



2008 Biology

Advanced Higher

Finalised Marking Instructions

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2008 Biology Advanced Higher

Marking scheme

Section A

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

Marking Instructions

Biology Advanced Higher

Section B

Question	Acceptable Answer	Mark	Notes	Negates
<p>1</p> <p>(a)</p> <p>(i)</p> <p>(ii)</p> <p>(b)</p> <p>(i)</p> <p>(ii)</p> <p>(iii)</p> <p>(iv)</p>	integral/intrinsic	<p>1</p>	Accept transmembrane	
	Quaternary has subunits and aquaporin has four	<p>1</p>	Not implication that quaternary always has four subunits	
	so direction/movement can be traced/tracked/determined OR can tell which/how many water molecules came from inside	<p>1</p>	Monitored/observed/detected OK for traced	
	(in isotonic conditions) water molecules will move inwards and at equal volume/rate	<p>1</p>	Not reference to water concentration being equal	
	kinase	<p>1</p>		
	1.8 to 20 OR 18.2 increase (in hypertonic) 1 for data taken from hypertonic	<p>1</p>		
	18.2/1.8 × 100 = 1011% 1 for calculation	<p>1</p>		

Question	Acceptable Answer	Mark	Notes	Negates
(c) (i)	significant difference between NN(Nn) and nn for loss OR nn loses 14% more than NN(Nn)	1	Must have comparison and relevant comparative quantification	
	NN has AQP1 and nn doesn't OR (in the absence of AQP-1) nn unable to reabsorb as much as NN (in descending limb)	1		
	(ii) (when dehydrated) Nn loses same mass as NN (21 to 22%) (Fig 3)	1		
	increase/change in urine concentration is the same/1700 in both NN and Nn	1		
(d) (i)	reference to error bars overlapping OR differences not significant	3	Error bars/significance can relate to either Figure	
	(ii) (normal 70% reabsorption in the descending limb through AQP1 but)			
(d) (ii)	OR NDI people will have unchanged urine output following water shortage	1		
	no/less reabsorption in collecting duct because AQP2 non-functioning/AQP2 does not reabsorb water/lack of sensitivity to ADH	1		

Question	Acceptable Answer	Mark	Notes	Negates
<p>2 (a) (i)</p> <p> (ii)</p> <p>(b) (i)</p> <p> (ii)</p>	<p>Nucleosome</p> <p>DNA negatively charged + protein positively charged OR protein neutralises DNA charge</p> <p>compact ‘storage’ (of DNA)</p> <p>leads to chromosome formation/essential for mitosis</p> <p style="text-align: right;">any 2</p> <p>Agrobacterium (tumefaciens)/A. tumefaciens</p> <p>cellulase and digest cell wall/cellulose</p>	<p>1</p> <p>2</p> <p>1</p> <p>1</p>	<p>Not to do with how much DNA</p> <p>Breakdown = digest Not dissolve</p>	
<p>3</p>	<p>1. four rings OR correct shape drawn</p> <p>2. variation in side groups in different steroids</p> <p>3. hydrophobic/non-polar/lipid-soluble and can diffuse/ pass/travel through plasma membrane/into cell</p> <p>4. bind to proteins/in cytoplasm/nucleus</p> <p>5. (protein complex) regulates genes OR switches on gene (transcription)</p> <p>6. (steroid) hormones (are signalling molecules) eg testosterone</p> <p style="text-align: right;"><i>point 1 plus any 3</i></p>	<p>1</p> <p>4</p>	<p>Wrong diagram does not negate correct description. Not <i>based on</i> <i>cholesterol</i>.</p>	

Question	Acceptable Answer	Mark	Notes	Negates
4	(a) Enzyme/active site changes shape when substrate binds (to improve the fit)	1	Not idea that substrate changes shape to fit active site	
	(b) it has sites away from the active site where inhibitors/ activators/modulators can bind	1		
	(c) AMP inhibits the enzyme OR AMP exhibits (end-)product inhibition 1 so there is less PRPP/intermediates OR the production of AMP decreases OR AMP 'causes' negative feedback 1	2		
5	(a) $(175/13000) \times 100 = 1.3\%$ OR 1.346 OR 1.35	1	Not 1.4	Additional answer
	(b) $175 - 105 = 70 \text{ kJ m}^{-2} \text{ day}^{-1}$	1	Must have units	
	(c) (Eco efficiency for) P/1 is $12/175 = 7\%$ OR 6.86% OR 6.9% OR (Eco efficiency for) 1/2 is $2/12 = 17\%$ OR 16.67% OR 16.7%	1	OR if 10% rule then the transfers would be 17.5 P/1 and 1/2 would be 1.2	
	Either calculation carried out correctly			
	(d) Heat	1		
(e) Decomposers external and detritivores internal enzyme digestion	1	Focus is on enzymes not role of organisms Accept <i>excrete</i> enzymes		

