

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

B732/02

BIOLOGY B

Unit B732: Biology module B4, B5, B6 (Higher Tier)

Candidates answer on the question paper
 A calculator may be used for this paper.

OCR Supplied Materials:
 None

Duration: 1 hour 30 minutes

Other Materials Required:

- Pencil
- Ruler (cm/mm)


Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil .
- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **85**.
- This document consists of **28** pages. Any blank pages are indicated.

Examiner's Use Only:			
1		9	
2		10	
3		11	
4		12	
5		13	
6			
7			
8			
Total			

Answer **all** the questions.

Section A – Module B4

- 1 Look at the photograph.
It shows two palm trees.



© iStockphoto.com/Giorgio Fochesato

- (a) During photosynthesis, the trees make glucose.

The trees change the glucose into other substances, such as starch for storage.

- (i) Describe **one other** substance into which trees change glucose and what the new substance is used for.

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..... [2]

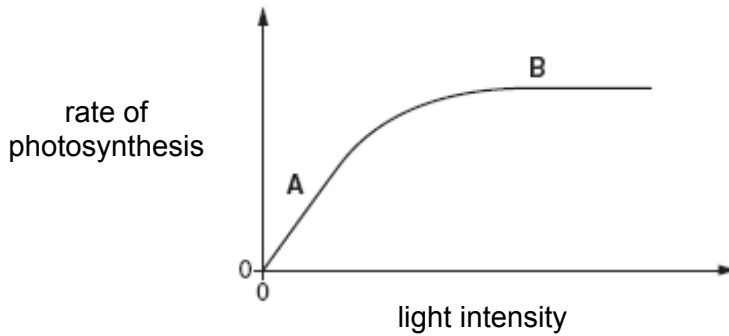
- (ii) Give **two** reasons why soluble glucose is turned into insoluble **starch** for storage.

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..... [2]

(b) Look at the graph.

It shows the effect of increasing light intensity on the rate of photosynthesis.

The concentration of CO₂ is kept at 0.04% throughout the experiment.



(i) Explain the shape of the graph.

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..... [2]

(ii) Julie says that if the CO₂ concentration is increased, the graph will be steeper at **A** and level off at the same value at **B**.

Niall says that if the CO₂ concentration is increased, the graph will be the same at **A** but will level off at a higher value at **B**.

Who is correct? Explain your answer.

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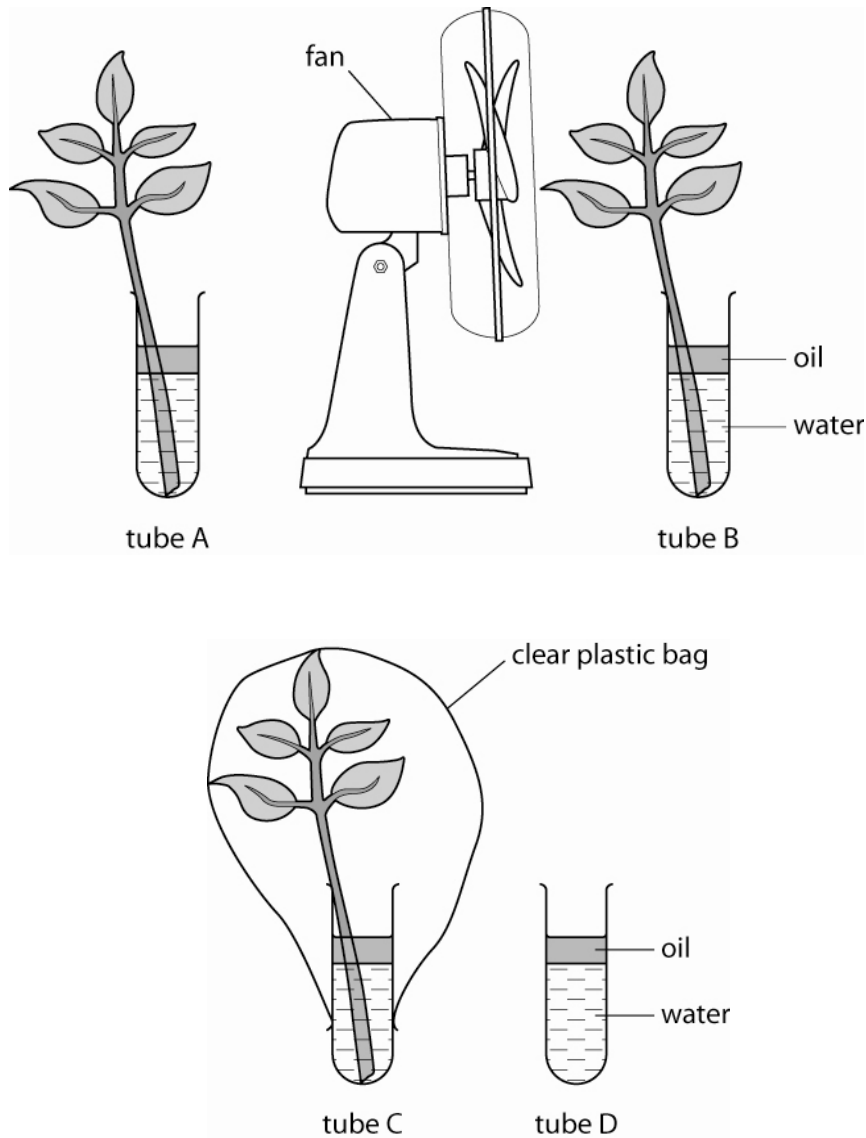
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..... [2]

[Total: 8]

2 Jo is investigating the effect of some factors on transpiration in plants.

Look at the diagram. It shows the apparatus she uses.



