ST MARY'S SCIENCE DEPARTMENT:

PHYSICS

F

GCSE PHYSICS **HOMEWORK BOOK**
TOPIC 6: FORCES - INTERACTIONS
STUDENT BOOK

YOU MUST ANSWER ALL THREE SECTIONS IN EACH PART OF THE HOMEWORK TASKS

NAME	
CLASS	
TEACHER	
FORM	

TASK	MARK	GRADE
1		
2		
3		
4		
5		
6		
OVERALL		

GCSE PHYSICS

YEAR 11

TOPIC 1

HOMEWORK SCHEDULE

Please use the following table to ensure each homework task is completed and submitted on time.

Carrying out these homework tasks can only increase your ability to gain a high grade in the GCSE examinations.

Failure to hand in work on time will lead to sanctions to complete this work.

Task	Submission Date	Completed?	On Time?
Task 1 Scalars and Vectors			
Task 2 Resultant Forces			
Task 3 Gravity			
Task 4 Forces and Elasticity			
Task 5 Moments, Levers and Gears			
Task 6 Pressure			

PHYSICS DEPARTMENT MARKING CODE

ID = Insufficient detail in answer
W = Wrong understanding of physics
IR = Irrelevant information given.
V = This is too vague to get a mark.
AQ = Answer the question asked
R = Read the question/information
M = Maths mistake
BOD = Benefit of the doubt given.
E = Explain the answer further please.
U = Wrong units used.
SF = Wrong significant figures used.
SP = Wrong spelling of a technical term
SR = Same reason given twice.
A circle means this lost you marks
An underline means this gained you marks

IMPORTANT NOTE

All sections in each task must be **FULLY ATTEMPTED.**

If students fail to achieve an acceptable mark on each task, they will be made to carry out supervised intervention the following week.

Each week, intervention sessions will be provided to help assist with answering the questions in the homework booklet if students are struggling with the difficulty of the problems.

PLEASE READ

This homework booklet has made with custom selected examination questions and activities to assess your understanding in the concepts covered in class. This will increase your familiarity with the style of examination questions.

Carrying out these questions can only increase your ability to gain a high grade in the GCSE examination.

Thank you for your hard work in completing this book, and good luck.

Mr. Turnbull

TASK 1: SCALARS AND VECTORS

SPEC CHECK

Content	Achieved?
Scalar quantities have magnitude only.	
Vector quantities have magnitude and an associated direction.	
A vector quantity may be represented by an arrow. The length of the arrow represents the magnitude, and the direction of the arrow the direction of the vector quantity.	
A force is a push or pull that acts on an object due to the interaction with another object.	
All forces between objects are either: • contact forces – the objects are physically touching • non-contact forces – the objects are physically separated. Examples of contact forces include friction, air resistance, tension and normal contact force. Examples of non-contact forces are gravitational force, electrostatic Force and magnetic force.	
Force is a vector quantity. Students should be able to describe the interaction between pairs of objects which produce a force on each object. The forces to be represented as vectors.	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task? Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?	**What Topics Do I Need to Revise?**

SECTION A

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. Cobalt-60 is a radioactive isotope used to treat cancer.

1.1 An atom of cobalt-60 can be represented as:

$$^{60}_{27}Co$$

How many protons and neutrons are there in the nucleus of a cobalt-60 atom?

[2 marks]

Number of protons = ...

Number of neutrons = ...

1.2 Atoms of cobalt-60 contain protons, neutrons and one other type of particle.

Name the other type of atomic particle in an atom of cobalt-60.

[1 mark]

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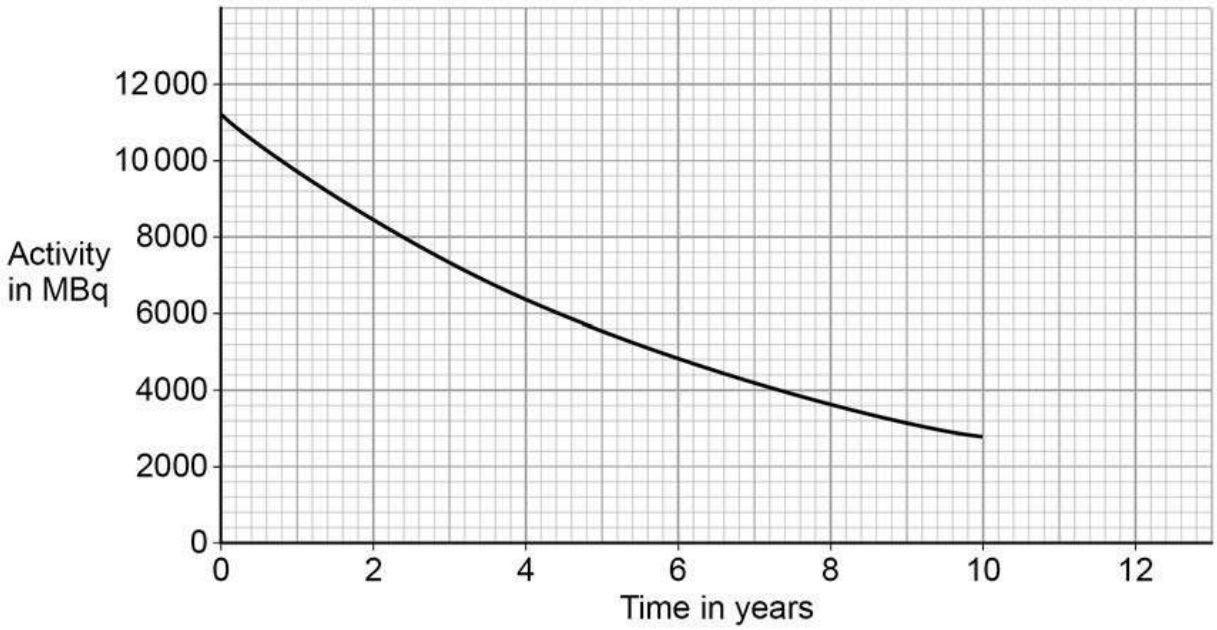
.....

1.3 Figure 3 shows how the activity of a sample of cobalt-60 changes with time.

Figure 3



Determine the half-life of cobalt-60.

Show your working on **Figure 3**.

[2 marks]

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Half-life = _____ years

1.4 Samples of cobalt-60 are used in schools to demonstrate radioactive decay.

Suggest two safety precautions that should be used in schools when using radioactive sources.

[2 marks]

Precaution One

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Precaution Two

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SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

Q1. When two objects interact, they exert forces on each other.

1.1 Which statement about the forces is correct?

Tick (✓) **one** box.

[1 Mark]

	Tick (✓)
The forces are equal in size and act in the same direction.	
The forces are unequal in size and act in the same direction.	
The forces are equal in size and act in opposite directions.	
The forces are unequal in size and act in opposite directions.	

A fisherman pulls a boat towards land.

The forces acting on the boat are shown in **Diagram 1**.

The fisherman exerts a force of 300 N on the boat.
The sea exerts a resistive force of 250 N on the boat.

Diagram 1

1.2 Describe the motion of the boat.

[2 Marks]

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1.3 When the boat reaches land, the resistive force increases to 300 N.
The fisherman continues to exert a force of 300 N.

Describe the motion of the boat.

[1 Mark]

Tick **one** box.

Accelerating to the right	☐
Constant velocity to the right	☐
Stationary	☐

1.4 Explain your answer to part **1.3**

[2 Marks]

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1.5 Another fisherman comes to help pull the boat. Each fisherman pulls with a force of 300 N, as shown in **Diagram 2**.

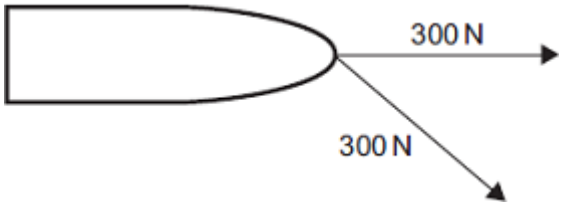
Diagram 2 is drawn to scale.

Add to **Diagram 2** to show the single force that has the same effect as the two 300 N forces.

Determine the value of this resultant force.

[4 Marks]

Diagram 2



Resultant force = ... N

SECTION C

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1.1 Force is a vector quantity.

Which statement is correct for a vector quantity?

Tick **one** box.