Question	Acceptable Answer	Mark	Notes	Negates		
6	(a)	Must have oxygen (to carry out metabolism/respiration) OR Can only grow in the presence of oxygen.	1	Cyanobacteria (in lichens)		
	(b)	(i)	Rhizobium (in legumes)			1
		(ii)	Nitrogenase			1
		(iii)	Absorbs/binds oxygen to create anaerobic conditions OR prevents enzyme being inhibited by oxygen OR prevents oxygen reaching the enzyme			1
	(c)	no effect/no loss/remains the same (since nitrate conversion to N gas/denitrification is anaerobic)	1			
7	(a)	Cultivation/growing of single species/crop (over large area).	1	Not herbicide or insecticide; not <i>apply chemicals</i>		
	(b)	If plants are at least 1.25m /more than 1.25m apart (no new pustules are formed)	1			
	(c)	Fungicide/pesticide Selective breeding for resistant varieties Genetic engineering/transgenic plants to get resistant varieties	1			

Question	Acceptable Answer	Mark	Notes	Negates
<p>8 A</p> <p>(i) phosphate enrichment</p> <p>(ii) exotic species</p> <p>(iii) persistent toxic pollutants</p> <p>(i) phosphate enrichment;</p> <p>1. Phosphate is a limiting factor in (aquatic) ecosystems</p> <p>2. Eutrophication as phosphate/nutrient enrichment</p> <p>3. Appropriate source; fertilisers/leachate/sewage etc.</p> <p>4. Algal bloom/algal population explosion mentioned</p> <p>5. Growth unsustainable/death of algae occurs</p> <p>OR less light for plants below</p> <p>6. Bacterial decomposition of dead algae/plants</p> <p>OR toxin production</p> <p>7. Oxygen depletion as consequence of bacterial action</p> <p>8. Loss of diversity/death of aquatic organisms</p> <p>(ii) exotic species;</p> <p>9. Defined as foreign/introduced/alien species</p> <p>10. Example(s)</p> <p>11. Reason for success</p> <p>12. Description of damaging effect</p> <p>(iii) persistent toxic pollutants</p> <p>13. Definition of pollution as discharge of harmful substances</p> <p>14. Example; eg heavy metals/DDT</p> <p>15. Origin of pollutant, eg industry/agriculture</p> <p>16. Non-biodegradable nature/persistence explained</p> <p>17. Bioaccumulation = build up in single trophic level</p> <p>18. Biological magnification defined as build up in successive trophic levels</p> <p>19. Consequences show up at higher trophic levels</p> <p>20. Effect described; eg eggshell thinning/reduced disease resistance/death of top predators</p>	<p>5</p> <p>4</p> <p>6</p>	<p>5</p> <p>4</p> <p>6</p>	<p>Reason = density dependent factors generally, eg competition or predation</p> <p>Description of effect = loss of diversity or population decrease or population explosion in exotic species</p> <p>Non degradable/persistence – stability of substance in toxic form; long half-life</p> <p>Biomagnification = biological amplification</p>	

Question	Acceptable Answer	Mark	Notes	Negates
<p>8 B (i)</p> <p> (ii)</p> <p> (iii)</p> <p> (i)</p> <p> (ii)</p> <p> (iii)</p>	<p>dormancy 7</p> <p>mimicry 4</p> <p>mutualism 4</p> <p>dormancy</p> <p>1. period of suspended/reduced activity OR reduction in metabolism</p> <p>2. means of resisting/tolerating/surviving/avoiding adverse conditions</p> <p>3. Predictive anticipates/before onset of conditions</p> <p>4. Consequential is in response to/after onset of conditions</p> <p>5. Resting spores/seeds are structures that germinate when suitable conditions return</p> <p>6. Diapause – suspended development in insects</p> <p>7. Hibernation referring to energy conservation/reduction in body temperature in cold period</p> <p>8. Aestivation is response to high T/drought</p> <p>9. Named example in context</p> <p>mimicry</p> <p>10. Batesian where palatable/harmless species resembles a harmful one</p> <p>11. Relative numbers – mimics lower than model</p> <p>12. Mullerian where harmful species resemble each other</p> <p>13. Example of either type of mimicry; coral snake – false coral; monarch and viceroy butterflies</p> <p>14. Reference to aposematic/warning coloration</p> <p>15. Survival value = defence against predation</p> <p>mutualism</p> <p>16. Mutualism is a form of symbiosis</p> <p>17. Mutualism is close/intimate/long-term relationship</p> <p>18. Relationship in which both species benefit</p> <p>18. Name of two species involved</p> <p>19. Description of mutual benefits</p>	<p>7</p> <p>4</p> <p>4</p>	<p>Activity = growth, development</p> <p>Symbiosis is a close association between two species</p>	