Jo records the mass of each tube and its contents.

She leaves the apparatus for 5 days in the same room.

She then records the mass again.

The table shows Jo's results.

tube	A - left at room temperature	B - left in room with a moving fan next to it	C - left in room with a clear plastic bag over it	D - no plant left at room temperature
mass at start in g	42.4	47.3	39.2	31.9
mass at end in g	35.3	35.8	38.5	31.9

- (a) Compare the effects of increasing air movement and increasing humidity on the rate of transpiration in Jo's plants.

Use information from the table, as well as your own calculations, to help you answer.

✎ The quality of your written communication will be assessed in your answer to this question.

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- (b) In Jo's experiment, water moves from the tubes to the leaves through transport vessels.
Write down the name of these vessels.

..... [1]

[Total: 7]

3 Australia produces a lot of sugar cane.

Insects eating the sugar cane affect the production of the crop.

(a) Farmers use pesticides to kill the insects.

The pesticides cause the death of some animals higher in the food chain.

Explain why this happens.

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..... [2]

(b) Cane toads were introduced to feed on the insects.

Cane toads are much bigger than the native Australian toads. Cane toads are also poisonous.

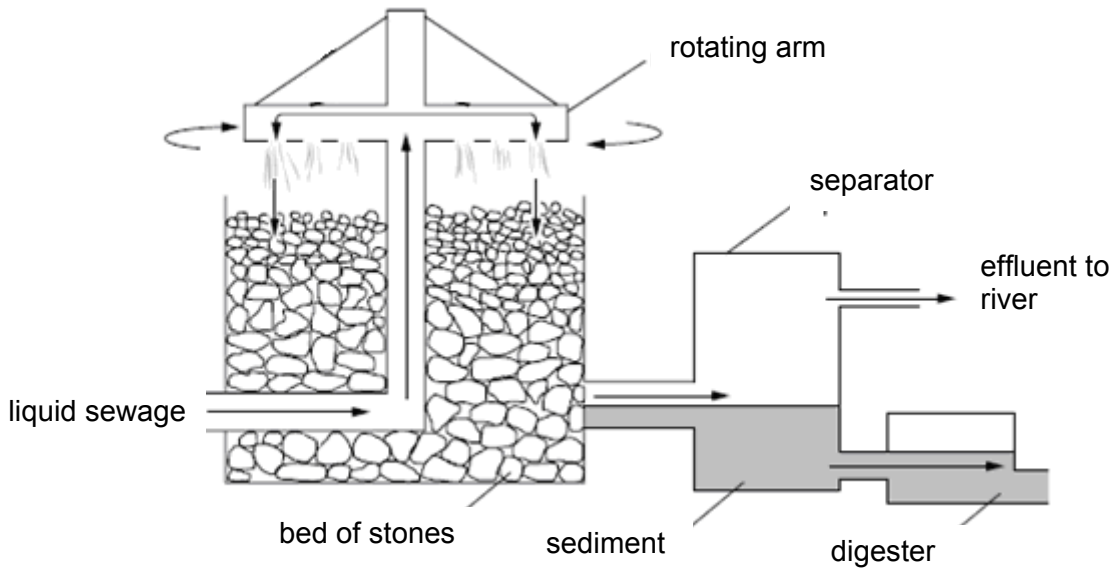
The introduction of cane toads was **not** a success.

Suggest **two** reasons why.

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..... [2]

[Total: 4]

4 Look at the diagram. It shows part of a sewage works.



- (a) Sewage is broken down (decayed) by microbes such as bacteria.
 Sewage is broken down more quickly in the summer than in the winter.
 Give **two** reasons why.

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..... [2]

(b) After sewage has been treated it can be used as a fertiliser.

(i) Fertilisers provide minerals containing elements that are needed for healthy plant growth.

Two of these elements are nitrogen and magnesium.

Explain why plants need each element.

nitrogen

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magnesium

..... [2]

(ii) Explain how minerals are taken into the root hairs of plants.

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..... [2]

[Total: 6]

