Mark Scheme 2806/01
June 2005

Unifying Concepts in Biology

Abbreviations, annotations and conventions used in the Mark Scheme	/	=	alternative and acceptable answers for the same marking point
	;	=	separates marking points
	NOT	=	answers which are not worthy of credit
	R	=	reject
	( )	=	words which are not essential to gain credit
	___	=	(underlining) key words which **must** be used to gain credit
	ecf	=	error carried forward
	AW	=	alternative wording
	A	=	accept
	ora	=	or reverse argument

Expected Answers **Marks**

1 (a) *2 marks for the correct answer*

$\frac{46 \text{ mm} +/-1}{20\,000}$;

answer 2(μm) ; *accept error carried forward if answer is a whole number* **max 2**

(b) (i) Golgi (apparatus) / dictyosome ;
modifies proteins ; **A** collects / processes
adds, carbohydrate / sugars / polysaccharide ;
A makes glycoproteins / glycosylation
(packages into) vesicles (for export) / lysosomes ; **max 3**

(ii) vesicles fuse with, cell membrane / plasmalemma ;
ref to exocytosis ; **A** reverse pinocytosis
cell wall permeable ;
reference to spaces between cellulose microfibrils ;
AVP ; e.g. reference to enzymes
breaking up / disrupting, cell wall **max 2**

(iii) respiration ;
(protein / glycoprotein) synthesis / exocytosis ;
requires, energy / ATP ; **A** active
(mitochondria) release energy / produce ATP ;
R produce / make / create, energy **max 2**

[Total: 9]

Question	Expected Answers	Marks
2 (a) (i)	*penalise lack of units once in answer* increase in, elongation / length, with auxin concentration up to, 1.4 / 1.8, µmol dm^{-3} ; peak / maximum, at 1.4 µmol dm^{-3} ; decrease between 1.4 and 1.8 µmol dm^{-3} ; data quote with any 2 points ; linear / directly proportional, before 1.2 *or* linear inversely proportional after 1.5 ; **R** length decreases	**max 3**
(ii)	*mark first three factors* temperature ; age of stems ; light, intensity / wavelength ; concentration of dissolved, ions / salts ; (concentration of) other named growth substance ; AVP ;;; e.g. pH, genotype (of plant), concentration of named metabolite (e.g. glucose / amino acids), O_2 concentration, CO_2 concentration **R** 'amount of'	**max 3**
(b)	cell, enlargement / elongation ; **R** stem enzyme synthesis ; vacuolation ; increase in plasticity of cell walls ; (cell) wall softened by, H^+ / lowered pH ; high concentration of auxin causes inhibition of growth ; AVP ; e.g. cell division, mitosis, replication, cytokinesis, increase in number of cells **R** ref to uptake of nutrients	**max 2**
(c)	*assume answer is about plant growth substances unless stated otherwise* *treat refs to target, cells / tissue(s) and external stimuli as neutral* growth substances produced by, dividing cells / meristems ; *ora* hormones produced by, islets of Langerhans / alpha cells / beta cells / endocrine gland / pancreas growth substances move, in phloem / in xylem / from cell to cell ; *ora* hormones / named hormone(s), move in blood growth substances usually produce a permanent change in the plant ; *ora* hormones produce reversible change in blood sugar (GS) not homeostatic / no negative feedback ; *ora* for hormones **R** positive feedback **A** description of negative feedback (GS) not protein / not polypeptide ; *ora* insulin / glucagon, are proteins AVP ;	**max 2**
		[Total: 10]

Question			Expected Answers	Marks
3	(a)		*accept any three correct statements based on the data;;; for example* populations of, mites / springtails, much greater / more than twice the number, in the climax forest than before trees established *ora* number of species of springtail greatest in the climax community *ora* small difference in numbers / no significant difference, between areas with young trees and areas with mature trees there were always (many) more mites than springtails in the sample	max 3
	(b)		succession ;	1
	(c)	1	consumers have alternative sources of food ; *ora*	
		2	change in numbers of one species has less effect on another trophic level ;	
		3	ref competition ;	
		4	regulation of population size ;	
		5	food / energy, exploited efficiently / AW ; **R** general ref to energy flow	
		6	interlinking food chains ;	
		7	role of named organisms in recycling / recycling of C *or* N *or* Fe *or* P ;	
		8	food available throughout the year / AW ;	
		9	niche / idea ;	
		10	example(s) of any of the points 1 to 9 ;	max 3
	(d)		no trees to, take up / absorb / use, nitrate ; decomposition of, organic matter / named plant part ; **R** animal nitrate soluble (in water) ; leaching / run off ; detail of any stage in protein to nitrate ; **R** ref to 'nitrogen' at any point	max 2

