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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Biology 3411/H
Specification B

Mark Scheme

2006 examination – June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Biology (Specification B)
Higher Tier 3411/H

3411/H Q1

question	answers	extra information	mark
(a)(i)	C		1
(ii)	lack of nucleus / others have a nucleus **or** chromosome / DNA / genetic material free in cytoplasm	accept plurals do **not** accept just 'has a strand of DNA'	1
(b)(i)	breathe in <u>air</u> / droplets exhaled by other people / breathe same air **or** higher concentration of bacteria in the <u>air</u> **or** more likely to be coughed on	mark for mechanism do **not** penalise reference to virus / TB / germ ignore answers involving proximity unqualified	1
(ii)	(bacteria / it) enter body / lungs by breathing / via air		1
(iii)	via the blood	accept via rbc or other components of blood accept lymph	1
(c)	any **two** from: • skin • scabs / clot • mucus / cilia • stomach acid / gut protease	accept tears do **not** accept ear wax / saliva / sebum apply list principle ignore nasal hair	2
total			7

3411/H Q2

question	answers	extra information	mark
(a)	34	ignore working or lack of working $\frac{10\,200}{300}$ for **1** mark	2
(b)(i)	mouth / small intestine / duodenum / ileum		1
(ii)	amylase	accept phonetic spelling accept carbohydrase	1
(iii)	sugar / maltose / glucose / disaccharide / monosaccharide / dextrin		1
(iv)	small intestine / duodenum / ileum		1
total			6

3411/H Q3

question	answers	extra information	mark
	Quality of written communication:	For <u>correct use of</u> scientific terms: at least **two** from: e.g. cancer, mutation, bronchitis, emphysema, arteries, atheroma, carbon monoxide, carcinogen, trachea, bronchus, bronchiole, cilia, alveoli, haemoglobin, mucus, red blood cell, white blood cell, ulcer, angina, nicotine, addiction, etc. annotate as Q ✓ or Q ✗	1
	any **four** from: • tar present • (chemicals from smoke / tar) enter the blood • mutation • (lung) cancer / reference to carcinogen • bronchitis / emphysema • less surface area / less oxygen enters blood • circulatory disease / blood clots / blocked arteries / heart attack / stroke • carbon monoxide • less oxygen carried by blood / CO combines with Hb • damage cilia / alveoli • microbes or correct named e.g. remain in lungs	do **not** accept just tar enters blood accept x **from** tar gets in the blood nb award less oxygen mark once only do **not** accept blocked by tar nb award less oxygen mark once only accept no oxygen	4
total			5

3411/H Q4

question	answers	extra information	mark
(a)(i)	oxygen / O_2	do **not** accept O only	1
(ii)	photosynthesis	accept phonetic spellings	1
(b)	Graph:		
	points	ACCURACY ± ½-square minus 1 mark per error	2
	line	single line best fit curve, **not** straight line **or** ruled point-to-point must attempt to start at origin	1
(c)	any **two** from:		2
	• carbon dioxide (concentration)		
	• temperature / too cold	accept 'heat' do **not** accept temperature too high	
	• water / moisture / rain / humidity	 do **not** accept lack of chlorophyll	
total			7

3411/H Q5

question	answers	extra information	mark
(a)	animal which / it kills/ hunts / catches (other animals)	ignore references to prey	1
	it / animal which eats other animals / it is a carnivore		1
		animal kills <u>and</u> eats its prey = 2 marks	
		an animal that preys on another animal = 0 marks	
(b)	lemming population decreases before / when no owls present	accept converse	1
(c)	any **three** from:		3
	• lack of food		
	• due to competition / due to over-eating by lemmings / due to high lemming population	nb competition for food = 2 marks	
	• disease		
	• severe weather drought / flood / **or** too hot / too / very cold		
	• other predators	accept humans as predators	
total			6

3411/H Q6

question	answers	extra information	mark
	Quality of written communication:	Ideas given in a sensible order: at least one correct named substance linked to its correct effect annotate Q ✓ or Q ×	1
	any **four** from:	max 2 for named substances extra wrong substances cancel	4
	Substance **Effect**		
	carbon dioxide • greenhouse effect / global warming / mechanism described		
	• sea-level rise / melting ice-caps / flooding / rainfall change	do **not** accept just climate change	
	sulphur dioxide nitrogen oxides • acid rain / lowering soil pH / water acidification		
	• damages leaves / trees kills plants / animals / breathing difficulties / bronchitis / eye irritation / deaths of people / damaging statues / buildings	accept reduced mineral availability to plants do **not** accept toxic unqualified	
	carbon monoxide • combines with Hb / less O_2 carried in blood		
	soot / (smoke) particles • reducing light / photosynthesis	ignore ash correct substance and wrong effect = 1 mark only	
total			5

