GCSE

WJEC GCSE
The Sciences (Double Award)

Approved by Qualifications Wales

Sample Assessment Materials

Unit 1: Biology - Basis of Life
Foundation Tier

Teaching from 2026
For award from 2028



This Qualifications Wales regulated qualification is not available to centres in England.

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Ready for the world.

WJEC would like to thank the students and teachers of Fitzalan High School, Cardiff and Llanwern High School, Newport for their participation in the creation of these covers.

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Surname	Centre number	Candidate number
First name(s)		0

GCSE

3455U1

The Sciences (Double Award)
Unit 1
Biology: Basis of Life
FOUNDATION TIER
1 hour 15 minutes
SAMPLE ASSESSMENT MATERIALS

Additional materials

A calculator and ruler are permitted.

Instructions to candidates

Use black ink or black ball-point pen. Do **not** use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

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

Answer **all** questions.

For examiner's use only		
Question	**Maximum mark**	**Mark awarded**
1.	**6**	
2.	**4**	
3.	**7**	
4.	**6**	
5.	**6**	
6.	**13**	
7.	**7**	
8.	**7**	
Total	**56**	

Write your answers in the spaces in this booklet. If you need more space, use the additional page(s) at the back of this booklet. Number the question(s) correctly.

Information for candidates

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

The total number of marks available is **56.**

You should think carefully about how you use your time.

Your responses must be clear, accurate and well presented.

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Answer **all** questions

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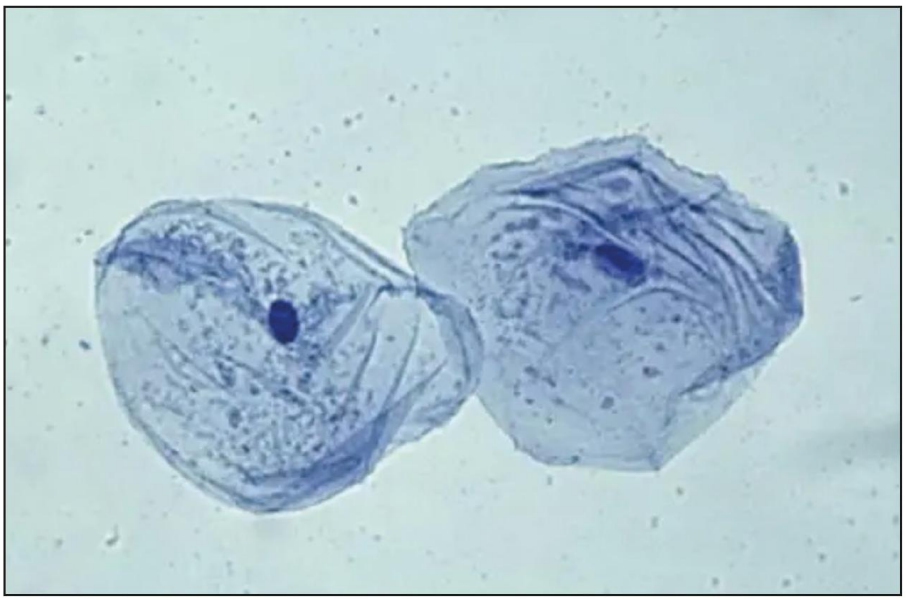
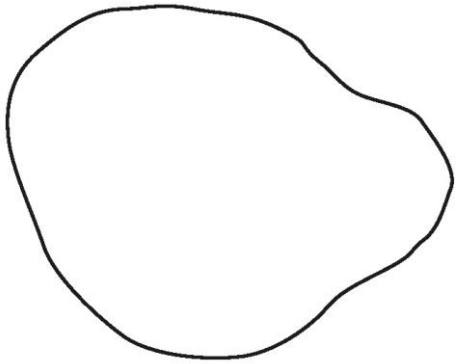
1. (a) Students were looking at cells using a light microscope**. Image 1.1** shows two animal cells they saw using the light microscope.

Image 1.1



The drawing in **Image 1.2** represents one of the cells.

Image 1.2



(i) On the drawing in **Image 1.2**, draw **two** labelled arrows to identify [2]
- the cytoplasm;
- the cell membrane.

(ii) **Add the nucleus** to the drawing in **Image 1.2**. [1]

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(b) Use **one** term from the box below to **answer the following questions**.

aerobic respiration	chloroplast	photosynthesis	vacuole
diffusion	cell wall	cell membrane	

(i) State the process that occurs in the mitochondria in cells**.** [1]

……..……..