(e) *all points refer to strip felling but accept reverse argument*

1 uncut strip acts as, reservoir / refuge ;
2 faster regeneration (of trees) ;
3 species less likely to become extinct / maintains biodiversity ;
4 does not disturb, food webs / habitats / ecosystems ; **A** conserves / maintains
5 ref to, nest sites / breeding sites / territories / migration channels ;
6 creates new habitats (on margins) ;

7 soil less likely to dry out (with strip felling) / AW ;
8 soil erosion / mud slides, less likely ; **A** refs to, surface run off / gullies
9 ref to roots of trees binding soil ; **R** 'trees protect soils'
10 ref to flooding ;
11 ref to, nutrient / mineral / C / N / Fe / P, cycles ; **R** refs to, CO_2 / global warming
12 ref to, nutrient leaching / eutrophication ;

13 less change to microclimate / more humid beneath the trees ;

14 ref to, amenity / aesthetics ;

15 ref to sustainability ;
16 ref to cost ;
17 larger total area of forest may be exploited or disturbed ;
18 more, roads / access, needed than if one (compact) area exploited ;
19 ref to, pollution / noise / hunters / AW ;
20 AVP ; e.g. damage, wastage, not all timber used, prolonged disturbance,
21 AVP ; labour intensive, niches preserved, quality of timber, ref to fertiliser **max 6**

QWC – legible text with accurate spelling, punctuation and grammar **1**

[Total: 16]

Question		Expected Answers	Mark
4	(a)	ref limiting factor ; not carbon dioxide ; named factor e.g. light / temperature / limited number of chloroplasts ; **R** water photosynthesis at maximum rate ; explanation of effect of named factor e.g. ref to enzyme action ;	2 max 2
	(b)	ref respiration ; production of carbon dioxide ; **R** release (at low concentrations, CO_2 was) diffusing / moving down a concentration gradient ; respiration faster than photosynthesis / AW ; AVP ; e.g. below compensation point	2 max 2
	(c)	control of variables / light is a variable ; **R** 'fair test' unqualified	1
	(d)	*accept ora here* maintenance of water supply ; xylem / vascular bundles, intact ; water required for, photosynthesis / turgor ; **A** water prevents wilting stomata might close if the leaf detached ; leaves site of photosynthesis ; AVP ; e.g. ABA, water stress, sugar transport	2 max 2
	(e)	1 one similarity between barley and sugar cane ; 2 one difference between barley and sugar cane ; 3 temperature ref between or within species ; 4 CO_2 concentration ref between or within species ; **A** ppm for concentration 5 data quote comparison with units ; 6 ref to habitat ; e.g. tropics, named country, biomes (biological zones), climate 7 ref to biochemistry ; e.g. C4 / C3, different enzymes 8 ref to enzymes ; 9 AVP ; e.g. ref compensation point	5 max 5
			[Total: 12]

Question		Expected Answers	Marks
5	(a)	AATCCC / adenine adenine thymine cytosine cytosine cytosine ; (first 6)	1
	(b)	does not result in the synthesis of (messenger) RNA ; not <u>transcribed</u> ; does not code for, protein / polypeptide / amino acid sequence / AW ; **R** amino acid	max 2
	(c)	more, cell division / generations of cells / mitosis / replication ; loss of, telomere / DNA / nucleotides / part of chromosome, at each replication ; **R** loss of bases	max 1
	(d)	(bacterial / prokaryote) DNA is, circular / loop / not linear ; **A** no chromosome(s)	1
	(e)	provides sites for binding ; ref to, spindle fibres / microtubules ; ref to genes being spaced out along chromosome ; places to break and rejoin (during meiotic division) ; **A** chiasmata formation function may not yet have been discovered ; 'junk' implies no, function / purpose ; *ora* AVP ; e.g. raw material for, evolution / natural selection, required for, cell division / mitosis / meiosis	max 2
	(f)	straight line sloping up from left to right ; (does not need to start at origin)	1
	(g)	ATP / NAD / NADP / RNA / phospholipid / GP / TP / RuBP / ADP / RUP / AMP / cAMP/ phosphocreatine / AVP ; **R** DNA	1
	(h)	*penalise ref to nitrate once only in answer* increase, uptake / absorption ; promotes / increased / more, growth of, (aquatic) plants / algae ; **A** algal bloom more food for herbivores ; species that need low phosphate concentration may be adversely effected ; less light penetrating water / ref to plants or algae blocking light ; less photosynthesis in submerged plants ; plants die (in context) ; increase in, decomposers / bacteria ; <u>eutrophication</u> ; ref to (bacteria) use O_2 / <u>aerobic</u> respiration / depletion of O_2 / raises BOD ; ref to death of, animals / named animals / named group of animals, linked to O_2 ; AVP ; e.g. effect on humans, decrease in biodiversity	max 4
			[Total: 13]