Section B – Module B5

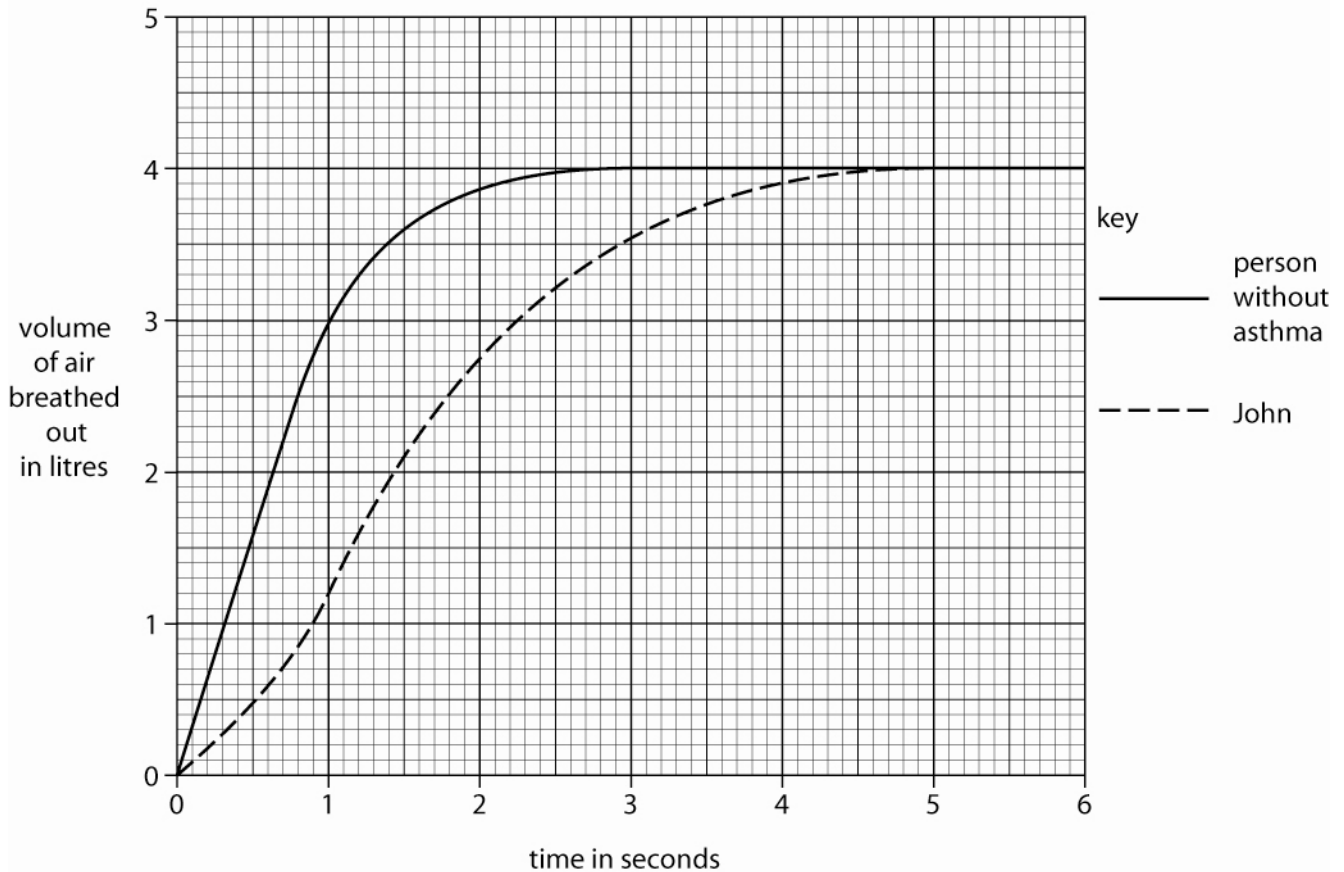
5 (a) John has asthma.

He goes to his doctor who asks him to breathe into a machine called a spirometer.

This measures the volume of air John breathes out in a single deep breath.

The graph shows the results for John.

It also shows the results for a person of John's size and age who does **not** have asthma.



(i) John and the other person have the same vital capacity.

Look at the graph.

What is their **vital capacity**?

answer litres [1]

(ii) The doctor can decide how severe John's asthma is from the graph.

He reads off the volumes of air breathed out **after one second** and does this calculation.

$$\text{asthma value} = \frac{\text{volume of air breathed out after one second by John}}{\text{volume of air breathed out after one second by person without asthma}}$$

He looks up John's level of asthma in this table.

asthma value	level of asthma
more than 0.80	none
0.80 – 0.55	mild
0.55 – 0.30	moderate
less than 0.30	severe

Use the graph to calculate John's asthma value.

.....

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.....

asthma value

Use the table to work out what level of asthma John has.

level of asthma [1]

(iii) What type of treatment could the doctor prescribe based on the results of the calculation?

..... [1]

- (b) John was worried that blowing hard into the spirometer might lead to an asthma attack. Describe what happens inside the lungs during an asthma attack.

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- (c) John's doctor is concerned that John could be suffering from a different condition called chronic obstructive pulmonary disease (COPD). COPD causes progressive and permanent damage to the lung tissue. Some people with COPD have low oxygen levels in their blood. Suggest why.

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..... [2]

[Total: 8]

6 Astronauts sometimes spend long periods of time in space.



When astronauts return to Earth a number of changes may have happened to their bodies.

These include:

- weakening of the muscles
- increased risk of blood clots
- decreased amount of haemoglobin
- weaker bones
- lower heart rate and blood pressure.

(a) Which **one** of these changes could be treated with heparin?

..... [1]

(b) Scientists have used studies on astronauts to learn more about the disease osteoporosis.
How can studying astronauts help them learn more about osteoporosis?

.....
..... [1]

(c) Returning astronauts may develop kidney problems.
Explain how one of the changes can lead to astronauts developing kidney problems.

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..... [2]

(d) Suggest why astronauts in space have a lower heart rate than they normally do on Earth.

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..... [2]

[Total: 6]

7 There are many reasons why some couples have difficulties conceiving babies.

One possible treatment for infertility is IVF.

(a) (i) How does fertilisation in IVF differ from normal fertilisation?

