

**2005 Biology**

**Advanced Higher**

**Finalised Marking Instructions**

**These Marking Instructions have been prepared by Examination Teams for use by SQA Appointed Markers when marking External Course Assessments.**

## 2005 Biology Advanced Higher

### Marking scheme

#### Section A

1.	B	14.	D
2.	B	15.	B
3.	C	16.	A
4.	D	17.	C
5.	A	18.	C
6.	C	19.	D
7.	C	20.	C
8.	B	21.	A
9.	D	22.	A
10.	D	23.	D
11.	A	24.	B
12.	A	25.	B
13.	C		

Marking Instructions

Biology Advanced Higher

Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates		
1	(a) (i)	Vector/secondary host	1	carrier		
	(ii)	obligate	1			
	(b)	fewer (adult) mosquitoes/vectors	1	Implication that parasite develops in larva		
		for Plasmodium to develop in <b>OR</b> to transmit/pass on parasite/Plasmodium (between humans)	1	Using <i>disease or malaria</i> as alternative to parasite		
	(c) (i)	5 to 4.3	1	Not % values		
		(ii)	18 (°C)	1		
		(iii)	(as temp increases up to 32° C) adults are arising more quickly/larval stage getting quicker	1		
		<b>AND</b> (Plasmodium) development/sexual stage is faster				
		more likely that the Plasmodium will develop within the lifespan of the adult fly	1			
<b>OR</b> both larvae and Plasmodium sexual stage/development times are speeding up so more Plasmodium can develop before the flies die.						

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(iv)	(asexual stage occurs in) <b>humans</b> which <b>have constant temperature</b> <b>OR</b> human has homeostatic control of temperature <b>OR</b> is thermoregulator/endotherm/homeotherm	1	Humans have homeostatic mechanisms <i>without mentioning temperature</i> not <i>the body</i> equivalent to human	
(d) (i)	3a and 3c both have the critical rainfall  only area 3a has malaria because the temperature is high enough (for both Plasmodium and mosquitoes to complete their development) <b>OR</b> temp too low for parasite to reach maturity (inside the lifespan of mosquito) in 3c  <b>OR</b> 3a has both critical rainfall (5 months) and critical temperature (18) 3c has critical rainfall but not the critical temperature	1  1  1		
(ii)	by the time there has been 5 months of rain of 80+ mm (March) there are only two more months when temperature is high enough for successful plasmodium development <b>OR</b> the rainfall is correct but the temp is only high enough for a <b>short period</b> /temp too low for three months	1	Suggesting that malaria is transmitted <b>during</b> the 5 months of high rainfall	
(e)	burning fossil fuels raises/produces CO <sub>2</sub> disposal of fridges/use of aerosols releases CFC into atmosphere deforestation so less CO <sub>2</sub> used intensive farming increase methane  <i>Any two</i> One mark for two different activities with no mention of the gases involved; any two activities, even if the same gas produced	2	Water/water vapour	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2	<p>(a) occurs in response to/as a result of/following <b>adverse</b> conditions/swamp drying up <b>OR</b> does not occur before adverse conditions (as in predictive)</p> <p>(b) Aestivation</p> <p>(c) have body temperature that fluctuates with/depends on ambient temperature <b>OR</b> they are thermoconformers</p>	<p>1</p> <p>1</p> <p>1</p>		
3	<p>(a) overlap in (the range of) food/prey <b>size</b> <b>OR</b> sharing/competing for prey of the same <b>size</b></p> <p>(b) species A takes smaller food items <b>OR</b> converse <b>OR</b> reduces competition</p> <p>(c) disease/parasitism</p>	<p>1</p> <p>1</p> <p>1</p>	<p>niche overlap</p> <p><i>predation or competition</i></p>	
4	<p>(a) organisms <b>cause</b> change in conditions/resources/habitat</p> <p>which favours colonisation/growth of different species/another community</p> <p>(b) increased biodiversity/species diversity/number of species increased habitat variety/niches increase in complexity of food webs/stability/ecosystem increase in size of plants/biomass increase in nutrient levels/soil depth change from r to K strategists any <b>3 points for 2</b> marks 2/1 for 1 mark</p>	<p>1</p> <p>1</p> <p>2</p>	<p>complexity of organisms populations get bigger increased productivity</p>	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(c)	1. Leaching or description 2. nutrient enrichment/eutrophication 3. algal bloom 4. death of algae leads to large bacterial population/ less photosynthesis <b>OR</b> algal bloom (blocks out light and) reduces photosynthesis 5. (outcome of algal bloom leads to) oxygen depletion idea/high BOD 6. aquatic animals die/loss of complexity <i>any 4</i>	4		
5 (a)	check (success of) DNA replication/ OR check enough DNA to make two nuclei/cells	1	not check DNA present not check DNA integrity	
(b)	7 cycles	1	not 7.2	
(c)	cells divide at the same rate/time stays constant cells become smaller/comparative essential <i>both</i>	1	cells are small cells are dividing faster after treatment	
6 (a)	amplify DNA/increase number of copies of <b>same</b> DNA fragments/make many replicas of DNA	1	not clone DNA/genetic material/ duplicate DNA	
(b) (i)	82(°C)	1		
(ii)	70(%) / answer consistent with b(i)  eg 90 deg -> 50%, 86 deg -> 60%,	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(c) (i)	as the % /G-C pairs increases the T <sub>m</sub> increases (so the DNA is harder to break apart) <b>OR</b> if A-T was creating stability, then as G-C increases the T <sub>m</sub> would decrease	1		
(ii)	<b>3 H bonds</b> in G-C rather than 2	1		
7 (a)	one of 6 (kb) and one of 14(kb)	1		
(b)	<div data-bbox="474 609 846 738" data-label="Diagram"> </div> <p><b>OR</b> reverse</p>	1		
(c)	DNA (fragment) has (-ve) charge <b>OR</b> electrophoresis applies an electric field/current  fragments towards +ve terminal <b>OR</b> small fragments move faster/further	1		
		1		





Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
<p><b>B</b></p> <p>(i)</p> <p>(ii)</p> <p>(iii)</p>	<p><i>Apply transferability of marks between sections of essay.</i></p> <p><b>induced fit</b></p> <ol style="list-style-type: none"> <li>1. <b>active site idea</b>/ where substrate binds to enzyme</li> <li>2. explanation of specificity: shape of active site is specific/complements shape of substrate/idea of fit or close match</li> <li>3. (correct) substrate brings about conformational change <b>OR</b> new shape is a better fit</li> <li>4. makes reaction more likely/lowers activation energy/temperature needed for reaction</li> <li>5. binding of substrate may allow/enhance binding of second substrate/idea of co-operativity</li> </ol> <p><b>enzyme activation</b></p> <ol style="list-style-type: none"> <li>6. modulators change the rate of reaction/activity</li> <li>7. positive modulators are activators <b>OR</b> positive modulators/activators – increase rate <b>OR</b> negative modulators/inhibitors – decrease rate</li> <li>8. bind to other/allosteric site on enzyme away from/different from the active site</li> <li>9. causes conformation/shape change in protein/enzyme</li> <li>10. affects substrate binding (hence rate of reaction)</li> <li>11. covalent modification (affects activity)</li> <li>12. eg phosphorylation/the addition of phosphate</li> <li>13. eg inactive form of enzyme converted to active form</li> <li>14. named example of conversion eg trypsinogen (inactive enzyme) to trypsin (active enzyme)</li> </ol> <p><b>OR</b> kinases enzyme carry out phosphorylation/adds phosphate</p> <p><b>end product inhibition</b></p> <ol style="list-style-type: none"> <li>15. operates in biochemical pathway/series of reactions</li> <li>16. where the product of the final reaction binds to/inhibits the enzyme for the first reaction</li> <li>17. (inhibition of the first enzyme of the pathway) therefore controls whole pathway</li> <li>18. reduces substrate concentration for subsequent reactions (hence reaction rates)</li> <li>19. likely to be allosteric effect/first enzyme allosteric</li> <li>20. form of negative feedback</li> <li>21. explanation of negative feedback/how the self-regulation works</li> <li>22. prevents wasteful build up of end product/ intermediates</li> </ol> <p>(diagrams acceptable)</p>	<p><b>Max 4</b></p> <p><b>Max 6</b></p> <p><b>Max 5</b></p>	<p><i>not improves efficiency</i></p> <p>not Na-K pump as eg</p>	