(ii) Suggest the name of **one** structure that would **also** be present in **Image 1.2** if the cells shown were from a **plant cell**. [1]

……...

(iii) The function of the cell membrane is to control what enters and leaves the cell.

State the process by which substances can cross the cell membrane. [1]

……

6

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2. Respiration is a chemical reaction which releases energy in living organisms.

There are two types of respiration: aerobic and anaerobic.

Table 2 compares the features of both types of respiration**.**

Table 2

Feature of respiration	Aerobic	Anaerobic	Both
Releases energy			✓
Uses glucose			
Produces carbon dioxide			
Produces lactic acid			
Uses oxygen			

(a) Tick the correct column of **Table 2** (aerobic, anaerobic or both) for each feature of respiration. The first one has been done for you. [4]

4

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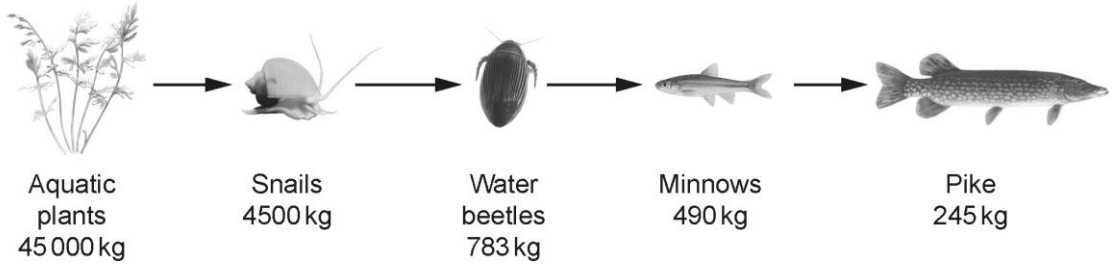
3. Ecologists studied organisms living in a lake. They identified a food chain from the lake and calculated the biomass of the organisms at each level of the food chain. This is shown in **Image 3.**

Image 3



(a) (i) Identify the producer and the top consumer from the food chain in **Image 3** [2]

Producer ……..

Top consumer ……..

(ii) State what is represented by the arrows in the food chain. [1]

……

……

(b) (i) Calculate the percentage transfer in biomass between the snails and the beetles using the following equation. [2]

$$\text{Percentage transfer in biomass} = \frac{\text{biomass of beetles}}{\text{biomass of snails}} \times 100$$

Space for working:

Percentage transfer in biomass = ……..

(ii) Suggest **one** reason why the food chain ends with the pike. [1]

……

……

(iii) A disease affected the minnows and decreased their population.

Use **Image 3** to suggest why the population of snails would decrease. [1]

……

……

7

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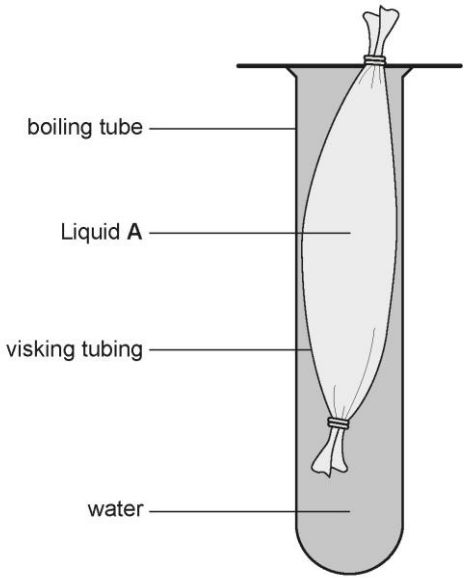
4. A teacher set up a demonstration using Visking tubing as a model of the gut. Visking tubing has small pores (holes) in it, so acts like a selectively permeable membrane.

(a) **Image 4.1** shows the apparatus at the start of the demonstration.

Image 4.1



Liquid **A** was tested for glucose and starch at the beginning of the investigation.

(i) Iodine solution was used to test for starch.

Describe the chemical test that was used to test for glucose. [2]

……

……

Table 4.2 shows the colour changes that occurred for each test.

Table 4.2

Substance	Colour change	Conclusion (present or absent)
Glucose	Blue to brick red	.....
Starch	Brown to blue black	.....

