

Surname	Centre Number	Candidate Number
Other Names		0



**GCSE**

4791/01



W16-4791-01

**ADDITIONAL APPLIED SCIENCE**  
**UNIT 1: Science at Work in Applied Contexts**  
**FOUNDATION TIER**

A.M. THURSDAY, 7 January 2016

1 hour

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	10	
2.	13	
3.	5	
4.	4	
5.	4	
6.	11	
7.	13	
<b>Total</b>	<b>60</b>	

**ADDITIONAL MATERIALS**

In addition to this paper you may require a calculator and a ruler.

**INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

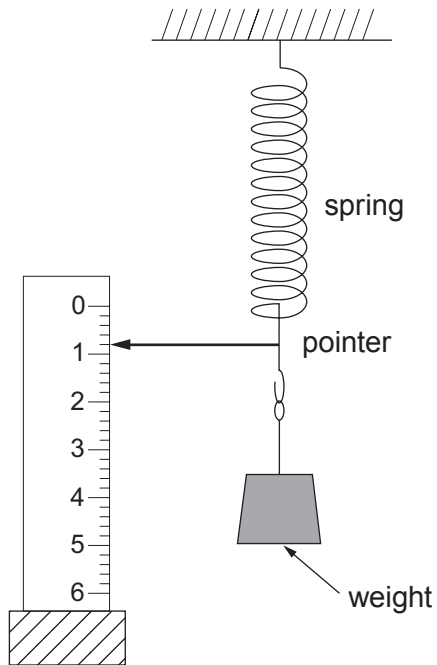
The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question 7(c).

You are reminded to show all your working. Credit is given for correct working even when the final answer given is incorrect.

Answer **all** the questions in the spaces provided.

1. (a) The diagram below shows the apparatus used to measure the stiffness of a spring.