**Section C: Biotechnology**

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
<p><b>1</b></p> <p><b>(a)</b></p> <p><b>(i)</b></p> <p><b>(ii)</b></p> <p><b>(b)</b></p> <p><b>(i)</b></p> <p><b>(ii)</b></p> <p><b>(c)</b></p>	<p>chymosin/rennet/rennin</p>	<p><b>1</b></p>		
	<p>the enzyme inactivates/breaks down/digests the kappa casein (so the calcium can now cause the alpha and beta caseins to clot)</p>	<p><b>1</b></p>		
	<p>gene for enzyme removed from source</p> <p>placed in plasmid/in microbe <b>OR</b> microbe genetically engineered <b>OR</b> gene cloned</p> <p>microbe cultured/grown in fermenter</p> <p>enzyme removed/purified</p> <p><i>Any 3 - 2marks</i> <i>Any 2 - 1mark</i></p>	<p><b>2</b></p>		
	<p>acceptable to vegetarians</p> <p>consistent quality/purity/control of quality</p> <p>unlimited amount/mass or large scale production</p> <p>reference to public perception of health concerns over BSE in cow products</p>	<p><b>1</b></p>		
	<p>lactic acid</p>	<p><b>1</b></p>		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
<p>2</p> <p>(a)</p> <p>(i)</p> <p>(ii)</p> <p>(iii)</p> <p>(iv)</p> <p>(b)</p> <p>(i)</p> <p>(ii)</p> <p>(iii)</p> <p>(iv)</p>	<p>error ranges overlap in treatments</p> <p>shoot slices <b>OR</b> chopped shoot tips</p> <p>45% (45.2; 45.16)</p> <p>Any correct conclusion/chopping is better than slicing <b>OR</b> converse</p> <p>sexual incompatibility (between species)/breeding barrier</p> <p>to combine the desirable characteristics of the two species/lupins/plants to produce a plant with high protein and oil content and a high yield</p> <p>Cellulose/hemicellulase <b>and</b> pectinase</p> <p>PEG/polyethylene glycol</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>		<p>Inclusion of wrong option</p> <p>More than these two enzymes</p>
<p>3</p>	<ol style="list-style-type: none"> <li>1. microbe grown/cultured in a fermenter</li> <li>2. sterilise equipment/fermenter/growth media</li> <li>3. aseptic techniques/conditions</li> <li>4. Temperature/pH maintained at the optimum</li> <li>5. Sensors/probes used to monitor <b>plus one</b> eg pH, nutrient levels, oxygen and carbon dioxide levels</li> <li>6. Production in stationary phase</li> <li>7. antibiotics are secondary metabolites</li> <li>8. Substrate or feedstock is cheap waste material/eg starch or plant oils</li> </ol> <p style="text-align: right;"><i>Any 5</i></p>	<p>5</p>		

**Section C: Animal Behaviour**

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
<p><b>1 (a)</b></p> <p><b>(b)</b></p>	<p>proximate – physiological/immediate/short-term mechanisms – the 'how' ultimate – evolutionary/adaptive /survival reasons – the 'why'</p> <p>proximate – nervous and sensory; use of sting ultimate – inheritance of successful genes; increased survival of offspring</p>	<p><b>1</b></p> <p><b>1</b></p>		
<p><b>2 (a)</b></p> <p><b>(b) (i)</b></p> <p><b>(ii)</b></p> <p><b>(c) (i)</b></p> <p><b>(ii)</b></p> <p><b>(iii)</b></p>	<p><i>need comparison and quantification</i> Lone wolves achieve 9 kg prey per day <b>and</b> large packs obtain much less/ about 5 kg prey per day <b>OR</b> converse <b>OR</b> large pack capture a bigger total (18x5 kg per day) than lone wolves do (9x1 kg per day).</p> <p>Wolves should hunt in packs of two.</p> <p>Energy <b>expended</b> (in hunting in packs of different size)/energy gain from captured prey/net energy gain</p> <p>Behaviour which helps/enhances the survival/fitness of others (at cost to self) <i>(concept needed)</i></p> <p>Related individuals have genes in common/reference to coefficient of relatedness. (Helping related individuals) may increase frequency of own (selfish)/shared genes in next generation. <i>(idea of increasing chance of passing on own genes)</i></p> <p>Hamilton’s rule/when benefits outweigh the costs/when <math>rb-c &gt; 0</math>/the greater the relatedness (<math>r</math>) value the more likely the spread of altruism</p>	<p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p>	<p>Self-sacrifice not examples</p>	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
<p><b>(d) (i)</b></p> <p><b>(ii)</b></p>	<p>Increases energy expended so that it becomes greater than energy gained from prey (ie general principle)  <b>OR</b>  Increased energy expenditure in chasing ravens away  <b>OR</b>  Heavy losses shared by smaller number of wolves  <b>OR</b>  Increased energy expenditure necessitated by having to capture more prey</p> <p>Small packs – big difference in energy balance between heavy and zero scavenging /caused by scavenging</p> <p>level of scavenging makes almost no difference to large packs</p> <p>Energy balance becomes positive for heavy scavenging as pack size increases</p> <p><i>Any two</i></p>	<p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p>		
<p><b>3 (a)</b></p> <p><b>(b)</b></p> <p><b>(c)</b></p>	<p>Sexual dimorphism</p> <p>To attract females/let females select ‘best’ male</p> <p>Camouflage decreases chances of predation  <b>OR</b>  Improves chances of survival for young/of female</p>	<p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p>		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4	<ol style="list-style-type: none"> <li>1. Innate behaviour is genetically determined</li> <li>2. <b>Simple/basic</b> song pattern/template is inherited/innate</li> <li>3. Predisposition/what can be learned is genetically determined <b>OR</b> birds' songs are species-specific</li> <li>4. Learning is modification of behaviour (by stimuli/experience)</li> <li>5. Song patterns modified/elaborated/learned by hearing other birds sing/dialects are learned</li> <li>6. Development also depends on bird hearing itself sing <b>OR</b> birds isolated when young only develop basic/template song pattern</li> <li>7. Final/adult song pattern from individual depends on both genes and environment/innate and learned</li> </ol> <p style="text-align: right;"><i>Any 5</i></p>	5		