Section C: Biotechnology

Question	Acceptable Answer	Mark	Notes	Negates
<p>1 (a)</p>	<p>Any 2 from:</p> <ol style="list-style-type: none"> 1. small number of cells to start with/for division 2. period of adaptation/adjustment 3. some cells may be depleted of essential growth metabolites/substances/may need to absorb nutrients 4. cells undergoing repair (due to damage during storage) 5. essential enzymes are being induced/change takes place in cells 	<p>2</p>	<p>Not <i>not enough nutrients</i></p>	
<p>(b) (i)</p>	<p>overlapping cells are only included in the count once OR if included overlapping cells lead to overestimate</p>	<p>1</p>		
<p>(ii)</p>	<p>volume over grid = $0.2 \times 0.2 \times 0.1$ count is 20 cells, so 1mm^3 contains $20/0.004 = 5000$ cells</p>	<p>1</p>		
<p>(c) (i)</p>	<p>bacteriostatic – inhibitory/cells arrested not dead OR regrow when diluted bactericidal – lethal/kills</p>	<p>1</p>	<p>Accept <i>dormant</i></p>	
<p>(ii)</p>	<p style="text-align: right;">both defined</p> <p>Streptomycin/tetracycline/erythromycin etc.</p>	<p>1</p>	<p>Variants of penicillin are OK, eg amoxycillin</p>	
<p>(d) (i)</p>	<p>B lymphocytes</p>	<p>1</p>		
<p>(ii)</p>	<p>Diagnostic testing/diagnosis of disease Elisa Treatment of disease (eg rabies, breast cancer)</p>	<p>1</p>	<p>Accept Herceptin;hepatitis antibodies; pregnancy testing Not <i>Vaccination</i></p>	

Question	Acceptable Answer	Mark	Notes	Negates
2	1. polygalacturonase breaks down pectin 2. which causes fruit to soften OR modification/treatment slows down ripening/bruising 3. gene for enzyme is cloned 4. gene inserted into plant genome in reverse/antisense technology idea 5. m RNA strand from inserted gene is complementary to mRNA for enzyme OR sense and antisense mRNAs bind 6. gene silenced/translation prevented 7. enzyme not made/reduced enzyme level <p style="text-align: right;">max 4 points</p>	4		
3	(a) (i) Trend: as proportion of BK1 increases biomass increases + any one correct quantification (ii) higher nitrogen content of BK1 or more amino acids available for growth (b) Starter for silage OR for silage production	2 1 1	Not <i>silage</i> alone Not dairy industry products	

Question	Acceptable Answer	Mark	Notes	Negates
<p>4 (a)</p> <p>(b)</p> <p>(c)</p>	<p>breakdown of yeast cells by their own enzymes</p> <p>stage of life cycle age of yeast culture yeast strain pre-treatment of yeast cells with enzymes mechanical disruption of yeast cell wall pH temperature enzymes produced by yeast due to genetic makeup</p> <p style="text-align: right;">any 2</p> <p>source of vitamins (as in Marmite) flavourings (of soups/gravies/sauces/foods with non animal origin)</p>	<p>1</p> <p>2</p> <p>1</p>	<p>Breakdown = hydrolysis, digestion</p> <p>Not <i>medium</i></p> <p>Not processes that require live yeast cells</p>	

Section C: Animal Behaviour

Question	Acceptable Answer	Mark	Notes	Negates	
1	(a)	Female choice OR advantage following female preference, eg advantage from size through genes OR burrowing OR survival OR Male-male rivalry OR Competitive advantage arising from size eg access to more females	1	Idea of preference needed	
	(b)	Proximate: to avoid drying out/heat/environmental conditions Ultimate: increased breeding success/survival of genes	2	Looking for stimulus that would trigger burrowing behaviour Not <i>to avoid dying</i> ; not <i>survival</i> alone	
	(c)	Female: Greater energy/costs because of bigger gametes/incubation of eggs/carrying young in pouch OR converse for males	1		
	(d)	Genetically determined/stereotyped/instinctive	1	Not <i>not learned</i>	
	(e)	Reduced	1		
2	(a)	(Natural selection favouring) behaviour that increases relative's survival/fitness	1	Accept <i>Favouring</i> as behaviour	
	(b)	(Those without B have) no receptors/protein and either cannot identify intruder ants OR don't distinguish other colony members from their own	1	Not just a repeat of stem; need reference to intruder ants, or offspring from other queens/colonies	
		so not aggressive to intruders OR don't maintain loyalty to their queen	1		2
(c)	<i>Drosophila per</i> gene/hygienic behaviour in bees	1	Must be single gene behaviour effects		