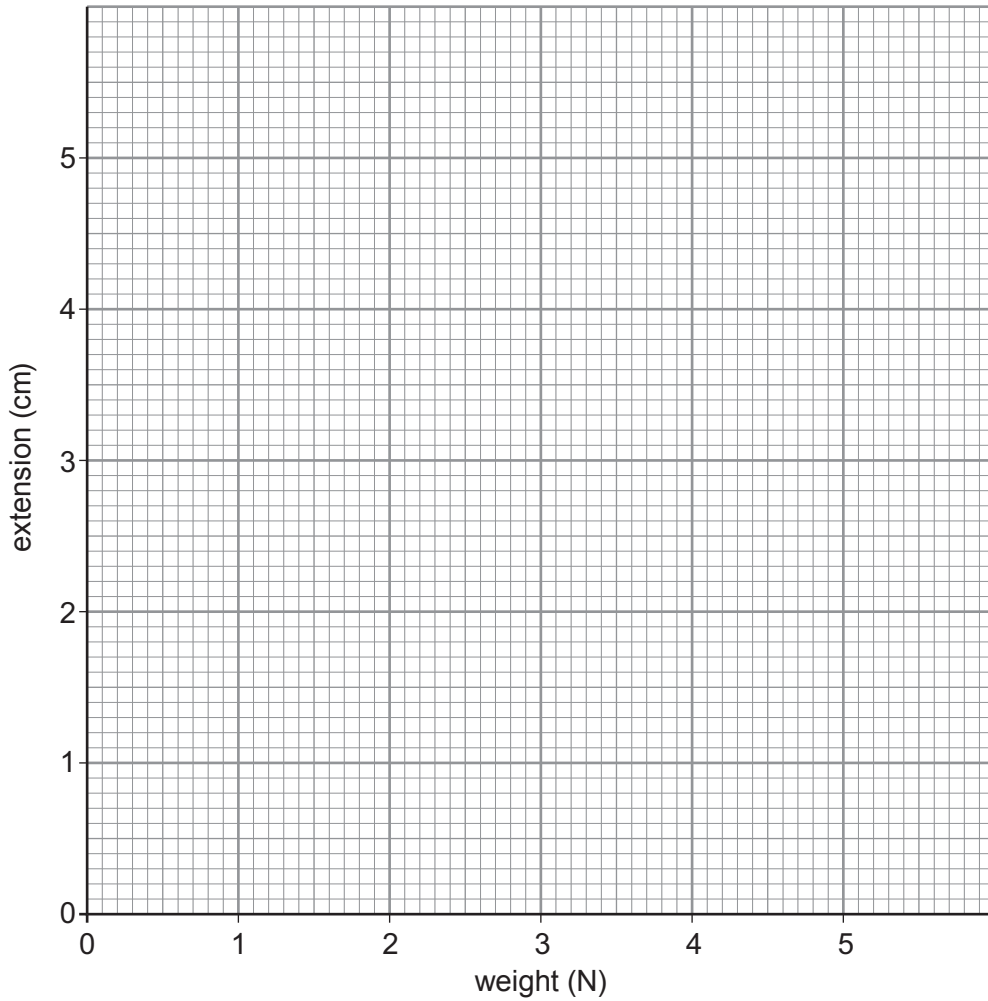


Results from the experiment are shown in the table.

weight (N)	extension (cm)
0.0	0.0
0.5	0.6
1.0	1.2
1.5	1.8
2.0	2.4
3.0	3.6
4.0	4.8

(i) Use the results to plot a graph on the grid.

[3]



(ii) Use the graph to find the extension for a weight of 2.5 N.

[1]

extension = ..... cm

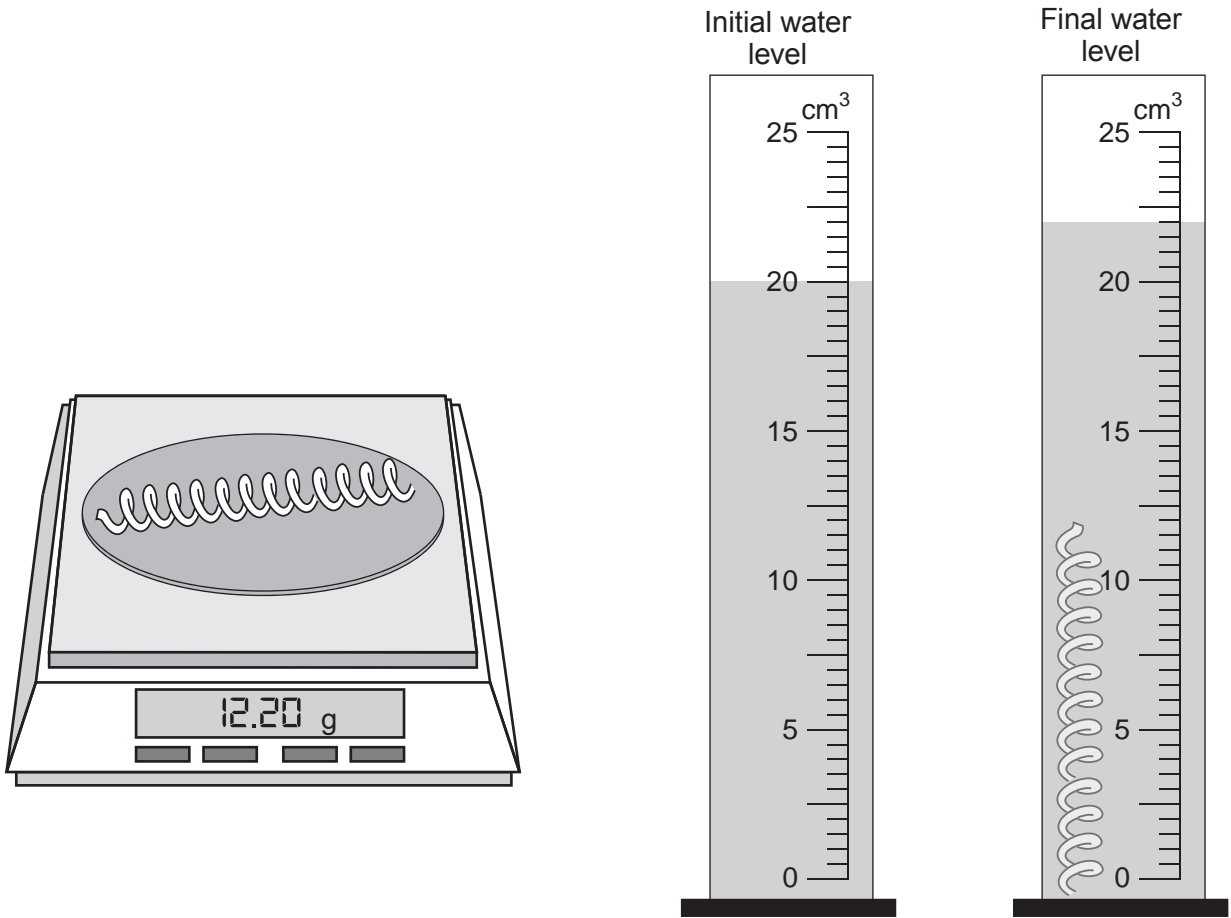
(iii) Calculate the spring constant using the equation:

