Write your name here

Surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9 - 1)

Centre Number | Candidate Number

Physics

Paper 2

Foundation Tier

Sample Assessment Material for first teaching September 2016

Time: 1 hour 45 minutes

Paper Reference
1PH0/2F

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an asterisk (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

S50051A

S 5 0 0 5 1 A 0 1 3 6

PEARSON

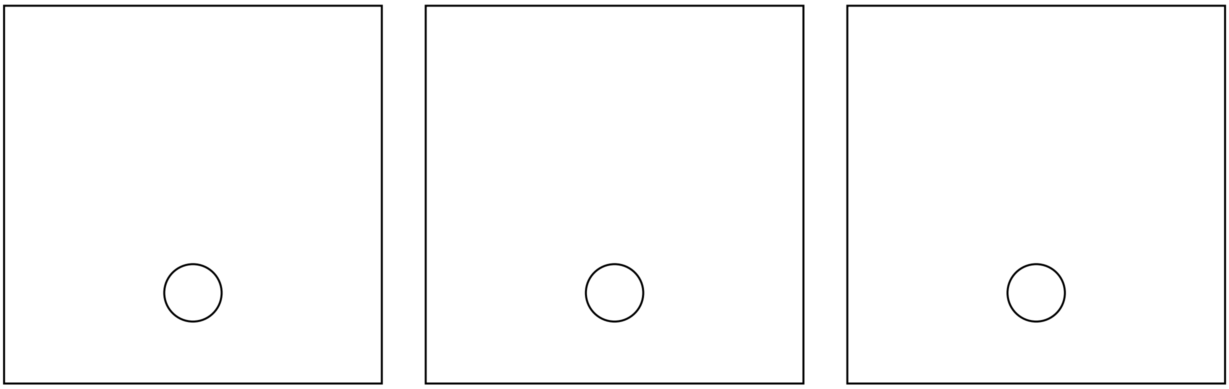
Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒ .
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 (a) (i) Complete each box in Figure 1 to show how particles are arranged in a solid, liquid and gas.

One particle in each box has been drawn for you.

(3)



solid liquid gas

Figure 1

(ii) Which row of the table is correct for water compared to steam?

(1)

		the density of water is	the water molecules are
☐	**A**	bigger	smaller
☐	**B**	smaller	bigger
☐	**C**	bigger	closer together
☐	**D**	smaller	further apart

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(b) A student investigates the density of a copper block and the density of a small stone, as shown in Figure 2.

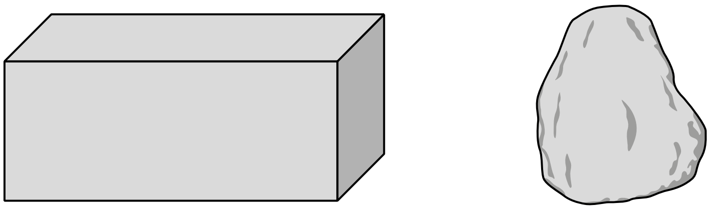


Figure 2

(i) The student calculates the volume of the block as 13 cm^3.

She finds that the mass of the block is 100 g.

Calculate the density of the block.

Use the equation

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

(2)

density = ... g/cm^3

(ii) The student found the volume of the copper block by multiplying the area of its base by its height.

The small stone does not have straight sides.

Describe how the student could measure the volume of the small stone. You may use a diagram if it helps your answer.

(3)

....

....

....

....

....

....

(Total for Question 1 = 9 marks)

2 (a) Figure 3 shows a coil of wire called a solenoid.

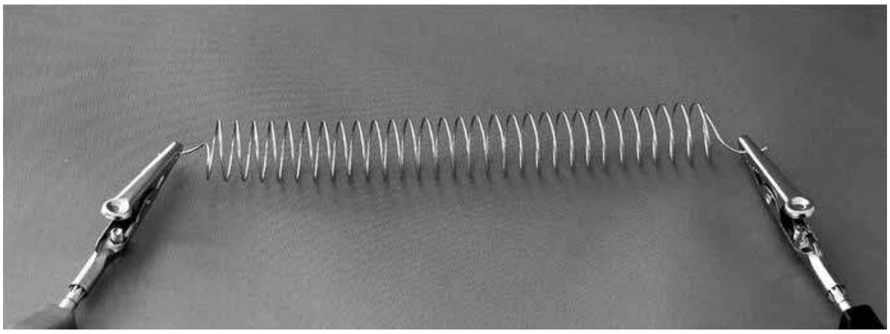


Figure 3

Figure 4 gives information about the magnetic field of a solenoid.

description of the magnetic field	**part of magnetic field**	
	inside the coil	**outside the coil**
strong	✓	✗
weak	✗	✓
uniform	✓	✗
non-uniform	✗	✓

Figure 4

(i) Draw lines on Figure 5 to show the shape of the magnetic field **inside** the solenoid.

Use information from Figure 4.

(1)

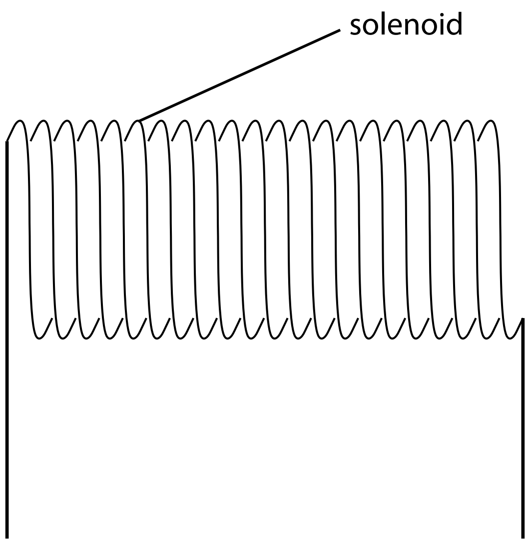


Figure 5

(ii) Describe how a student can determine the shape of the magnetic field around the solenoid.

(2)

....

....

....

....

(b) A student investigates the magnetic properties of three rods. Each rod is made of one of the following materials:

- soft iron
- steel
- wood

The student places each rod in a solenoid that is connected to a direct current power supply.

