

GCSE

Biology B

Unit **B731/02**: Modules B1, B2, B3 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2014

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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.

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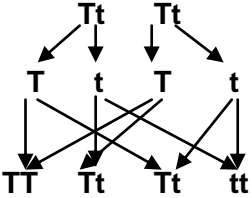
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Annotations used in scoris

Annotation	Meaning
	correct response
	incorrect response
BOD	benefit of the doubt
NBOD	benefit of the doubt not given
ECF	error carried forward
	information omitted
I	ignore
R	reject
CON	contradiction

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

- / = alternative and acceptable answers for the same marking point
- (1)** = separates marking points
- allow** = answers that can be accepted
- not** = answers which are not worthy of credit
- reject** = answers which are not worthy of credit
- ignore** = statements which are irrelevant
- () = words which are not essential to gain credit
- = underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
- e cf = error carried forward
- AW = alternative wording
- ora = or reverse argument

Question	Answer	Marks	Guidance									
1 a i	amino acids (1)	1										
ii	EAR = 7.2 (g) (1)	1	allow 0.0072 kg allow 7.20 (g)									
iii	15 year olds body mass is larger (1) EAR is calculated using body mass (not age) (1)	2	allow 15 year olds are bigger / heavier ORA allow idea of growth spurts/adolescence/puberty(needing more protein) ignore just growth / growth stages allow weight for mass									
b	parent genotypes/gametes (1) offspring genotypes (1) 0.25 / 25% / 1/4 / 1 in 4 / 1 to 3 of having beta thalassaemia (1)	3	<table border="1" style="display: inline-table; margin-right: 20px;"> <tr> <td></td> <td>T</td> <td>t</td> </tr> <tr> <td>T</td> <td>TT</td> <td>Tt</td> </tr> <tr> <td>t</td> <td>Tt</td> <td>tt</td> </tr> </table> <p>Correct diagram = 2</p>  <p>If no marks awarded allowed ecf for max 1 mark for either offspring genotypes or ratio allow alternative letter code</p>		T	t	T	TT	Tt	t	Tt	tt
	T	t										
T	TT	Tt										
t	Tt	tt										
Total		7										

Question	Answer	Marks	Guidance
2 a i	mosquitoes suck infected blood/blood from someone with malaria (1) pass plasmodium into (new) individual/human/host (1)	2	ignore bacteria or virus ignore reference to merely biting but allow feeding/drinking infected blood ignore references to vector unless qualified allow pathogen / protozoan / parasite for plasmodium ignore malaria is transferred allow mosquitos suck blood with plasmodium and pass on to another human (2)
ii	mosquitoes breed in water / (female) mosquito lays eggs in water (1) ora and spraying insecticide kills mosquito/larvae/eggs/offspring (1)	2	ignore insecticide kills plasmodium/pathogen ignore it stops the eggs being laid in the water ignore insects unqualified
b	heat stroke (1) dehydration (1)	2	ignore just 'stroke' allow hyperthermia allow insufficient water to remove toxins allow higher level answers e.g. damage to enzymes / stops enzymes working / denatures enzymes (1) allow preventing chemical reactions happening (1) ignore kills enzymes ignore burn or body becomes too hot or overheats ignore damage to any body part e.g. organ failure
	Total	6	

Question	Answer	Marks	Guidance
3 a	Type <u>1</u> and a correct reason Type 1 is insulin dependent/early onset/juvenile (1) Type 1 doesn't produce any/enough insulin (1) Type 2 can be controlled with diet only (1)	1	Type 2 / Type A / Type B = 0 allow Type 1 has to be controlled by injecting insulin / she needs insulin ignore she injects insulin (in the stem of the question) / she uses insulin allow pancreas doesn't work allow Type 2 is late onset / associated with obesity Jessica is neither / Type 2 not insulin dependent
b	insulin dose would be less /decreases (1) because she would use up blood sugar / glucose (1)	2	ignore sugar / glucose unless clearly linked to blood
Total		3	

Question	Answer	Marks	Guidance
4	<p>[Level 3] Identifies Kevin's and Jeanette's cause and correction</p> <p>and at least one reason for and one against surgery.</p> <p>Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Identifies Kevin's or Jeanette's cause or correction</p> <p>and at least one reason for and one against surgery.</p> <p>Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Identifies Kevin's or Jeanette's condition or cause or correction</p> <p>or at least one reason for or one against surgery.</p> <p>Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to A.</p> <p>Indicative scientific points at level 1, 2 and 3 may include:</p> <p>Cause</p> <ul style="list-style-type: none"> • Kevin as eyeball too long or lens too fat/too refractive/not thin enough. • Jeanette eyeball too short or lens too thin/not refractive enough/not fat enough. <p>Correction</p> <ul style="list-style-type: none"> • Kevin needs concave / diverging lens for correction. • Jeanette needs convex/ converging lens. <p>Reasons for</p> <ul style="list-style-type: none"> • benefits outweigh surgery risks • work not hindered • may be sportsperson • weather problems of glasses • makes appearance better • no need to wear glasses • long-lasting remedy <p>Reasons against</p> <ul style="list-style-type: none"> • Valid reason for not having surgery e.g. risk of going wrong / fear/pain of operation • cost of surgery compared to glasses • may still need glasses later in life when eyes worsen <p>Indicative scientific points at level 1 may include:</p> <p>Condition</p> <ul style="list-style-type: none"> • Kevin is short-sighted / can only see near objects in focus • Jeanette is long-sighted / can only see distant objects in focus <p>Use the L1, L2, L3 annotations in Scoris. Do not use ticks.</p>
	Total	6	