[2]

$$\text{spring constant} = \frac{\text{force (N)}}{\text{extension (cm)}}$$

spring constant = ..... N/cm

(b) The mass and volume of the spring are found as shown below.



Use information in the diagrams above to answer the following questions.

(i) Calculate the volume of the spring. [1]

volume = ..... cm<sup>3</sup>

(ii) State the mass of the spring. [1]

mass = ..... g

(iii) Calculate the density of the spring using the equation: [2]

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

density = ..... g/cm<sup>3</sup>

2. The table below tells you about the solubility of salts.

Soluble salts	Insoluble salts
all nitrates	no insoluble nitrates
sodium carbonate potassium carbonate	most carbonates
most chlorides most bromides most iodides	silver chloride silver bromide silver iodide lead chloride lead bromide lead iodide
most sulfates	lead sulfate barium sulfate
sodium hydroxide potassium hydroxide	most hydroxides

(a) In a precipitation reaction, two soluble salts make an insoluble salt.

- (i) **Salt 1** and **Salt 2** are mixed together in water.  
Use the information about solubilities to complete the table.

[4]

<b>Salt 1</b>	Soluble? Yes / No	<b>Salt 2</b>	Soluble? Yes / No	Example of a precipitation reaction? Yes / No	Insoluble salt produced? Yes / No
sodium nitrate	yes	barium sulfate	.....	no	no
sodium sulfate	.....	lead nitrate	yes	yes	yes
potassium nitrate	yes	sodium carbonate	yes	no	.....
lead bromide	no	barium hydroxide	no	.....	.....

- (ii) Silver chloride is used to make sunglasses and stained-glass windows.  
Complete the equation below to show how silver chloride is made.

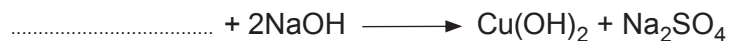
[3]



(b) Another example of a precipitation reaction is shown in the equation below.

copper sulfate + sodium hydroxide  $\longrightarrow$  copper hydroxide + sodium sulfate

(i) Complete the symbol equation for this reaction. [1]



(ii) Calculate the relative formula mass of copper hydroxide using the information in the table below. [4]

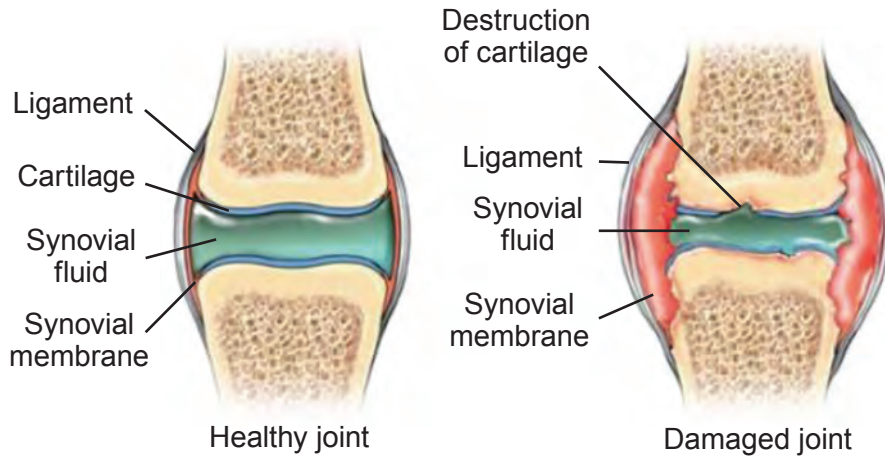
Element	Relative atomic mass	Number of atoms in $\text{Cu(OH)}_2$	Total mass
hydrogen	1	2	2
copper	64	1	.....
oxygen	16	.....	.....
<b>Relative formula mass =</b>			.....