[1 mark]

- A vector quantity has magnitude only. ☐
- A vector quantity has direction only. ☐
- A vector quantity has magnitude and direction. ☐

1.2 Which of the following is a vector quantity?

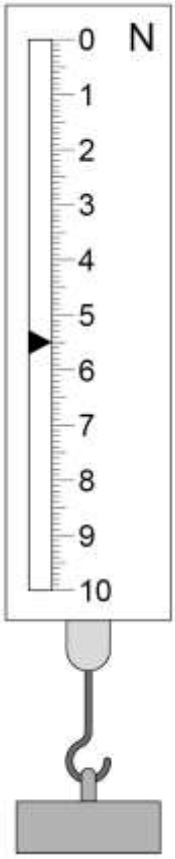
Tick **one** box.

[1 mark]

- Acceleration ☐
- Distance ☐
- Speed ☐
- Time ☐

1.3 Figure 1 shows a newton meter, which is used to measure the weight of an object.

Figure 1



Give the weight of the object in **Figure 1.**

[1 mark]

Weight =..... N

1.4 The same object weighs less on the Moon.

Why is the weight of the object less on the Moon?

Tick **one** box.

[1 mark]

Gravitational field strength is less on the Moon.	☐
The mass of the object is less on the Moon.	☐
There is no air on the Moon.	☐
There is no gravity on the Moon.	☐

FEEDBACK SHEET

Overall Mark:	**/21**	**GRADE ACHIEVED:**	
		5 ☐	**1** ☐
		4 ☐	**U** ☐
		3 ☐	
		2 ☐	
Section A: Mark	/7		
Section B: Mark	/10		
Section C: Mark	/4		

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding

Strengths:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving
Areas to Improve:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving

Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	**(your target)**
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

☐ Carry out **independent** revision. ☐ Complete outstanding work. ☐ Make corrections as indicated by the teacher. ☐ Attend intervention for this topic ☐ Include more information in responses. ☐ Include more key words in responses. ☐ Attend departmental revision sessions. ☐ Read the questions carefully. ☐ Explain your answers in more detail. ☐ Carry out revision on Seneca Learning.	☐ Revise the equations. ☐ Check the units on answers. ☐ Check the correct amount of sig figs on answers. ☐ Check to convert values correctly. ☐ Show your full working out. ☐ Check your calculations. ☐ Revise the science investigative skills. ☐ Revise the key concepts of the topics. ☐ Thoroughly check your work for mistakes. Other:

Student response:

TASK 2: RESULTANT FORCES

SPEC CHECK

Content	Achieved?
A number of forces acting on an object may be replaced by a single force that has the same effect as all the original forces acting together. This single force is called the resultant force.	
Students should be able to calculate the resultant of two forces that act in a straight line.	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task?
Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?

What Topics Do I Need to Revise?

SECTION A

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1.1. Which are the properties that make for good insulation?

Tick **three** boxes.

[3 Marks]

The material is very heavy.	☐
The material contains trapped air particles.	☐
The material has a low thermal conductivity.	☐
The material can be moulded into any shape.	☐
The material has high thermal conductivity.	☐
The material is easy to wash.	☐

1.2 The thickness of the material improves the insulation properties.

Discuss this suggestion in relation to the three examples of home insulation in **Figure 1**.

[3 Marks]

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1.3 Suggest **one** reason why people are now more aware of the importance of good insulation in the home.

[1 Mark]

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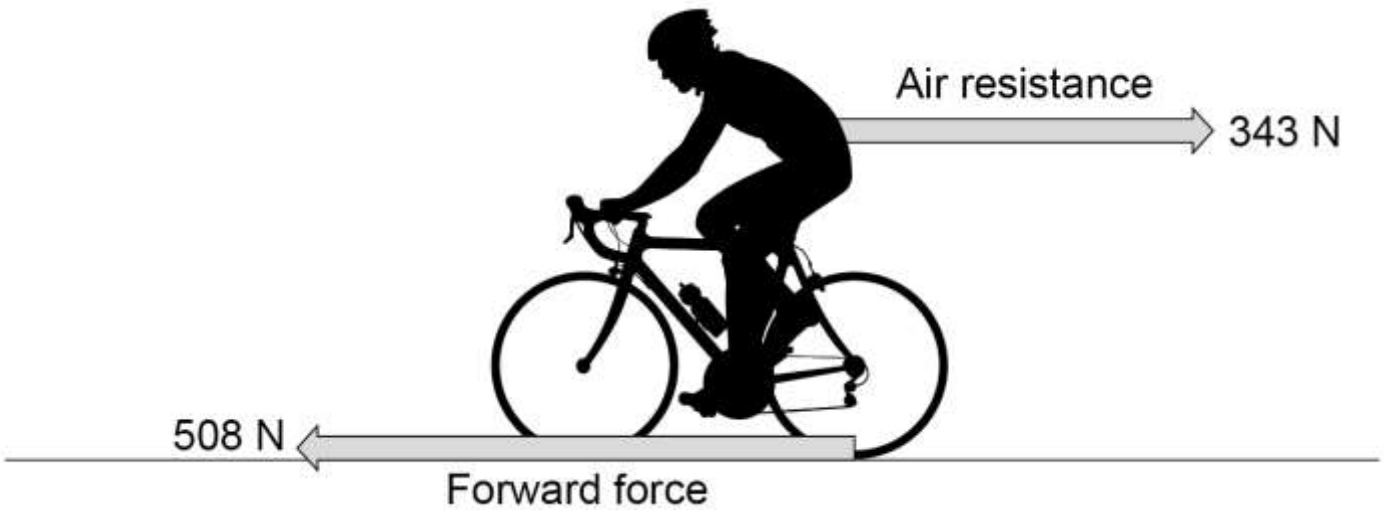
SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

1. Figure 2 shows the horizontal forces acting on a bicycle and cyclist when cycling along a dry road.

Figure 2



1.1 Calculate the resultant force on the bicycle and cyclist.

[2 marks]

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Resultant Force = ... N

1.2 The bicycle accelerates from rest to a velocity of 6.0 m/s in a time of 4.0 s.

Calculate the acceleration of the bicycle.

[2 marks]

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Acceleration = ... m/s^2

1.3 The mass of the bicycle and cyclist is 110 kg.

The bicycle is moving at a speed of 6.0 m/s.

Calculate the kinetic energy of the bicycle and cyclist.

[2 marks]

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Kinetic Energy = ... J

1.4 Explain why the bicycle slows down when the cyclist stops pedalling.

Use ideas about forces in your answer.

[2 marks]

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SECTION C

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. Figure 10 shows the horizontal forces acting on a man swimming in the sea.

Figure 10

1.1 Describe the movement of the man when the resultant horizontal force is 0 N

[1 mark]

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1.2 The man increases Force **A.**

Explain what happens to Force **B** and to the movement of the man.

[4 marks]

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1.3 A boat moves through the sea.

There is a 3000 N force to the west on the boat.

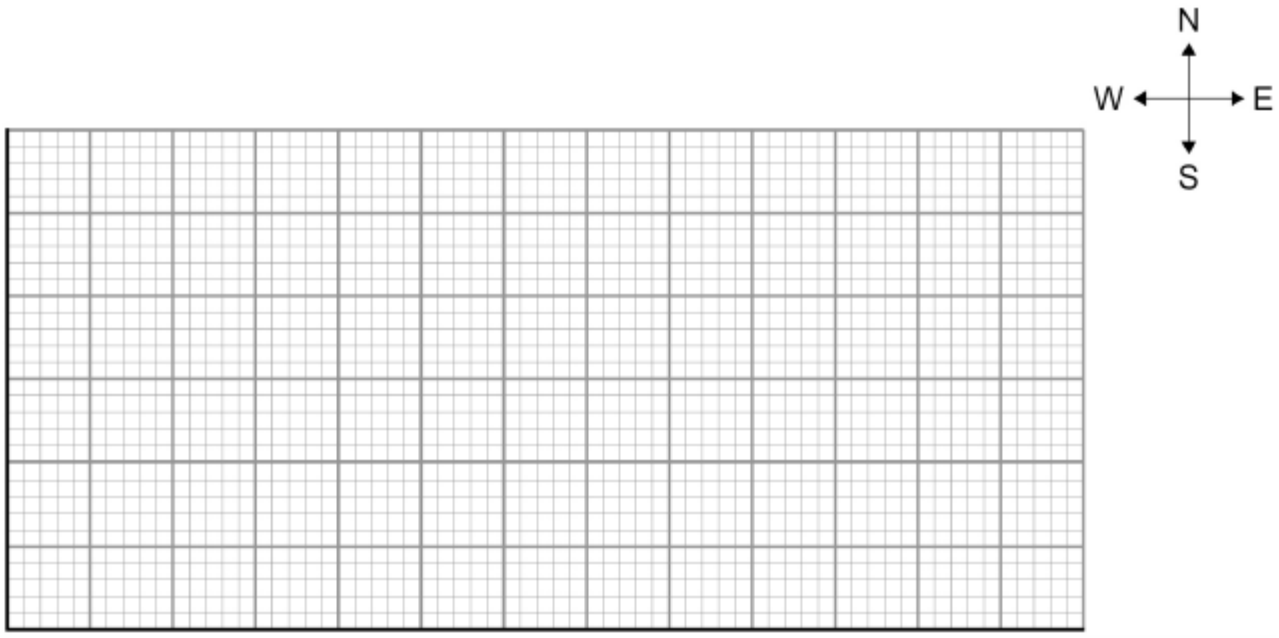
There is a 1000 N force to the south on the boat.

