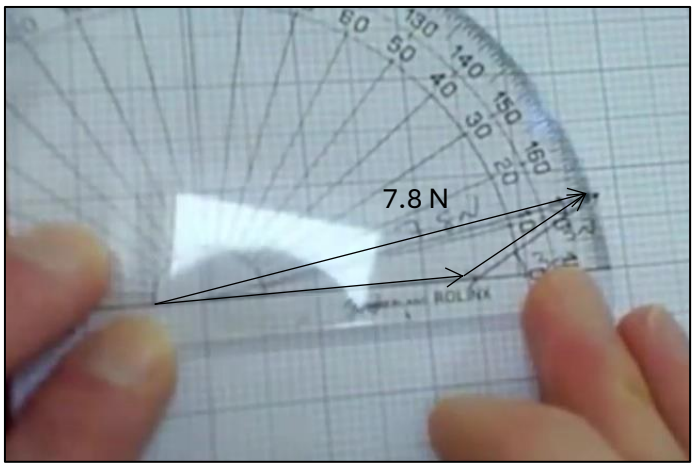
Now we can draw our 3 N force vector – 3 cm long at 30° to the horizontal:



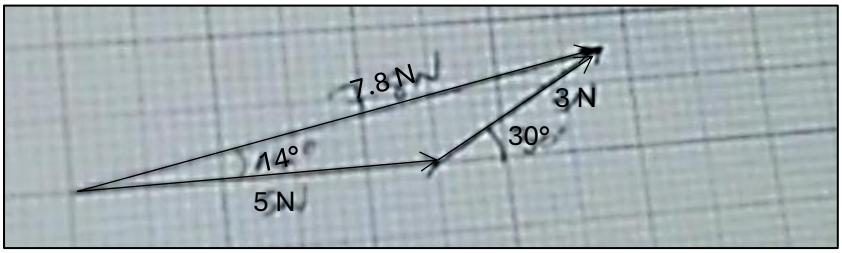
Then we join the point where we started the 5 N force to the point where we finished the 3 N force. This line is the resultant of the two. The length is measured and, using the scale we decided on, the size of the resultant is found:



The final stage of the work is to measure the angle – remember a vector MUST be quoted with both the size and the direction:



So the resultant of our two vectors has been found by scale drawing!



Resultant: 7.8 N (8 N)

$\theta = 14°$ to 5 N

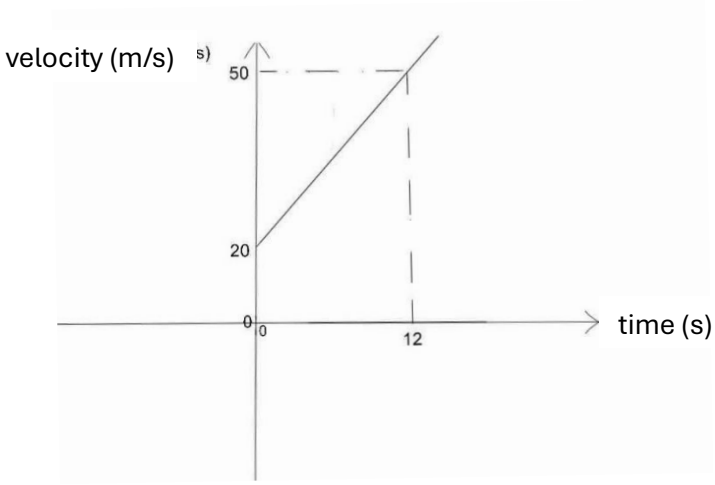
PRACTICE QUESTIONS

1. The displacement is the vector distance between two points. That means we need to know the length of the straight line between the two points, but also the angle that line makes with the horizontal or vertical, for example. By making measurements from the diagram, write down the displacement between A and B.
   The diagram is to scale. (2 marks)