The power supply is switched on for a short time.

The student tests the magnetic strength of each rod by seeing how many paper clips it can pick up as shown in Figure 6.

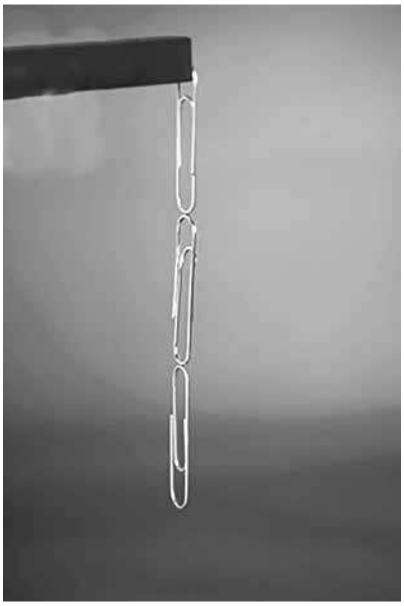


Figure 6

The student's results are shown in Figure 7.

	number of paper clips picked up by rod			
rod	**before rod is placed in solenoid**	**when there is current in solenoid**	**1 minute after current is switched off**	**10 minutes after current is switched off**
A	0	0	0	0
B	0	6	1	0
C	0	8	7	7

Figure 7

Complete the table below to show which material (soft iron, steel or wood) each rod is made from, with the reason why.

Part of the table has been done for you.

Use information from Figure 7.

(3)

rod	material	reason
A		It is not magnetic because it does not pick up paper clips whether there is a current or not.
B		
C		

(Total for Question 2 = 6 marks)

3 An electric heater is used to heat some water.

Figure 8 shows the experimental setup used.

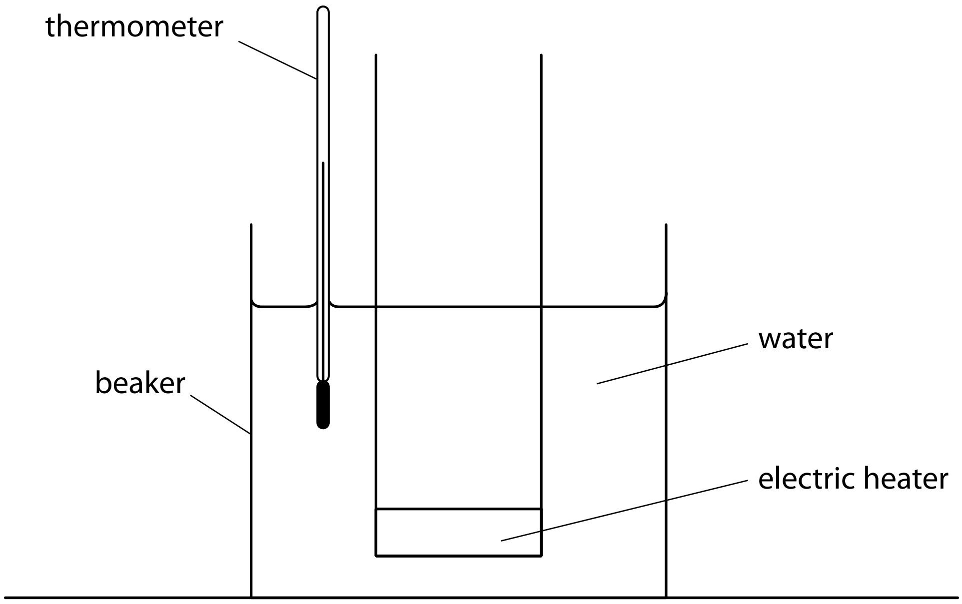


Figure 8

(a) Figure 9 shows the energy transferred by the electric heater in 1 second.

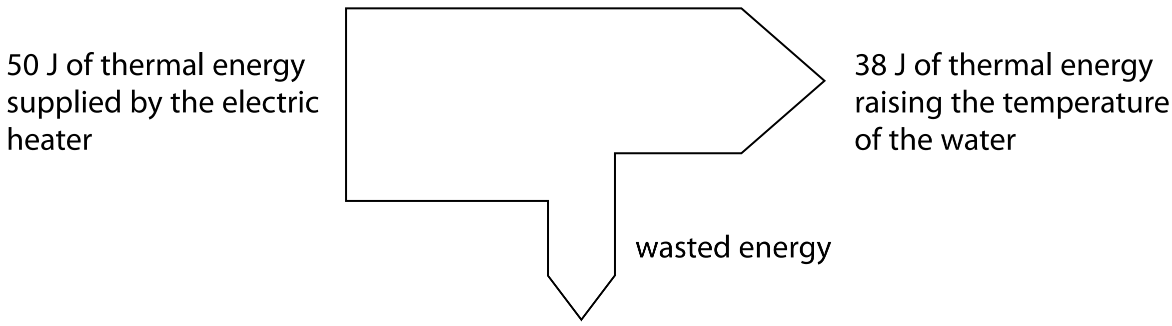


Figure 9

(i) How much energy is wasted each second?

(1)

- ☒ **A** 12 J
- ☒ **B** 38 J
- ☒ **C** 50 J
- ☒ **D** 88 J

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(ii) Describe what happens to the wasted energy.

(2)

....

....

....

....

(b) Explain **one** way the experiment can be improved to reduce the amount of wasted energy.

(2)

....

....

....

....

....

(c) The initial mass of the water in the beaker is 0.72 kg.

The electric heater is switched on for some time and the water boils.

The mass of the water after the heater is switched off is 0.60 kg.

The thermal energy transferred to the water while it boils is 270 000 J.

Use an equation from the formula sheet to calculate the specific latent heat of the water.

(3)

specific latent heat = ... J/kg °C

(Total for Question 3 = 8 marks)

4 A man pulls a suitcase with a horizontal force, *F*, as shown in Figure 10.

Two other forces acting on the suitcase are labelled *P* and *Q*.

