OCR
Oxford Cambridge and RSA

GCE

Biology B (Advancing Biology)

Unit **H022/02:** Biology in depth

Advanced Subsidiary GCE

Mark Scheme for June 2018

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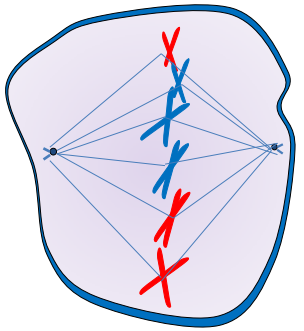
This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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.

Annotations

Annotation	Meaning
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

Question			Answer	Mark	Guidance
1	(a)	(i)	*Drawing to include:* spindle fibres drawn **AND** six chromosomes drawn (vertically) at the equator ✓ centrioles drawn at both poles ✓ *Labelling*: Any **two** from: centromere spindle (fibres) centriole chromatid ✓	1 2	 **Two correctly labelled structures required for 1 mark**
1	(a)	(ii)	*A stem cell* = **6** **AND** *A sperm cell* (*gamete*) = **3** ✓	1	**Both** required for one mark. Must be in correct order.
1	(a)	(iii)	apoptosis ✓	1	**ALLOW** programmed cell death
1	(b)		more chance of predation **OR** more chance of dehydration **OR** *idea that there is* fluctuation in temperature ✓	1	**ALLOW** 'more chance of being eaten'

Question			Answer	Mark	Guidance
1	(c)*		***Summary of instructions to markers:*** *Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.)* *Using a 'best-fit' approach based on the science content of the answer, first decide which of the level descriptors,* ***Level 1****,* ***Level 2*** *or* ***Level 3****, best describes the overall quality of the answer.* *Then, award the higher or lower mark within the level, according to the* ***Communication Statement*** *(shown in italics):* ○ *award the higher mark where the Communication Statement has been met.* ○ *award the lower mark where aspects of the Communication Statement have been missed.* • ***The science content determines the level.*** • ***The Communication Statement determines the mark within a level.***		

Question			Answer	Mark	Guidance
			Level 3 (5–6 marks) Provides a comprehensive description of how embryonic stem cells are used and the concerns that arise due to their use. *There is a well-developed line of reasoning which is clear and logically structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.* **Level 2 (3–4 marks)** Provides a brief description of how embryonic stem cells are used and the concerns that arise due to their use. *There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.* **Level 1 (1–2 marks)** Provides a brief description of how human embryonic stem cells are used or the concerns that arise due to their use. *The information is communicated with only a little structure. Communication is hampered by the inappropriate use of technical terms.* **0 marks** No response or no response worthy of credit	6	Uses for **human** embryonic stem cells taking into account any concerns that could arise by using these cells for research purposes. **Indicative scientific points may include** **Uses of Embryonic stem cells** totipotent / pluripotent able to express all the genes able to make all cells used to treat spinal cord injury heart disease stroke burns arthritis diabetes retina damage organ transplant **Concerns** could lead to reproductive cloning the potential risks and side effects are unknown embryos cannot give consent religious objection embryo could be used in fertility treatment. taken from embryo at less than 5 days old
			Total:	**12**	

Question			Answer	Mark	Guidance
2	(a)	(i)	allows a comparison to be made ✓	1	Allow baseline, show effect of digoxin
2	(a)	(ii)	Any **one** from age gender fitness stress level of patients ✓	1	Allow ref to mass, other treatment
2	(a)	(iii)	*Before treatment* 85 to 103 (18) **AND** *Eight weeks after* treatment 62 to 81 (19) ✓	1	**Both** ranges needed for 1 mark. Must be in correct order.
2	(a)	(iv)	22% **OR** 21.7% ✓✓	2	Correct answer = 2 marks **ALLOW** one mark for $\frac{92-72}{92}$
2	(b)	(i)	(AVN) delays impulse ✓ (so) allows time for , atria to empty / ventricles to fill ✓ (AVN) transmits impulse on to , ventricles / bundle of His / Purkinje tissue ✓	Max 2	**ALLOW** prevents impulse from passing on immediately to ventricles
2	(b)	(ii)	*idea that* AVN delays impulse for longer than normal ✓ allows more time for ventricles to fill with blood ✓ increases , stroke volume / cardiac output ✓	Max 2	**ALLOW** idea of more blood ejected from heart per beat
			Total	9	

