OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced Subsidiary GCE
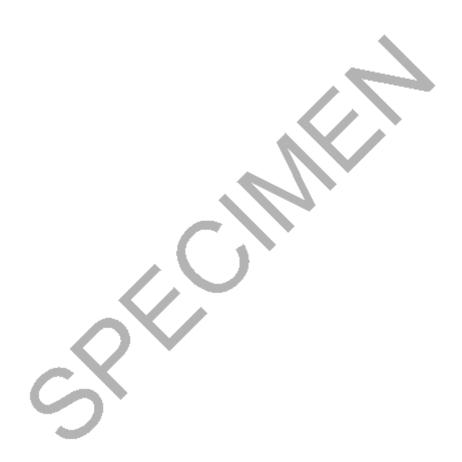
BIOLOGY   **F212 MS**

Unit F212: Molecules, Biodiversity, Food and Health

Specimen Mark Scheme

The maximum mark for this paper is **100**.

SPECIMEN

Question Number	Answer	Max Mark
1(a)	breaking (glycosidic) bond; **R** if incorrect named bond glycosidic / correct bond drawn; treat 'covalent' = neutral addition of water / H_2O;	**max[2]**
(b)	*accept* ✓ = *yes* x = *no* *each correct row = I mark*	

	gum arabic	amylose	cellulose	glycogen
branched structure		no;		yes;
heteropolysaccharide		no;		no;
found in animals/plants		plants;		animals;
function in organism		storage / reserve; **R** 'energy' alone	structural / strength / stops bursting / cell wall / support / gives cell shape; **R** protects rigid = neutral	

[4]

Question Number	Answer	Max Mark
(c)(i)	crush (small amount of) seed pod; add (small volume of) biuret, A / NaOH, <u>and</u> biuret, B / CuSO$_4$; positive = colour change from blue to, mauve/purple;	max[2]
(c)(ii)	*preparation - allow 2 marks max:* 1 crush, samples / leaves and seed pods, separately with water; 2 use same mass of each / AW and use same volume of water; 3 filter; *method - allow 4 marks max:* 4 add benedict's reagent to filtrate; **A** CuSO$_4$ in alkaline solution 5 <u>excess</u> reagent used / stated volume; 6 same volume added; 7 heat in a water bath/ at near boiling; 8 for stated time (up to 5 min); *analysis - allow 2 marks max:* <u>either</u> 9 colour change from blue to green / yellow / orange / red; 10 shows increasing concentration of reducing sugar; <u>or</u> 11 use of centrifuge to remove precipitate; 12 use of colorimeter to compare intensity of blue colour in liquid portion; 13 red filter used in colorimeter;	[8]
(d)	humans eat only the seeds so do not gain, nutrition / energy, from, leaves / pods; seeds maybe deficient in (some) essential amino acids; cattle better at digesting, plant matter / seeds / leaves / pods, than humans / AW; meat (from cattle) provides more essential amino acids for humans (than plant material)/AW; cattle also produce milk; AVP; e.g. cattle naturally roam to find food / intensive labour needed for human collection of plant material;	max [3]
		Total: [19]

Question Number	Answer	Max Mark
2(a)(i)	<u>deoxyribose</u> sugar; a nitrogenous/ nitrogen containing, base / named base; ecf for thiamine phosphate group; AVP; e.g. deoxyribose is a pentose sugar/correct diagram of same *accept A, T, G and C in place of names.*	**max[3]**

(a)(ii)	hydrogen bonds between bases;
	<u>complementary</u> base pairing;
	purine to pyrimidine;
	A to T <u>and</u> G to C;
	
	AVP; further detail e.g. 2 H bonds between A and T / 3 H bonds between
	        C and G
	        DNA polymerase
		max[4]

(b)	ribose (instead of deoxyribose); uracil /U, replaces thymine; single stranded (instead of double stranded); smaller molecule/ different 3-D structure to DNA;	**[3]**

(c)(i)	*any three from the following:*
	award mark only if structure related to suitable function
	
	variable region is antigen binding site; **R** receptors / 'sticky ends' / active
	        site
	(shape of) variable region specific to antigen / amino acid sequence (of
	        variable region) gives, complementary / matching, shape;
	
	hinge region allows flexibility in binding / AW;
	
	constant region, for binding to receptors on cells / phagocytes / mast cells;
	
	AVP; e.g. disulphide bonds hold polypeptide chains together
		[3]

(c) (ii)	human and chimp are more closely related; common ancestor is more recent; less time for, mutations / variation, to arise;	**[2]**
		Total: [15]

Question Number	Answer	Max Mark
3(a)	*award two marks if correct answer (12) is given* 6/30 / 6/0.5 x 60; 12;	[2]
(b)	*assume candidates are referring to the initial rate unless otherwise stated.* concentration of, substrate / H_2O_2, molecules, high / higher at start; more chance of, substrate/ H_2O_2, molecules entering active site; all / most, active sites occupied;	[3]

(c)	*at optimum temp - max 3 marks*
	molecules in culture have kinetic energy;
	(frequent) collisions between enzyme and substrate molecules;
	more enzyme-substrate complexes formed;
	max rate of reaction / protein production achieved;
	
	at higher temp - max 5 marks
	(at higher temperature) molecules have _more_ kinetic energy /
	       collisions occur more frequently and with more energy;
	molecules vibrate and, bonds/ hydrogen bonds, broken;
	tertiary structure / 3D shape, of enzymes altered;
	active site loses, precise / complementary, shape;
	enzymes are _denatured_;
	substate molecule no longer fits active site;
	(may be) irreversible so reaction/ protein production stops; **A** fungus
	       destroyed
		[8]

		Total: [13]