Determine the magnitude and direction of the resultant force on the boat.

Draw a vector diagram of these forces to scale on **Figure 11**

[3 marks]

Figure 11



Magnitude of resultant force = _____ N

Direction of resultant force = _____°

1.4 The force to the south on the boat increases.

What effect does this have on the resultant force on the boat?

[2 marks]

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FEEDBACK SHEET

Overall Mark:	**/25**
Section A: Mark	/7
Section B: Mark	/8
Section C: Mark	/10

GRADE ACHIEVED:

5	☐	**1**	☐
4	☐	**U**	☐
3	☐		
2	☐		

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding

Strengths:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving
Areas to Improve:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving

Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	**(your target)**
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

☐ Carry out **independent** revision.	☐ Revise the equations.
☐ Complete outstanding work.	☐ Check the units on answers.
☐ Make corrections as indicated by the teacher.	☐ Check the correct amount of sig figs on answers.
☐ Attend intervention for this topic	☐ Check to convert values correctly.
☐ Include more information in responses.	☐ Show your full working out.
☐ Include more key words in responses.	☐ Check your calculations.
☐ Attend departmental revision sessions.	☐ Revise the science investigative skills.
☐ Read the questions carefully.	☐ Revise the key concepts of the topics.
☐ Explain your answers in more detail.	☐ Thoroughly check your work for mistakes.
☐ Carry out revision on Seneca Learning.	Other:

Student response:

TASK 3: GRAVITY

SPEC CHECK

Content	Achieved?
Weight is the force acting on an object due to gravity. The force of gravity close to the Earth is due to the gravitational field around the Earth.	
The weight of an object depends on the gravitational field strength at the point where the object is.	
The weight of an object can be calculated using the equation: weight = mass × gravitational field strength W = m x g weight, W, in newtons, N mass, m, in kilograms, kg gravitational field strength, g, in newtons per kilogram, N/kg (In any calculation, the value of the gravitational field strength (g) will be given.)	
The weight of an object may be considered to act at a single point referred to as the object's 'centre of mass'.	
The weight of an object and the mass of an object are directly proportional. Weight is measured using a calibrated spring-balance (a newton meter).	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task? Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?	What Topics Do I Need to Revise?

SECTION A

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. In nuclear power stations, nuclear reactors are surrounded by a barrier that absorbs radiation.

The barrier reduces radioactive emissions to safe levels.

Barriers can be several metres of concrete or a few centimetres of lead.

Table 4 gives two properties of concrete and lead.

Table 4

Material	Density in kg / m^3	Maximum temperature that the material can withstand in °C
Concrete	2400	> 1000
Lead	11 340	328

1.1 Give **two** reasons why concrete is usually used for the barrier instead of lead.

Use information from **Table 4**.

[2 marks]

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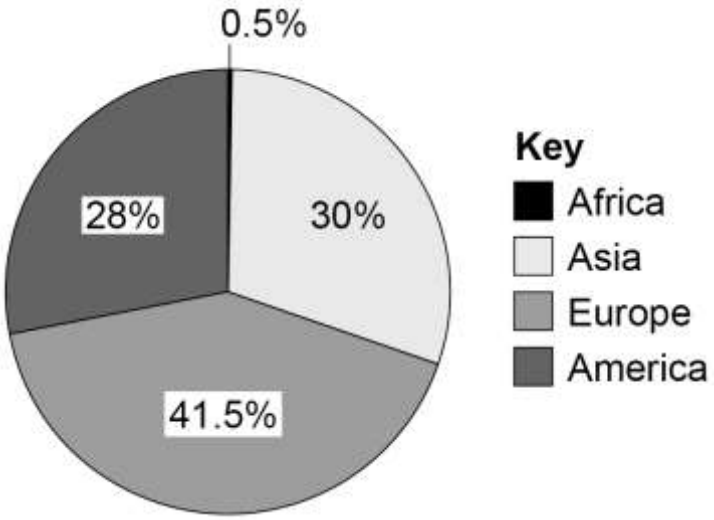
1.2 There are 450 nuclear power stations generating electricity around the world.

Figure 9 shows the percentage of these nuclear power stations that are in different continents.

Figure 9



Calculate the number of nuclear power stations in Asia.

[2 marks]

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Number of Power Stations = ...

1.3 New nuclear power stations are being built around the world.

Suggest **two** reasons why more nuclear power stations are being built.

[2 marks]

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SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

1. Forces are vector quantities.

1.1 What is the difference between a vector quantity and a scalar quantity?

[2 marks]

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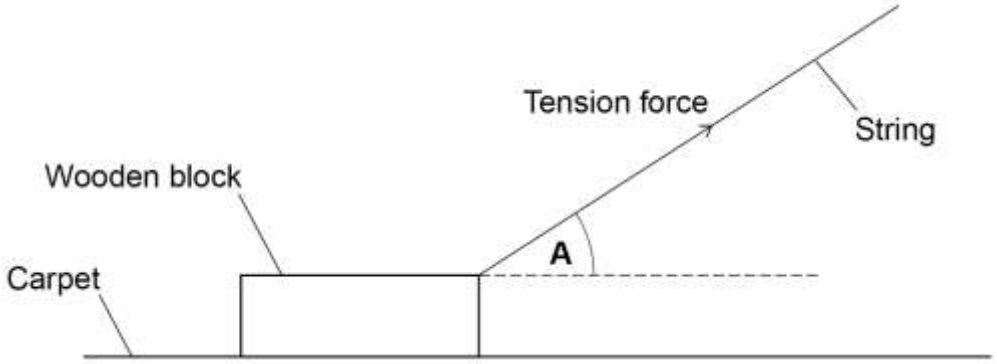
Figure 4 represents a wooden block being pulled across a surface at a constant speed in a straight line.

The block is in contact with the surface.

The arrow in **Figure 4** represents the tension force in the string pulling the block.

Figure 4

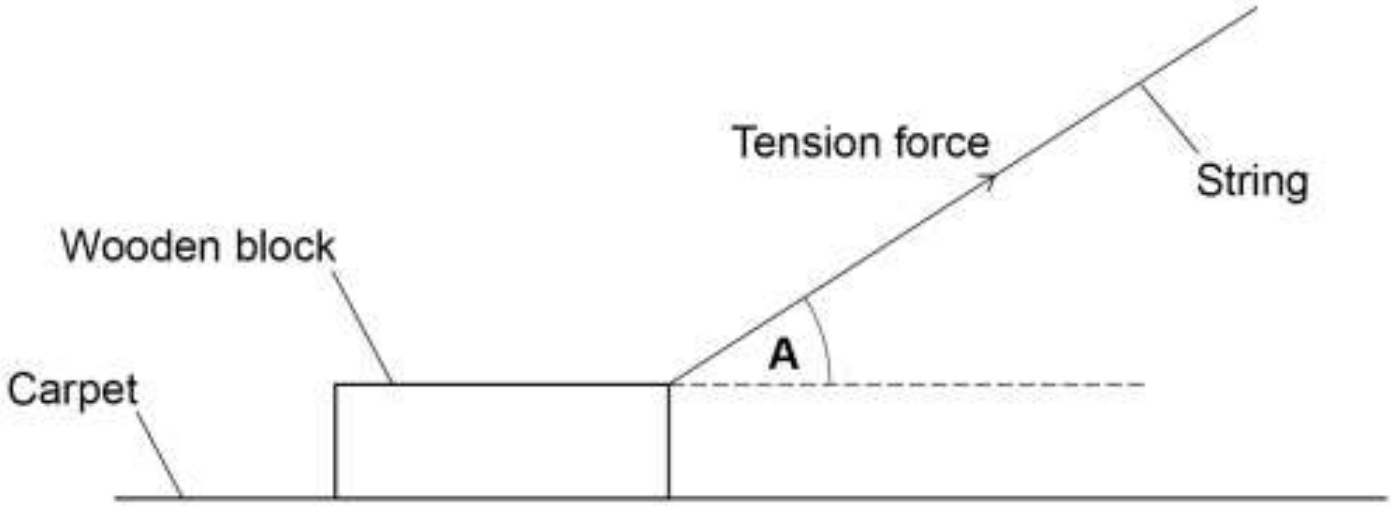


1.2 Complete **Figure 4** to show the other three forces acting on the block.

[3 marks]

Figure 5 is a copy of **Figure 4** to help you answer the following question.

