OCR
Oxford Cambridge and RSA

GCE

Biology B (Advancing Biology)

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

Advanced Subsidiary GCE

Mark Scheme for June 2016

Annotations

Annotation	Meaning
✔	Correct response
✘	Incorrect response
I	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
CON	Contradiction
ECF	Error carried forward
BP	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.

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	

SECTION B

Question			Answer	Marks	Guidance

21	(a)		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 ✓
				2 max	**ACCEPT** description of osmosis e.g. by moving from higher to lower water potential
					CREDIT ORA
					IGNORE water concentration

	(b)		gives time for haemolysis to occur (in the solution)
			OR
			idea that gives time for water potential to
			   equilibrate between solution and cytoplasm /AW
			OR
			osmosis may be slow depending
			        on water potential gradient ✓
				1	**DO NOT ACCEPT** allows time for <u>reaction </u>to occur
					
					ACCEPT time for osmosis OR to reach equilibrium

	(c)		colorimeter gives quantitative results ✓
			
			observing haemolysis is qualitative / AW ✓
			
			advantages of colorimeter
			takes away human subjective judgement
			         on haemolysis / AW ✓
			
			allows calibration to give concentration at which cells
			   are isotonic with sodium chloride solution / AW ✓
				3 max	**ACCEPT** colorimeter gives data with numbers
					OR allows (numerical) data to be plotted on a graph

Question			Answer	Marks	Guidance
21	(d)	(i)	*idea that* absorbance in both solutions is 　　　　　　　　similar up to 0.10 moldm^{-3} ✓ for both solutions as concentration increases 　　　　　　　　absorbance increases ✓ *idea that* sodium chloride has higher absorbance 　　　　　　　　at concentrations of , 0.15 / 0.20 moldm^{-3} ✓ in 0.05 and 0.10 moldm^{-3} for both solutes haemolysis has occurred ✓ 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} ✓ comparative figures with units given at least once ✓	2 max	**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**
		(ii)	*idea that* 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 ✓	1	***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} **IGNORE** ref to anomalous result
			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 ✓ *idea that* 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 ✓ *idea that* it lowers sucrose concentration because sucrose is used for respiration / metabolism ✓ *idea that* sucrose removed from phloem (so) water potential increases in phloem ✓	3 max	**ACCEPT** assimilates for sucrose
			Total	6	

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

Question			Answer	Marks	Guidance
23	(b)		*X* variable region **AND** where antibody binds to specific antigen ✓ *Y* constant region **AND** allows attachment to phagocytes ✓ *Z* hinge region **AND** allows the antibody to flex **OR** to attach to more than one antigen ✓	3	**ACCEPT** antigen-binding site for variable region **ACCEPT** complementary as AW for specific **ACCEPT** macrophage for phagocyte

	(c)		flow cytometry ✓
			
			idea that bacteria / *L.monocytogenes* , are tagged
			    by antibodies labelled with fluorescent markers ✓
			
			idea of antibodies being immobilised ✓
			
			antibodies may, bind / attach to ,
			    (test) antigen / protein / p60 ✓
			
			idea that antibodies may be linked to
			    enzymes producing colour reaction ✓
				3 max	
					
					ACCEPT *idea of* binding leading to production of colour
					ACCEPT description of ELISA

			Total	10	

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** *idea that* 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 ✓ *idea that* mitosis is stopped in metaphase ✓ chromosomes stained ✓ *idea that* 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

Question			Answer	Marks	Guidance

24	(c)		drug is tested on people with the disease ✓
			tests how effective the drug is against the disease ✓
			
			gathers information about dosage of the drug ✓
			determines if the drug is, more effective /
			                 better than , existing drugs ✓
			idea that more people participate than in
			                 previous phases ✓
			
			qualified reference to placebo ✓
				2 max	disease only needs to be referred to once if awarding both **mps 1** and **2**
					e.g. *the drug is given to people with the disease to see how effective it is* gets **mps 1** and **2**.
					
					IGNORE references to side effects
					ACCEPT compares effectiveness with existing drug
					
					ACCEPT lar<u>ge</u>r scale than previous trials
					
					e.g. don't usually have placebo because it would be unethical to give to a person with the disease

	(d)	(i)	83.3 % ✓✓	2	**ALLOW** for 1 mark 1250 / 1500 x 100 **OR** 83.3333…
		(ii)	(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) *idea that* patient **G** did not continue with the treatment✓	1	**CREDIT** ORA for patient **F** **ACCEPT** very different blast counts 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
			Total	11	

Question			Answer	Marks	Guidance
25	(a)		*age* students (in AS class) would not provide a big enough range **AND** *environmental temperature* *idea that* it would be, unsafe / unethical, to test temperature on humans / AW **OR** *idea that* could not get a wide enough range of temperatures (in the classroom) ✓	1	**ACCEPT** students (in AS class) would be same age **IGNORE** reference to homeostasis **IGNORE** same environment **CREDIT** *idea that* environmental temperature is difficult to measure or control (in a classroom)
	(b)	(i)	*credit examples of* : *human error in timing* e.g.took the heart rate measurement after exercise ✓ *human error in exercise* e.g.did not jog as quickly / AW ✓ *human error in equipment* e.g. electronic bands became loose ✓	1 max	**IGNORE** counting errors as heart rate was measured electronically *Other examples* 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)
		(ii)	(student) was , fitter / undertaking athletic training ✓ (student) had a higher stroke volume ✓ (student) had **correctly named** heart condition ✓ genetic reasons ✓	1 max	**CREDIT** *idea that* 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	**DO NOT CREDIT** minus numbers in column

Table:

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**

ECF mp 2 if mp 1 incorrect
        mp3 if mp2 incorrect

Figures should be no more than 1dp different between mps.

Question			Answer	Marks	Guidance
25	(b)	(iv)	no / conclusion rejected **AND** *reason* *idea that* some students have heart rates that fall outside one SD of the mean ✓	1	**CREDIT** *idea that* 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	

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)	*smooth muscle* contracts to , control / adjust / reduce lumen size ✓ *elastic fibres* 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 ✓ *idea that* the virus is inside host cell so does not attract antibody ✓ *idea that* frequency of mutation is high ✓	1 max	
			Total	7	

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