(ii) Complete **Table 4.2** using the colour changes to show if each substance was present or absent in liquid **A** at the start of the investigation**.** [2]

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(iii) After 30 minutes the water in the boiling tube was tested for glucose and starch. Glucose was present, but starch was not. Use your knowledge of the size of the molecules to explain why. [2]

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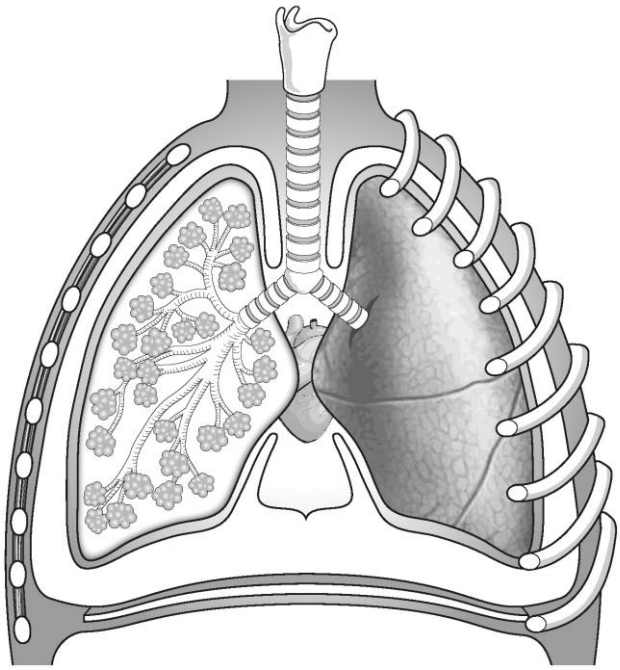
5. (a) Asthma is a significant health issue in Wales and results in many people being admitted to hospital each year**.** It is a condition that affects your lungs because the bronchioles become inflamed.

Image 5.1 shows a diagram of the respiratory system.

Image 5.1



(i) Add **one** arrow to **Image 5.1**.to label the part of the lungs that is affected by asthma. [1]

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(ii) In Wales, 314 000 people are currently receiving treatment for asthma, of these 59 032 are children.

Calculate the percentage of the people in Wales with asthma that are children. [2]

Space for working:

Percentage of people with asthma that are children = ...

(b) A peak flow meter is used to measure how quickly you can blow air out of your lungs. It is often used to help diagnose and monitor asthma.

Two people (**A** and **B**) have completed the peak flow test. Normal peak flow is between 400 and 700 l/min.

Image 5.2A and **5.2B** show the results on the peak flow meters.

Image 5.2A
Patient A



Image 5.2B
Patient B



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(i) Use **Images 5.2A** and **5.2B** to identify the peak flow readings for patients **A** and **B**. [1]

Patient **A** peak flow = ... l/min

Patient **B** peak flow = ... l/min.

(ii) One of the patients is suspected of having asthma.
Use your answer to (i) to conclude which patient has asthma. Use your knowledge of the respiratory system to explain your answer. [2]

……

……

……

……

6

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6. (a) Enzymes are needed in the body to break down food in digestion.

(i) Complete **Table 6.1** to show the substrate and products of the enzymes carbohydrase and protease. [2]

Table 6.1

Enzyme	Substrate	Products
Carbohydrase	Starch	……..
Protease	……..	Amino acids

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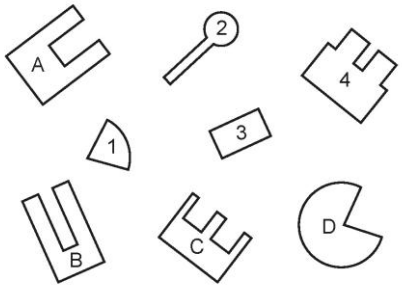
Image 6.2 shows four **enzymes** (**A-D**) and four **substrates** (**1-4**).

Image 6.2



(ii) Complete **Table 6.3** by matching each enzyme to the correct substrate. [1]

Table 6.3

Enzyme	Substrate
A	.....
B	.....
C	.....
D	.....