(iii) State the mass of **one** mole of copper hydroxide. [1]

mass = ..... g

3. Footballers rely on healthy knee joints.

The diagrams below show a healthy and a damaged knee joint.



(i) **Join** each part of the joint to its function with a straight line.

[3]

Part of the joint	Function
synovial fluid	pads the ends of bones
cartilage	lubrication
ligament	support
bone	joins bones together

(ii) State **two** reasons why the damaged joint can cause pain.

[2]

1. ....
2. ....

5

4. The box below contains some methods used in an analytical laboratory.

flame test	limewater test	microscopy
paper chromatography	titration	genetic profiling

Select the best method from the box for each of the following tasks.

[4]

- (i) How to measure the concentration of an acid.  
.....
- (ii) How to find out if sodium is present in a powder.  
.....
- (iii) How to separate the different components of food dyes or ink.  
.....
- (iv) How to test for carbon dioxide.  
.....

4

5. (i) State **three** ways to slow down the growth of bacteria on food.

[3]

- 1. ....
- 2. ....
- 3. ....

(ii) Give **one** reason why bacteria can cause food poisoning.

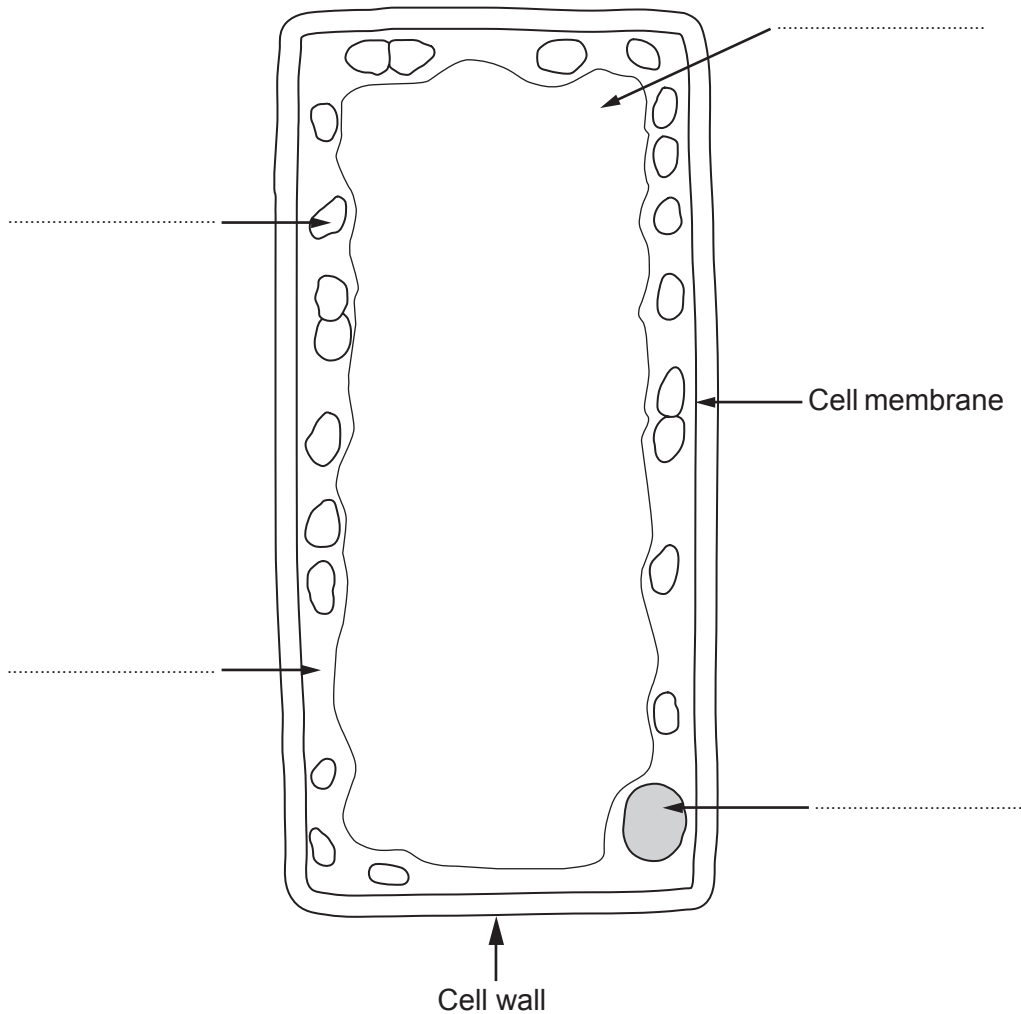
[1]

.....