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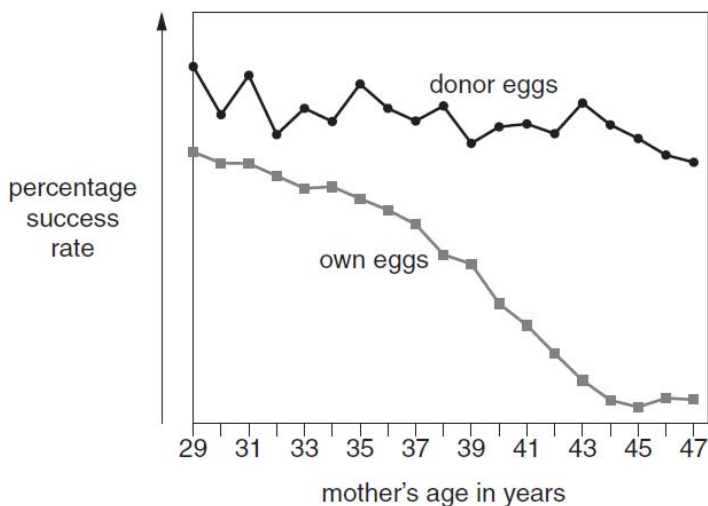
(ii) Before IVF with their own eggs, women are usually treated with FSH (follicle-stimulating hormone).

Explain why.

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 [2]

(b) The graph shows the percentage success rate of IVF for women of different ages.

It shows the success rate using their own eggs or eggs from a donor.



Discuss the issues that parents have to consider when deciding which type of eggs to use for IVF. Use the information in the graph and your own knowledge.

.....

 [2]

[Total: 5]

8 Anya is investigating the effect of bile salts on the digestion of fats by lipase.

She sets up tubes containing the same amount of fat and pH indicator.

She changes the amounts of lipase and bile salts.

She then adds distilled water to make the volume the same in each tube.

The pH indicator changes colour when the pH of a solution goes from pH8 to pH6.

Anya times how long it takes for the indicator to change colour in each tube after all the solutions have been added.

She records the time in minutes in a table.


Look at her table.

		amount of lipase solution in cm ³				
		0.0	0.4	0.8	1.2	1.6
amount of bile salt solution in cm ³	0.0	*	*	12	4	4
	0.4	*	21	8	2	2
	0.8	*	15	5	1	1
	1.2	*	9	3	0.5	0.5
	1.6	*	7	2	0.4	0.4

* = no change after 30 minutes

Section C – Module B6

9 Read the article from a newspaper.

	<p><u>Fighting cholera with potatoes!</u></p>
	<p>Cholera can spread very quickly from person to person. It is a disease caused by bacteria. It kills 200 000 people a year.</p>
	<p>Scientists have used potato plants to make a new medicine. They hope that this new medicine might stop people getting cholera.</p>
	<p>The scientists put a gene into potato plants to make them produce the medicine. They hope that just eating the potatoes will protect people from the disease.</p>

(a) Cholera often spreads very quickly after natural disasters such as earthquakes.

Explain why earthquakes can cause **cholera** to spread very quickly.


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..... [2]

(b) The scientists have put a gene from another species into the potato plant.

Describe how this is done, explaining how different enzymes are used in this process.

 *The quality of written communication will be assessed in your answer to this question.*

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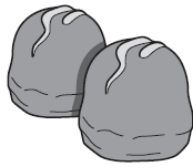
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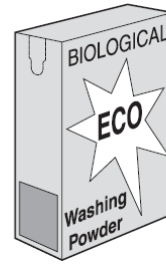
[6]

[Total: 8]

10 The diagrams show some products made using enzymes.



low sucrose chocolates



biological washing powder

- (a) The chocolates are made low in sucrose using sucrase.
How will this affect the taste of the chocolates compared to chocolates high in sucrose?

..... [1]

- (b) (i) On the packet of biological washing powder there is a warning.
It says that the powder will **not** clean clothes very well if used in areas where the tap water is very acidic.
Explain why.

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..... [2]

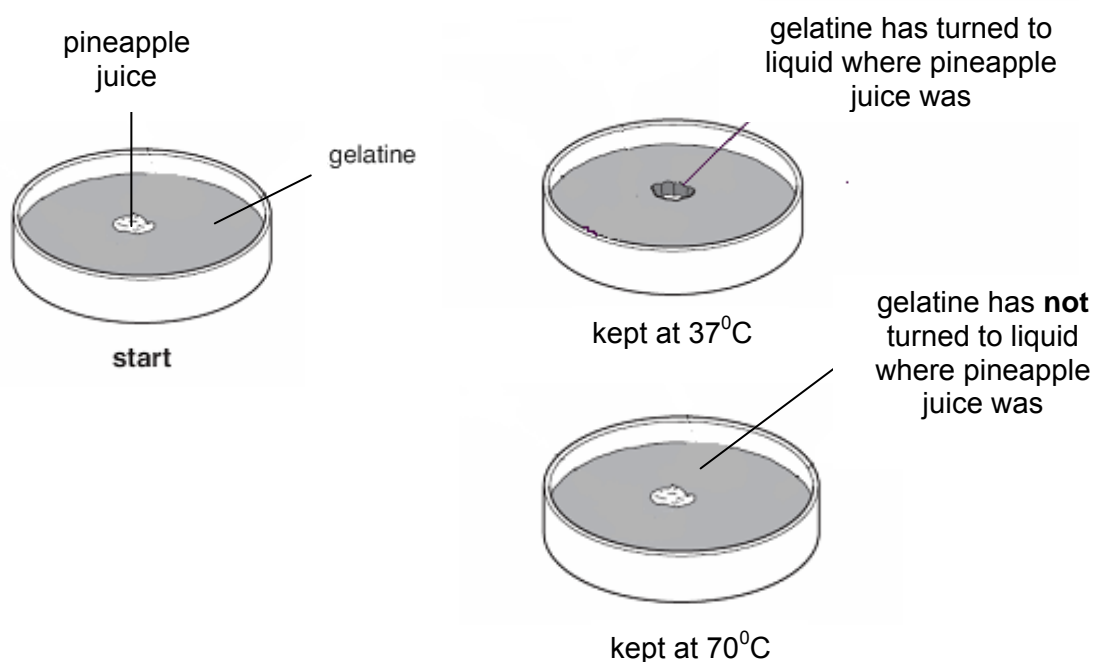
(ii) Gerant decides to do an experiment with pineapple juice.