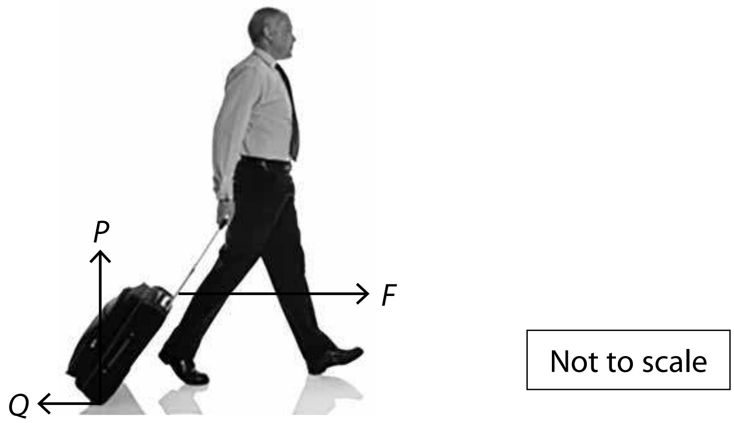


Figure 10

(a) (i) Which of these gives the correct names for the forces *P* and *Q*?

(1)

		name of	
		force *P*	**force *Q***
☒	**A**	upthrust	reaction
☒	**B**	reaction	friction
☒	**C**	reaction	reaction
☒	**D**	friction	upthrust

(ii) Draw an arrow on the diagram to represent the weight of the suitcase.

(1)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(b) The man pulls the suitcase for 80 m along a horizontal path.

The mass of the man and the suitcase is 85 kg.

The man does 1200 J of work on the suitcase as he pulls the suitcase along.

He walks with an average velocity of 1.5 m/s.

(i) Calculate the kinetic energy of the man and the suitcase.

(2)

kinetic energy = ... J

(ii) Calculate the horizontal force, *F*, that the man exerts on the suitcase.

Use the equation:

work done = force × distance moved in the direction of the force

(2)

force = ... N

(c) The man runs up a set of stairs carrying his suitcase.

Explain whether he does more total work if he walks up the same stairs instead of running.

(2)

....

....

....

....

(d) The man lifts his suitcase.

The increase in gravitational potential energy of the suitcase is 264 J.

The mass of the suitcase is 12 kg.

Calculate the vertical height the suitcase is raised.

(gravitational field strength, g = 10 N/kg)

Use the equation:

change in gravitational potential energy = mass × g × change in vertical height

(2)

height raised = ... m

(Total for Question 4 = 10 marks)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

5 The efficiency of an electric motor is investigated as shown in Figure 11.

The motor lifts a mass at a constant speed.

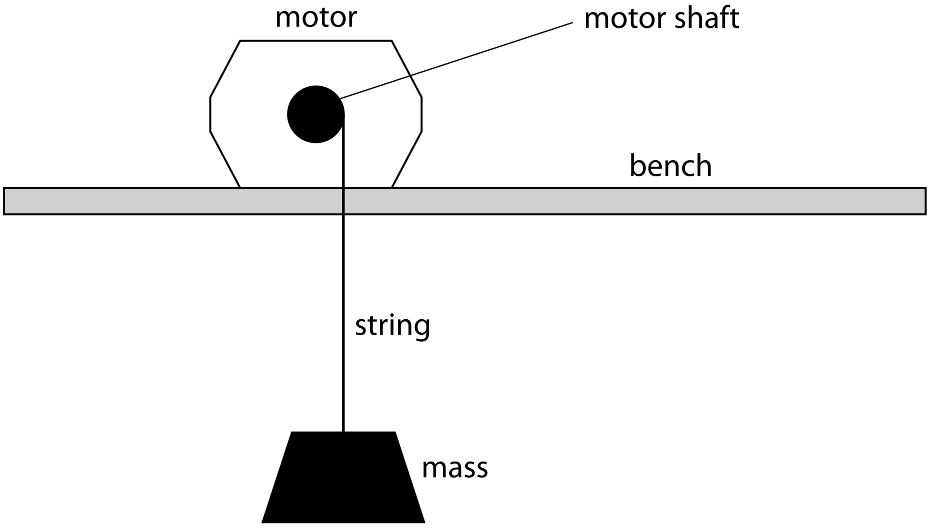


Figure 11

The results are shown in Figure 12.

current in motor	1.9 A
voltage across motor	10.0 V
time taken to lift mass	9.0 s

Figure 12

(a) (i) Which of these changes would improve the results?

(1)

- ☒ **A** Repeating the investigation with different masses
- ☒ **B** Repeating the readings and calculating averages
- ☒ **C** Using a motor that works with a higher voltage
- ☒ **D** Using a shorter piece of string to lift the mass

(ii) Which of these best shows the energy stores as the mass is lifted?

(1)

		kinetic energy of the mass	potential energy of the mass
☒	**A**	constant	increasing
☒	**B**	constant	decreasing
☒	**C**	decreasing	increasing
☒	**D**	decreasing	decreasing

(b) (i) Show that the total energy supplied to the motor in the 9 s is about 170 J.

(2)

(ii) During the 9 s the efficiency of the motor is 70%.

Calculate the amount of useful energy transferred in the 9 s.

Use the equation

$$\text{efficiency} = \frac{\text{useful energy transferred}}{\text{total energy supplied}}$$

(3)

useful energy = ... J

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(c) Which row of the table is correct for the resistance of the motor?

(1)

	resistance of motor =	resistance of motor =
☒ **A**	$I \div V$	$I^2 \div P$
☒ **B**	$V \div I$	$P \div I^2$
☒ **C**	$V \div I$	$P \times I^2$
☒ **D**	$I \times V$	$P \div I^2$

(d) When the motor lifts the mass, the coil in the motor becomes warm.

Explain why the coil becomes warm.

(3)

....

....

....

....

....

....

(Total for Question 5 = 11 marks)

6 (a) Figure 13 shows a tank for holding water.

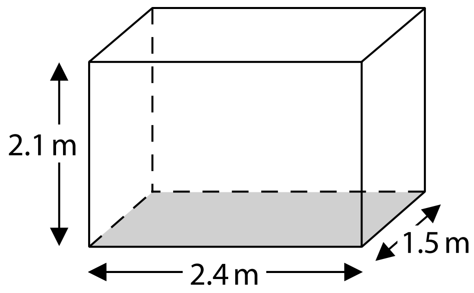


Figure 13

The tank has sides of 2.4 m, 2.1 m and 1.5 m.

