2006 Biology

Advanced Higher

Finalised Marking Instructions

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Marking scheme

Section A

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

Section B

Question			Acceptable Answer	Mark	Notes	Negates
1	**(a)**	**(i)**	Sugars/(poly/oligo)saccharide/carbohydrate	**1**	NOT: Glycogen, glycerol, not glucose on its own	
		(ii)	Cell(-cell) recognition/cell identity markers/antigens	**1**		
	(b)	**(i)**	They have the same sequence/order of amino acids OR idea showing understanding of primary structure	**1**		
		(ii)	Disulphide(bridges), ionic (bonds), Van der Waals/dipole (attractions), hydrophobic (interactions)	**1**	Covalent only with disulphide	
	(c)	**(i)**	There is no variation reported/no error bars (in the 0:1 results)	**1**	Not comparison saying mouse and human are 100% in 0:1 treatment. There are results for only one sample. Reference to y axis not being mean values.	
		(ii)	As (ratio of) breaker to PrP^{sc} increases: - (the %) PrP^{sc} decreases (in mice) - there is a bigger (%) PrP^{sc} decrease in mice than humans OR works better/greater effect - (in mice the %) PrP^{sc} decrease gets less /the breaker gets less effective at higher concentrations Best effect in humans is 100:1 Larger variation in digestion of human PrP^{sc} **Any two**	**2**	Not looking for graph descriptions or selected data, need trends/conclusions Quoting values does not negate	

Question			Acceptable Answer	Mark	Notes	Negates
1	(d)	(i)	Beta sheets resist breakdown 1 (results show) a decrease in beta sheet content 1 (36 to 9%)	2	Distinction between breaker digestion and cell digestion must be clear	
		(ii)	the proportion of alpha helices OR beta sheets in PrP^c /PrP/normal protein OR the ratio of helices to sheets at which the beta sheets do not inhibit breakdown OR Time to break down incubated PrP^{sc} in comparison to time for non–incubated PrP^{sc}	1		
		(iii)	Protease/proteolytic	1	NOT: hydrolase	
	(e)	(i)	10^{-2} (0.01)	1		
		(ii)	The lower the concentration (of PrP^{sc}) the greater the delay in onset of symptoms OR converse	1		
	(f)		More breaker Incubate PrP^{sc} with breaker (before injection)/incubate longer/different length of incubation Reduce the PrP^{sc} concentration **Any two**	2		

Question			Acceptable Answer	Mark	Notes	Negates
2	(a)	(i)	The OH on C1 of glucose **a** was down (/below carbon 1) and it bonded with (OH of) C4 (of glucose b)	1		
		(ii)	Bond is between C1 of both glucose molecules/1,1 bond	1		
	(b)		Hydrolysis	1		
3	(a)		Nuclease/endonuclease	1		
	(b)		(Gel) electrophoresis	1		
	(c)		Single-stranded (Base sequence of probe is) <u>complementary</u> (to DNA) base sequence Binds (to DNA in the extract) by base pairing **Any two**	2		
	(d)	(i)	A test that distinguishes affected/unaffected/carrier individuals OR idea that the **purpose** of the test is to pick up if an individual has/will/might develop a condition	1		
		(ii)	It cuts the normal site but not the mutated site/sequence/DNA OR Produces more fragments for normal than abnormal gene/DNA	1	Cut = recognise = identify = detect Can have "it only cuts the normal" But NOT: "it will not cut mutant DNA"	

Question	Acceptable Answer	Mark	Notes	Negates
4	1. Cycle is interphase plus mitosis OR Interphase is G1,S and G2 2. Control is at checkpoints in G1, G2 and M 3. G1 checkpoint– size/mass/volume/amount of material is monitored 4. G2 checkpoint– success of DNA replication 5. M – chromosome alignment/triggers exit from mitosis/triggers cytokinesis 6. MPF controls entry into mitosis 7. timing: **two from** G1 checkpoint during G1, G2 checkpoint at end of G2, M check in metaphase **Any five**	5	NOT: growth factors at pt 6	
5 **(a)**	Phytoplankton are producers/autotrophs/photosynthesise/require light Light decreases with depth (idea here - lower+less light) **One mark for each**	2		
(b)	Loss of energy at each trophic level/transfer OR 10% rule for each transfer OR biomass decreases (at each trophic level) OR biomass/energy of top level/carnivores insufficient to support another (trophic) level	1	Take care when *organism* is being used instead of trophic level NOT: productivity decreases	
(c)	Description or diagram: phytoplankton layer 1 would be wider than the zooplankton layer Reason: productivity/annual energy fixed includes 1 or depends on rate of reproduction in phytoplankton OR Biomass pyramid refers only to standing crop/ignores reproduction rates.	2	Not just *the pyramid is bigger* Accept high reproduction in phytoplankton	

