



GCE

Biology B (Advancing Biology)

Unit **H022/01**: Foundations of biology

Advanced Subsidiary GCE

Mark Scheme for June 2016

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.













All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Annotations

Annotation	Meaning
	Correct response
	Incorrect response
	Ignore
	Could be used for Point already given (i.e. Given max)
	Underline (for ambiguous / contradictory wording)
	Omission
	Marking point partially met
	Benefit of doubt
	Benefit of doubt not given
	Contradiction
	Error carried forward
	Blank page

Subject-specific Marking Instructions**INTRODUCTION**

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

H022/01

Mark Scheme

June 2016

SECTION A

Question	Answer	Marks	Guidance
1	C	1	
2	B	1	
3	B	1	
4	C	1	
5	B	1	
6	A	1	
7	C	1	
8	A	1	
9	A	1	
10	C	1	
11	B	1	
12	C	1	
13	C	1	
14	B	1	
15	C	1	
16	B	1	
17	D	1	
18	C	1	
19	A	1	
20	D	1	
	Total	20	

H022/01

Mark Scheme

June 2016

SECTION B

Question		Answer	Marks	Guidance
21	(a)	<p>cell surface / plasma , membranes have been disrupted ✓ (because) water has entered the cells by osmosis ✓ (because) water potential of the sodium chloride solution is higher ✓</p>	2 max	<p>ACCEPT description of osmosis e.g. by moving from higher to lower water potential CREDIT ORA IGNORE water concentration</p>
	(b)	<p>gives time for haemolysis to occur (in the solution) OR <i>idea that</i> gives time for water potential to equilibrate between solution and cytoplasm /AW OR osmosis may be slow depending on water potential gradient ✓</p>	1	<p>DO NOT ACCEPT allows time for <u>reaction</u> to occur ACCEPT time for osmosis OR to reach equilibrium</p>
	(c)	<p>colorimeter gives quantitative results ✓ observing haemolysis is qualitative / AW ✓ <i>advantages of colorimeter</i> takes away human subjective judgement on haemolysis / AW ✓ allows calibration to give concentration at which cells are isotonic with sodium chloride solution / AW ✓</p>	3 max	<p>ACCEPT colorimeter gives data with numbers OR allows (numerical) data to be plotted on a graph</p>

H022/01

Mark Scheme

June 2016

Question			Answer	Marks	Guidance
21	(d)	(i)	<p><i>idea that</i> absorbance in both solutions is similar up to 0.10 moldm^{-3} ✓ for both solutions as concentration increases absorbance increases ✓ <i>idea that</i> sodium chloride has higher absorbance at concentrations of , $0.15 / 0.20 \text{ moldm}^{-3}$ ✓</p> <p>in 0.05 and 0.10 moldm^{-3} for both solutes haemolysis has occurred ✓</p> <p>in sodium chloride solution no haemolysis occurs above 0.15 moldm^{-3} OR in glucose haemolysis occurs at concentrations between 0.05 and 0.20 moldm^{-3} ✓</p> <p>comparative figures with units given at least once ✓</p>	2 max	<p>MUST be linked to another mark point e.g. for sodium chloride at concentration of 0.15 moldm^{-3} the absorbance of 0.70 a.u. is higher than glucose which is only 0.18 gets mps 3 and 6</p>
		(ii)	<p><i>idea that</i> the critical point for determining the concentration of solute at which haemolysis occurs is between 0.20 moldm^{-3} and 0.30 moldm^{-3} / AW ✓</p>	1	<p>look for idea that absorbance shows that at 0.20 moldm^{-3} haemolysis occurs but at 0.30 moldm^{-3} there is no haemolysis so 0.25 moldm^{-3} could go either way e.g. they could conclude that haemolysis occurs at the wrong concentration such as 0.30 but it could have happened at 0.25 moldm^{-3} the haemolysis could have occurred earlier at 0.25 rather than 0.30 moldm^{-3}</p> <p>IGNORE ref to anomalous result</p>
			Total	9	

Question			Answer	Marks	Guidance
22	(a)	(i)	S ✓	1	
		(ii)	waxy cuticle (to prevent water loss) ✓ roots (for obtaining water) ✓ gas exchange structures ✓	1 max	CREDIT named gas exchange structures e.g. correct references to stomata or lenticels IGNORE chloroplasts
		(iii)	large and multicellular ✓ have small SA:V ✓ <i>idea that</i> diffusion distance is large and diffusion is too slow to meet need ✓	1 max	
	(b)		removes sucrose from phloem ✓ decreases hydrostatic pressure at (sink) end of sieve tube ✓ <i>idea that</i> it lowers sucrose concentration because sucrose is used for respiration / metabolism ✓ <i>idea that</i> sucrose removed from phloem (so) water potential increases in phloem ✓	3 max	ACCEPT assimilates for sucrose
			Total	6	

