

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4791/01

ADDITIONAL APPLIED SCIENCE

UNIT 1: Science at Work in Applied Contexts

FOUNDATION TIER

A.M. THURSDAY, 15 May 2014

1 hour

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	6	
3.	6	
4.	8	
5.	8	
6.	9	
7.	10	
8.	8	
Total	60	

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 6(ii).

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.

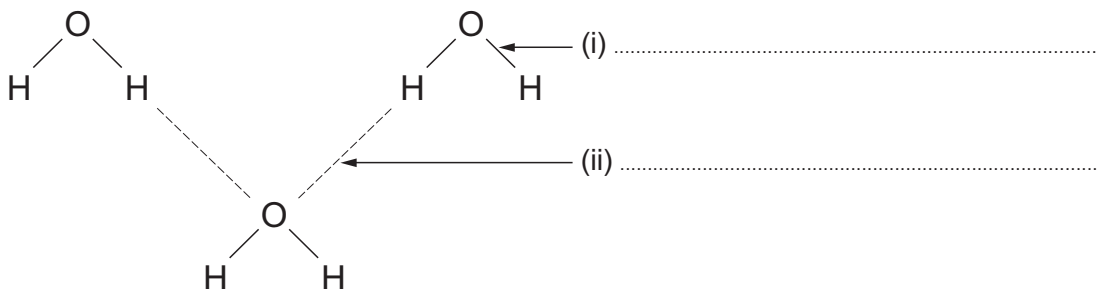
1. (i) State **two** conditions needed for bacteria to grow quickly on food. [2]
1.
2.
- (ii) State **two** methods of storing food for longer before it spoils. [2]
1.
2.
- (iii) What illness is caused by eating food contaminated with bacteria? [1]
-

2. (a) Complete the following sentences by underlining the correct term in the brackets. [4]
- (i) Ions of metals are (negative / neutral / positive).
- (ii) A metal ion and a non-metal ion are held together by (weak / gravitational / strong) forces.
- (iii) The force between metal ions and non-metal ions in ionic compounds is (magnetic / electromagnetic / electrostatic).
- (iv) The melting points of ionic compounds are (below 0°C / between 0 and 100°C / higher than 100°C).

- (b) The simple diagram below shows the structure of water.

Use the correct terms from the box below to label (i) and (ii) in the diagram. [2]

strong covalent bond weak force between molecules strong ionic bond



3. Plant growers use trials to enable them to improve output.

- (i) In one trial, growers investigated whether the rate of germination (when seeds sprout and begin to grow) is affected by storing the seeds at a low temperature (5°C) before planting them.

Three groups of 100 seeds were stored as shown in the table below **before** planting.

The table shows the numbers of seeds that germinated at 10-day intervals **after** planting.

Group	Treatment	Number of seeds germinating after:						
		0 days	10 days	20 days	30 days	40 days	50 days	60 days
A	Stored at 5°C for 120 days before planting	0	3	37	55	66	70	73
B	Stored at 5°C for 40 days before planting	0	0	0	0	2	9	10
C	Not stored at a low temperature before planting	0	0	0	0	0	0	0

State **three** conclusions the growers made from their results. [3]

1.
2.
3.

- (ii) Plants make food by photosynthesis.

Once germinated, the seedlings were grown under cover as shown in the photograph below.



Explain how using fluorescent lighting and gas burners affects the rate of photosynthesis. [3]