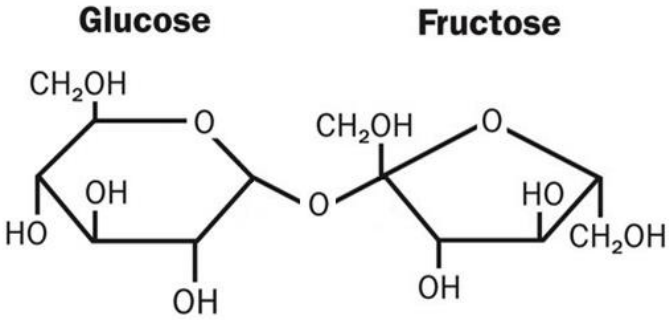
Question			Answer	Mark	Guidance
3	(a)	(i)	already known to have some medicinal properties ✓ some side effects were known ✓ reduced time in finding , drug / quinine , to treat malaria / AW ✓	Max 2	**ALLOW** already used to treat fever
3	(a)	(ii)	*idea that* the parasite starves ✓ *idea that* (host) haemoglobin not hydrolysed to amino acids ✓ amino acids needed for making (parasite) proteins ✓ *idea that* the incomplete breakdown of haemoglobin is toxic ✓	Max 2	
3	(b)	(i)	looks / tastes the same, without the active ingredient ✓	1	
3	(b)	(ii)	random method / random selection explained ✓ use of double-blind trial / AW ✓ gender ✓ age ✓ similar , stage / severity , of , condition / syndrome ✓	Max 2	
3	(c)		9 (g) ✓✓	2	**ALLOW** one mark for 9000 mg provided units are stated
			Total	9	

Question			Answer	Mark	Guidance
4	(a)		*description* **1.** (small) increase in antibody concentration from ✓ **2.** rapid increase in antibody concentration between days 5 and 25 ✓ **3.** antibody concentration peaks at day 25 ✓ **4.** antibody concentration decreases from day 25 ✓ **5.** antibody concentration remains higher than before the BCG vaccine ✓ *explanation* **6.** *idea that* time needed for , antigen / vaccine , to trigger immune response ✓ **7.** *idea that* antibody production rises due to differentiation of (B) lymphocytes to plasma cells ✓ **8.** *idea that* production and break down of antibody are balanced ✓ **9.** idea that fewer antibodies produced and more broken down ✓	**Max 4**	**ALLOW 3 max from description** **ALLOW 3 max from explanation** **ALLOW** any stated day between 5 to 10 **ALLOW** any stated days between 5 to 10 and 25 to 30 **ALLOW** antibody concentration peaks between days 25 and 30 **ALLOW** any stated day between 25 to 30
4	(b)		34% ✓✓	**Max 2**	**ALLOW** one mark for (84,300/95,000)

Question			Answer			Mark	Guidance
4	(c)		***Statement***	***True (T) or False (F)***	✓✓	2	Three correct = 2 marks Two correct = 1 mark One correct = 0 marks
			An injection of antibodies against the rabies virus will provide artificial active immunity.				
			A person recovering from an infection of measles will have natural active immunity to the measles virus.				
			A breast- fed baby receiving maternal antibodies will have natural passive immunity.				

Question			Answer	Mark	Guidance
4	(d)*		***Summary of instructions to markers:*** *Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.)* *Using a 'best-fit' approach based on the science content of the answer, first decide which of the level descriptors,* ***Level 1****,* ***Level 2*** *or* ***Level 3****, best describes the overall quality of the answer.* *Then, award the higher or lower mark within the level, according to the* ***Communication Statement*** *(shown in italics):* o *award the higher mark where the Communication Statement has been met.* o *award the lower mark where aspects of the Communication Statement have been missed.* • ***The science content determines the level.*** • ***The Communication Statement determines the mark within a level.***		