Question Number	Answer	Max Mark
4(a)	number of different species present/AW;	**[1]**
(b)(i)	0.62;; *award one mark if working correct but answer wrong*	**[2]**
(ii)	*award marks only if comparative points given* hedge vegetation has greater species richness than wheat; numbers of insects under hedge more evenly spread compared with numbers in wheat field / AW; more niches for insects in vegetation under hedge/ more species of plants grow under hedge than in wheat field/ AW; ref. use of, chemicals/ insecticides/herbicides, on wheat and not on hedge vegetation; AVP; e.g. ref. plants under hedge more likely to be wild/native compared with wheat crop / AW	**max[3]**
(c)	*Any four from the following:* ref. random samples; sweep net; repeats in each habitat; ref need for same technique in each habitat; classify and count numbers of each species(of insect) caught; AVP; e.g. further detail of sampling such as use of suitable chemical to stun the insects;	**max[5]**
(d) (i)	ref to (bio)diversity values and need for conservation; ref to endangered species and need for protection; ref to laws concerning endangered species (that might affect decision); ref to planning stipulation e.g. translocation of species; AVP; e.g. example of type of local planning decision;	**max[3]**
(d) (ii)	damage to environment / ecosystem; disturbance to animals in area; habitats best left alone / left to nature/AW; AVP; e.g. may advertise presence of endangered species to collectors	**max[2]**
		Total: [16]

Question Number	Answer	Max Mark
5(a)	Animalia / animal(s); Phylum; **A** phylum Order; **A** order *Panthera*; species;	**[5]**
(b)	Fungi; **A** fungi Protoctista; **A** protoctists / protista / protists	**[2]**
(c)	scientific knowledge changes as new discoveries are made / AW; technological developments lead to new discoveries; named technological development; e.g. microscopes, new DNA technology ref. (legitimate) differences of opinion amongst biologists/scientists /taxonomists; ref. true bacteria (bacteria) and archaea; ref. differences between bacteria and archaea; e.g. different RNA polymerase, membrane structure, flagellae, histones AVP; e.g. other relevant detail of prokaryotes	**max[4]**
(d)(i)	change in DNA/ genetic material, through spontaneous mutation;	**[1]**
(d)(ii)	DNA/ genetic material, determines protein structure/controls protein synthesis; (mutation) changes protein structure/ enzyme structure/ antigen structure;	**[2]**
(e)	*any four from following:* development of new strains (of bacterium)/ bacteria multiply rapidly; development of resistance to antibiotics; need to find more antibiotics; need wide range of antibiotics for one species of bacterium; vaccines no longer effective; AVP; e.g. antibodies may not recognise changed antigens / no longer effective / ref. MRSA	**[4]**
		Total: [18]

Question Number	Answer	Max Mark

6(a)(i)	*any three from following:*
	
	education on HIV / AIDS less effective **;**
	sexual attitudes / number of partners **;**
	availability of condoms **;**
	poverty / poorer / less money **;**
	sex industry **;**
	less primary health care / less likely to be diagnosed **;**
	
	AVP **;** e.g. ref to unscreened or untreated blood
	        unsterilised needles or surgical apparatus
	        civil war / rape
	        no alternative to breast feeding
	
	R access to drugs for treatment
	R no vaccine
	R ref to intravenous drug addiction
		[3]

(ii)	*any three from the following:* to find out where rates, are highest / people are most at risk **;** to keep track of infection rates over time/ AW **;** to see where disease is likely to spread / where epidemic most likely **;** to help research (into how it is spread / into effectiveness of drugs) **;** to allow organisations to provide, aid / health care, where it is needed most **;** to allow organisations to provide education (about disease) where it is needed most **;** AVP **;** e.g. tourist industry	**[3]**
(b)	find person who is immune and isolate gene that provides immunity **;** use gene to find shape of protein that provides immunity and manufacture protein to use as vaccination / cure **;** find shape of CD4 receptor **;** develop drug to block receptor **;**	**2 max**
		Total: [9]

Question Number	Answer	Max Mark
7(a)(i)	species numbers have become low / habitat reduced, qualified; population has reached a critical level / AW; there is a risk of extinction;	**max [2]**
(ii)	*any two from the following:* shot to prevent damage to farmland; **A** other appropriate reason habitat destruction; hunting; poaching; killed for horn; **A** ivory killed, for meat / hides;	**[2]**
(b)	*any two from the following:* signatory countries made it illegal to, kill / poach, rhinos; ban placed on trade (in horns); increased cooperation between countries; permits / licenses, issued; education / raising awareness;	**[2]**
(c)	source of food; source of plant varieties for cross breeding / selection; to breed in disease resistance / pest resistance; to breed in other named characteristic; e.g. higher protein content / quicker growth source of natural predators to pests; AVP;	**max [4]**
	Total:	**[10]**

Assessment Objectives Grid (includes QWC)

Question	AO1	AO2	AO3	Total
1(a)	2			2
1(b)	3	1		4
1(c)(i)			2	2
1(c)(ii)	3	2	3	8
1(c)(iii)		3		3
2(a)(i)	3			3
2(a)(ii)	4			4
2(b)	3			3
2(c)(i)	3			3
2(c)(ii)		2		2
3(a)		2		2
3(b)		3		3
3(c)	3	5		8
4(a)	1			1
4(b)(i)		2		2
4(b)(ii)		3		3
4(c)			5	5
4(d)(i)	1	2		3
4(d)(ii)		2		2
5(a)		5		5
5(b)	2			2
5(c)	2	2		4
5(d)(i)	1			1
5(d)(ii)	2			2
5(e)		4		4
6(a)(i)	1	2		3
6(a)(ii)		4		4
6(b)		2		2
7(a)(i)	2			2
7(a)(ii)	2			2
7(b)	2			2
7(c)	2	2		4
Totals	42	48	10	100
Targets	42	48	10	100

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