Figure 5



1.3 Figure 5 is drawn to scale. The scale is 1 cm: 0.5 N

Determine the horizontal and vertical components of the tension in the string.

Show these components on **Figure 5**.

[3 marks]

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Horizontal Component = _____N

Vertical Component = _____N

A student collects data on the size of the force required to pull the block across different surfaces at a constant speed.

Table 2 shows the results.

Table 2

Type of surface	Force in N			Mean force in N
	Trial 1	Trial 2	Trial 3	
Cardboard	1.4	1.6	1.5	1.5
Carpet	2.6	3.1	3.9	3.2
Glass	0.7	0.8	0.6	0.7
Sandpaper	5.2	**X**	5.3	5.4

1.4 Calculate value **X** in **Table 2**.

[2 marks]

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X = _____ N

1.5 Give three control variables for this investigation.

[3 marks]

Variable **1**

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Variable **2**

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Variable **3**

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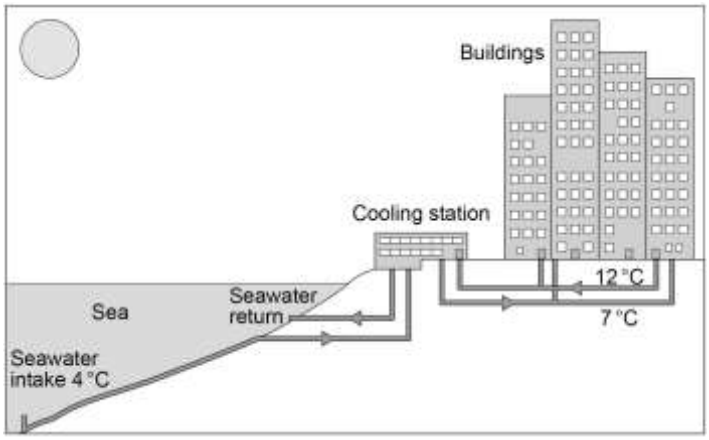
SECTION C

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. Figure 17 shows a system that uses cold sea water to cool buildings.

Figure 17



1.1 Some of the energy from the Sun is absorbed by the surface of the sea.

Explain why heating the water at the surface increases the rate of evaporation from the sea.

[3 marks]

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1.2 Energy from the Sun that is absorbed by the sea does not heat up the water deep below the surface.

Explain why.

[4 marks]

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1.3 The cooling station shown in **Figure 17** has a power of 315 MW. It cools water from 12 °C to 7 °C.

Calculate the mass of water that the cooling station can cool each second.

specific heat capacity of water = 4200 J/kg °C

Use the Physics Equations Sheet.

[4 marks]

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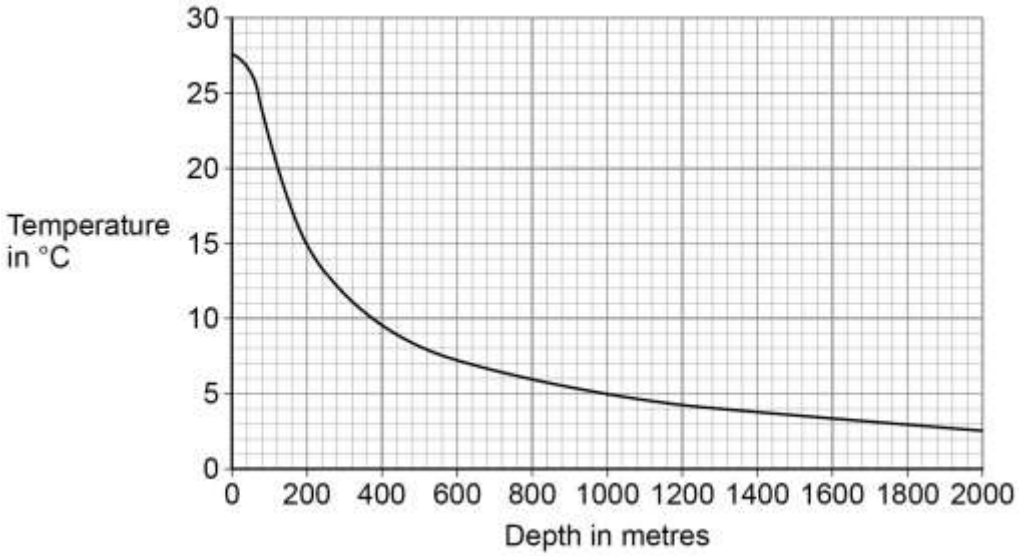
Mass of Water Each Second =..... kg

1.4 Figure 18 shows the temperature of the sea at different depths.

Figure 18



Explain why sea water is not pumped up to the cooling station from depths greater than 1700 m.

[3 marks]

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FEEDBACK SHEET

Overall Mark:	**/33**	**GRADE ACHIEVED:**	
		5 ☐	**1** ☐
		4 ☐	**U** ☐
		3 ☐	
		2 ☐	
Section A: Mark	/6		
Section B: Mark	/13		
Section C: Mark	/14		

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding

Strengths:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving
Areas to Improve:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving

Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	**(your target)**
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

☐ Carry out **independent** revision.	☐ Revise the equations.
☐ Complete outstanding work.	☐ Check the units on answers.
☐ Make corrections as indicated by the teacher.	☐ Check the correct amount of sig figs on answers.
☐ Attend intervention for this topic	☐ Check to convert values correctly.
☐ Include more information in responses.	☐ Show your full working out.
☐ Include more key words in responses.	☐ Check your calculations.
☐ Attend departmental revision sessions.	☐ Revise the science investigative skills.
☐ Read the questions carefully.	☐ Revise the key concepts of the topics.
☐ Explain your answers in more detail.	☐ Thoroughly check your work for mistakes.
☐ Carry out revision on Seneca Learning.	Other:

Student response:

TASK 4: FORCES AND ELASTICITY

SPEC CHECK

Content	Achieved?
Students should be able to: • give examples of the forces involved in stretching, bending or compressing an object • explain why, to change the shape of an object (by stretching, bending or compressing), more than one force has to be applied – this is limited to stationary objects only • describe the difference between elastic deformation and inelastic deformation caused by stretching forces.	
The extension of an elastic object, such as a spring, is directly proportional to the force applied, provided that the limit of proportionality is not exceeded.	
Calculate work done in stretching (or compressing) a spring (up to the limit of proportionality) using the equation: elastic potential energy = 0.5 × spring constant × extension ^{2} $E_e = 1/2 \times k \times e^2$	
A force that stretches (or compresses) a spring does work and elastic potential energy is stored in the spring. Provided the spring is not inelastically deformed, the work done on the spring and the elastic potential	
Students should be able to: • describe the difference between a linear and non-linear relationship between force and extension. • calculate a spring constant in linear cases. • interpret data from an investigation of the relationship between force and extension.	
force = spring constant × extension $F = k \times e$ force, F, in newtons, N spring constant, k, in newtons per metre, N/m extension, e, in metres, m This relationship also applies to the compression of an elastic object, where 'e' would be the compression of the object. The energy stored will be equal to the elastic potential energy store.	

SECTION A

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. In a nuclear power station, the energy released in the fission of uranium-235 is used in the generation of electricity.

1.1 What are the drawbacks of generating electricity in a nuclear power station?

Tick **two** boxes.

[2 marks]

Decommissioning costs are high.	☐
Carbon dioxide is released into the atmosphere.	☐
Radioactive waste is produced and is difficult to dispose of.	☐
Nuclear power stations are a reliable source of energy.	☐
Uranium-235 is a renewable resource.	☐

1.2 Energy is released during the process of nuclear fission.

What is nuclear fission?

[1 mark]

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1.3 A common product of nuclear fission is caesium-137.