Question			Answer	Mark	Guidance
			Level 3 (5–6 marks) Provides a comprehensive **comparison** of the roles of **both** B and T-lymphocytes including similarities **and** differences *There is a well-developed line of reasoning which is clear and logically structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.* **Level 2 (3–4 marks)** Provides a description of the roles of **both** B and T-lymphocytes including similarities **OR** differences *There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.* **Level 1 (1–2 marks)** Provides a brief description of the role of **either** B **OR** T-lymphocytes with limited/no comparison *The information is communicated with only a little structure. Communication is hampered by the inappropriate use of technical terms.* **0 marks** No response or no response worthy of credit	**6**	**cientific points may include** ***B-lymphocyte*** Processed in bone marrow Specific antibody production Differentiation into plasma cells ***T lymphocyte*** Processed in thymus T-helpers Use of cytokines Stimulation of B lymphocytes T-killer/cytotoxic T-regulatory/suppressors ***Both (similarities)*** complementary receptors clonal selection clonal expansion proliferation differentiation memory cell specificity
			Total	**14**	

Question			Answer	Mark	Guidance
5	(a)		*drawn as a diagram* glycosidic bond between two molecules shown by oxygen atom✓ bond drawn between correct carbon atoms ✓	2	
5	(b)	(i)	*Support statement* (blue-green) result in leaf shows little sucrose present **OR** (green-orange) result in stem shows (greater) concentration of sucrose present ✓ (so) supports loading of sucrose into phloem , from source / as it is produced ✓ (blue-green) result in root shows sucrose is used by , roots / sinks ✓ (so) supports starch formation/use in respiration *Do not support statement* *idea that* (Benedict's) test does not distinguish between reducing and non-reducing sugars ✓ the blue-green result for , leaf / root , extract could be interpreted as a negative test ✓	max 4	**ALLOW** sucrose is converted to starch in roots **ALLOW** does not distinguish between glucose and sucrose **ALLOW** reducing sugar / glucose , could be causing positive result

Question			Answer	Mark	Guidance
5	(b)	(ii)	**Any three from:** same temperature of water bath ✓ (equal) volume of Benedict's / test solutions ✓ excess sodium hydrogen carbonate needed ✓ same time left in water bath ✓ use method for obtaining quantitative results ✓	3	**ALLOW** boiling water bath **ALLOW** must be added until mixture stops fizzing e.g. filter precipitate and weigh e.g. use colorimeter
5	(c)		tomato plants are dicot(yledon)s **AND** cereal crops are monocot(yledon)s ✓ *Differences* tomato plant leaves have branching veins ✓ tomato plant stems have vascular bundles arranged in rings ✓ AVP ✓ *Similarities* both have vascular bundles ✓	3	**2 max for differences ALLOW ora** e.g. xylem in tomato plant root arranged in shape of cross **ora** **ALLOW** both have phloem / xylem
5	(d)		starch , hydrolysed / broken down into , sugars / glucose / maltose ✓ enzyme / amylase ✓ germination ✓	3	
			Total	15	

Question			Answer	Mark	Guidance
6	(a)	(i)	**G** neutrophil ✓ **H** lymphocyte ✓	2	**ALLOW** granulocyte
6	(a)	(ii)	30 μm **OR** 0.03 mm ✓✓	2	**Correct units required** **ALLOW** for 1 mark 30 / 0.03 **OR** 15 000 ÷ 500 **OR** 15 ÷ 500
6	(b)	(i)	*missing stage* use of spreader ✓ *effect* *idea that* blood cells could not be seen clearly because the film would be too thick ✓ **OR** *missing stage* add , methanol / fixative *effect* *idea that* cells would be washed off the slide ✓	Max 2	Effect must be linked to correct missing stage
6	(b)	(ii)	stains some structures darker / provides contrast ✓ allows the shape of the nucleus to be seen ✓ allows the type of cell to be identified ✓	2 max	
6	(c)		*useful for* counting cells ✓ *idea that* it can count large numbers of cells quickly ✓ allows analysis of , physical / chemical , characteristics ✓ diagnosis of blood cancers ✓	1 Max 2	 **ALLOW** can analyse size and shape Allow disease of the blood
			Total	12	

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