H022/01

Mark Scheme

June 2016

Question			Answer	Marks	Guidance
23	(a)	(i)	<p><i>opsonin</i> protein / antibody , that enhances phagocytosis by marking antigens / AW ✓</p> <p><i>phagocytosis</i> (the process by which) cell / phagocyte , engulfs bacteria / pathogens / cell debris ✓</p>	2	<p>CREDIT other named cells e.g. macrophage IGNORE references to engulfing antigens IGNORE digests DO NOT CREDIT lymphocyte for a phagocyte</p>
		(ii)	<p><i>in mammalian cells</i> <i>idea that</i> the protein is synthesised on , rough endoplasmic reticulum / rER</p> <p>OR protein synthesis on , larger / 80S , ribosomes ✓</p> <p><i>idea that</i> the protein is, packaged / modified , by Golgi (apparatus) ✓</p> <p><i>idea that</i> the protein is packaged into vesicles which fuse with cell surface membrane ✓</p>	2 max	<p>CREDIT ORA throughout for bacterial cells</p> <p>CREDIT exocytosis occurs</p>

H022/01

Mark Scheme

June 2016

Question		Answer	Marks	Guidance
23	(b)	<p>X variable region AND where antibody binds to specific antigen ✓</p> <p>Y constant region AND allows attachment to phagocytes ✓</p> <p>Z hinge region AND allows the antibody to flex OR to attach to more than one antigen ✓</p>	3	<p>ACCEPT antigen-binding site for variable region</p> <p>ACCEPT complementary as AW for specific</p> <p>ACCEPT macrophage for phagocyte</p>
	(c)	<p>flow cytometry ✓</p> <p><i>idea that bacteria / <i>L.monocytogenes</i> , are tagged by antibodies labelled with fluorescent markers ✓</i></p> <p><i>idea of antibodies being immobilised ✓</i></p> <p>antibodies may, bind / attach to , (test) antigen / protein / p60 ✓</p> <p><i>idea that antibodies may be linked to enzymes producing colour reaction ✓</i></p>	3 max	<p>ACCEPT <i>idea of binding leading to production of colour</i></p> <p>ACCEPT description of ELISA</p>
		Total	10	

H022/01

Mark Scheme

June 2016

Question		Answer	Marks	Guidance
24	(a)	a disease that , has a slow onset / has symptoms that worsen over time / lasts a long time ✓	1	IGNORE caused by pathogens or may be incurable
	(b)	(i)	(multipotent stem cells) can <u>differentiate</u> into different types of (blood) cell / AW ✓ mutation is passed onto (blood) cells ✓	1 max DO NOT CREDIT any type of cell alone OR many types of cell unqualified
		(ii)	(one of) chromosome 9 is longer AND (one of) chromosome 22 is shorter (than normal) ✓	1 CREDIT <i>idea that</i> each chromosome in normal pairs (of 22 and 9) would be same length
		(iii)	karyotyping ✓ take cells from sample of correctly named body fluid ✓ (cells) stimulated to divide by mitosis ✓ <i>idea that</i> mitosis is stopped in metaphase ✓ chromosomes stained ✓ <i>idea that</i> chromosomes are arranged in order (of size) to produce , image / photograph ✓	3 max CREDIT cells taken using amniocentesis or CVS ACCEPT cell cycle for mitosis

H022/01

Mark Scheme

June 2016

Question		Answer	Marks	Guidance	
24	(c)	<p>drug is tested on people with the disease ✓ tests how effective the drug is against the disease ✓</p> <p>gathers information about dosage of the drug ✓ determines if the drug is, more effective / better than , existing drugs ✓ <i>idea that</i> more people participate than in previous phases ✓</p> <p>qualified reference to placebo ✓</p>	2 max	<p>disease only needs to be referred to once if awarding both mps 1 and 2 e.g. <i>the drug is given to people with the disease to see how effective it is gets</i> mps 1 and 2.</p> <p>IGNORE references to side effects ACCEPT compares effectiveness with existing drug</p> <p>ACCEPT <u>larger</u> scale than previous trials</p> <p>e.g. don't usually have placebo because it would be unethical to give to a person with the disease</p>	
	(d)	(i)	83.3 % ✓✓	2	<p>ALLOW for 1 mark 1250 / 1500 x 100 OR 83.3333...</p>
		(ii)	<p>(y axis) patient G had a much higher blast count (at the start of the trial) AND (x axis) patient G was being given a higher dose OR (x axis) <i>idea that</i> patient G did not continue with the treatment✓</p>	1	<p>CREDIT ORA for patient F ACCEPT very different blast counts</p> <p>e.g. patient G had much less time on the drug e.g. patient G decided to opt out of the trial e.g. blast count of patient G had reduced sufficiently e.g. patient G had stabilised</p>
			Total	11	