The pressure at the bottom of the tank is 12 kPa.

(i) State the equation relating pressure, force and area.

(1)

(ii) Calculate the weight of water in the tank.

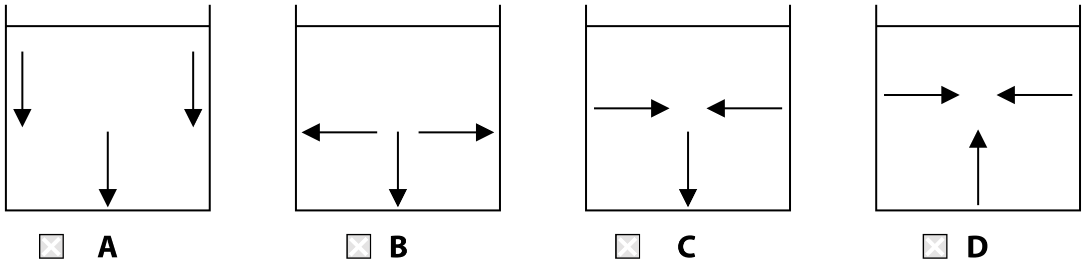
(4)

weight = ... N

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(iii) Which diagram shows the direction of the forces from the water on the inside of the tank?

(1)



(b) A student makes the following hypothesis:

‘*When I increase the pressure on a fixed mass of gas, the volume of the gas decreases.*’

She has the equipment shown in Figure 14.

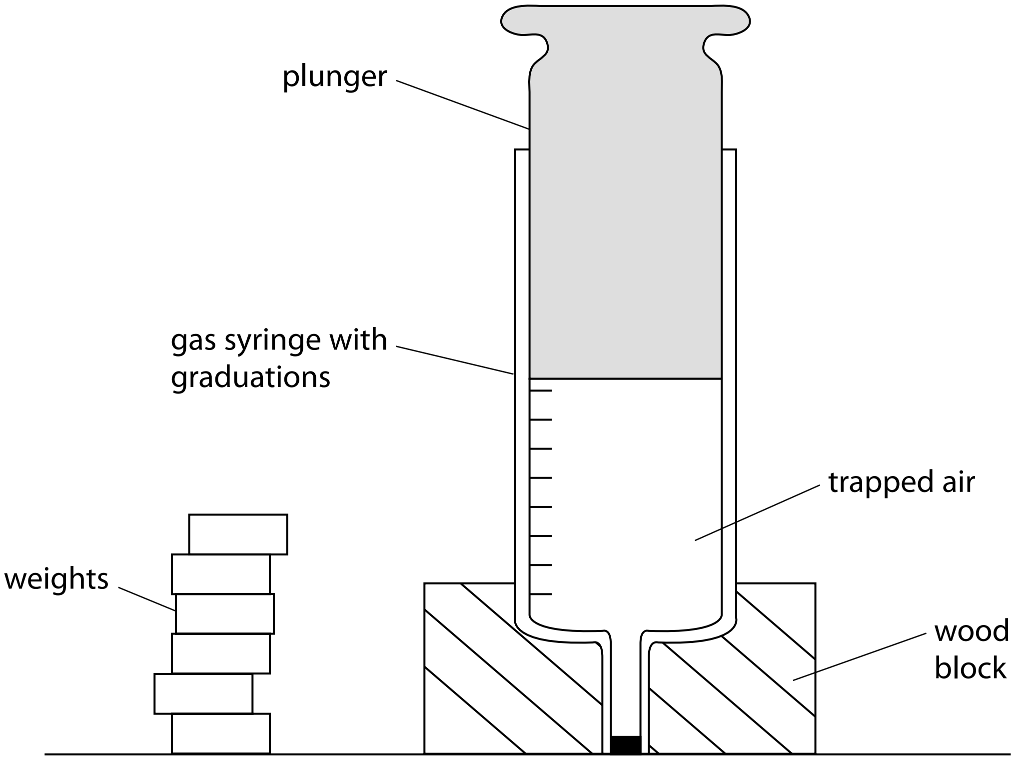


Figure 14

She measures the area of the plunger.

Devise a plan to test her hypothesis.

(4)

....

....

....

....

....

....

....

....

(Total for Question 6 = 10 marks)

DO NOT WRITE IN THIS AREA

7 (a) Balloon **P** hangs from an insulating thread.

A teacher gives the balloon a positive electric charge, as shown in Figure 15.

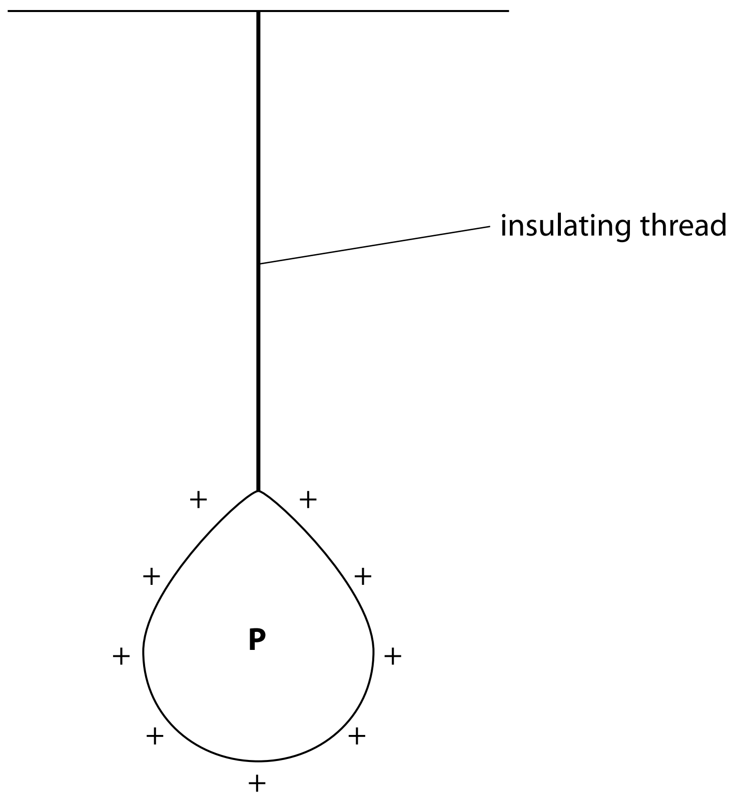


Figure 15

(i) When the balloon is charged like this, it has

(1)

☒ **A** gained electrons

☒ **B** lost electrons

☒ **C** gained protons

☒ **D** lost protons

(ii) Two more balloons, **Q** and **R**, are charged and placed either side of balloon **P**.