He puts a small amount of the pineapple juice in a dish containing a jelly called gelatine.

Gelatine is a protein. When gelatine is digested it turns to liquid.

He keeps the dish at 37°C.

He repeats this with another dish but keeps this dish at 70°C.



Explain the results of Gerant's experiment.

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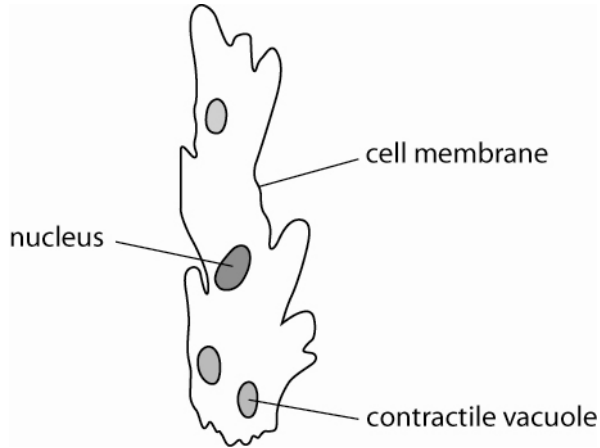
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[4]

[Total: 7]

11 Amoeba is the name of a group of single-celled organisms.

Look at the diagram of *Amoeba lacerate*. It lives in rivers.

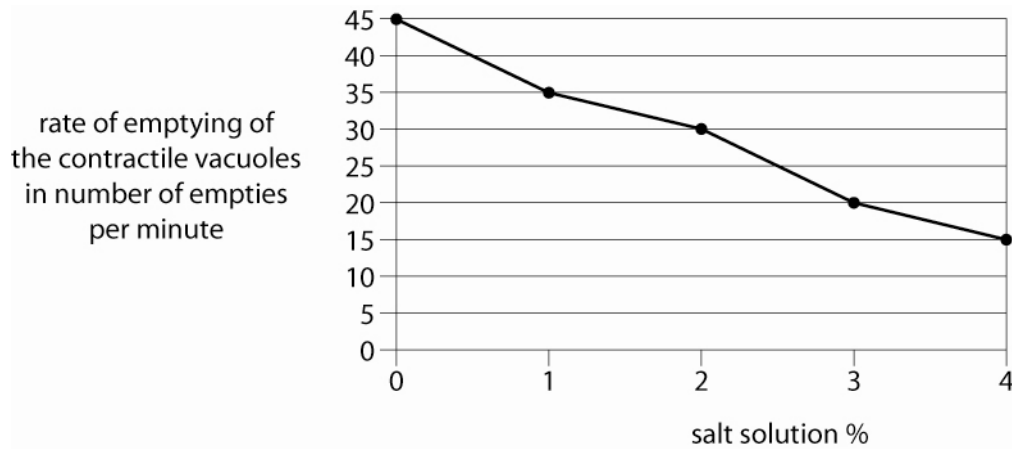


An experiment is performed on *Amoeba lacerata*.

The amoeba is placed in salt solutions of different concentrations.

The rate of emptying of its contractile vacuoles is then measured.

The graph shows the results.



(a) The contractile vacuoles empty at different rates in different salt solutions.

Explain these results.

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..... [3]

- (b) The experiment counted the number of 'empties' per minute as a measure of how quickly the amoeba removed water.

Suggest **one** reason why this data might **not** be a valid measurement of how quickly the amoeba removed water.

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..... [1]

- (c) When the amoeba are placed in 8.5% salt solution, the rate of emptying of the contractile vacuoles is close to zero.

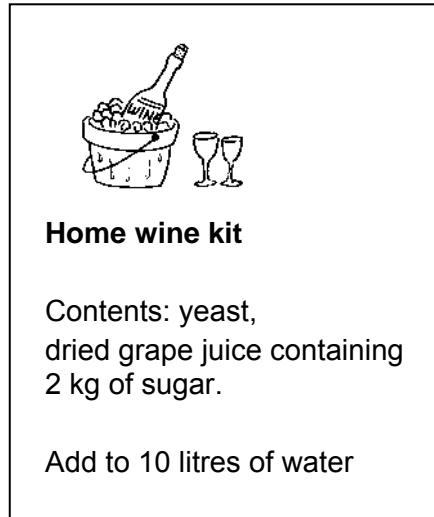
What can you deduce from this observation?

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..... [1]

[Total: 5]

12 Chris wants to make some home-made wine.



She buys two identical kits.

To one kit she adds no extra sugar.

To the second kit she adds 1kg of **extra** sugar.

She adds 10 litres of water to each, as in the instructions.

She then allows each one to ferment and produce a batch of wine.

- (a) Chris has a table showing the maximum concentration of alcohol that can be made from different starting concentrations of sugar.

starting concentration of sugar in kg per litre	maximum final alcohol concentration %
0.10	5.6
0.15	8.4
0.20	11.2
0.25	13.6
0.30	15.6

What is the maximum final alcohol concentration for the wine that has extra sugar added?

Show how you worked out your answer.

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.....

concentration =% [2]

(b) Look at the table.