Question			Acceptable Answer	Mark	Notes	Negates
6	**(a)**		1500 (per year) (9000 over the 6 years)	**1**		
	(b)	**(i)**	55% (100 – 45) accept 11/20 or 55/100	**1**		
		(ii)	Increase in seal population size 1	**2**		
			leading to (increased) physical 1 damage/trampling etc OR Less competitive against *Prasiola*		NOT feeding – seals feed in sea NOT blocking out sunlight	
		(iii)	• reduced competition (for space) • greater tolerance of trampling/resistance • *P.crispa* is a pioneer species • tolerance of waste material/high N content of soil/N promotes **Any one**	**1**		
	(c)		(Homeotherms are) endothermic/generate heat/expend energy and keep temperature constant	**1**		

Question			Acceptable Answer	Mark
7	(a)	(i)	features of primary autogenic succession	9
		(ii)	effects of human activity.	6

1. succession defined as gradual change in (plant) community composition
2. autogenic defined as caused by biological processes
3. primary succession is where there have been no plants before/not colonised before
4. barren location eg sand dunes, rock/scree, pond, new volcanic island
5. bare rock disintegrates to form mineral particles /weathering /erosion – sand etc
6. pioneer species colonise
7. (pioneers) adapted to initial/unfavourable conditions/or eg adaptation
8. death/wastes/litter decay to form humus/organic matter(to form soil)
9. facilitation used and defined – (community) alters conditions so they favour other species and not themselves
10. illustration of idea linking change and next coloniser
11. development of/towards climax community

12, 13 14 Changes in complexity associated with succession: any three from
    increase in diversity of species, variety of habitats, variety of niches, complexity of food, webs, stability, soil
    depth, humus, *decrease* in productivity as climax is reached/big biomass but slower growing

Any 9 from 14

15. monoculture described as single species farming
16. relate hedge removal to reduction in complexity
17. use of pesticides reduces complexity
18. loss of soil condition from use of chemical fertilisers rather than organic material
19. eutrophication – cause of eutrophication as nutrient enrichment
20. causes algal bloom/lowers oxygen which reduces complexity/diversity/eliminates species
21. toxic pollution described eg discharge into water or air of toxin
22. follow through effect on complexity eg species diversity decreases – eg lichens and SO2
23. habitat destruction + eg OR introduction of exotic species + eg
24. consequences for ecosystems, eg loss of plant species, nesting sites etc

Any 6 from 10

Question		Acceptable Answer	Mark
7	**(b)**	Discuss positive/negative (+/-) interactions between species under the following headings:	
	(i)	Grazing 1. grazing defined as (usually) consumption of green plant material by animals 2. only part of (plant) structure removed 3. positive/benefits/'good for' grazer as it gains energy/nutrients (Not *gains food*) 4. negative/ to grazed organism since damaged 5. describe example – named (species for) grazer and grazed 6. but grazed species may not be killed OR regrowth/regeneration occurs 7. plants with basal meristems may tolerate grazing better (than aerial meristems) **Any 4 from 7**	**4**
	(ii)	parasitism 8. defined as interaction between 2 species where host is harmed (-) and parasite benefits (+) 9. positive to parasite/parasite benefits as it gains energy/nutrients/resources 10. negative to host since resources/energy are lost to parasite 11. consequences to host depend on host health 12. host death detrimental to parasite/no benefit if parasite kills host 13. unless transmission to new hosts achieved 14. brief description of one method; eg direct contact/secondary hosts etc. 15. described example of parasitism – named species for parasite and host **Any 5 from 8**	**5**
	(iii)	defence against predation 16. camouflage – transformation to something not seen as prey or not recognised 17. crypsis – blending with background 18. disruptive coloration – breaks up outline 19. aposematic/warning coloration – bold/conspicuous patterns 20. advertise as distasteful to deter predators 21. batesian mimicry – resemblance to unpalatable/harmful prey 22. mullerian mimicry – several unpalatable species have similar markings 23. described example to illustrate above with named species 24. described example to illustrate above with named species. **Any 6 from 9**	**6**