The balloons move to the positions shown in Figure 16.

Add the charges on balloons **Q** and **R** in Figure 16.

(2)

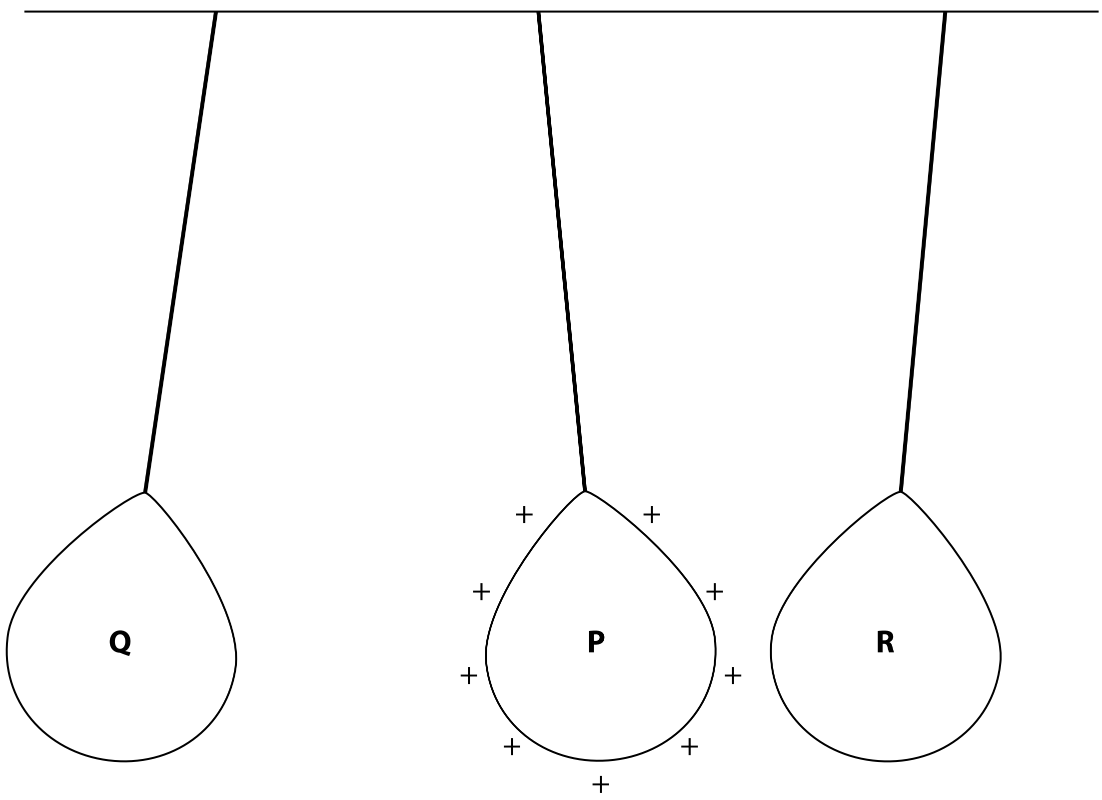


Figure 16

(b) Figure 17 shows an airport worker refuelling an aircraft.

(Source: © Stanisław Tokarski/123RF)

Figure 17

(i) As fuel moves through the pipe, it becomes positively charged.

Explain how the worker can prevent a build-up of charge when pumping fuel into the aircraft.

(3)

....

....

....

....

....

....

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(ii) Explain how an aircraft can become electrically charged as it flies through the air.

(2)

....

....

....

....

(c) Fuel weighing 230 000 N is pumped into the aircraft.

This fuel moves upwards through a vertical height of 4.7 m.

The power developed by the pump is 1600 W.

Calculate the time needed to refuel the aircraft.

(3)

time = ... s

(Total for Question 7 = 11 marks)

8 A student investigates how the resistance of a thermistor varies with temperature.

(a) The student uses the equipment shown in Figure 18 to measure the temperature of the thermistor.