4



6. (a) A diagram of a plant cell is shown below.



(i) **Complete** the labelling of the diagram. [4]

(ii) I. State the function of the cell wall. [1]

.....  
 II. State which part controls all the activities of the cell. .... [1]

III. State the function of the cell membrane. [1]

.....

(b) Chloroplasts contain a green substance that absorbs light for photosynthesis.

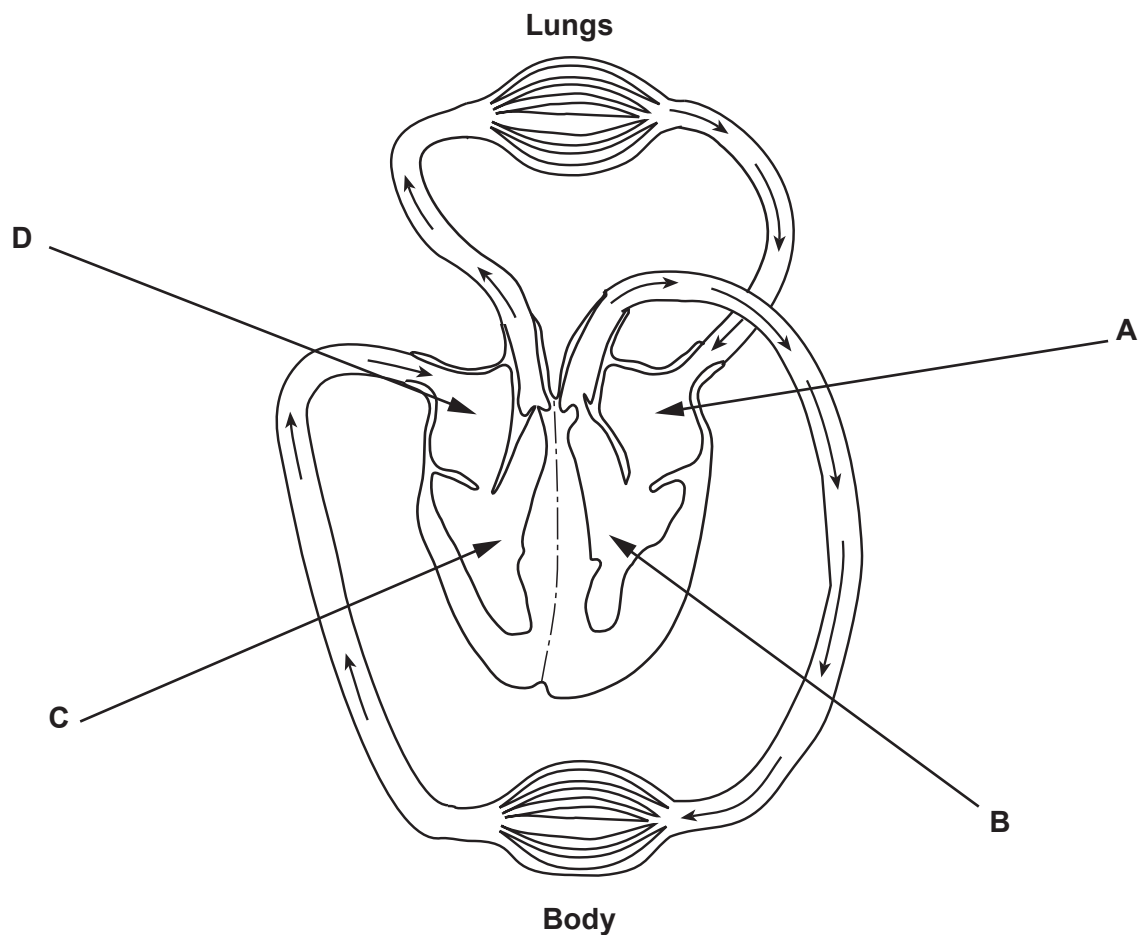
(i) Name this green substance. .... [1]