Question	Acceptable Answer	Mark	Notes	Negates
3	1. High levels of homozygosity in inbred populations 2. Heterozygosity in outbred populations 3. Inbreeding increases expression of disadvantageous/lethal recessive genes OR converse for outbreeding 4. Inbreeding results in lower fitness/inbreeding depression/reduced breeding success OR converse for outbreeding 5. Male dispersal in mammals/or example 6. Female dispersal in birds/or example	4	Not <i>naked mole rats</i> ; they actively inbreed	
4	(a) (i) 1 year versus 3/4/adult, 2 year versus 4/adult 3 year versus adult (ii) increasing feeding rate as they get older because they learn what is edible/compete better/feed more efficiently (iii) 300 s OR 298.8/299 (b) Allow (more) accurate recording (of age/feeding rate) OR reduces errors Watch again to check/ensure accuracy Observer does not affect behaviour (c) Changes in: diet/or example OR foraging behaviour/or example 1 habitat preference/or eg OR nesting behaviour 1	1 1 1 1 2	Not 3 versus 4 Not because they are <i>bigger</i> The question is related to learning, so experience = learning using 0.05 prey/15s $1/.05 \times 15s = 300 \text{ s}$ OR 5 minutes $(18/5 \times 83) = 298.8 = 299$ Not <i>just you can watch it again</i> Examples Feed at land fill/bins follow fishing boats/plough town/inland dwelling; no longer coastal	

Section C: Physiology, Health and Exercise

Question	Acceptable Answer	Mark	Notes	Negates	
1	(a)	Coronary arteries/coronary blood vessels	1		
	(b)	Build up of plaque/atheroma in vessel wall Composition of atheroma: fatty material/cholesterol/fibrous material/smooth muscle cells/calcium	2	Not <i>on</i> or <i>in</i> the lining/artery Not deposition of LDL	
		loss of elasticity/hardening of vessel walls (increasing BP) /LDL transport of cholesterol for deposition			
	(c) (i)	Lumen volume increases (so increased blood flow) Quantification: doubles lumen volume/65 to 129-133 mm ³ OR Atheroma decrease is 15 mm ³	2		
	(ii)	Angina/Angina pectoris	1	Accept <i>Ischaemic heart pain</i>	
2	(a)	Bones become (more) porous/brittle OR reference to spine curvature	1	Not <i>lower bone density</i> – too similar to mass; not <i>low calcium</i> not <i>brittle hair</i>	
	(b)	More common in women with low/reduced oestrogen/ in menopausal or post-menopausal women	1	Not <i>increasing with age</i>	
	(c) (i)	The number with osteoporosis is increasing (from 7.8 to 10.5 million)	1		
	(ii)	The percentage/proportion of women with low bone mass who go on to develop osteoporosis is decreasing (35.7% to 34.5%.)(ratio 2.8:1 to 2.9:1)	1	Accept <i>Rate of low bone mass increasing faster than rate of osteoporosis</i>	
	(d)	Jogging is weight-bearing exercise OR swimming is not Jogging/regular weight-bearing exercise maintains/ increases/promotes bone mass/strength/density OR Jogging when younger maximizes bone density before age-related loss	1 2 1	Not <i>impact</i> activities	

Question	Acceptable Answer	Mark	Notes	Negates
<p>3</p> <p>(a) (i)</p> <p>(ii)</p> <p>(b)</p> <p>(c)</p>	<p>$(10 \times 29.4)/3 = 98$ (days)</p> <p>$96/1.74 \times 1.74 = 31.7$</p> <p>Increased body mass may be due to a large muscle mass or bone mass and High lean: fat is healthier/muscle accumulation healthy OR high fat: lean unhealthy/fat accumulation is unhealthy</p> <p>Densitometry/skinfold thickness/bioelectric impedance analysis/waist to hip ratio/mid-upper arm circumference.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>High body fat is not good; high BMI can arise from larger proportion of muscle/lean or greater bone density Need reference to health in relation to fat or muscle</p> <p>Not BMI Not BIA Not bodpod</p>	
<p>4</p>	<ol style="list-style-type: none"> 1. Testing can be maximal or sub-maximal 2. Sub-maximal testing used to monitor/improve aerobic fitness of cardiac patients/less fit 3. Maximal testing measures maximal oxygen uptake/VO_{2max} in athletes/fit people 4. Sub-maximal tests are predictive/estimates of VO_{2max} 5. Predictive/sub-maximal tests assume a linear relationship between heart rate and O_2 consumption/exercise intensity 6. Description of exercise stress test(s) used: step test/shuttle test/treadmill OR Maximal tests to exhaustion 	<p>4</p>	<p>More than just naming</p>	

[END OF MARKING INSTRUCTIONS]