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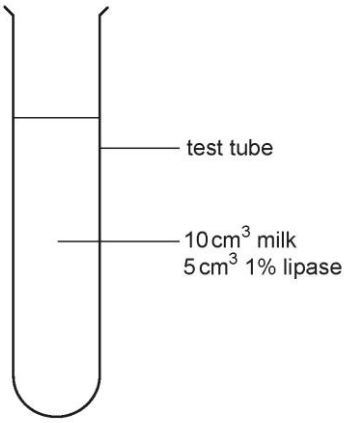
(b) Students investigated the activity of the enzyme lipase on milk at different temperatures. They set up a test tube at each temperature as shown in **Image 6.4.**

Image 6.4



The students repeated the test at each temperature three times. The results are shown in **Table 6.5**.

Table 6.5

	Enzyme Activity (a.u.)			
Temperature (˚C)	Test 1	Test 2	Test 3	Mean
10	20	18	22	20
20	149	22	142	146
30	449	415	456	440
40	381	397	404	394
50	99	116	105	……..
60	27	23	28	26

(i) Calculate the missing mean value for **50 ˚C** and write your answer to the nearest whole number in **Table 6.5**. [2]

Space for working:

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(ii) **Table 6.5** contains an anomalous result.

I. Circle the anomalous result in **Table 6.5**. [1]

II. Explain why you have circled this result. [1]

……

……

(iii) Explain the effect of temperature on the activity of lipase in the following temperature ranges. [2]

10-30 ˚C

……

……

40-60 ˚C

……

……

(iv) I Use the results in **Table 6.5** to suggest the optimum temperature for lipase. [1]

Optimum = ... ˚C

II To determine a more accurate optimum temperature for this enzyme it is necessary to repeat the experiment using a narrower temperature range.

Tick the temperature range that should be used. [1]

Repeat the experiment at temperatures between:	Tick (✓)
40 °C - 60 °C	
20 °C - 40 °C	
0 °C - 20 °C	

(v) I State the substance in milk which lipase acts on. [1]

……

II Name the part of the digestive system where lipase performs its function. [1]

……

13

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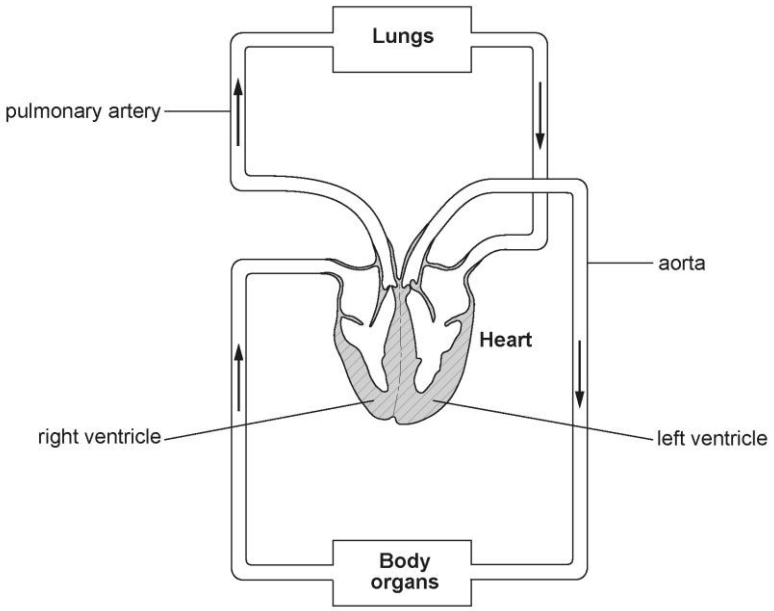
7. **Image 7.1** shows the double circulatory system in a human body.

Image 7.1



(a) State what is meant by a double circulatory system. [2]

……

……

……

……

(b) **Table 7.2** shows the blood pressure in some of the blood vessels in **Image 7.1.**

Table 7.2

Blood vessel	Blood pressure (kPa)	
	Maximum	Minimum
Aorta	18.0	11.0
Pulmonary artery	12.0	8.0

Use **Image 7.1** to explain why the maximum pressure in the aorta is greater than the maximum blood pressure in the pulmonary artery. [1]