(ii) Complete the word equation for photosynthesis. [3]



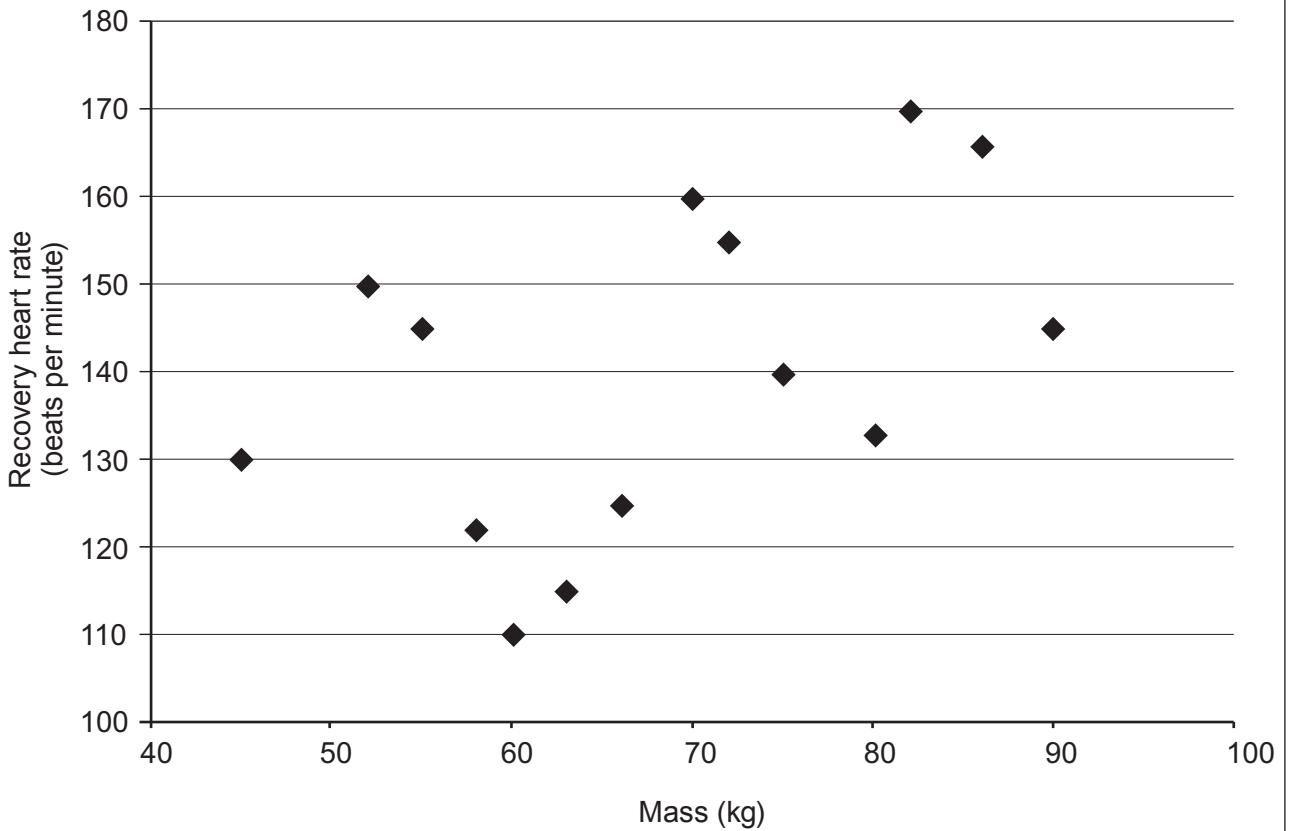
7. A nurse is monitoring the heart of a patient.

(a) Answer the questions using the diagram of the circulatory system below.