The chemical symbol for caesium-137 is

Give the number of protons and the number of neutrons in an atom of caesium-137.

[2 marks]

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Number of Protons = ...

Number of Neutrons = ...

SECTION B

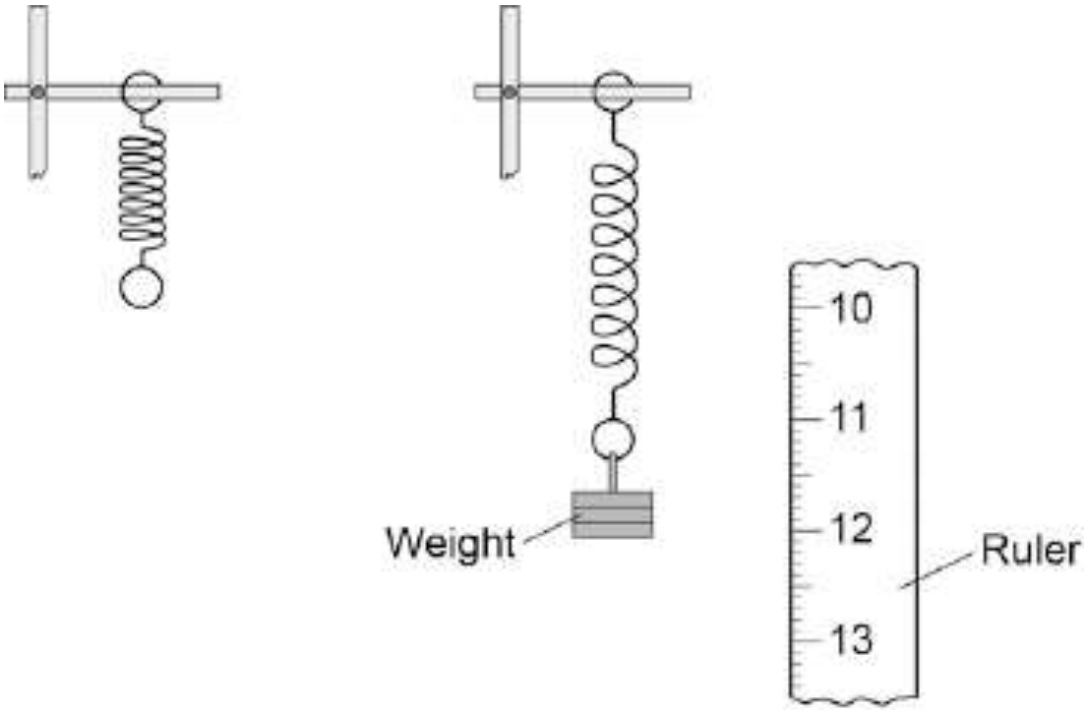
This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

1. A student suspended a spring from a laboratory stand and then hung a weight from the spring.

Figure 1 shows the spring before and after the weight is added.

Figure 1



1.1 Measure the extension of the spring shown in **Figure 1**.

[1 mark]

Extension = ... mm

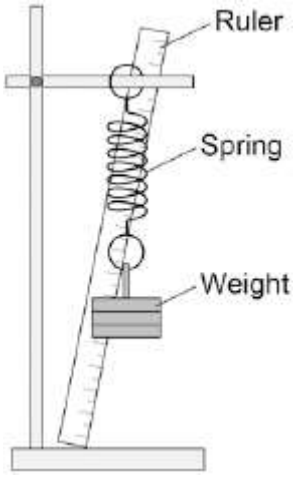
The student used the spring, a set of weights and a ruler to investigate how the extension of the spring depended on the weight hanging from the spring.

Before starting the investigation, the student wrote the following prediction:

The extension of the spring will be directly proportional to the weight hanging from the spring.

Figure 2 shows how the student arranged the apparatus.

Figure 2



1.2 Before taking any measurements, the student adjusted the ruler to make it vertical.

Explain why adjusting the ruler was important.

[2 marks]

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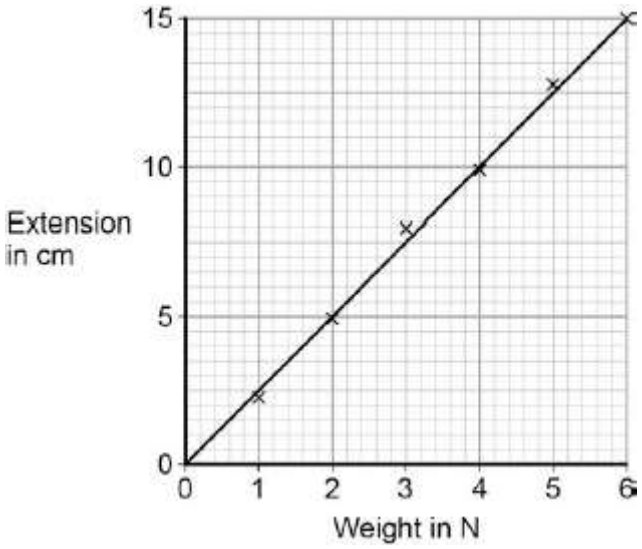
1.3 The student measured the extension of the spring using a range of weights.

The student's data is shown plotted as a graph in **Figure 3**.

Figure 3



What range of weight did the student use?

[1 mark]

.....

.....

1.4 Why does the data plotted in **Figure 3** support the student's prediction?

[1 mark]

.....

.....

1.5 Describe **one** technique that you could have used to improve the accuracy of the measurements taken by the student.

[2 marks]

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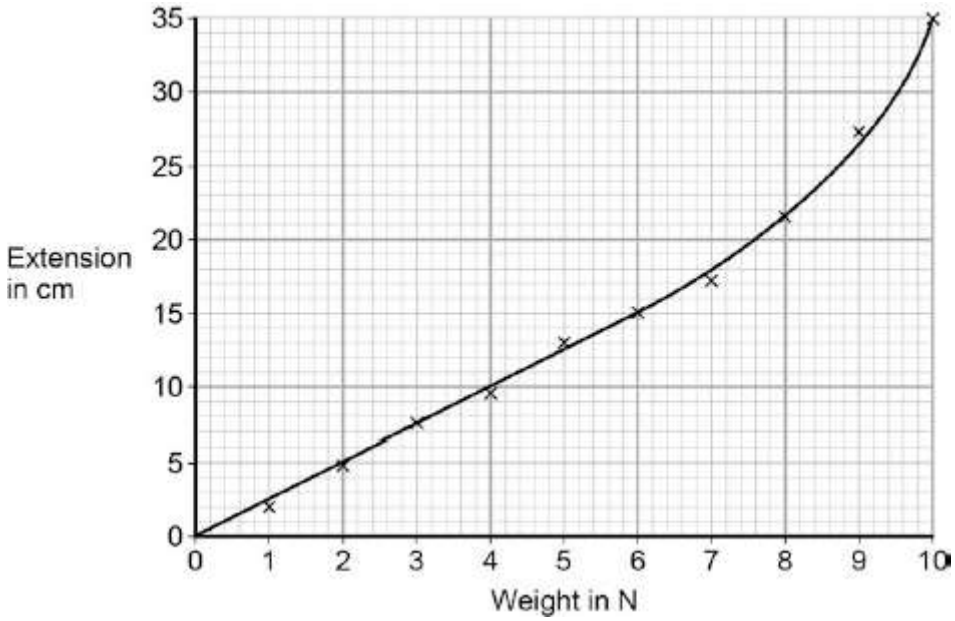
1.6 The student continued the investigation by increasing the range of weights added to the spring.

All of the data is shown plotted as a graph in **Figure 4**.

Figure 4



At the end of the investigation, all of the weights were removed from the spring.

What can you conclude from **Figure 4** about the deformation of the spring?

[2 marks]

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Give the reason for your conclusion.