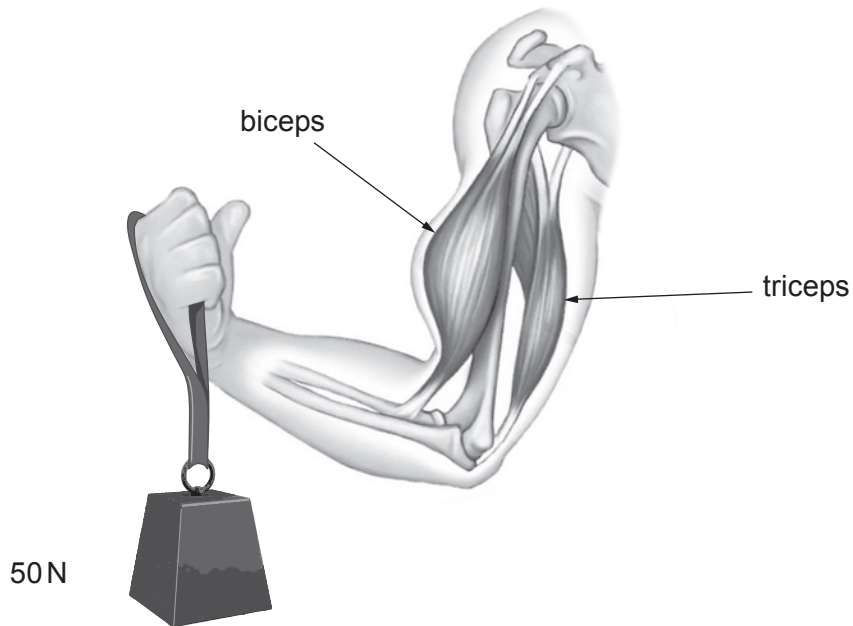
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4. The diagram shows an arm lifting a weight.



(a) (i) Describe what happens to the biceps and triceps when the arm lifts the weight. [2]

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(ii) Describe the changes to these muscles when the arm straightens. [2]

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(b) When the arm lifts a weight it is acting as a lever.

The perpendicular distance from the weight to the elbow joint is 40 cm. The perpendicular distance from the biceps muscle to the elbow is 5 cm.

(i) Calculate the moment of the 50 N weight using the equation: [2]

Moment = force × perpendicular distance between force and point of turning

Moment = N cm

(ii) To hold the weight in the position shown, the moment created by the biceps must be equal to the moment of the weight.

I. Give **one** reason why the biceps must produce a force bigger than the weight. [1]

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II. Circle the force created by the biceps when lifting the weight. [1]

40 N

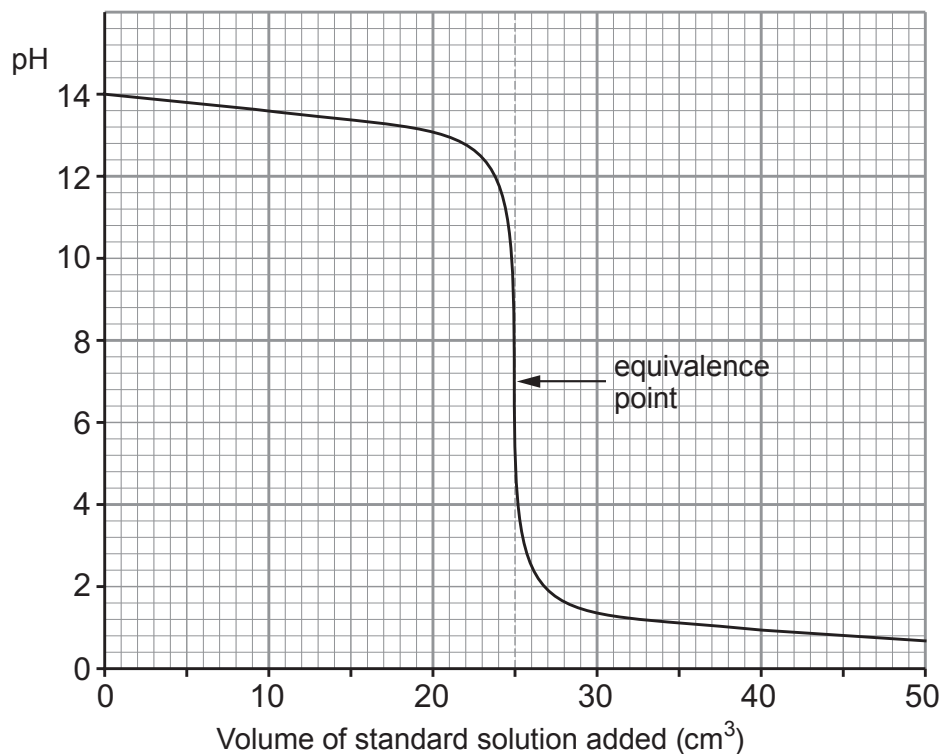
400 N

4 000 N

8

5. Brian is trying to work out the concentration of an alkali using a titration. He knows the concentration of the standard solution.

