OCR
RECOGNISING ACHIEVEMENT

SPECIMEN H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

BIOLOGY B

B732/02

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

MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK 85

This document consists of 16 pages

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)		**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) **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) **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) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**relevant points include:** • 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			**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) **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) **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) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**relevant points include:** • indicator changes colour because fatty acids made during breakdown of fats • fatty acids will lower the pH of the solution to an acidic pH results show • 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 • digestion occurs in the absence of bile salts • increasing amount of bile salts increases the rate of digestion • effect of bile salts is less than effect of lipase conclusions • 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)		**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) **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) **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) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**relevant points include:** • 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)	because acidic conditions change the shape of enzyme / active site (1) causing enzymes to be denatured (1)	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)	because pineapple juice contains enzyme / protease (1) so the (enzyme / protease) breaks down / digests gelatine (1) this (breakdown / digestion) only occurs at low temperatures (37^{o}C) / does not occur at high temperatures (70^{o}C) / AW (1) because the enzyme denatures / changes shape at high temperature (70^{o}C) / ORA (1)	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**