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SECTION C

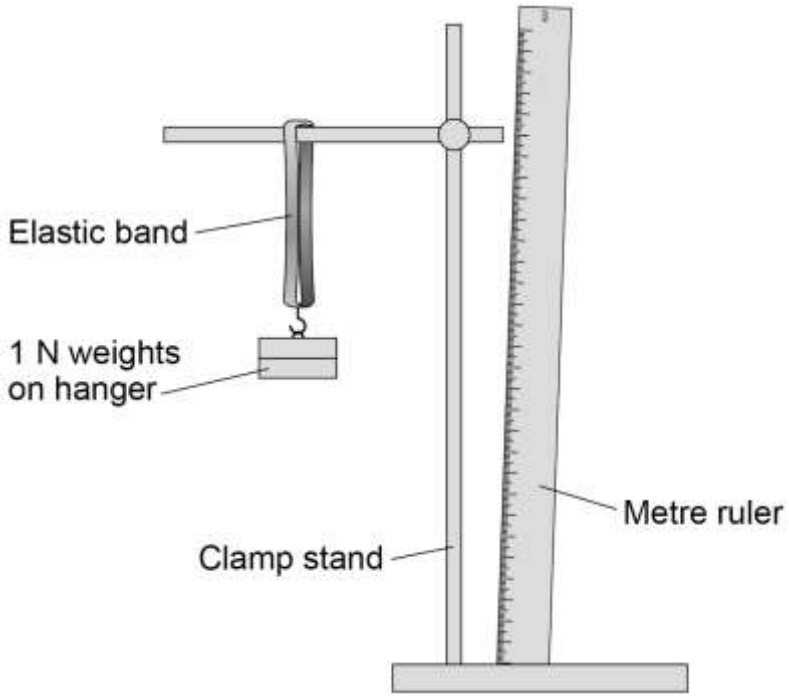
This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. A student investigated the relationship between the force applied to an elastic band and the extension of the elastic band.

1.1 The student set up the equipment as shown in **Figure 10.**

Figure 10



State **two** errors that the student made when setting up the equipment.

For each error give the difficulty that it will cause during the experiment.

[4 marks]

Error 1

.....

.....

Difficulty

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Error 2

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Difficulty

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The student realised the errors and corrected them. The student then:

• added weights to the hanger, 1 N at a time

• measured the extension for each weight

• repeated the investigation twice.

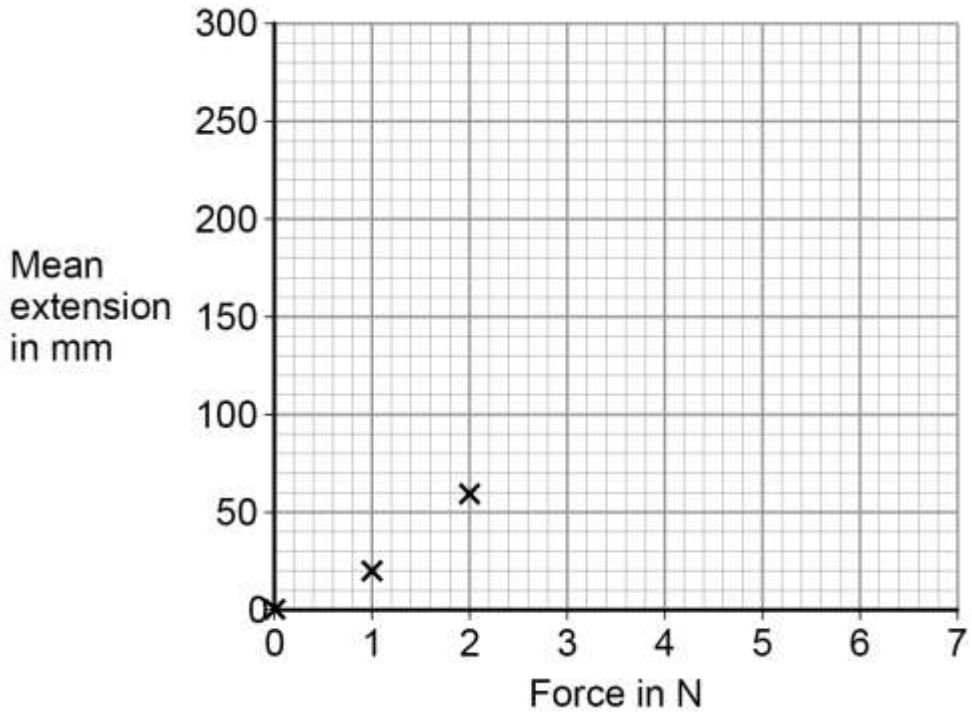
1.2 The student obtained the results in **Table 3.**

Table 3

Force in N	Extension in mm			
	1	2	3	Mean
0	0	0	0	0
1	20	19	20	20
2	59	57	57	58
3	115	113	116	115
4	170	173	167	170
5	228	226	222	225
6	266	266	272	268

Some of the mean results from **Table 3** have been plotted on the graph in **Figure 11.**

Figure 11



Complete **Figure 11** by plotting the missing mean results from **Table 3** and then drawing a line of best fit.

[3 marks]

1.3 Describe the relationship between force and extension shown on Figure 11.

[2 marks]

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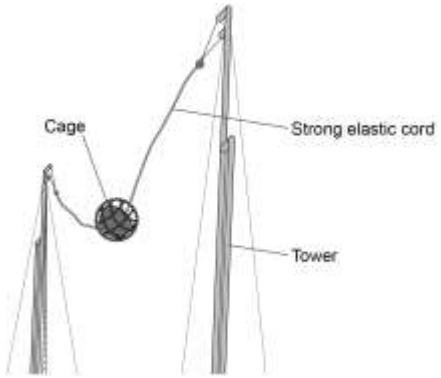
Figure 12 shows a theme park ride. Two strong elastic cords are attached to towers and are stretched so that the cage is on the ground. Passengers are fastened into the cage. The cage is released and reaches a velocity of 40 m/s as it moves upwards. The total mass of the cage and passengers is 390 kg.

Figure 12



1.4 Calculate the maximum kinetic energy of the cage and passengers just after it is released.

[2 marks]

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Maximum Kinetic Energy = ... J

1.5 On the ride, a person can feel a force up to six times the force of gravity as the cage is released. **Table 4** shows the possible effects of different gravitational forces on the human body.

Table 4

Number of times the force of gravity	Possible effect when experienced for several seconds
2	Feeling of heaviness
3	Difficulty moving arms and legs
5	Temporary eyesight problems
7	Unconsciousness

Do you think that the ride is safe? Give one reason for your answer.

[1 mark]

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FEEDBACK SHEET

Overall Mark:	**/26**	**GRADE ACHIEVED:**	
		5 ☐	**1** ☐
		4 ☐	**U** ☐
		3 ☐	
		2 ☐	
Section A: Mark	/5		
Section B: Mark	/9		
Section C: Mark	/12		

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding

Strengths:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving
Areas to Improve:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving

Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	**(your target)**
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

☐ Carry out **independent** revision. ☐ Complete outstanding work. ☐ Make corrections as indicated by the teacher. ☐ Attend intervention for this topic ☐ Include more information in responses. ☐ Include more key words in responses. ☐ Attend departmental revision sessions. ☐ Read the questions carefully. ☐ Explain your answers in more detail. ☐ Carry out revision on Seneca Learning.	☐ Revise the equations. ☐ Check the units on answers. ☐ Check the correct amount of sig figs on answers. ☐ Check to convert values correctly. ☐ Show your full working out. ☐ Check your calculations. ☐ Revise the science investigative skills. ☐ Revise the key concepts of the topics. ☐ Thoroughly check your work for mistakes. Other:

Student response:

TASK 5: MOMENTS, LEVERS AND GEARS

SPEC CHECK

Content	Achieved?
A force or a system of forces may cause an object to rotate. The turning effect of a force is called the moment of the force. The size of the moment is defined by the equation: moment of a force = force × distance M = F x d With moment of a force, M, in newton-metres, Nm force, F, in newtons, N distance, d, is the perpendicular distance from the pivot to the line of action of the force, in metres, m.	
If an object is balanced, the total clockwise moment about a pivot equals the total anticlockwise moment about that pivot.	
You should be able to calculate the size of a force, or its distance from a pivot, acting on an object that is balanced.	
A simple lever and a simple gear system can both be used to transmit the rotational effects of forces.	
You should be able to explain how levers and gears transmit the rotational effects of forces.	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task? Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?	What Topics Do I Need to Revise?

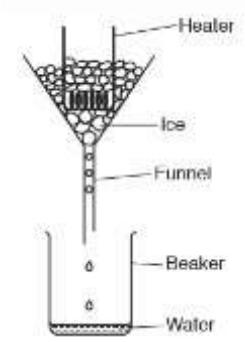
SECTION A

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. Two students design an experiment to find the specific latent heat of water.

They set up their equipment as shown in the diagram.



The students also have access to a power supply, a voltmeter, an ammeter, a stop-clock and a top-pan balance.

1.1 Explain how the students could use this equipment to determine an accurate value for the specific latent heat of water.

[6 Marks]

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1.2 The students find that 250 g of ice takes 95 kJ of energy to change state.