Chris thinks that the starting concentration of sugar will be in direct proportion to the alcohol concentration in the wine.

(i) Do the data support her idea? Explain your answer.

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..... [2]

(ii) Would you expect the alcohol concentration to continue to increase as more sugar is added? Explain your answer.

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..... [1]

[Total: 5]

Section D

13 (a) Amy measures her resting pulse rate.

She counts her pulse for 15 seconds. She does this three times.

Amy uses each measurement to calculate her pulse rate in **beats per minute** (bpm).

She now has three values for her pulse rate in bpm.

The table shows her results.

	number of pulses in 15 seconds	pulse rate in beats per minute
1 st measurement	18	72
2 nd measurement	17	68
3 rd measurement	19	76

Neil measures his resting pulse rate.

He counts his pulse for 60 seconds (1 minute).

He does this three times.

The table shows his results.

	pulse rate in beats per minute
1 st measurement	66
2 nd measurement	67
3 rd measurement	65

Compare the methods used by Amy and Neil for measuring pulse rate.

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..... [2]

(b) Neil and Amy want to compare their fitness levels.

First, they measure their resting pulse rates.

Then they exercise by doing press-ups for one minute.

Then they measure their pulse rates every minute for five minutes.

The table shows their results.

	pulse rate in bpm						
	resting pulse rate in bpm	straight after exercise	1 min after exercise	2 min after exercise	3 min after exercise	4 min after exercise	5 min after exercise
Neil	66	110	82	68	66	66	66
Amy	72	128	114	102	92	84	78

Look at the table.

Who is the fittest, Neil or Amy?

Explain your answer using data from the table.

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..... [2]

(c) Amy looks at some data for 1578 teenage girls.

The girls were divided into 5 groups depending on their Body Mass Index (BMI) scores.

Each group carried out 4 fitness tests.

The table shows the **mean** results for each group.

fitness tests	very underweight	underweight	normal weight	overweight	obese
	BMI <17	BMI 17-18.4	BMI 18.5-24.9	BMI 25.0-29.9	BMI ≥30
push-ups in count per min	30.4	29.4	27.9	23.9	17.3
sit-ups in count per min	30.0	31.7	31.9	30.1	22.4
sit-and-reach in cm	30.2	32.0	32.4	32.6	31.0
distance run in 9min in m	1371.9	1382.1	1358.5	1242.9	1140.0

K-K Mak et al. BMC Public Health 2010, 10:88

(i) Amy says that people with lower BMIs have higher fitness levels.

Is Amy correct? Explain your answer.

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..... [3]

(ii) Amy's BMI is 29.3.

Amy uses the table to predict that she will do 30.1 sit-ups in a minute in a sit-up test.

Is this a reasonable prediction for Amy for this test?

Explain your answer.

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..... [3]

[Total: 10]

[Paper Total: 85]

END OF QUESTION PAPER



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GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

B732/02

BIOLOGY B

Unit B732: Biology modules B4, B5, B6 (Foundation Tier)

MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK 85

Guidance for Examiners

Additional guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/ = alternative and acceptable answers for the same marking point

(1) = separates marking points

not/reject = answers which are not worthy of credit

ignore = statements which are irrelevant - applies to neutral answers

allow/accept = answers that can be accepted

(words) = words which are not essential to gain credit

words = underlined words must be present in answer to score a mark

ecf = error carried forward

AW/owtte = alternative wording

ora = or reverse argument

eg mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)

work done = 0 marks


work done lifting = 1 mark

change in potential energy = 0 marks

gravitational potential energy = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

Question			Expected answer	Marks	Additional guidance
1	(a)	(i)	cellulose (1) for cell walls (1) OR fats / oils (1) for storage / water proofing / buoyancy (1) OR protein (1) for growth / repair (1)	2	allow other molecules eg chlorophyll / amino acids / vitamins / water / carbon dioxide plus correct use allow sucrose but not sugar use must match named molecule to award second mark but always allow energy / respiration / make ATP (1) allow makes leaves / makes new roots etc as alternative to growth ignore transport
		(ii)	because it does not move away to other cells (1) because it does not affect water concentration (1)	2	
	(b)	(i)	A - photosynthesis increases with increasing light because light is the limiting factor / limits rate (1) B - light is not the limiting factor / does not limit the rate as increasing light has no effect OR CO ₂ / temperature is limiting rate as increasing light has no effect (1)	2	ignore water
		(ii)	(Niall is correct) (no mark): at A CO ₂ is not the limiting factor so an increase will not cause any change (1) at B CO ₂ is the limiting factor so an increase in CO ₂ will cause the rate to continue to increase until something else becomes the limiting factor (1)	2	
			Total	8	

Question		Expected answer	Marks	Additional guidance
2	(a) 	<p>Level 3 Answer applies knowledge of factors that affect transpiration to draw conclusions which correctly compare the effects of increased air movement and increased humidity on the rate of transpiration, supported by calculations of percentage loss. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5–6 marks)</p> <p>Level 2 Answer applies knowledge of transpiration to correctly describe the effects of increased air movement and increased humidity on the rate of transpiration shown in the experimental data, supported by calculations. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3–4 marks)</p> <p>Level 1 Answer applies knowledge of transpiration to correctly describe the effect of either increased air movement or increased humidity on the rate of transpiration, using some data from the table. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1–2 marks)</p> <p>Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>relevant points include:</p> <ul style="list-style-type: none"> reference to what each experiment is testing ie A = natural air movement + natural humidity therefore control, B = high air movement, C = high humidity in A: mass of water lost = 7.1g, % mass lost = 16.7% in B: mass of water lost = 10.6g, % mass lost = 24.3% in C: mass of water lost = 0.8g, % mass lost = 1.8% increased air movement increases rate of transpiration increased humidity decreases rate of transpiration reference to comparing result from B-A against C-A to compare the effects positive effect of increased air movement (24.3 – 16.7 = 7.6) is less than negative effect of increased air humidity (1.8 - 16.7 = -14.9)
2	(b)	xylem (1)	1	
Total			7	