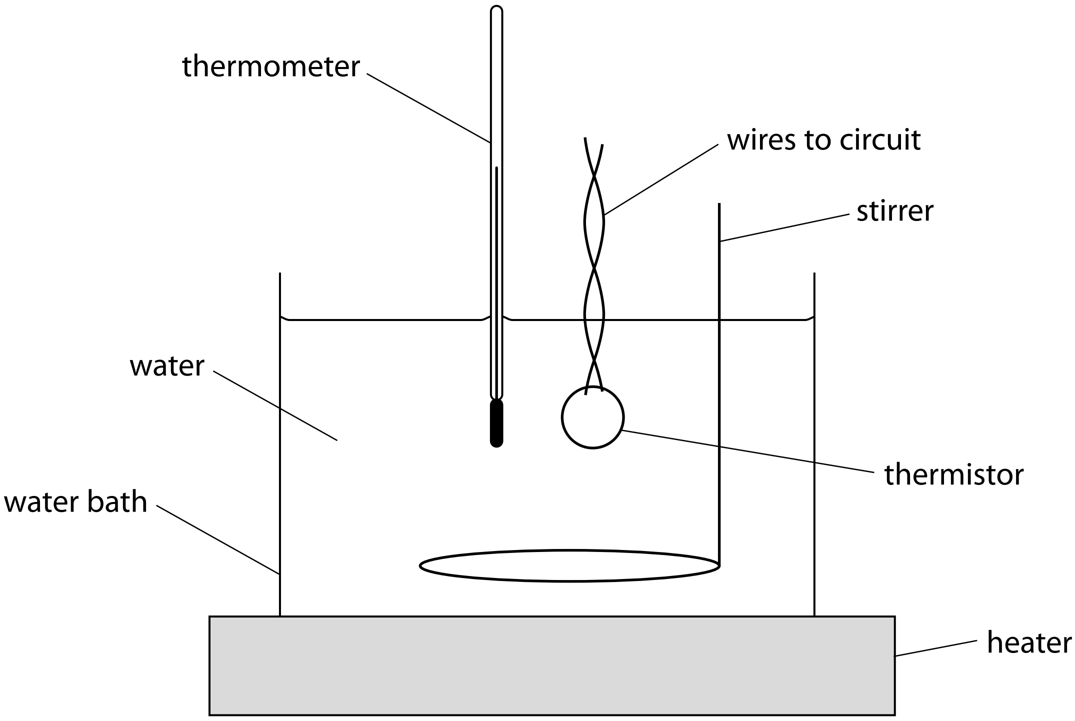


Figure 18

(i) Give **one** reason for using a water bath.

(1)

....

....

(ii) The equipment shown in Figure 18 is for investigations in the temperature range from 20 °C to 100 °C.

State **one** way the student could develop this experimental procedure to investigate temperatures outside this range.

(1)

....

....

(b) The student takes measurements for two other components, **A** and **B**.

The results for both these components are shown in Figure 19.

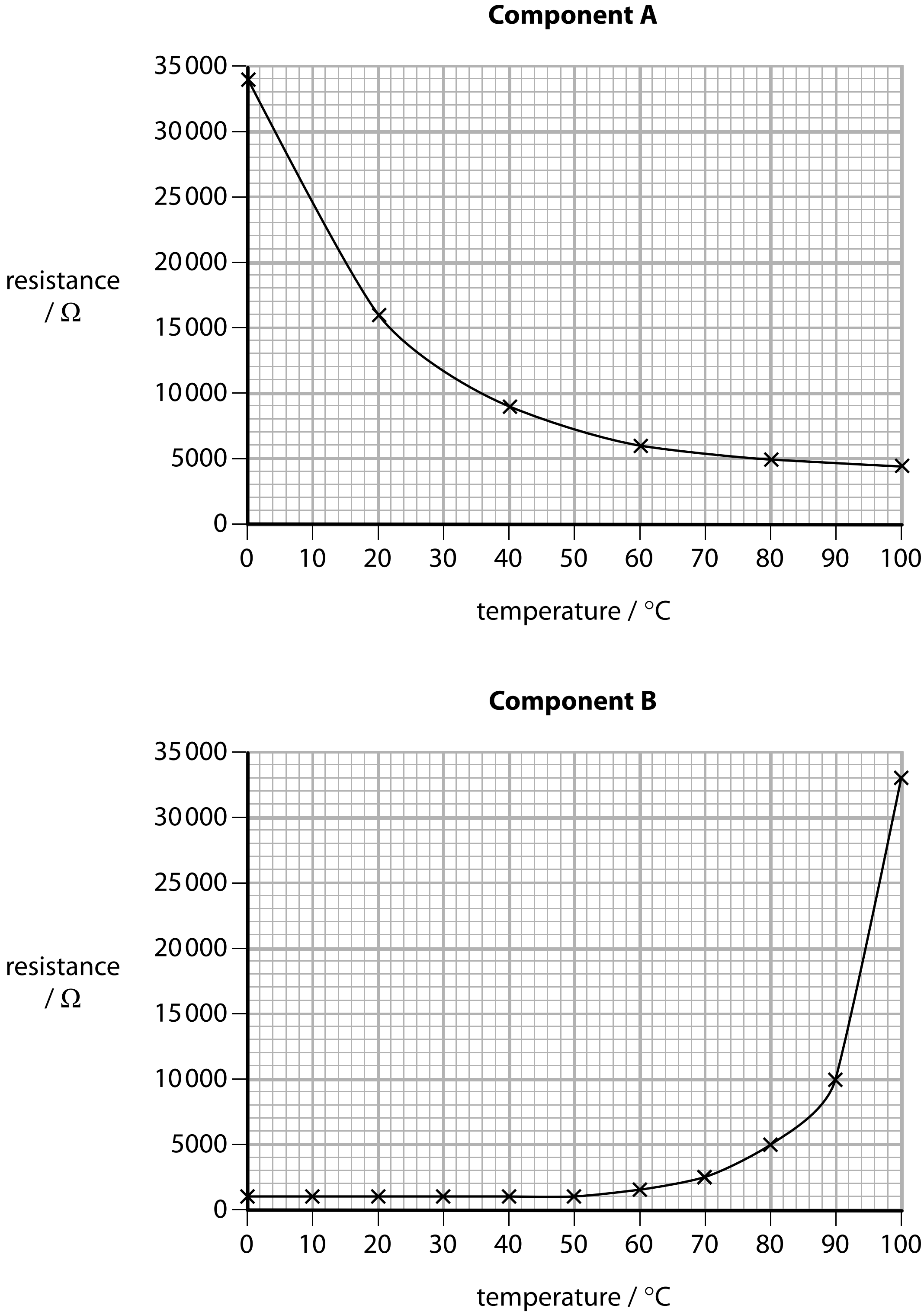


Figure 19

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

Compare and contrast how the resistances of component **A** and component **B** vary with temperature.

(3)

....

....

....

....

....

*(c) Describe how the student should carry out an experiment to determine the specific heat capacity of water.

(6)

....

....

....

....

....

....

....

....

....

....

....

....