B

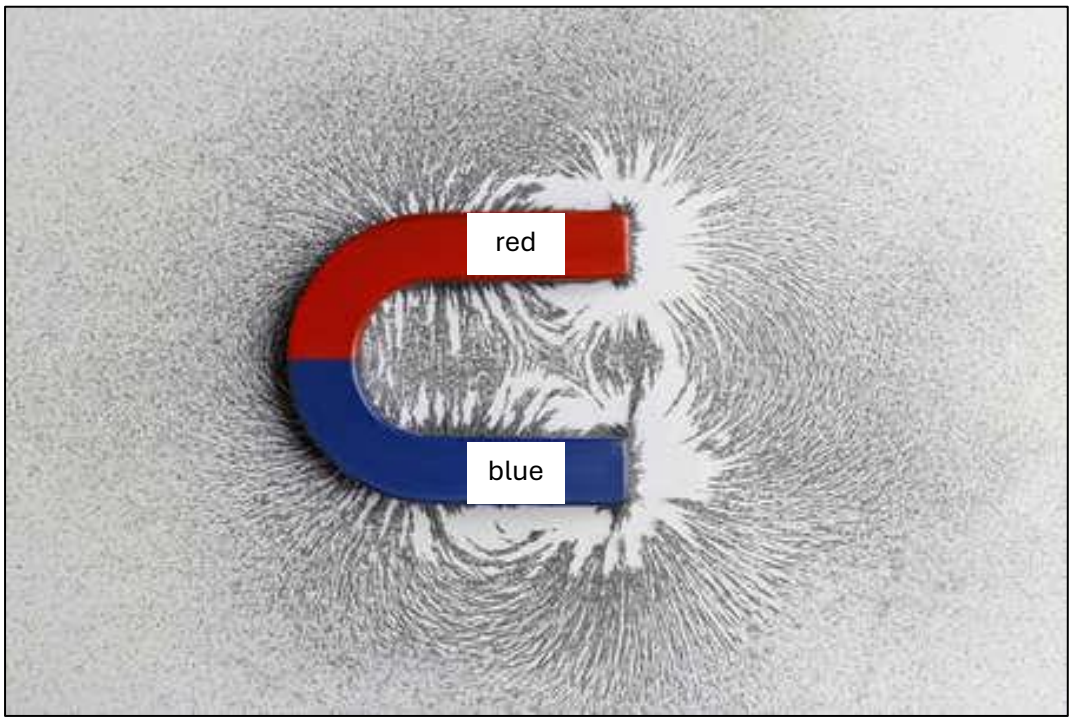
A

The magnitude (size) of the displacement can be found by working out the area under the velocity–time graph for a moving object. Calculate the displacement of the car for which the velocity–time graph is as shown. (3 marks)



3. In a children's soft play area there are lots of inflated cubes for the children to jump on without getting hurt. Each of these cubes has a side of length 50 cm. Taking the density of air as 1.2 kg/m^3 and knowing that $\text{density} = \frac{\text{mass}}{\text{volume}}$, calculate the mass of air in one cube, in kg. (4 marks)

4. Here is a picture of a magnet's field lines being highlighted using iron filings:



Draw a 2D representation of this picture. Just draw four field lines from the prongs of the magnet. Assume the red side is north and put arrows on your lines accordingly. (3 marks)

Extra Maths

B2 Algebra

1. Write the following expression in words: $x \sim y$

   .....

2. Make variable u the subject of this equation.

   $v^2 =$ $u^2 + 2as$

   .....

3. A certain constant can be calculated using the equation

   $$\text{constant} = \frac{\text{force}}{\text{current} \times \text{length}}$$

   Given that the units of force = N, current = A and length = m, what are the units of the constant?

   .....

4. A car is travelling at 10 m/s and accelerates at 3 m/s^2 to 20 m/s. Calculate the distance travelled by the car during the acceleration. Use the equation in question 2, where u = 10 m/s, v = 20 m/s and a = 3 m/s^2.

   .....

   .....

5. If I eat one square of chocolate from a bar of chocolate every minute until I've eaten it all, describe the relationship between the amount of chocolate **remaining** and the time I have it for.

   .....

6. Water pours into a bucket at a rate of 50 cm^3 per second. If the bucket contained 500 cm^3 of water to begin with, describe the relationship between the volume of water in the bucket and the time for which the water is flowing into the bucket.

   .....

7. If the temperature, θ, of a cup of tea falls from 95 °C to 85 °C in 300 seconds, calculate $\Delta\theta$, the rate of change of the temperature of the tea.

   .....

   .....