- (i) Which chamber, **A**, **B**, **C** or **D**, pumps blood to the lungs? .....[1]
- (ii) Into which chamber, **A**, **B**, **C** or **D**, does blood return from the body? ..... [1]
- (iii) The symptoms of left ventricular failure are tiredness, shortness of breath and irregular heart rate. Which chamber, **A**, **B**, **C** or **D**, is the left ventricle? [1]  
.....
- (iv) **Add** an arrow labelled **V** to the diagram to show a vein. [1]

(b) Recovery heart rate is the heart rate measured one minute after exercise. The scatter graph below shows the recovery heart rate for boys of different mass.

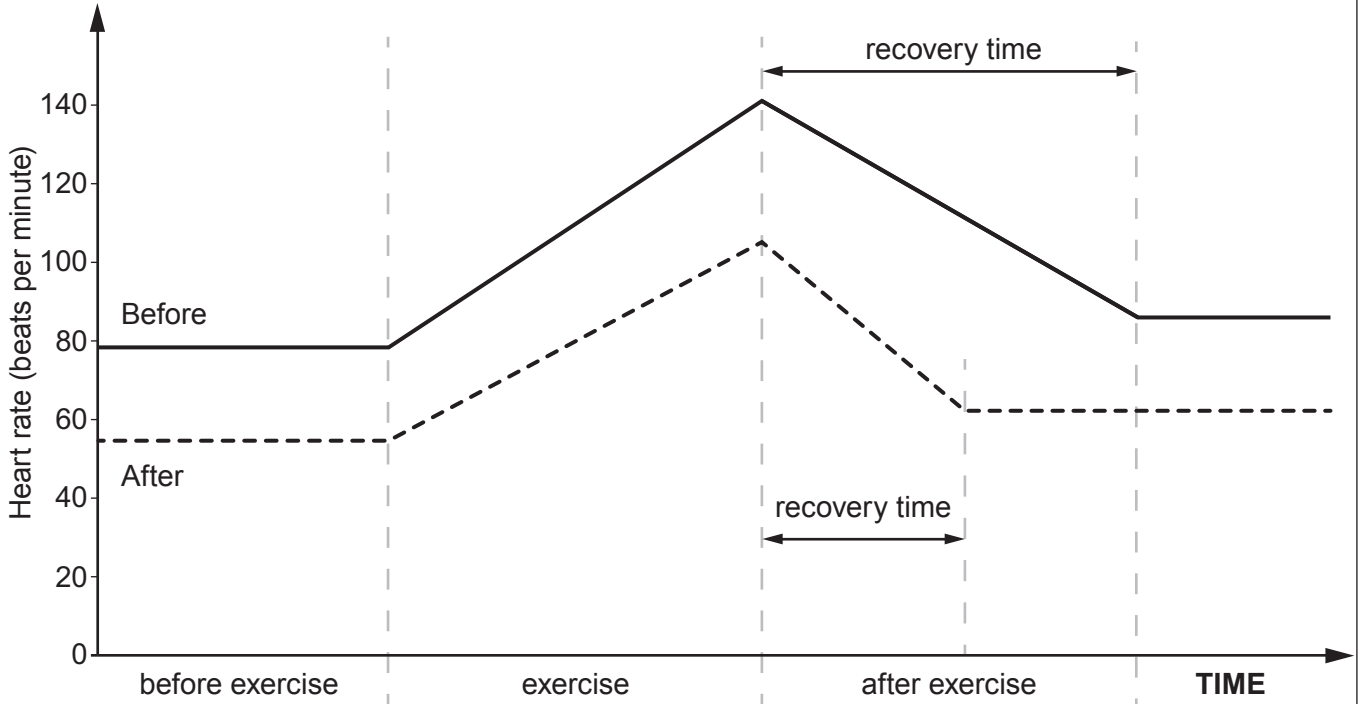


Use the information in the scatter graph to answer the following questions.

(i) What is the mass of the fittest student? [1]  
 ..... kg

(ii) Explain whether recovery heart rate depends on body mass. [2]  
 .....  
 .....

(c) The boys carried out a 6-month training programme. The graph below shows the effect of the same amount of exercise on one boy's heart rate **before** and **after** the training programme.



Explain the differences between the heart rates **before** and **after** the training programme. [QWC 6]

Your answer should include:

- a description of the differences between both graphs;
- an explanation of why these differences exist.

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