Question	Answer	Marks	Guidance
5 a	(auxin) made in tip and because when tip is covered / missing then no growth towards the light / bending towards the light (1)	1	allow ora eg no tip exposed to light then no curvature must be sure response is to light allow there is no positive phototropism when tip is covered
b	no response with mica as mica prevents diffusion / response with gelatin as gelatin allows diffusion (1)	1	allow by diffusion as when diffusion is prevented it doesn't grow (towards the light)
c	idea of more auxin on shaded / right side and (more cell) elongation on shaded / right side (1)	1	ora allow auxin moves to shaded / right side because elongation greatest on shaded side ignore auxin destroyed by light response must indicate an unequal distribution of auxin in response to light
	Total	3	

Question	Answer	Marks	Guidance
6 a i	<p style="text-align: center;">family <input type="checkbox"/></p> <p style="text-align: center;">genus <input type="checkbox"/></p> <p style="text-align: center;">kingdom <input type="checkbox"/></p> <p style="text-align: center;">order <input type="checkbox"/></p> <p style="text-align: center;">phylum <input type="checkbox"/></p> <p style="text-align: center;">species <input checked="" type="checkbox"/></p>	1	<p>more than one answer = 0</p> <p>allow other unambiguous answers, e.g. X in box, underlining, circle</p>
ii	variety of life is a continuous spectrum AW (1)	1	<p>allow different living things look very similar/have similar characteristics</p> <p>allow they have features that fit into more than one group</p> <p>allow they can't see the genetic code/DNA</p> <p>allow they can't see if they produce fertile offspring</p> <p>allow animals could look different but still belong to the same group due to common ancestors</p>
b	<p>natural systems are based on evolutionary relationships / (large number of) common characteristics (1)</p> <p>and artificial systems are based on one/a few/limited number of characteristics (1)</p>	2	<p>must be clear which type of system they are referring to</p> <p>allow natural based on ancestors / archaeological evidence / record in the rocks / physiology / biochemistry / reproduction / DNA</p> <p>allow artificial systems only based on what can be seen /physical features or behaviours e.g. flight or no flight</p>
Total		4	

Question	Answer	Marks	Guidance
7 a i	CFCs (1) aerosols / refrigeration (1)	2	if mention global warming / greenhouse gases max 1 mark allow (ozone) is broken down to oxygen / reacts to form oxygen (1)
ii	South America (1) (people will be more) exposed to UV radiation / (more at risk from skin) cancer (1)	2	allow mutation / DNA damage as alternative to cancer
b	<p>[Level 3] Identifies the names of both types of competition and shrinking ice caps means competition is greater between polar bears in a smaller territory/area. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Identifies the names of both types of competition or shrinking ice caps means competition is greater between polar bears in a smaller territory/area. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Identifies one type of competition or idea of more of polar bears on smaller ice caps/in a smaller area. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to A*.</p> <p>Indicative scientific points at level 2 and 3 may include:</p> <ul style="list-style-type: none"> • competition between polar bears in a smaller territory greater. • competition between polar bears is intraspecific. • competition between polar bears and killer whales is interspecific. <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> • competition between polar bears is intraspecific / within a species • competition between polar bears and killer whales interspecific / between species • idea of less land for polar bears • idea of competition between polar bears is on land and between polar bears and killer whales is in water <p>Use the L1, L2, L3 annotations in Scoris. Do not use ticks.</p>
	Total	10	

Question	Answer	Marks	Guidance
<p>8 a i</p>	<p>correct size bars (1) correct labels (1)</p>	<p>2</p>	<p>ignore asymmetry small fish = 8 small squares (16mm) wide by 5 small squares (10mm) high +/- ½ mm square</p> <p>cormorant = between a single line and max of 1 square wide (2mm) by 5 small squares (10mm) high or 4 small squares +/- ½ mm square</p>
<p>ii</p>	<p>humans are involved in other food chains / more than one trophic level (1)</p> <p>taking dry mass of humans / whales would be very difficult (1)</p>	<p>2</p>	<p>allow humans eat other things / have a varied diet</p> <p>allow can't dry out a human allow not allowed to kill whales / humans allow difficulty to catch / weigh whales</p>
<p>b</p>	<p>numbers were very low (1)</p> <p>protection has allowed numbers to recover (1)</p> <p>numbers are now high enough so no longer endangered (1)</p>	<p>3</p>	<p>allow between 1940 and 1980's numbers were at critical level / risk of extinction</p> <p>allow pre 1940 hunting/poisoned/habitats destroyed allow examples of protection e.g. banning poaching/captive breeding allowed the numbers to recover allow between 2000 and 2007 numbers no longer at critical level / risk of extinction</p> <p>allow disease / disaster could wipe out small population (1) allow reduced gene pool when population is low (1) ora</p>
<p>Total</p>		<p>7</p>	