Section C: Biotechnology

Question			Acceptable Answer	Mark	Notes	Negates
1	**(a)**		The two mRNAs are complementary/will 1 combine/form a double helix OR cloned mRNA binds to the original mRNA	**2**	NOT: *genes combining* Look for correct cause and correct outcome	
			No translation OR gene expression prevented 1			
	(b)	**(i)**	Polygalacturonase/pectinase	**1**		
		(ii)	Longer shelf life/less bruising/longer to soften/longer to ripen/don't soften so easily so survive handling better	**1**	NOT: go off quicker Note relative idea	
	(c)		Public perception: GM foods as not being safe to eat Principles: people object to the principle of GM/genetic engineering/human interference/environmental impact	**1**		
2	**(a)**		<u>B lymphocytes</u> (accept beta)	**1**		
	(b)		To make the cell line immortal/so the fused cells can divide indefinitely Don't need anchorage	**1**	NOT: cells live longer/cells are immortal – they only live till they divide	
	(c)		Hybridomas	**1**		
	(d)		To prevent fused cells producing two kinds of antibodies/monoclonal idea – one type of antibody must be clear	**1**	NOT: for example, *pure antibodies will be produced*	

Question			Acceptable Answer		Mark	Notes	Negates
3			1 Problem: clarity/haze/cloudiness 2 Solution: araban-arabanase or starch-amylase or pectin-pectinase 3 Problem: filtration/viscosity 4 Solution: pectin-pectinase 5 Problem: yield/mechanical extraction/cell wall strength 6 Solution: cellulose (in cell walls) and cellulase **Any four**		**4**	Pectinase only once – either 2 or 4	
4	**(a)**		Protein reduced + quantification	1	**2**		
			ammonia, other N products and amino acids all increased + one correctly quantified	1			
	(b)		(10 : 25 : 40 →) <u>2 : 5 : 8</u>		**1**		
	(c)	**(i)**	Protein conversion to other materials (hence their increase) – ie. what has been spoiled	1	**2**	Penalise once for same error from (a) eg calling protein N.	
			Reference to loss of nutritional quality (from the activity of spoilage organisms) OR animals reject the silage – ie. significance of the change for cattle	1		Looking for stress on the dramatic differences in poor silage	
		(ii)	Anaerobic conditions + low pH (less than 5)/lactic acid		**1**		
		(iii)	*Lactobacillus/Enterococcus*		**1**		

Section C: Animal Behaviour

	Question	Acceptable Answer	Mark	Notes	Negates
1	**(a)**	Figure 1/scatterplot shows hunting activity when 1 fruit availability is high	**2**		
		Figure 2 shows no significant/very small 1 difference in % mating whether meat is shared or not.		NOT: "error bars overlap" if no reference to 2 different bars/groups	
	(b)	Reciprocal or non-random meat-sharing between males. Meat sharing associated with aid/support in conflict/ agonistic situations/altruism/grooming/bonding behaviour unrelated to dominance **Any one**	**1**		
	(c)	1. Hierarchy depends on dominance/system of social ranking 2. (Hierarchy) established by fighting/conflict OR Maintained by threat displays/appeasement 3. Rank determines access to food/resources/mates 4. (Hierarchy) reduces actual physical fighting 5. Hierarchies generally linear/alliances may be formed where animals of subordinate ranks join 6. Rank changes with time as animals grow/ reproduce/age etc 7. Grooming to lower dominance threat/reinforce close relationships/maintain rank 8. Sexual presentation as appeasement gesture **Any five**	**5**		