Calculate the specific latent heat.

[3 Marks]

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Answer = ... J/kg

SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

The steering mechanism of a lorry is connected to a gear wheel of radius 40 cm (**Figure 1**). This gear wheel is used to turn a second gear wheel of radius 15 cm with a force of 85 N.

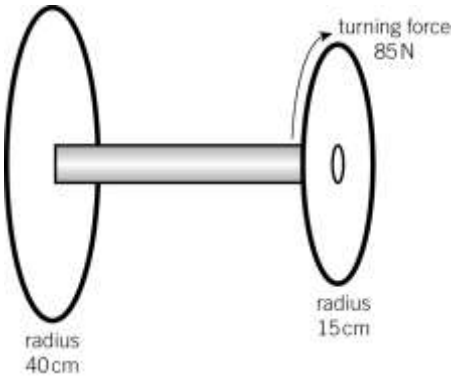

Figure 1

1.1 Calculate the moment of the turning force on the second gear wheel.

Give your answer correct to 2 significant figures.

[3 Marks]

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A large gear wheel is attached to the shaft from an engine (**Figure 2**). The large gear wheel is attached to a smaller gear wheel on an output shaft connected to the wheel of a car.

Figure 2

1.2 Describe what happens to the smaller gear wheel if the radius of the large gear wheel is increased. The engine speed stays the same.

[2 Marks]

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1.3 A student writes that the displacement of the lorry is 5 km when delivering goods. Explain why this statement may not be correct.

[2 Marks]

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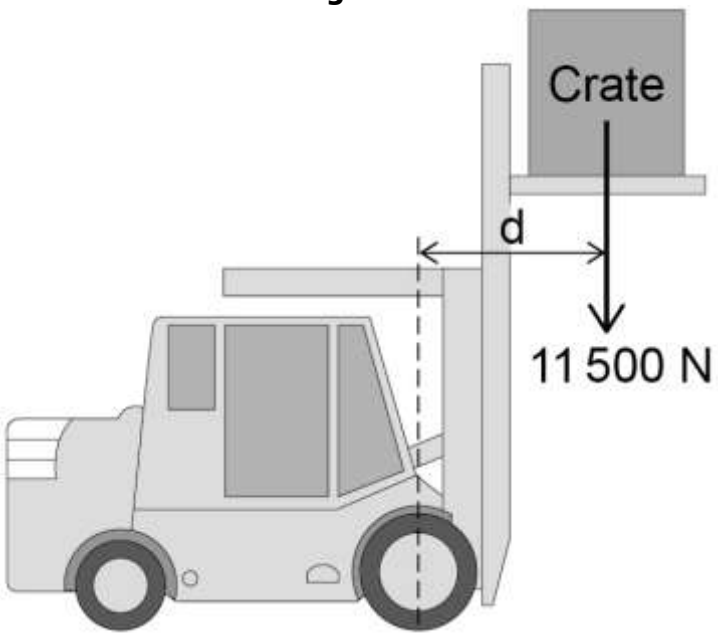
SECTION C

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. Figure 9 shows a fork-lift truck lifting a heavy crate.

Figure 9



1.1 The crate weighs 11 500 N and is lifted vertically 2.60 m.
Calculate the work done to lift the crate.
Use the equation:
work done = force × distance

[2 marks]

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Work Done = ... J

The weight of the crate causes a clockwise moment of 13 800 Nm about the centre of the front wheel of the fork-lift truck.

1.2 The weight of the fork-lift truck and driver cause an anticlockwise moment.
What is the minimum size of the anticlockwise moment needed so that the fork-lift truck does not topple over?

[1 mark]

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1.3 Write down the equation which links distance, force and moment of a force.

[1 mark]

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1.4 Calculate the distance 'd' marked on **Figure 9.**

[3 marks]

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Distance 'd' = ... m

FEEDBACK

Overall Mark:	**/23**
Section A: Mark	/9
Section B: Mark	/7
Section C: Mark	/7

GRADE ACHIEVED:

5	☐	**1**	☐
4	☐	**U**	☐
3	☐		
2	☐		

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding

Strengths:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving
Areas to Improve:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving

Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	**(your target)**
Effort:	Poor	Inconsistent	Good	Excellent

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Student response:

TASK 6: PRESSURE

SPEC CHECK

Content	Achieved?
A fluid can be either a liquid or a gas. The pressure in fluids causes a force normal (at right angles) to any surface. The pressure at the surface of a fluid can be calculated using the equation: pressure = force normal to a surface / area of that surface p = F / A With pressure, p, in pascals, Pa force, F, in newtons, N area, A, in metres squared, m	
The pressure due to a column of liquid can be calculated using the equation: pressure = height of the column × density of the liquid × gravitational field strength p = h x ρ x g With pressure, p, in pascals, Pa height of the column, h, in metres, m density, ρ, in kilograms per metre cubed, kg/m3 gravitational field strength, g, in newtons per kilogram, N/kg (In any calculation, the value of the gravitational field strength (g) will be given.) You should be able to explain why, in a liquid, pressure at a point increases with the height of the column of liquid above that point and with the density of the liquid. You should be able to calculate the differences in pressure at different depths in a liquid. A partially (or totally) submerged object experiences a greater pressure on the bottom surface than on the top surface. This creates a resultant force upwards. This force is called the upthrust. You should be able to describe the factors which influence floating and sinking	
The atmosphere is a thin layer (relative to the size of the Earth) of air round the Earth. The atmosphere gets less dense with increasing altitude. Air molecules colliding with a surface create atmospheric pressure. The number of air molecules (and so the weight of air) above a surface decreases as the height of the surface above ground level increases. So as height increases there is always less air above a surface than there is at a lower height. Atmospheric pressure decreases with an increase in height.	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task? Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?	What Topics Do I Need to Revise?

SECTION A

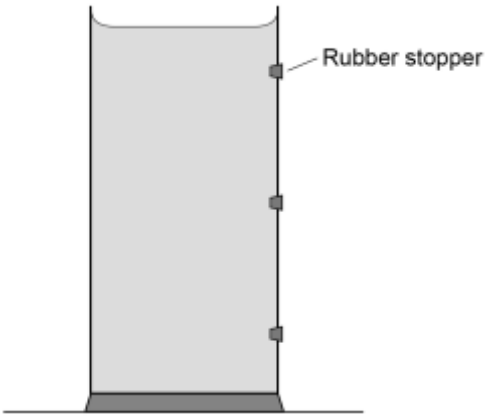
This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. Figure 11 shows a container filled with water.

The three holes in the side of the container are sealed with rubber stoppers.

Figure 11



1.1 The water exerts a force of 27 N on the bottom of the container.

The cross-sectional area of the bottom of the container is 0.009 m^2.

Calculate the pressure exerted by the water on the bottom of the container.

Use the equation:

pressure = force/area

Choose the unit.

[3 marks]

kg/m^3	**N/m**	**Pa**

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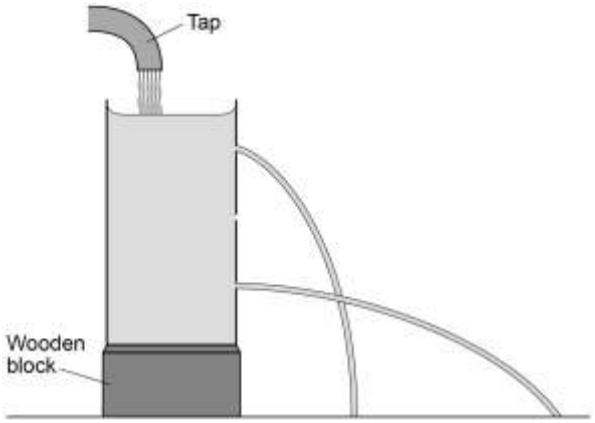
Pressure = ... Unit = ...

The container is put under running water from a tap and the three rubber stoppers removed.

Figure 12 shows the path taken by the water escaping from the top and bottom holes.

Figure 12



1.2 Complete **Figure 12** to show the path taken by the water escaping from the centre hole.

[1 mark]

1.3 What can be concluded from **Figure 12** about the pressure in a liquid?

[1 mark]

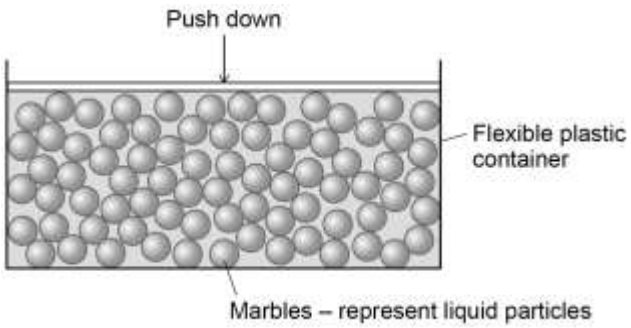
.....