……

……

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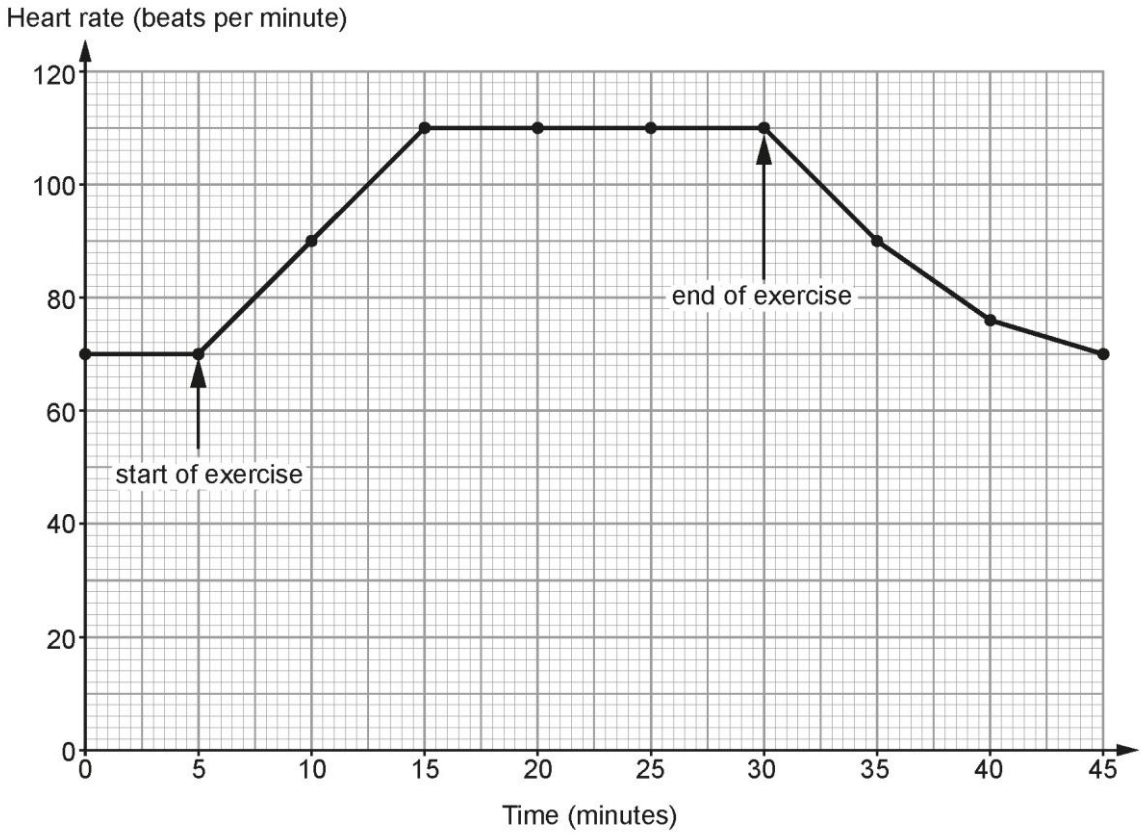
(c) Cardiac output is used as an indicator of cardiovascular fitness in athletes. Cardiac output is a measurement of the volume of blood pumped by a ventricle in one minute.

Graph 7.3 shows the heart rate of an individual during and after a session on an exercise bike.

Graph 7. 3



(i) The volume of blood in a ventricle of an average human is 70cm^3.

Use the equation below to calculate the cardiac output for the individual in **Graph 7.3** at **15 minutes**. [2]

cardiac output = volume of blood in ventricle × heart rate

Cardiac output = …….. cm^3

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(ii) The cardiac output of the individual at 5 minutes was 4900cm^3. Explain the increase in cardiac output between 5 and 15 minutes. [2]