(a) A titration curve is shown below.



Use the information in the graph to answer the questions below.

[5]

- (i) What is the pH of the solution before titration begins?
- (ii) What type of solution has a pH of this value?
- (iii) What is the pH of the solution at the equivalence point?
- (iv) What type of solution is the standard solution?
- (v) What volume of standard solution neutralises the unknown solution?

- (b) In **another** titration, 20 cm^3 (V_{HCl}) of HCl is neutralised by 25 cm^3 (V_{NaOH}) NaOH. The concentration of the NaOH (C_{NaOH}) is 0.50 mol/dm^3 .

Calculate the concentration of the HCl solution to **two decimal places**, using the equation: [3]

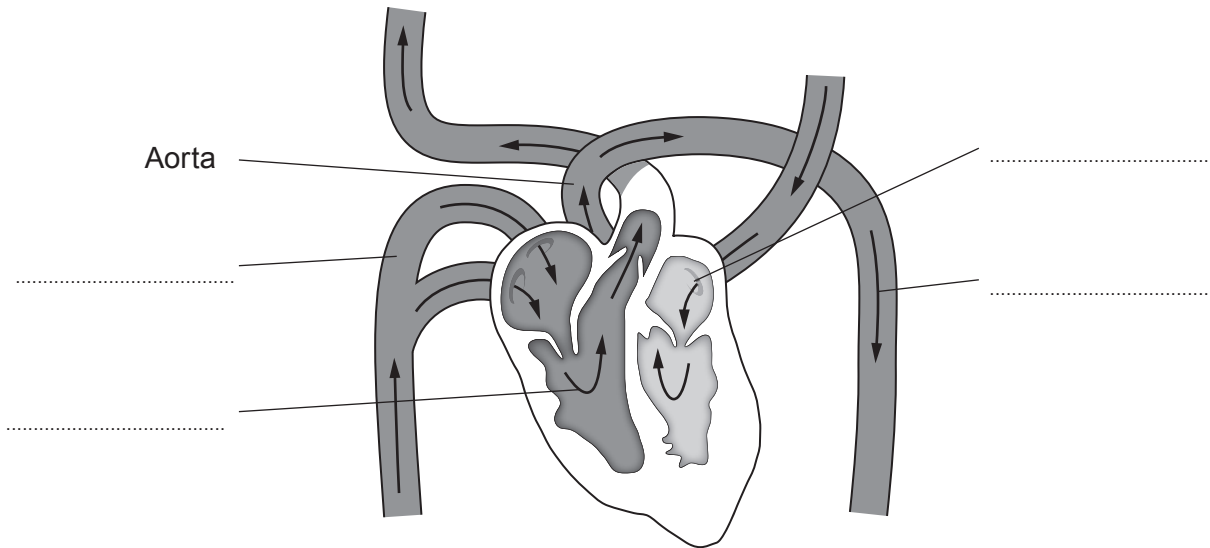
$$\text{Concentration of HCl} = \frac{C_{\text{NaOH}} \times V_{\text{NaOH}}}{V_{\text{HCl}}}$$

Concentration of the HCl = mol/dm^3

6. The diagram below shows the heart and the blood vessels connected to it. The arrows show the direction of the blood flow.

(i) Label the following parts on the diagram below: [3]

ventricle *atrium* *vein* *artery*



(ii) Explain how the cardiovascular system enables aerobic respiration to occur in muscles. [QWC 6]

Include in your answer:

- the reactants needed and how they get to the muscles;
- what happens to the waste products.