3411/H Q7

question	answers	extra information	mark
(a)	any **three** from: moving left • **X** contracts • **Y** relaxes moving right • **Y** contracts • **X** relaxes	max 2 if both directions of movement not given / implied **or** direction wrong If no other marks are awarded allow antagonism **or** a description of antagonism for **1** mark	3
(b)	any **three** from: muscles (contract to) move the tail (tail fin) provides large surface area pushes (backwards) against water	 accept shorten / tense for contract accept other suitable description of force pushes water backwards = 2 marks	3
total			6

3411/H Q8

question	answers	extra information	mark
(a)(i)	2550		1
(ii)	1943		1
(b)	bacterium / bacteria		1
(c)	painkiller	accept named types e.g. aspirin paracetamol etc / anti-inflammatory	1
(d)	**Quality of written communication:**	one mark is available for the use of correct scientific terminology (at least two terms required) e.g. pathogen, antibody, bacteria, virus, antigen, protein, WBC / named WBC, memory cells, inject annotate Q✓ or Q✗	1
	any **three** from: (active) • given before getting disease • dead / inactive / attenuated pathogen injected or prior exposure • (stimulating) antibody production • long lasting (passive) • given after exposure • antibody injected • rapid response	Max 2 if no reference to active / passive or wrong Max 2 if only reference to active or passive accept converse for passive for this mark	3
total			8

3411/H Q9

question	answers	extra information	mark
(a)	provide oxygen (for respiration) **or** to make it aerobic	in either order	1
	circulate/mix (contents of fermenter)		1
(b)(i)	60°C		1
(ii)	respiration (of microorganisms) **or** metabolism (of microorganisms / bacteria)		1
(iii)	any **one** from: • water-cooled jacket • cooled / cold air in	 accept descriptions accept heat exchanger	1
(c)	Penicillium	check spelling at end of word carefully accept pencilleum	1
total			6

3411/H Q10

question	**answers**	**extra information**	**mark**
(a)	cornea **and** lens	accept v / a humours	1
(b)	(muscle **A**) contracts		1
	lens gets fatter or lens bends light rays inwards more or lens becomes more converging / curved	do **not** accept lens expands / gets bigger	1
total			3

3411/H Q11

question	answers	extra information	mark
(a)(i)	mitosis	do **not** accept 'meitosis' / 'miosis' **or** other hybrid spellings	1
(ii)	**D – B – A – C – E**		1
(b)(i)	mutation		1
(ii)	radiation / UV / X-rays / γ-rays / tobacco smoke / formaldehyde / mustard gas / smoking	accept any correct named mutagen	1
total			4

3411/H Q12

question	answers	extra information	mark
	any **four** from: • fertilisers dissolve / washed / leached • growth of algae / water plants • block / reduce light • less photosynthesis / less O_2 produced • plants / algae die • rotting / decay caused by microorganisms / bacteria / saprotrophs • (microbes) use oxygen / are aerobic • less fish <u>respiration</u> • effect of hot weather <u>described</u> e.g. less O_2 dissolved in water **or** increased metabolism / growth of bacteria / increased fertiliser concentration	ignore 'decomposers'	4
total			4

3411/H Q13

question	answers	extra information	mark
(a)	on graph: '**X**' – between 1 h and 2 h '**Y**' – between 0.25 h and 1 h		 1 1
(b)	any **two** from: • genetically-engineered is identical to human insulin • no immune reaction / no antibodies made / wbcs will not regard it as 'foreign' • no need to kill animals / reference to 'easier to purify' **or** can be made in large quantities • no disease transmission from animals	 accept converse accept no rejection / no allergic reaction do **not** accept just 'no reaction' need detail – **not** just 'easier / cheaper to produce'	2
total			4

3411/H Q14

question	answers	extra information	mark
(a)(i)	**X** = guard cell **Y** = stoma / stomata		1 1
(ii)	1st Species **B** (no mark), because: any **two** from: • fewer stomata / pores / Y / named from (a)(i) • sunken stomata / described • thick(er) cuticle • less mesophyll	accept stomata further apart	2
(b)	water is lost by evaporation / transpiration water loss is greater than water intake cells lose turgor or less pressure inside cells or need turgid cells for support or cells become flaccid / plasmolysed	do **not** accept just no water uptake	1 1 1
total			7