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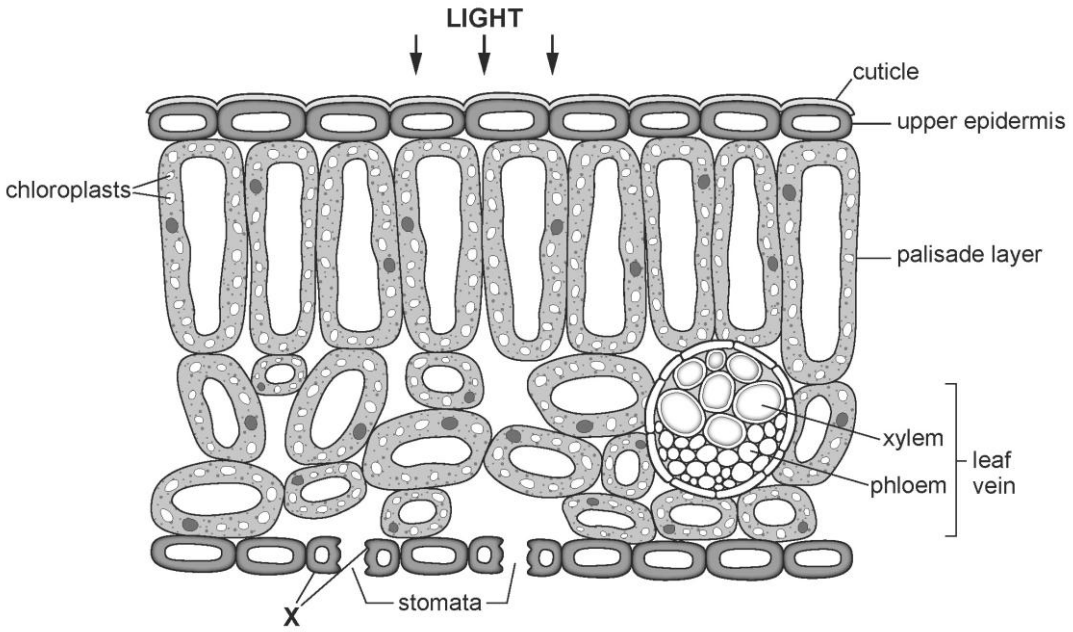
8. **Image 8.1** shows a section through a leaf of a plant.

Image 8.1



(a) Explain why most photosynthesis happens in the cells of the palisade layer. [2]

……

……

……

……

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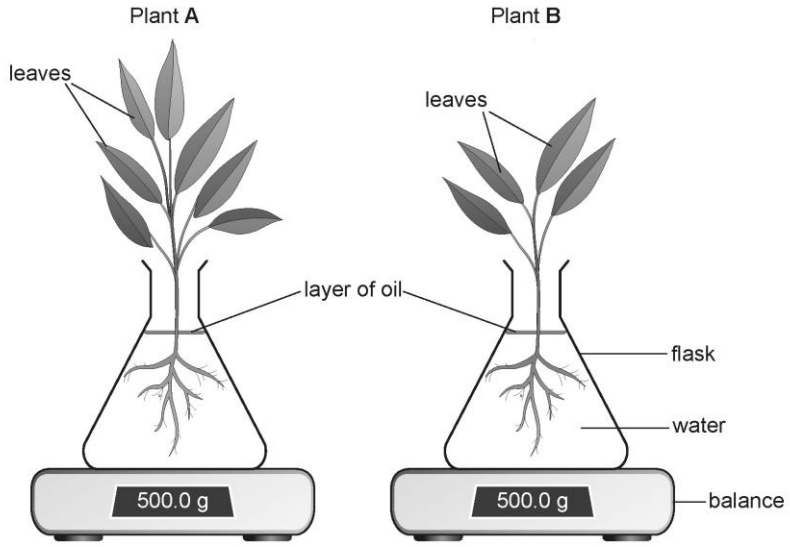
(b) A student investigated transpiration in two plants, **A** and **B**, of the same species.

Image 8.2 shows the apparatus used by the student.

Image 8.2



The student recorded the mass of the apparatus at the start of the investigation and at every hour for seven hours.

Table 8.3 shows the results of the investigation.

Table 8.3

Species	Mass (g)							
	Start	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours	7 hours
A	500	495	485	480	465	450	440	425
B	500	496	492	488	484	483	482	481

(i) Name the tissue that transports water in plants. [1]

……

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(ii) State the conclusion that can be made from the results of this investigation. Explain your answer. [2]

……

……

……

……

(iii) Apart from species, suggest **two** other factors that should have been kept constant in this investigation. [2]

1……

……

2……

……

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7

END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.
	…… ……

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THE SCIENCES (DOUBLE AWARD)
UNIT 1

Biology: Basis of Life

FOUNDATION TIER

MARK SCHEME

Guidance for examiners

Generic marking principles

- Marks awarded are always whole marks (not half marks, or other fractions).
- Answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.
- Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
- Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Positive marking

It should be remembered that candidates are writing under examination conditions and credit should be given for what the candidate writes, rather than adopting the approach of penalising candidates for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Marks should not be deducted for a less than perfect answer if it satisfies the criteria of the mark scheme.

For questions that are objective or points-based, the mark scheme should be applied precisely. Marks should be awarded as indicated and no further subdivision made.

Mark schemes often list points which may be included in candidates' answers. The list is not exhaustive. The inclusion of *'Credit any other valid response.*' (or similar instruction) within mark schemes allows for the possible variation in candidates' responses. Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme. Credit should be given according to the accuracy and relevance of candidates' answers.