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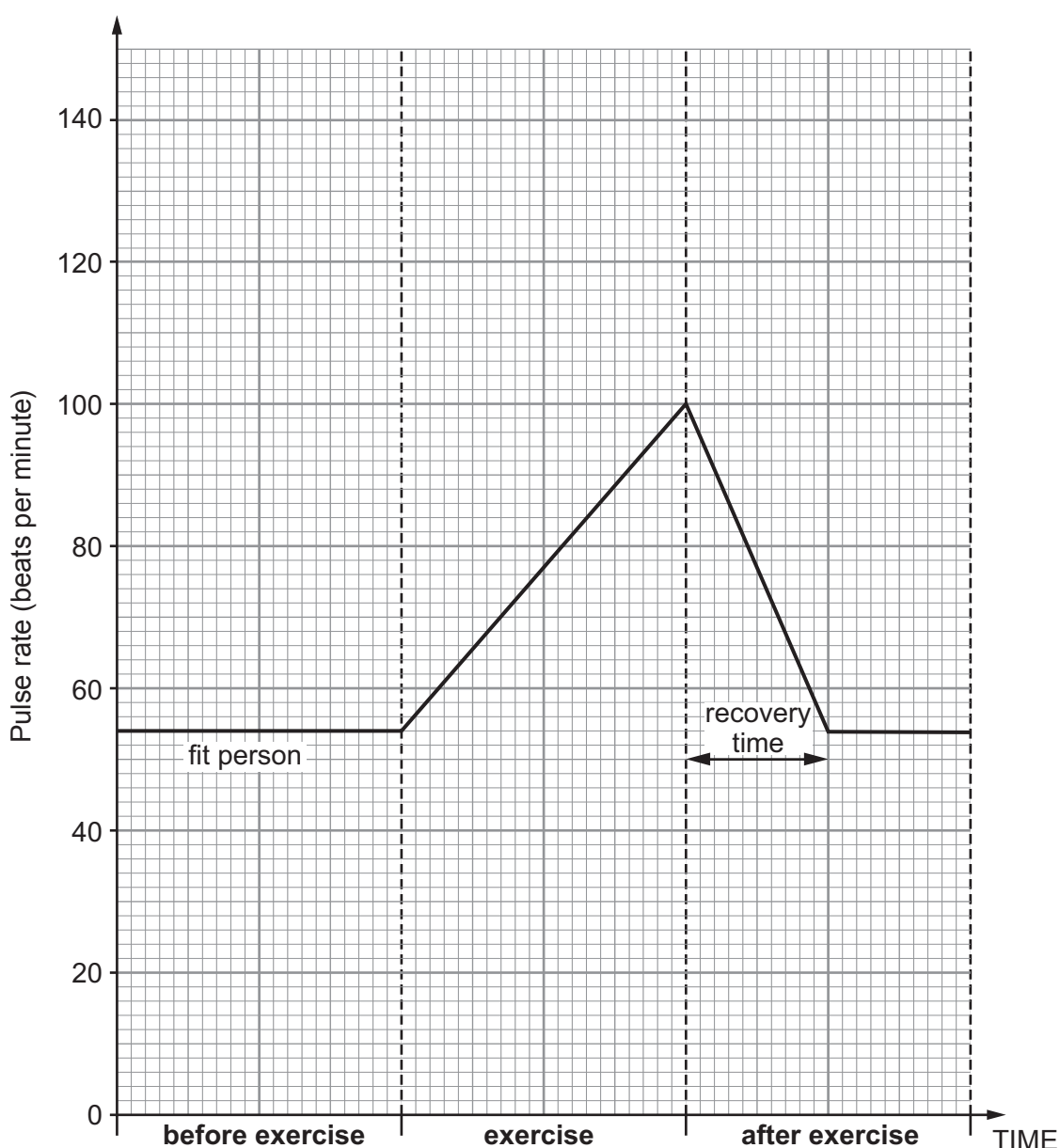
7. When members join a gym, their personal trainer will record basic information about them. One of these is pulse rate.

(a) Name **two** other body measurements that will be collected during the initial health check. [2]

1.

2.

(b) The graph below shows how the pulse rate for a fit person changes during the labelled time intervals.



- (i) An unfit person has a normal resting pulse rate of 80 beats per minute before exercise. During exercise, the pulse rate rises to 140 beats per minute. The pulse rate returns to normal by the end of the 'after exercise' time interval.