(Total for Question 8 = 11 marks)

BLANK PAGE

9 A student uses a digital calliper to measure the length of a spring, as shown in Figure 20.

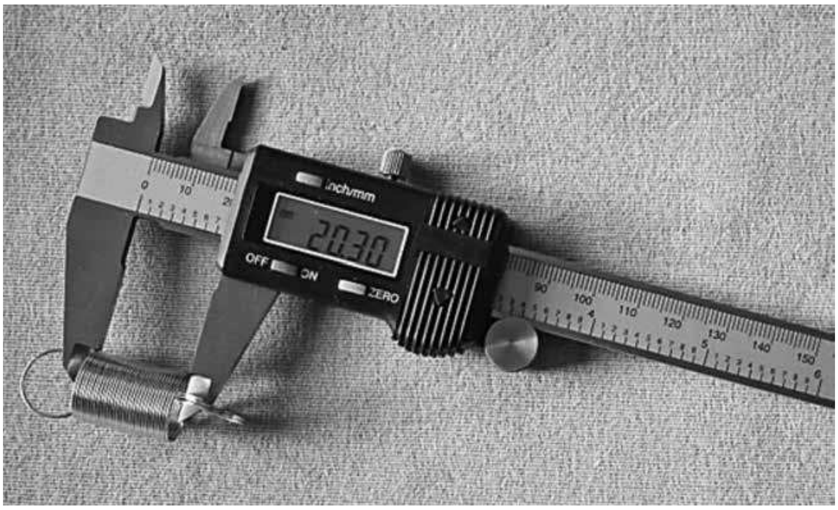


Figure 20

The spring is bendy and difficult to measure.

The student takes the six readings shown in Figure 21.

mm 20.31	mm 20.33
mm 20.44	mm 20.30
mm 20.33	mm 20.30

Figure 21

(a) Calculate the average length of the spring.

(2)

average length = ... mm

(b) The student investigates the stretching of a spring with the equipment shown in Figure 22.

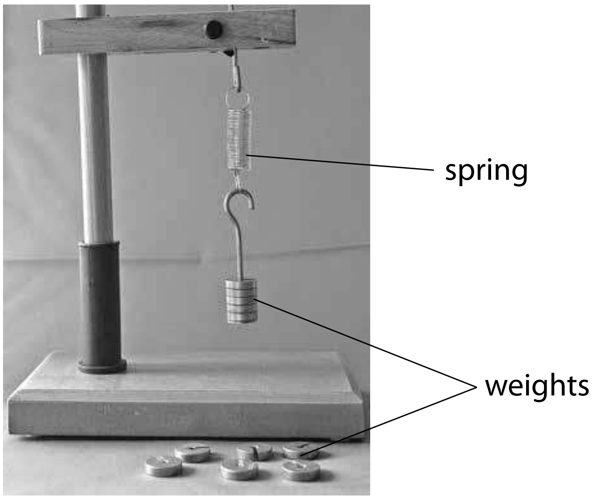


Figure 22

The student investigates the extension of the spring using six different weights.

The results are shown in Figure 23.

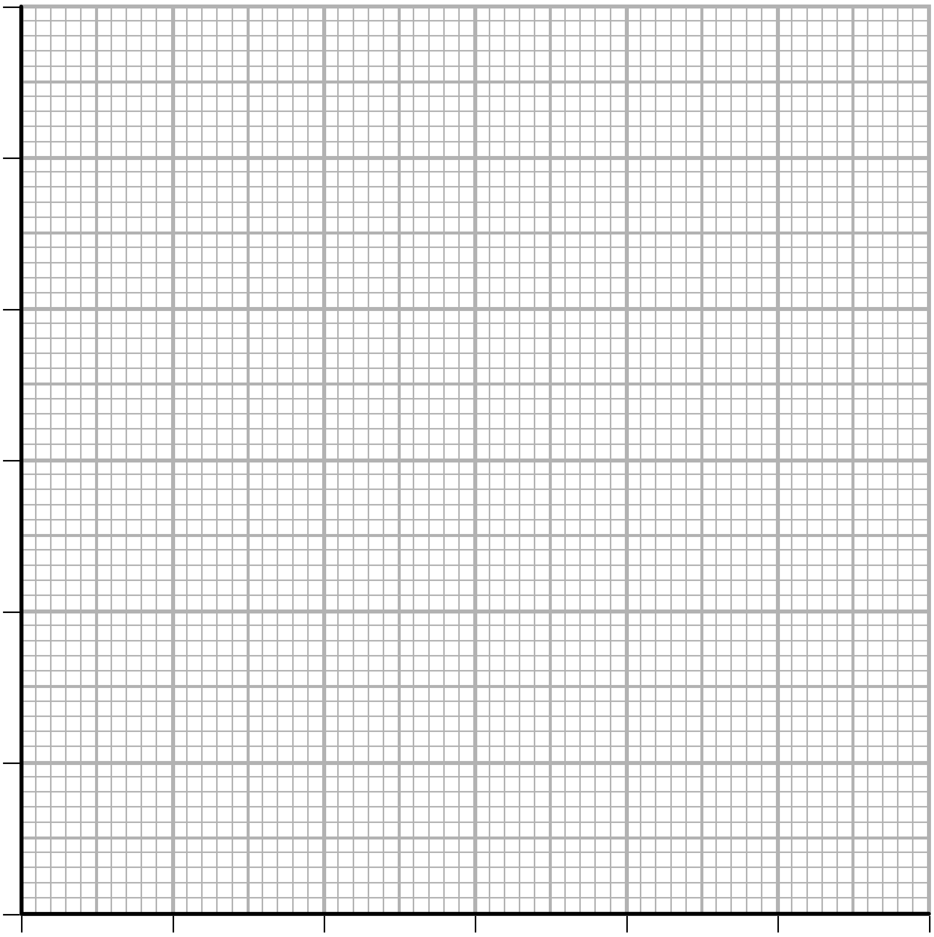
weight (N)	extension (mm)
0.20	4.0
0.40	8.0
0.60	12.0
0.80	16.0
1.00	20.0
1.20	24.0

Figure 23

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(i) Draw a graph for the readings, using the grid shown.

(3)



(ii) The student writes this conclusion:

'*The extension of the spring is directly proportional to the weight stretching the spring.*'

Comment on the student's conclusion.

(3)

(c) The student extends the investigation by finding information about the stretching of wires.

The student finds the graph shown in Figure 24 for the stretching of a wire.