3411/H Q15

question	answers	extra information	mark
	any **five** from: • (large number) of alveoli → large surface area • RBC has large surface area • diffusion / described re gradient • short distance or thin surface or one cell / two cells thick or closeness • (RBCs have) <u>haemoglobin</u> to combine with oxygen • formation of HbO_2 lowers (free) oxygen concentration / maintains concentration gradient • RBCs have no nucleus → more room for Hb / for O_2 • <u>blood flow</u> removes oxygen to maintain gradient • <u>breathing</u> supplies oxygen to maintain gradient • RBC's flow one at a time	ignore moisture	5
total			5

3411/H Q16

question	answers	extra information	mark
(a)	any **three** from: • digestion / hydrolysis • use of enzymes / named eg. • secretion / external • absorption by diffusion / active transport • respiration	 do **not** accept excrete ignore CO_2 release	3
(b)(i)	1025		1
(ii)	movement / warmth / digestion / excretion / active transport	accept internal movements – heart / peristalsis / breathing accept growth / reproduction / building molecules	1
(c)(i)	0.03 (%)	Correct answer: **2** marks $\frac{1.8 \times 100}{6000}$ or $\frac{180}{6000}$ = **1** mark	2
(ii)	indoors: less movement warmer environment / less heat loss / need less energy to keep warm		1 1
(iii)	any **two** from: • disease more likely to spread • competition for food / for space • more aggressive behaviour between animals or stressful for animals • use of more fossil fuel → more CO_2 / SO_2 / NO_x • waste disposal • cost of buildings / maintenance / food / labour / fuel	 accept waste of energy resource	2
total			11

3411/H Q17

question	answers	extra information	mark
(a)(i)	protein molecule is too big (to pass through the filter) protein molecule cannot fit through filter	accept converse	1
(ii)	glucose is taken (back) into blood / is reabsorbed 100% by active transport / description or by kidney tubule		1 1 1
(b)	any **four** from: • water lost in sweating / breathing • lower water (concentration) in blood or higher salt (concentration) in blood • detected by hypothalamus • causes release of ADH from pituitary gland • causes increased water (re)absorption by the kidney		4
total			8

3411/H Q18

question	answers	extra information	mark
(a)	fibres	accept cells for fibres	1
	contract		1
	when supplied with / using energy / ATP		1
(b)	ligament – joins bones to other bones – has tensile strength and some elasticity	both links must be correct for each mark	1
	tendon – joins muscles to bones – has tensile strength and little elasticity		1
	cartilage – covers the ends of bones – strong but not rigid		1
(c)(i)	no need for large / flight muscles	accept converse	1
	no need for (large keel for) attachment		1
(ii)	less / no / not hollow / honey-combed	do **not** accept heavier / more mass	1
	no need to reduce mass for flight **or** stronger for support / walking / running / kicking		1
total			10

3411/H Q19

question	answers	extra information	mark
(a)	any **two** from: • mineral / ions • protein / amino acids • vitamins • lipids / fats / fatty acids / glycerol	accept any **two** named vitamins or minerals	2
(b)	**E** largest / biggest circle / most growth		1
(c)	any **one** from: • mutation or description • natural selection or description of • (regular) exposure to (many) antibiotics		1
(d)	any **two** from: • complete course • reduce use of antibiotics • select most effective for particular infection **or** use range of antibiotics		2
(e)	viruses (live) inside cells antibiotic cannot enter cell/would need to damage cell	accept responses that offer alternative explanations, such as viruses have no metabolic activities **or** cell wall (i.e. the way in which antibiotics attack bacteria) ignore viruses are not alive	1 1
total			8

3411/H Q20

question	answers	extra information	mark
(a)	(mainly) herbivorous / plants / named plants		1
(b)	any **three** from: • food swallowed / enters rumen • bacteria • cellulose-digesting **or** produce cellulase **or** cellulose is digested • food re-chewed **or** chewing the cud		3
(c)(i)	(bacteria are in) large / long appendix / caecum **or** no complex stomach / named part		1
(c)(ii)	cellulose digested / appendix / caecum is beyond small intestine (eating faeces) allows absorption		1 1
total			7

3411/H Q21

question	answers	extra information	mark
(a)(i)	**nn**	only accept other letters if key given	1
(ii)	**Nn**	accept other letters	1
(b)	parental genotypes correct – both **Nn**	N.B. can pick up chain of logic at any point correctly derived from candidate's previous point	1
	gametes correctly derived from **P** genotypes / correct gametes as starting point		1
	offspring genotypes correctly derived from gametes		1
	correct probability from candidate's offspring genotypes – e.g. ¼ / 1 in 4 / 0.25 / 25% / 1:3	do **not** accept '3:1' **or** '1:4'	1
(c)(i)	(cell) membrane		1
(ii)	gene only in lung cells or gene not transferred to gametes		1
total			8