Section C: Physiology, Health and Exercise

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates	
1	(a) (i)	maximum oxygen uptake/consumption	1	Maximum volume per breath	
	(ii)	body mass/weight duration (of the exercise)		Volume air, composition of inhaled and exhaled air – given in text	
		<i>both</i>	1		
	(iii)	59% (59.1, 59.09)	1		
	(iv)	improvement in oxygen <b>delivery to working muscles/tissues</b> <b>OR</b> more oxygen available to muscles <b>OR</b> greater cardiac output/volume delivered per stroke <b>OR</b> increased efficiency of cardiovascular system	1    1	'Efficiency of heart' increases	
		tissues remain aerobic at higher work rate/for longer <b>OR</b> decrease in <b>anaerobic</b> activity/lactic acid build up		Not ATP <i>production</i> equivalent to (aerobic) respiration	
	(b) (i)	cardiac hypertrophy/heart (muscle) bigger/ myofibrils thicker/greater LV mass or thickness/ more capillaries (in heart)	1	anything not structural eg protein synthesis, strength of contraction	
	(ii)	stroke volume increases/bigger volume <b>per beat</b>	1		
		(so get) <b>same</b> cardiac output with lower pulse rate/ <b>same</b> total volume pumped with fewer beats per min	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2 (a)	Lipoproteins transport <u>cholesterol</u> /LDL transports <u>cholesterol</u> from liver to cells/HDL 'scavenges' cholesterol	1	Hardening of arteries  Not <i>atherosclerosis</i> (in stem of question)	
	Fatty material deposited in artery walls leads to atheroma/narrowing of arteries/plaque	1		
	(b) increases HDL and reduces LDL/HDL:LDL ratio increases	1		
3 (a)	being elderly is a risk factor for osteoporosis	1		
	data show that as age increases the number of fractures increases	1		
	<i>any correct conclusion from data specifying region proportion/% of fractures higher for women than men in USA data</i> Rate of fractures higher for women in Europe from 50 to 60 (approx.)			
	(b) (fracture) occurrence is higher in Europeans than Americans	1		
(c)	different levels of exercise different diets/vitamin supplement use family history/genetics different levels of alcohol/caffeine intake USA more obesity (so less osteoporosis) Sunlight and Vitamin D explanation	1		
	<i>any two</i>			



Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4	<p>Total energy expenditure affected by</p> <ol style="list-style-type: none"> <li>1. basal metabolic rate – defined as measure of energy expended to carry out basic body functions</li> </ol> <p>(EE/BMR affected by)</p> <ol style="list-style-type: none"> <li>2. body size - BMR increases as body mass increases/ weight increases</li> <li>3. body composition - lean tissue more active than fat/adipose</li> <li>4. age – higher BMR/EE per Kg in children/lower in adults</li> <li>5. sex – higher in males</li> <li>6. nutritional status - reduced by fasting or low energy intake</li> <li>7. thermic activity of food/use of energy to deal with food - different food affect EE differently</li> <li>8. physical activity - energy expended above resting – more activity gives higher EE</li> </ol> <p style="text-align: right;"><i>any 5</i></p>	5		

[END OF MARKING INSTRUCTIONS]