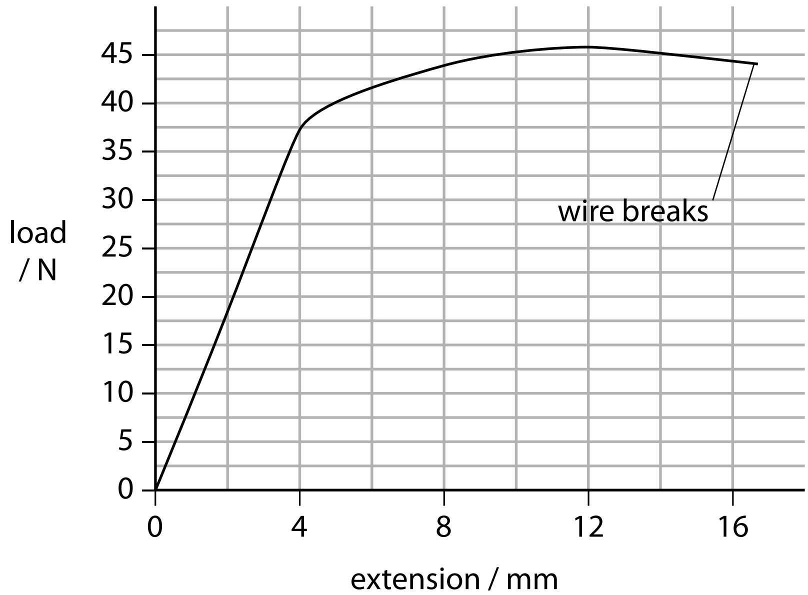


Figure 24

Describe the non-linear stretching of the wire shown in Figure 24.

(3)

....

....

....

....

....

....

(Total for Question 9 = 11 marks)

10 A scuba diver is on a sandy beach.

She checks her compressed air cylinders before a dive.
She has two identical steel cylinders, A and B.
Each cylinder contains the same amount of compressed air.

Figure 25 shows the diver's cylinders.

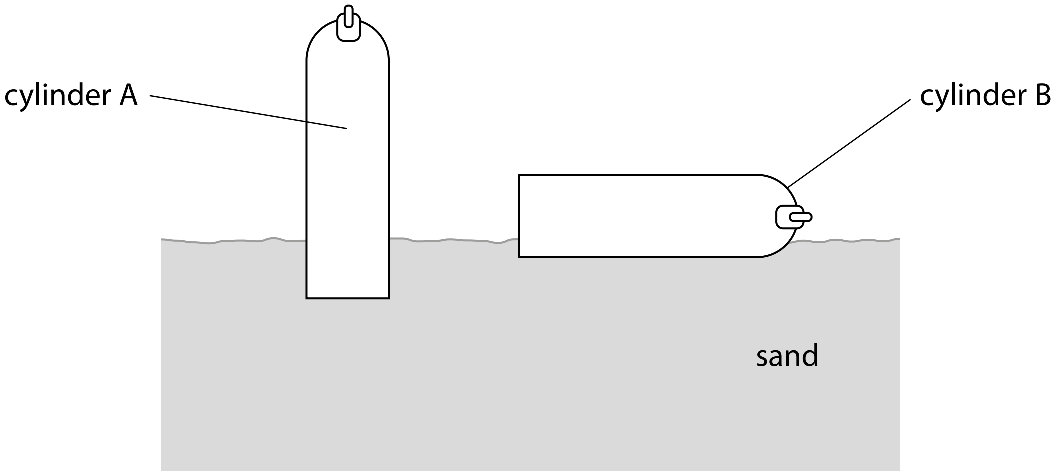


Figure 25

(a) Explain why cylinder A sinks further into the sand than cylinder B.

Use ideas about pressure, force and area in your answer.

(4)

....

....

....

....

....

....

....

(b) When underwater, the diver tries to move a large stone block.

The diver uses a long iron bar and a pivot, as shown in Figure 26.

When pushing down with a force of 120 N, the block is balanced.

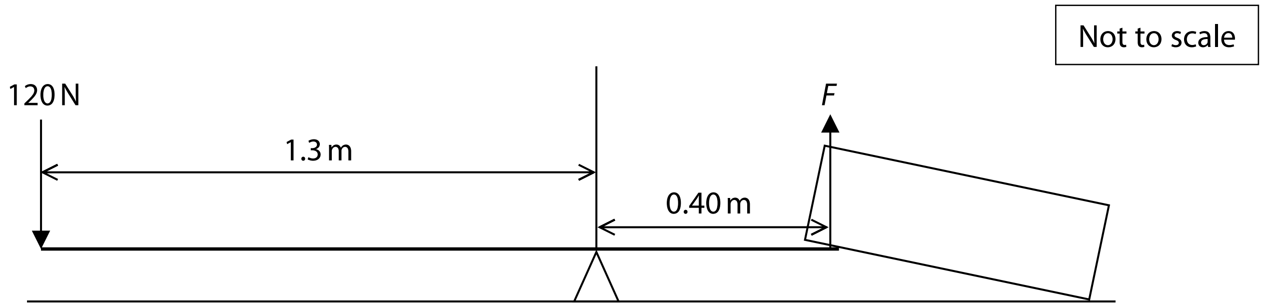


Figure 26

Calculate the size of the force, *F*, of the bar on the block.

(3)

force = ... N

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

*(c) When the diver is swimming under water, she breathes out bubbles of gas, as shown in Figure 27.

(Source: © mihtiander/123RF)

Figure 27

The bubbles of gas rise to the surface.
The temperature of the gas does not change.

Explain what happens to a bubble as it rises to the surface.
Your answer should refer to gas equations, kinetic theory and particles.

(6)

(Total for Question 10 = 13 marks)

TOTAL FOR PAPER = 100 MARKS

Equations

(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance $v^2 - u^2 = 2 \times a \times x$
energy transferred = current × potential difference × time $E = I \times V \times t$
potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil $V_p \times I_p = V_s \times I_s$
change in thermal energy = mass × specific heat capacity × change in temperature $\Delta Q = m \times c \times \Delta\theta$
thermal energy for a change of state = mass × specific latent heat $Q = m \times L$
$P_1 V_1 = P_2 V_2$ to calculate pressure or volume for gases of fixed mass at constant temperature
energy transferred in stretching = 0.5 × spring constant × (extension)^2 $E = \frac{1}{2} \times k \times x^2$