

**2806/01 Unifying Concepts in Biology**

**June 2005**

**Mark Scheme**

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

1 (a) 2 marks for the correct answer

$$\frac{46 \text{ mm } \pm 1}{20\,000} ;$$

answer 2( $\mu\text{m}$ ) ; 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)	<p><i>penalise lack of units once in answer</i></p> <p>increase in, elongation / length, with auxin concentration up to, 1.4 / 1.8, <math>\mu\text{mol dm}^{-3}</math> ;            peak / maximum, at 1.4 <math>\mu\text{mol dm}^{-3}</math> ;            decrease between 1.4 and 1.8 <math>\mu\text{mol dm}^{-3}</math> ;            data quote with any 2 points ;            linear / directly proportional, before <u>1.2</u> or linear inversely proportional after <u>1.5</u> ;  <b>R</b> length decreases</p>	max 3
(ii)	<p><i>mark first three factors</i></p> <p>temperature ;            age of stems ;            light, <u>intensity</u> / 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), <math>\text{O}_2</math> concentration, <math>\text{CO}_2</math> concentration</p> <p><b>R</b> 'amount of'</p>	max 3
(b)	<p><u>cell</u>, enlargement / elongation ; <b>R</b> stem            enzyme synthesis ;            vacuolation ;            increase in plasticity of cell walls ;            (cell) wall softened by, <math>\text{H}^+</math> / lowered pH ;            high concentration of auxin causes inhibition of growth ;            AVP ; e.g. cell division, mitosis, replication, cytokinesis, increase in number of cells</p> <p><b>R</b> ref to uptake of nutrients</p>	max 2
(c)	<p><i>assume answer is about plant growth substances unless stated otherwise</i>  <i>treat refs to target, cells / tissue(s) and external stimuli as neutral</i></p> <p>growth substances produced by, dividing cells / meristems ;  <i>ora</i> hormones produced by, islets of Langerhans / alpha cells / beta cells / <u>endocrine</u> gland / pancreas            growth substances move, in phloem / in xylem / from cell to cell ;  <i>ora</i> hormones / named hormone(s), move in blood            growth substances usually produce a permanent change in the plant ;  <i>ora</i> hormones produce reversible change in blood sugar            (GS) not homeostatic / no negative feedback ; <i>ora</i> for hormones  <b>R</b> positive feedback <b>A</b> description of negative feedback            (GS) not protein / not polypeptide ; <i>ora</i> insulin / glucagon, are proteins            AVP ;</p>	max 2
	[Total:	10]

Question	Expected Answers	Marks
3 (a)	<p>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 <i>ora</i>  number of species of springtail greatest in the climax community <i>ora</i>  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</p>	max 3
(b)	<u>succession</u> ;	1
(c)	<p>1 consumers have alternative sources of food ; <i>ora</i>  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 ; <b>R</b> general ref to energy flow  6 interlinking food chains ;  7 role of named organisms in recycling / recycling of C <i>or</i> N <i>or</i> Fe <i>or</i> P ;  8 food available throughout the year / AW ;  9 niche / idea ;  10 example(s) of any of the points 1 to 9 ;</p>	max 3
(d)	<p>no trees to, take up / absorb / use, nitrate ;  decomposition of, organic matter / named plant part ; <b>R</b> animal  nitrate soluble (in water) ;  leaching / run off ;  detail of any stage in protein to nitrate ; <b>R</b> ref to 'nitrogen' at any point</p>	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<sub>2</sub> / 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	Marks
4 (a)	ref limiting factor ; not carbon dioxide ; named factor e.g. light / temperature / limited number of chloroplasts ; <b>R</b> water photosynthesis at maximum rate ; explanation of effect of named factor e.g. ref to enzyme action ;	max 2
(b)	ref respiration ; production of carbon dioxide ; <b>R</b> release (at low concentrations, CO <sub>2</sub> was) diffusing / moving down a concentration gradient ; respiration faster than photosynthesis / AW ; AVP ; e.g. below compensation point	max 2
(c)	control of variables / light is a variable ; <b>R</b> 'fair test' unqualified	1
(d)	<i>accept ora here</i> maintenance of water supply ; xylem / vascular bundles, intact ; water required for, photosynthesis / turgor ; <b>A</b> water prevents wilting  stomata might close if the leaf detached ; leaves site of photosynthesis ; AVP ; e.g. ABA, water stress, sugar transport	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 <sub>2</sub> <u>concentration</u> ref between or within species ; <b>A</b> 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	max 5
<b>[Total:</b>		<b>12]</b>

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 ; <b>R</b> amino acid	max 2
(c)	more, cell division / generations of cells / mitosis / replication ; loss of, telomere / DNA / nucleotides / part of chromosome, at each replication ; <b>R</b> loss of bases	max 1
(d)	(bacterial / prokaryote) DNA is, circular / loop / not linear ; <b>A</b> 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) ; <b>A</b> chiasmata formation function may not yet have been discovered ; 'junk' implies no, function / purpose ; <i>ora</i> 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 ; <b>R</b> DNA	1
(h)	<i>penalise ref to nitrate once only in answer</i> increase, uptake / absorption ; promotes / increased / more, growth of, (aquatic) plants / algae ; <b>A</b> 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 <sub>2</sub> / <u>aerobic</u> respiration / depletion of O <sub>2</sub> / raises BOD ; ref to death of, animals / named animals / named group of animals, linked to O <sub>2</sub> ; AVP ; e.g. effect on humans, decrease in biodiversity	max 4
<b>[Total:</b>		<b>13]</b>