Question		Expected answer	Marks	Additional guidance
3	(a)	because pesticides / animals / insects containing the pesticide are eaten by animals higher in the food chain (1) pesticides accumulate / build up / concentration increases in these animals causing death (1)	2	allow pesticide passes up the food chain allow bioaccumulation allow pesticides do not breakdown / are not excreted / are stored / are persistent ignore just 'pesticide gets stronger' allow if insects are killed their predators have no / less food (1) ignore just the statement that pesticide kills animals (in question) BUT allow pesticides may be directly toxic to animals other than pests eg pesticides get into lakes and kill small animals there (1)
	(b)	any two from: cane toads had no (natural) predators (1) cane toads did not eat the pests (1) cane toads reproduced rapidly and outcompeted native toads (1)	2	allow organisms that ate the cane toads died which disrupted food chains/webs (1)
		Total	4	


Question		Expected answer	Marks	Additional guidance
4	(a)	because microbes / bacteria reproduce more quickly at higher temperatures (1) and microbes / bacteria respire more quickly at higher temperatures (1)	2	allow reactions within bacteria occur at higher rates at higher temperatures (1)
	(b)	(i)		
		nitrogen: (make) amino acids / proteins (1) magnesium: (make) chlorophyll (1)	2	allow (make) enzymes / DNA / RNA (1)
		(ii)		
		by active transport / active uptake / uptake using energy (1) against concentration gradient / up the concentration gradient / from lower concentration to higher concentration (1)	2	not osmosis ignore diffusion ignore just 'against the gradient'
		Total	6	

Question			Expected answer	Marks	Additional guidance
5	(a)	(i)	4 (litres) (1)	1	
		(ii)	(1.2 / 3 =) 0.4 moderate (1)	1	both answers for 1 mark
		(iii)	prescribe an inhaler (1)	1	
	(b)		any three from: lining (of airways) becomes inflamed (1) fluid builds up (in airways) (1) muscles (around bronchioles) contract (1) airways constrict (1)	3	
	(c)		because the alveoli/gaseous exchange surface is damaged reducing diffusion of oxygen into the blood (1) diffusion is reduced because of a reduced surface area of the lungs (1)	2	allow build up of mucus increasing diffusion distance / scarring causing thickening of alveoli reducing diffusion (1)
			Total	8	

Question		Expected answer	Marks	Additional guidance
6	(a)	increased risk of blood clots (1)	1	
	(b)	astronauts have weak(er) bones so can model / mimic the effect of osteoporosis (1)	1	ignore references to weak muscles
	(c)	pressure is needed to filter the blood (1) astronauts have lower blood pressure so filtering may not be so effective (1)	2	answer must link pressure needed for filtering to low blood pressure in astronaut to gain full credit allow blood clotting in kidneys blocking flow (1) reduces filtration (1)
	(d)	less activity / AW (1) not working against gravity / easier to move / AW (1)	2	
Total			6	

Question		Expected answer	Marks	Additional guidance
7	(a) (i)	it happens outside the body (1)	1	allow it happens in a dish / test tube ignore it happens in a lab / outside the womb
	(ii)	because FSH stimulates/increases egg production (1) which will increase chances of successful harvest / fertilisation / implantation (1)	2	answer must link increase egg production to increased chance of success to gain full credit
	(b)	success rate is higher using donor eggs making this a better option / ORA (1) but using donor eggs baby not genetically the mother's / AW (1)	2	allow the difference in success rates increases with the age of the mother (1) allow uncertainty over the egg donor's genes / AW (1)
Total			5	

Question	Expected answer	Marks	Additional guidance
8 	<p>Level 3 Applies understanding of lipase action to explain how it lowers pH, applies understanding of enzyme and bile action to thoroughly explain the results in terms of how varying the quantity affects rates of reaction. Complete conclusion linked to both lipase and bile. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5–6 marks)</p> <p>Level 2 Applies understanding of lipase action to identify that fatty acids are made, applies understanding of enzyme or bile action to explain some results. Limited conclusion linked to lipase or bile. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3–4 marks)</p> <p>Level 1 Applies understanding of enzyme or bile action to identify conditions for digestion of fats linking fat digestion to presence / absence of bile and lipase. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1–2 marks)</p> <p>Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>relevant points include:</p> <ul style="list-style-type: none"> • indicator changes colour because fatty acids made during breakdown of fats • fatty acids will lower the pH of the solution to an acidic pH <p>results show</p> <ul style="list-style-type: none"> • there is no digestion in the absence of lipase • increasing amount of lipase increases the rate of digestion • increasing amount of lipase has no effect at high concentrations <ul style="list-style-type: none"> • digestion occurs in the absence of bile salts • increasing amount of bile salts increases the rate of digestion <ul style="list-style-type: none"> • effect of bile salts is less than effect of lipase <p>conclusions</p> <ul style="list-style-type: none"> • lipase required for digestion of fats • reaction rate increased by presence of bile because bile emulsifies the fats • highest reaction rate at high concentrations of lipase and bile salts • at high concentrations, lipase is not the limiting factor for the reaction
	Total	6	