Appropriate terminology is reflected in exemplar responses in mark schemes. However, unless there is a specific requirement within a question, candidates may be awarded marks where the answer is accurate but expressed in their own words.

Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

ecf = error carried forward
bod = benefit of doubt

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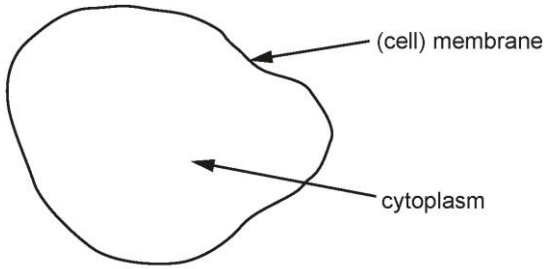
Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Enquiry Skills
1.	(a)	(i)	Correct labelled arrow for cytoplasm (1) Correct labelled arrow for cell membrane (1)  		2		2		2
		(ii)	Nucleus drawn correctly		1		1		1
	(b)	(i)	(aerobic) respiration	1			1		
		(ii)	**Any one (×1) from** Cell wall (1) Chloroplast (1) Vacuole (1)		1		1		
		(iii)	diffusion	1			1		
			Question 1 total	**2**	**4**	**0**	**6**	**0**	**3**

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<table>
<tr><th colspan="3" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Enquiry Skills</th></tr>
<tr><td>2.</td><td>(a)</td><td colspan="2"><table>
<tr><td>Feature of respiration</td><td>Aerobic</td><td>Anaerobic</td><td>Both</td></tr>
<tr><td>Releases energy</td><td></td><td></td><td>✓</td></tr>
<tr><td>Uses glucose</td><td></td><td></td><td>✓ (1)</td></tr>
<tr><td>Produces carbon dioxide</td><td>✓ (1)</td><td></td><td></td></tr>
<tr><td>Produces lactic acid</td><td></td><td>✓ (1)</td><td></td></tr>
<tr><td>Uses oxygen</td><td>✓ (1)</td><td></td><td></td></tr>
</table></td><td>4</td><td></td><td></td><td>4</td><td></td><td></td></tr>
<tr><td colspan="4">Question 2 total</td><td>4</td><td>0</td><td>0</td><td>4</td><td>0</td><td>0</td></tr>
</table>

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Enquiry Skills
3.	(a)	(i)	Producer – aquatic plants (1) Top consumer – pike (1)		2		2		
		(ii)	Transfer of energy/is eaten by	1			1		
	(b)	(i)	17.4 = 2 marks Allow 1 mark for 783/4500 x 100		2		2	2	
		(ii)	No predators of the pike/not enough energy left			1	1		
		(iii)	More beetles eating them (1)			1	1		
			Question 3 total	**1**	**4**	**2**	**7**	**2**	**0**

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<table>
<tr><th colspan="3" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Enquiry Skills</th></tr>
<tr><td>4.</td><td>(a)</td><td>(i)</td><td>Add Benedict’s solution (accept suitable alternative) (1)
Heat strongly (1)</td><td>2</td><td></td><td></td><td>2</td><td></td><td>2</td></tr>
<tr><td></td><td></td><td>(ii)</td><td><table><tr><th>Substance</th><th>Colour change</th><th>Conclusion</th></tr><tr><td>Glucose</td><td>Blue to brick red</td><td>(glucose) present (1)</td></tr><tr><td>Starch</td><td>Brown to blue black</td><td>(starch) present (1)</td></tr></table></td><td></td><td></td><td>2</td><td>2</td><td></td><td>2</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Glucose passed through and starch did not pass through (1)
Ref to molecule and pore size (1)</td><td></td><td>2</td><td></td><td>2</td><td></td><td>2</td></tr>
<tr><td colspan="4">Question 4 total</td><td>2</td><td>2</td><td>2</td><td>6</td><td>0</td><td>6</td></tr>
</table>