Question	Answer	Marks	Guidance
9 a	contains antifreeze protein / chemical (1)	1	ignore all behavioural responses ignore thick shell
b	Leg B (1) and any two from blood vessels close together (1) (more) heat transfer between vessels / heat transfer from blood flow into foot to blood flow out of foot (1) blood vessels further/away from leg surface/less blood near surface (1) counter current (1)	3	ignore arteries/veins if used singularly allow blood entering the foot flows close to the blood leaving the foot / AW allow blood returning to the body gets warmed up if Leg A or C given allow counter current (1) ignore blood transfer between blood vessels
	Total	4	

Question	Answer	Marks	Guidance
10 a	T = 27 (%) C = 23 (%) G = 23 (%) all correct = 2 one or two correct = 1	2	
b	idea of base pairing (1) BUT A pairs with T and C pairs with G (2)	2	allow the bases are complementary allow A pairs with T = 1 or C pairs with G = 1 allow bases pair - A links with T and C links with G = 2
c i	Idea that Watson and Crick / they could not have produced their model without Chargaff's / his discovery / AW (1)	1	allow without Chargaff's information they could not advance their work ignore he discovered the bases / base pairings ignore he helped them with the structure but allow he discovered the base pairings that helped them discover the structure
ii	Watson and Crick were the ones who came up with the structure of DNA / Chargaff did not come up with the structure of DNA / AW (1)	1	allow he was not in the group that came up with the final discovery
	Total	6	

Question	Answer	Marks	Guidance
11 a i	37.5 (°C) (1)	1	allow answer in range 35-40 (°C) allow single number, e.g. 37 (°C) or range, e.g. 37-38 (°C)
ii	(as temperature increases) time gets longer / rate gets slower (1) reaction stops / protein no longer broken down / AW (1) enzyme / pepsin denatures (at high temperatures) (1)	3	allow time increases allow any specific time greater than 6 allow time would be infinite / tube would not go colourless/ no reaction / the reaction won't work ignore it would not work if referring to enzyme only and not reaction allow description of denaturing in terms of changing shape of active site ignore protein is denatured
b i	The volume of carbon dioxide is less than the volume of oxygen / 2 nd box (1)	1	more than one answer = 0 allow other unambiguous answers, e.g. X in box, underlining, circle
ii	max three from structural (1) e.g. collagen / keratin (1) hormones (1) e.g. insulin (1) carrier molecules (1) e.g. haemoglobin (1) enzymes / biological catalyst (1) e.g. amylase (1)	3	only award marks for examples if have already gained the function mark ignore pepsin allow antibodies (1) receptors (1) muscles / growth / repair (1)
	Total	8	

Question	Answer	Marks	Guidance
12 a	mitosis (1)	1	allow phonetic spelling
b	<p>[Level 3] A correctly sequenced description of cloning technique including all 4 indicative points. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] A correctly sequenced partial description of cloning technique including 3 indicative points. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] A partial description of cloning technique including 2 indicative points. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to A*</p> <p>Indicative scientific points may include:</p> <ul style="list-style-type: none"> • nucleus removed from an egg cell/enucleated egg (ignore DNA / genetic material) • nucleus from the udder / body cell is inserted into the egg cell <p>BUT egg cell nucleus replaced with the nucleus from an udder / body cell (covers the first 2 indicative scientific points)</p> <p>(allow a correct example of a named body cell, ignore unqualified cell eg adult cell)</p> <ul style="list-style-type: none"> • (egg cell) given an electric shock to make it divide / multiply (ignore just grow) • embryo /Dolly is genetically identical to / a clone of the sheep from which the udder/body cell came from or udder/body cell taken from the sheep they want to clone <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
Total		7	

Question	Answer	Marks	Guidance
13 a	<p>increase / maintain rate of flow of blood (1)</p> <p>increase / maintain transport of materials around body (1)</p>	2	<p>allow increase speed of blood / make blood flow faster allow "it" for blood ignore so the heart still pumps</p> <p>allow named examples e.g. oxygen / food allow prevent renal failure ignore organ failure/ lack of blood to organs ignore just 'increases blood volume'</p> <p>allow other examples of the consequences of low blood pressure e.g. unconsciousness / fainting (1)</p> <p>allow transport of more oxygenated blood faster (2) ora for all responses</p>
b	<p>lack of/ less red blood cells / haemoglobin (1)</p> <p>lack of / less oxygen causes anaerobic respiration (1)</p>	2	ora
Total		4	

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