.....

1.4 Figure 13 shows a simple model of a liquid.

When a force pushes down on the marbles, the marbles push the sides and bottom of the container outwards.

Figure 13



What can be concluded from this model about the pressure in a liquid?

[1 mark]

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SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **15 minutes** answering this section.

A manufacturer of garden syringes is testing a new range of plastic syringes with variable size nozzles. The nozzles can be removed and replaced with another nozzle of a different size.

The syringe used in the test is shown in **Figure 1**.

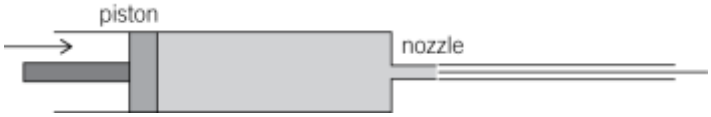

Figure 1

This is the method used:

1. Attach a 0.5 mm diameter nozzle onto the syringe.

2. Fill the syringe with 150 ml of water.

3. Press the piston into the syringe.

4. Measure the distance the water flows from the end of the nozzle.

5. Records the results in a table.

6. Repeat with other sizes of nozzle.

1.1 Name a piece of apparatus not shown.

[1 Mark]

.....

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.....

1.2 Name the independent variable.

[1 Mark]

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1.3 Name the dependent variable.

[1 Mark]

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.....

1.4 Name one factor that must be kept constant.

[1 Mark]

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1.5 Suggest one safety precaution.

[1 Mark]

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1.6 The results of the investigation are shown below.

Nozzle size in mm	Distance of water in cm		
	Test 1	Test 2	Mean
0.5	33.5	32.5	
1.0	25.0	24.5	24.8
1.5	18.0	14.5	16.3
2.0	13.0	12.5	12.8
2.5	10.0	10.0	10.0

Complete the table by calculating the mean value of the distance of water for a nozzle size of 0.5 mm.

[1 Mark]

1.7 State one advantage repeating the tests.

[1 Mark]

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1.8 A graph of the Test 2 results is shown in **Figure 2**.

Draw a line of best fit through the points on the graph.

[2 Marks]

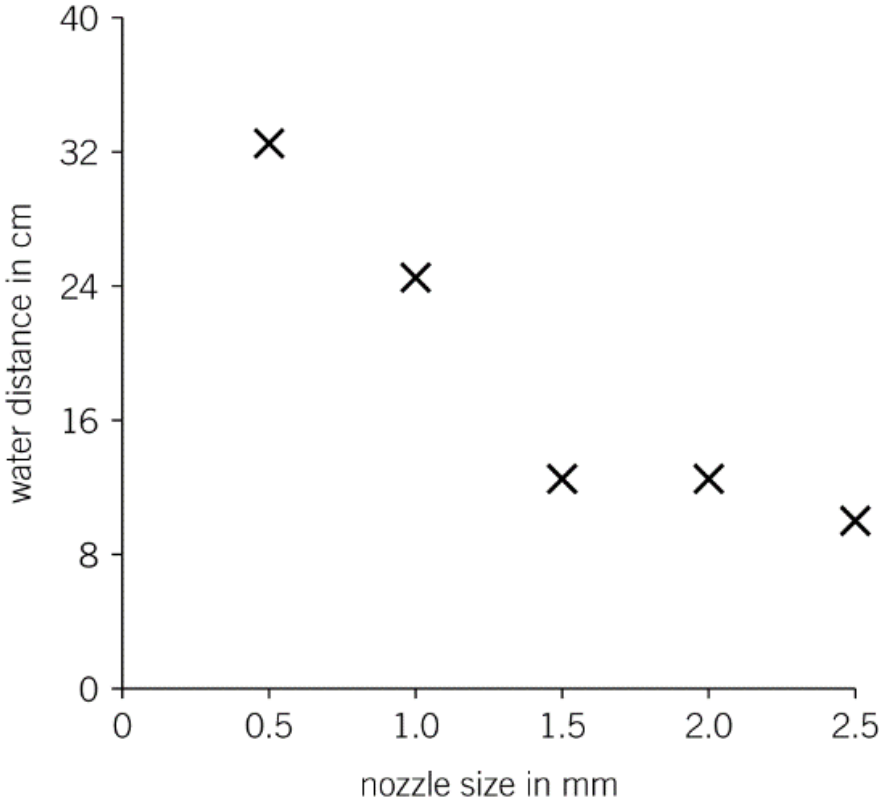

Figure 2

1.9 Conclude a relationship between the size of nozzle and the water distance.

[2 Marks]

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SECTION C

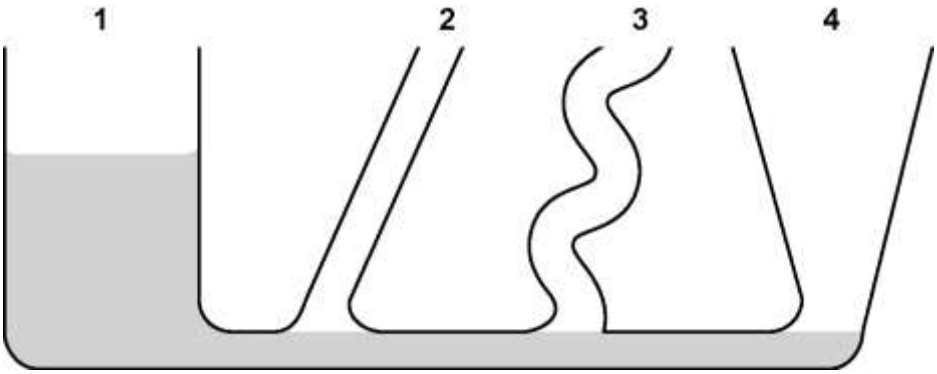
This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. Figure 6 shows an unusually shaped container.

The container has four vertical tubes of different shape and size.

Figure 6



Water is poured into the container up to the level shown in tube 1.

1.1 Complete **Figure 6** to show the height of the water in tubes 2, 3 and 4.

[1 mark]

1.2 The further a swimmer dives below the surface of the sea, the greater the pressure on the swimmer.

Explain why.

[2 marks]

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1.3 A person swims from a depth of 0.50 m to a depth of 1.70 m below the surface of the sea.

density of the sea water = 1030 kg/m^3

gravitational field strength = 9.8 N/kg

Calculate the increase in pressure on the swimmer.

Give the unit.

Use an equation from the Physics Equation Sheet.

[4 marks]

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Increase in Pressure = ... Unit = ...

FEEDBACK

Overall Mark:	**/24**	**GRADE ACHIEVED:**	
		5 ☐	**1** ☐
		4 ☐	**U** ☐
		3 ☐	
		2 ☐	
Section A: Mark	/6		
Section B: Mark	/11		
Section C: Mark	/7		

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding

Strengths:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving
Areas to Improve:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving

Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
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Student response:

EQUATIONS SHEET

AQA
Realising potential

GCSE Physics Equation Sheet

1	**pressure due to a column of liquid = height of column × density of liquid × gravitational field strength (g)**	$p = h \rho g$
2	(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance	$v^2 - u^2 = 2 a s$
3	**force = change in momentum / time taken**	$F = \frac{m \Delta v}{\Delta t}$
4	elastic potential energy = 0.5 × spring constant × (extension)^2	$E_e = \frac{1}{2} k e^2$
5	change in thermal energy = mass × specific heat capacity × temperature change	$\Delta E = m c \Delta \theta$
6	period = 1 / frequency	
7	magnification = image height / object height	
8	**force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length**	$F = B I l$
9	thermal energy for a change of state = mass × specific latent heat	$E = m L$
10	**potential difference across primary coil / potential difference across secondary coil = number of turns in primary coil / number of turns in secondary coil**	$\frac{V_p}{V_s} = \frac{n_p}{n_s}$
11	**potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil**	$V_s I_s = V_p I_p$
12	For gases: pressure × volume = constant	$p V = constant$

Acknowledgements

This document has been produced by Mr J Turnbull.

All relevant information has been credited in the document.

This document has been produced for educational purposes only.

This document has been produced for the AQA GCSE Physics Specification.