Plot the information for the unfit person on to the graph on the previous page. [3]

- (ii) Compare the pulse rate for the fit person with the unfit person for the time shown on the graph. [3]

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- (c) (i) State the name of the **group** of exercises (including cycling and running) that the unfit person needs to do, to eventually reduce their resting pulse rate. [1]

..... exercise

- (ii) Give **one** reason for your answer. [1]

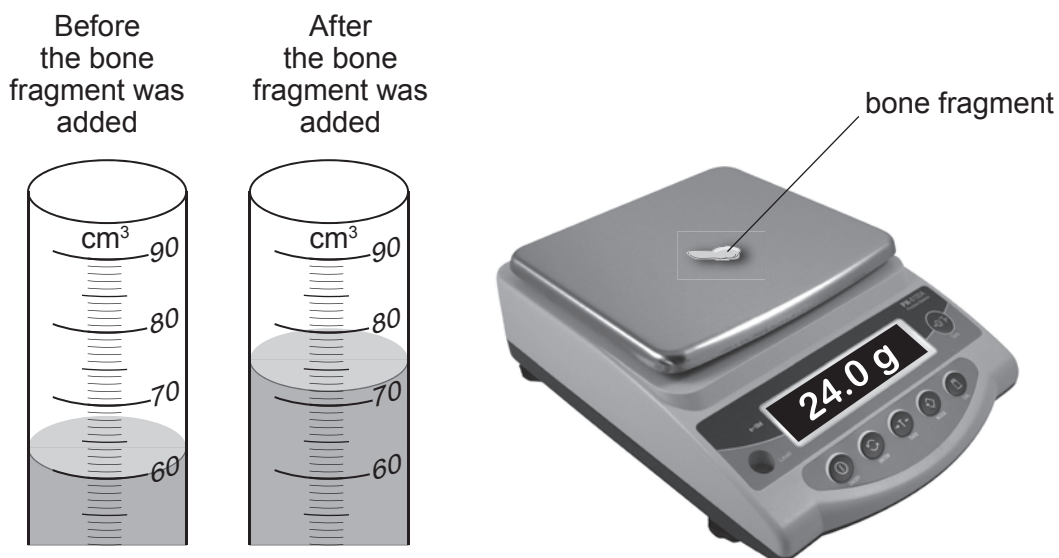
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8. (a) The diagrams below show the apparatus used to find the density of a fragment of bone.

The diagram of the measuring cylinder shows the water level before and after the bone fragment was added.



- (i) Use the information to find the volume of the bone. [1]

Volume = cm³

- (ii) Calculate the density of the bone using the equation: [2]

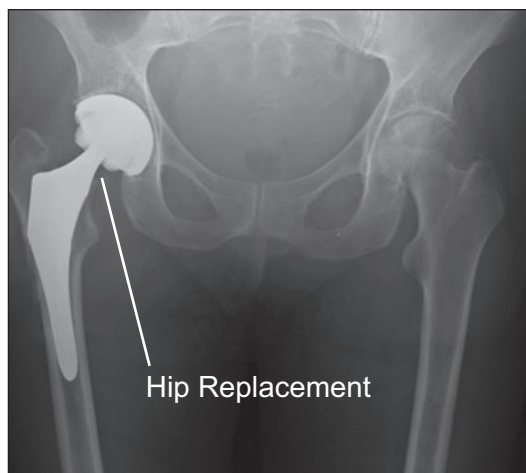
$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

Density = g/cm³

(b) Various tests are carried out on different materials and the data is recorded in the table below. Use this data to answer the questions that follow.

Material	Density (kg/m ³)	Strength MPa	Biologically inert	Resistant to corrosion	Brittle
bone	1900	170	Yes	Yes	No
stainless steel	7860	400	Yes	Yes	No
aluminium	2710	110	Yes	No	No
titanium	4500	450	Yes	Yes	No
glass	2190	50	Yes	Yes	Yes

(i) Explain why hip replacements are made from titanium rather than stainless steel or aluminium. [3]



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(ii) Give **two** reasons why glass would not be suitable for hip replacements. [2]

1.
2.

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