Question		Expected answer	Marks	Additional guidance
9	(a)	because earthquakes damage water supplies / sewage systems / AW (1) this means water supplies mix with sewage allowing transmission of cholera (1)	2	answers must link damaged sewage/water systems to transmission of cholera to gain full credit ignore other methods of transmission
	(b) 	<p>Level 3 Describes process in detail including explanation of the roles of restriction enzymes and ligase enzyme. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5–6 marks)</p> <p>Level 2 Limited description of the process including correct explanation of role of either restriction enzymes or ligase enzyme. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3–4 marks)</p> <p>Level 1 Limited description of the process without reference to the type and role of enzymes. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1–2 marks)</p> <p>Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>relevant points include:</p> <ul style="list-style-type: none"> • identification of a desired gene in another species • removal of gene from DNA • cutting open the DNA in the potato • restriction enzymes used to cut out the gene and cut open potato DNA • sticky ends produced at the end of the DNA strands • inserting the new gene into the DNA • ligase enzyme used to join DNA together so potato contains new gene • gene works in the potato to produce the medicine
		Total	8	




Question		Expected answer	Marks	Additional guidance
10	(a)	(low sucrose) will be sweeter (1)	1	
	(b)	(i)	2	answer must link change to enzyme to denaturing in acidic conditions to gain full credit allow reference to irreversible changes (1) ignore enzymes don't work as well / are damaged ignore powder is denatured not enzymes killed
		(ii)	4	answers must be linked and in order to gain full credit allow enzymes cannot react with substrate / protein at high temperatures (1)
		Total	7	

Question		Expected answer	Marks	Additional guidance
11	(a)	(in all concentrations) the amoeba absorbs water (by osmosis) (1) in the more concentrated salt solution the amoeba takes up water more slowly (so less to empty) (1) (because) in the more concentrated salt solution there is less difference in concentration between the amoeba and the solution (1)	3	allow in the more concentrated salt solution the amoeba takes up less water
	(b)	(contractile) vacuoles might not all be same size / AW (1)	1	
	(c)	that the concentration inside the amoeba is approximately 8.5% / that the concentration inside the amoeba is approximately the same as the salt solution(1)	1	allow answers in terms of osmotic potential being equal
		Total	5	

Question		Expected answer	Marks	Additional guidance
12	(a)	15.6 (%) (1) evidence of total sugar equalling 3kg which equals 0.3kg per litre (1)	2	
	(b)	(i) (no – mark) initially/from 0.1 to 0.2 as concentration of sugar doubles alcohol concentration doubles so is directly proportional however at higher sugar concentrations when the sugar concentration increases by 50% the alcohol concentration increased by 39.3% or less than 50% / AW (2) OR from sugar concentration of 0.1 to 0.3 the alcohol concentration does not triple (1)	2	'yes' scores 0 allow answers in terms of other equivalent correct calculations answers which do not identify change in proportionality with increasing sugar concentration limited to 1 mark ie do not identify the initial proportional relationship
		(ii) (no – no mark) not all sugar had fermented to alcohol because high concentration of alcohol (starts to) kill the yeast (1)	1	
Total			5	

Question		Expected answer	Marks	Additional guidance
13	(a)	the first method is quicker / ora (1) the first method less chance of miscounting / less accurate / ora (1) the first method is less precise / will only get final values that are multiples of 4 / ora(1)	2	
	(b)	Neil (no mark) Neil returned to resting value after 2 / 3 min (1) but Amy still had not returned to resting after 5 min / AW (1) Neil's pulse rate returned to resting level quicker than Amy's (1)	2	answers must support conclusion to gain full credit ignore simply 'Neil increased by less'
	(c) (i)	correct description of a trend / pattern from the table (1) idea that different tests give different trends (1) idea that there may be other factors involved (1) idea that conflicting evidence leads to different conclusions / there is a level of uncertainty in the conclusion (1)	3	
	(ii)	unlikely / AW (no mark) 30.1 is an average for a group (1) a person can not do 30.1 sit-ups / AW (1) she is close to the top of the BMI range so should expect to be below average for that range (1) Amy may be good or poor at sit-ups / not an average performer (1) Amy may be older or younger than the girls tested (1)	3	
Total			10	

Assessment Objectives (AO) Grid
(includes quality of written assessment )

Question	AO1	AO2	AO3	Total
1(a)(i)	2			2
1(a)(ii)	2			2
1(b)(i)		2		2
1(b)(ii)		2		2
2(a) 		4	2	6
2(b)	1			1
3(a)	2			2
3(b)		2		2
4(a)	2			2
4(b)(i)	2			2
4(b)(ii)	2			2
5(a)(i)		1		1
5(a)(ii)		1		1
5(a)(iii)	1			1
5(b)	3			3
5(c)		2		2
6(a)	1			1
6(b)		1		1
6(c)	1	1		2
6(d)		2		2
7(a)(i)	1			1
7(a)(ii)	2			2
7(b)	1	1		2
8 		4	2	6
9(a)	1	1		2
9(b) 	6			6
10(a)		1		1
10(b)(i)	2			2
10(b)(ii)		4		4
11(a)		3		3
11(b)		1		1
11(c)		1		1
12(a)		2		2
12(b)(i)			2	2
12(b)(ii)	1			1
13(a)			2	2
13(b)			2	2
13(c)(i)			3	3
13(c)(ii)			3	3
Totals	33	36	16	85

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