H022/01

Mark Scheme

June 2016

Question		Answer	Marks	Guidance
25	(a)	<p><i>age</i> students (in AS class) would not provide a big enough range</p> <p>AND <i>environmental temperature</i> <i>idea that</i> it would be, unsafe / unethical, to test temperature on humans / AW</p> <p>OR <i>idea that</i> could not get a wide enough range of temperatures (in the classroom) ✓</p>	1	<p>ACCEPT students (in AS class) would be same age</p> <p>IGNORE reference to homeostasis</p> <p>IGNORE same environment CREDIT <i>idea that</i> environmental temperature is difficult to measure or control (in a classroom)</p>
	(b) (i)	<p><i>credit examples of:</i></p> <p><i>human error in timing</i> e.g. took the heart rate measurement after exercise ✓</p> <p><i>human error in exercise</i> e.g. did not jog as quickly / AW ✓</p> <p><i>human error in equipment</i> e.g. electronic bands became loose ✓</p>	1 max	<p>IGNORE counting errors as heart rate was measured electronically</p> <p><i>Other examples</i> e.g. read it wrong e.g. wasn't taken exactly 4 minutes into exercise e.g. allowed to recover before taking heart rate e.g. didn't try as hard (during exercise)</p>
	(ii)	<p>(student) was , fitter / undertaking athletic training ✓ (student) had a higher stroke volume ✓ (student) had correctly named heart condition ✓ genetic reasons ✓</p>	1 max	CREDIT <i>idea that</i> they had an exercise programme

Question			Answer	Marks	Guidance																																												
25	(b)	(iii)	column for $(x - \bar{x})^2$ completed correctly ✓ variance = 35 or 34.7 ✓ SD = 6 or 5.9 or 5.89 ✓	3	<p>DO NOT CREDIT minus numbers in column</p> <table border="1"> <thead> <tr> <th>Student</th> <th>heart rate (x)</th> <th>(x - \bar{x})</th> <th>(x - \bar{x})²</th> </tr> </thead> <tbody> <tr><td>1</td><td>55</td><td>-11</td><td>121</td></tr> <tr><td>2</td><td>67</td><td>1</td><td>1</td></tr> <tr><td>3</td><td>73</td><td>7</td><td>49</td></tr> <tr><td>4</td><td>73</td><td>7</td><td>49</td></tr> <tr><td>5</td><td>71</td><td>5</td><td>25</td></tr> <tr><td>6</td><td>59</td><td>-7</td><td>49</td></tr> <tr><td>7</td><td>65</td><td>-1</td><td>1</td></tr> <tr><td>8</td><td>67</td><td>1</td><td>1</td></tr> <tr><td>9</td><td>66</td><td>0</td><td>0</td></tr> <tr><td>10</td><td>62</td><td>-4</td><td>16</td></tr> </tbody> </table> <p>ECF mp 2 if mp 1 incorrect mp3 if mp2 incorrect</p> <p>Figures should be no more than 1dp different between mps.</p>	Student	heart rate (x)	(x - \bar{x})	(x - \bar{x}) ²	1	55	-11	121	2	67	1	1	3	73	7	49	4	73	7	49	5	71	5	25	6	59	-7	49	7	65	-1	1	8	67	1	1	9	66	0	0	10	62	-4	16
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9	66	0	0																																														
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H022/01

Mark Scheme

June 2016

Question			Answer	Marks	Guidance
25	(b)	(iv)	no / conclusion rejected AND <i>reason</i> <i>idea that</i> some students have heart rates that fall outside one SD of the mean ✓	1	CREDIT <i>idea that</i> a given heart rate (from results) is more than one SD away from mean heart rate e.g. 59 is more than one SD away from 66
			Total	7	

H022/01

Mark Scheme

June 2016

Question			Answer	Marks	Guidance
26	(a)	(i)	<u>lumen</u> of, blood vessel /arteriole / artery ✓	1	IGNORE capillary
		(ii)	(squamous epithelial cells) do not have cilia ✓ (squamous epithelial cells) are flattened ✓ (squamous epithelial cells) have fewer mitochondria ✓	1 max	CREDIT ORA for epithelial cells lining bronchioles ACCEPT thinner
		(iii)	<i>smooth muscle</i> contracts to , control / adjust / reduce lumen size ✓ <i>elastic fibres</i> allow , stretch / recoil OR allow lumen to , dilate / return to usual size ✓	2	
	(b)		(wall of) trachea OR bronchus AND support / prevents (airway) collapse ✓	1	IGNORE references to shape and flexibility DO NOT CREDIT cartilage increases flexibility
	(c)	(i)	RNA ✓	1	IGNORE ref to type of RNA e.g. messenger
		(ii)	antigens (on viral coat) constantly change ✓ <i>idea that</i> the virus is inside host cell so does not attract antibody ✓ <i>idea that</i> frequency of mutation is high ✓	1 max	
			Total	7	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

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Head office
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Facsimile: 01223 552553

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