Question	Acceptable Answer	Mark	Notes	Negates
2 **(a)**	Inbreeding increases homozygosity/ double recessives in population Inbreeding increases expression of disadvantageous/ harmful recessive genes Results in lower fitness/lower breeding success/ inbreeding depression **Any two**	**2**	NOT: *brings out*	
(b)	Polygamy – males or females may have multiple mates (in one season) Monogamy – males or females have only one mate	**1**	*For life* does not negate	
(c)	Relating to the adaptive significance of the behaviour	**1**	NOT: *the why* Adaptive = : Evolutionary Survival Selective advantage	
(d)	Hunting in groups allows capture of larger/more dangerous prey Hunting success (rate) is higher Captured prey can be defended better More effective defence of hunting territory Foraging economics observations Weaker individuals also gain food **Any one**	**1**		

Question			Acceptable Answer	Mark	Notes	Negates
3	**(a)**		Because it results in modification of behaviour (as a result of experience).	**1**	NOT: re-definition of habituation (provided in the text)	
	(b)	**(i)**	Stimuli are releasers/sign stimuli 1	**2**		
		(ii)	Responses are fixed action pattern 1			
	(c)		Horizontal dummy – zigzagging decreases from approx 13 to approx 3 (+/- 2 or other correct quantification)	**1**		
	(d)		Dummies should be same colour/size Feeding regimes should be identical Abiotic factors eg light intensity/temperature should be identical Fish should be at same stage of development/life-cycle/age etc Fish not used in experiment before **Any one**	**1**	NOT: *shape*	
	(e)		To prevent influence of human observer To allow more accurate analysis of behaviour **Any one**	**1**		
	(f)		The male sticklebacks 'dislike' the horizontal dummy more (or equivalent)	**1**	The behaviour observed here is a fixed response; any suggestion about what the fish is thinking or wanting to do is anthropomorphic.	

Section C: Physiology, Health and Exercise

Question	Acceptable Answer	Mark	Notes	Negates
1 **(a)**	Blood supply to legs/heart/skin/muscles would increase AND Supply to abdomen/kidneys/intestines/stomach/abdominal organs would decrease	**1**		
(b)	Myocardium (or heart muscle) bigger/left ventricle (wall) thicker or heavier/fibres thicker/more (cardiac) blood vessels	**1**	NOT: heart *bigger* need structural **comparison** of athletic and normal heart NOT: more fibres	
(c)	Athlete's resting HR would be lower than 100 prior to race HR is rising before the race HR drops to a lower level after race than it was just before the race **Any two**	**2**		
(d)	89.5% (89.47, 90, 89)	**1**		
(e)	Build up of lactic acid (was causing muscle fatigue in legs) 1 Return journey was uphill/into a wind 1	**2**		
(f)	Heart rate would be higher Total time taken would be longer Recovery time would be longer Maximum heart rate reached sooner **Any two**	**2**	Note comparative	

Question		Acceptable Answer	Mark	Notes	Negates
2	(a)	Initial/fasting blood glucose level is higher Increase following glucose ingestion is greater Peak blood glucose level is later Blood glucose level takes longer to go down/reach start level **Any two**	2		
	(b)	Conversion of glucose to glycogen (in the liver) **and** increased uptake of glucose (by cells).	1		
3	(a)	Skinfold thickness	1		
	(b)	Add (skinfold thicknesses) from a number of places (location depending on technique) 1 (total is) compared to calibration tables (derived 1 from a large sample of individuals)/read fat value from tables/calculate fat value from equation	2	NOT: measure values on its own – must be combined/totalled	
	(c)	Densitometry/underwater weighing/ Bodpod/bioelectrical impedance/or descriptions **Any two for one**	1		

Question	Acceptable Answer	Mark	Notes	Negates
4	Identify any three modifiable risk factors (from) below Diet: reduce energy intake/fat intake/cholesterol intake/salt Smoking: reduce/give up Level of activity: regular/sustained/intense Obesity: more activity **and** less food (intake to reduce BMI/% body fat) **Any four**	**4**	NOT: alcohol, caffeine	Inclusion of non-modifiable factor

[END OF MARKING INSTRUCTIONS]