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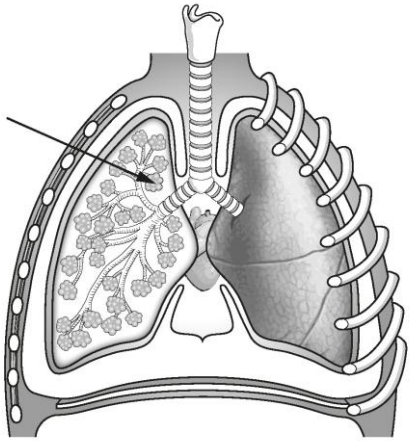
Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Enquiry Skills
5.	(a)	(i)	Unambiguous {arrow/line} drawn to any bronchiole (1) 		1		1		
		(ii)	18.8% = 2 marks Allow 1 mark for: 59032/314000x100		2		2	2	
	(b)	(i)	Patient A = 420-430 l/min and Patient B – 320-330 l/min		1		1		1
		(ii)	Patient B Asthma causes narrowing of the airways (1) and therefore lowers peak flow. (1)			2	2		2
			Question 5 total	**0**	**4**	**2**	**6**	**2**	**3**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Enquiry Skills
6.	(a)	(i)		Glucose (1) Protein (1)	2			2		
		(ii)		**A** 3 **B** 2 **C** 4 **D** 1 All correct for 1 mark		1		1		1
	(b)	(i)		107 = 2 marks 106.6 / 106.7 =1 mark		2		2	2	2
		(ii)	I	22 (1)			1	1		1
			II	Doesn't fit the pattern/is much smaller than other values/hasn't been included in the mean			1	1		1
		(iii)		10 – 30 Activity increases as temperature increases due to there being more (successful) collisions (between enzyme and substrate OWTTE (1) 40-60 (At higher temperatures activity decreases) as the active site has changed shape / enzyme has been denatured / OWTTE (1)		2		2		2

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		(iv)	I	30 (1)			1	1		1
			II	20 °C - 40 °C (1)			1	1		1
		(v)	I	Fats / lipids (1)		1		1		
			II	Small intestine (1)		1		1		
Question 6 total					**2**	**7**	**4**	**13**	**2**	**9**

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Enquiry Skills
7.	(a)		ref. systemic (1) and pulmonary circulation (1) Or Blood flows through the heart twice (1) in each full circuit (1) Or blood flows through body (1) and lungs in each circuit (1)	2			2		
	(b)		Correct ref. left ventricle wall is more muscular than the right ventricle wall (1)		1		1		
	(c)	(i)	Correct answer = 7700 = 2 marks **If incorrect award 1 mark for** 110 x 70 = 7700		2		2	2	
		(ii)	**Any two (×1) from:** Body requires more energy for exercise (1) From (aerobic) respiration (1) Blood carries (more) oxygen (to muscles)/ Blood removes (more) {carbon dioxide/lactic acid} from muscle (1)		2		2		
Question 7 total				**2**	**5**	**0**	**7**	**2**	**0**

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Enquiry Skills
8.	(a)		**Any two (×1) from:** Palisade cells have most chloroplasts (1) To absorb light (1) Palisade chloroplasts are closer to the (upper) surface (1)		2		2		
	(b)	(i)	Xylem (1)	1			1		
		(ii)	Plant A {loses more mass / loses more water / has an increased rate of transpiration} (1) Because (Plant A) has {more leaves / more stomata / greater surface area} (1) Accept reverse answers if Plant B referenced			2	2		2
		(iii)	**Any two (×1) from:** Light intensity / strength of light (1) (air) temperature (1) NOT <u>water</u> temperature Wind speed / air movement (1) Humidity (1) Age of shoot (1) Credit any other valid response			2	2		2
			Question 8 total	**1**	**2**	**4**	**7**	**0**	**4**

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SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question		AO1	AO2	AO3	TOTAL MARK	MATHS	Enquiry Skills
Non-overlap	**1**	2	4	0	6	0	3
	2	4	0	0	4	0	0
	3	1	4	2	7	2	0
	4	2	2	2	6	0	6
	5	0	4	2	6	2	3
	6	2	7	4	13	2	9
	Target	**11**	**21**	**10**	**42**	**3-4**	**6**
	TOTAL	**11**	**21**	**10**	**42**	**6**	**21**
Overlap	**7**	2	5	0	7	2	0
	8	1	2	4	7	0	4
	Target	**3**	**7**	**4**	**14**	**1**	**2**
	TOTAL	**3**	**7**	**4**	**14**	**2**	**4**
Paper total	**Target**	**14**	**28**	**14**	**56**	**4-5**	**8**
	TOTAL	**14**	**28**	**14**	**56**	**8**	**25**

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