MARK SCHEME for the May/June 2007 question paper

9700 BIOLOGY

9700/04

Paper 4 (A2 Structured Questions), maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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UNIVERSITY of CAMBRIDGE International Examinations

	Page 2		Mark Scheme	Syllabus	Paper
			GCE A/AS LEVEL – May/June 2007	9700	04
Se	ction /	A			
1	(a) t 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1. killed to be da 2. war ; 3. sale o 4. habita 5. loss o 6. AVP ;	/ hunted, qualified ; e.g. for meat / for fur / blood sport / ngerous A poaching (unqualified) f live young ; t destruction / AW ; f / competition for food ; e.g. disease	/ takes human fc	od / thought [3 max]
	(b) ((i) 1. fe 2. re 3. re 4. re 5. re 6. a	ewer animals need to be caught (for zoos) ; ef. becoming pregnant ; e.g. IVF / finding a mate eintroduction into the wild ; esearch easier with captive animals / AW ; ef. increase in numbers ; inte or postnatal care ;		[3 max]
	(1	ii) 1. in 2. gr 3. n 4. di 5. re 6. re	breeding / AW ; ene pool too small ; o fear of humans / difficulty in socialising with other go ifficulty in, finding food / reproducing ; ef. transfer of pathogens ; ef. effects of captivity : e.g. stress	rillas ;	[2 max]
		0.10			
					[Total: 8]

process	major products
glycolysis	ATP ; pyruvate ; reduced NAD ;
Krebs cycle	$\begin{array}{c} ATP \hspace{0.2cm} ; \\ reduced \hspace{0.2cm} NAD \hspace{0.2cm} / \hspace{0.2cm} reduced \hspace{0.2cm} FAD \hspace{0.2cm} ; \\ CO_2 \hspace{0.2cm} ; \end{array}$
oxidative phosphorylation	ATP ; water ; NAD / FAD ;

R NADP throughout

2

[8 max]

[Total: 8]

Page 3	Mark Scheme	Syllabus	Paper
	GCE A/AS LEVEL – May/June 2007	9700	04

3 (a) (i)

bacterial strain	A	В	
diameter (d) / mm	24	16 ;	
area / mm²	452 - 453	201 – 201.2 ;	A ecf
ratio of area A : area B	2.25 : 1	A 9:4	A ecf

[3]

- (ii) 1. penicillin kills more of strain A than strain B or C / AW ;
 - 2. ref. different active or binding sites ;
 - 3. A produces less penicillinase than B or C ;
 - 4. C is resistant (to penicillin);
 - 5. C has mutation ;
 - 6. penicillin cannot bind to enzymes ;
 - 7. penicillin inactivated by C / C produces much penicillinase ;
 - 8. AVP ; e.g. B is evolving into a more resistant strain / variation in carriers across membrane [4 max]
- (iii) 1. antibiotic, is selective agent / provides selective pressure ;
 - 2. resistant survive / susceptible die ;
 - 3. ref. reproduction ;
 - 4. resistants pass on, mutation / allele ; **R** gene
 - 5. ref. vertical transmission ;
 - 6. increases frequency of allele in population;
 - 7. may pass advantageous mutation to other species / ref. plasmid transfer ;
 - 8. ref. horizontal transmission ;

accept reference to strains A, B and C in correct context for points 2, 3 and 4

- (b) 1. competitive inhibitors (of transpeptidase);
 - 2. binds to enzyme ;
 - 3. blocks active site ;
 - 4. crosslnks in peptidoglycan wall cannot form ;
 - 5. weakens cell wall ;
 - 6. lysis / cell bursts ;

7. ref. high internal pressure of bacterial cell ;

[4 max]

[4 max]

[4 max]

[Total: 15]

- **4** (a) 1. norm concentration of blood glucose is 80 120 mg 100cm⁻³; (A within range)
 - 2. ß cells of, Islets of Langerhans / pancreas, detect increase ;
 - 3. ref. $\rm K^{\scriptscriptstyle +}$ channels close / role of Ca $^{2 +}$;
 - 4. secrete insulin ;
 - 5. ref. glycogenesis ;
 - 6. increased uptake of glucose (by cells);
 - 7. increased use of glucose in respiration / glucose converted to fat ;
 - 8. ref. negative feedback / described ;

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	Page 4			Mark Scheme	Syllabus	Paper
				GCE A/AS LEVEL – May/June 2007	9700	04
	(b)	reve mal from DNJ pro- ref. rest cut at s to g	erse t kes, n (hu A pol duces links semi trictio DNA pecifi jive st	transcriptase cDNA / single strand of DNA ; uman) mRNA ; ymerase s, second strand of DNA / double stranded DNA ; nucleotides (in context of backbone formation) ; conservative replication / ref. complementary base pai <i>n enzymes</i> / cut plasmid ; R cuts gene A cuts out gene ic sites / at palindromic sites ; ticky ends ; A blunt ends	ring ; [max 2] [max 2]	1
		sea	ls nic	ks in sugar-phosphate backbone ;		
		forn by a	ns rE addin	DNA; g_phosphate group;	[max 2]] [6 max]
						[Total: 10]
5	(a)	(i)	air s in m form	paces (between cells) / aerenchyma ; esophyll / cortex ; ned by cell death ;		[2 max]
		(ii)	prov for a ref. AVP	rides oxygen ; nerobic respiration / because conditions are anaerobic ; diffusion ; ? ; e.g. allows escape of ethene / buoyancy / active trar	; isport	[2 max]
	(b)	(i)	inter use	node length increases as water depth increases ; of figures ; (2 days) 2 depths + 2 lengths ignore uni	ts	[2]
		(ii)	part acce acce ref. (of plant is (always) above water ; ess to light ; ess to, air / oxygen / carbon dioxide ; pollination / flowering ;		[2 max]
		(iii)	ethe fluct com	ne concentration increases up to 30 or 40 cm water de uation / plateau between 30 or 40 cm to 60 cm water d parison between when water level is constant and whe	epth ; lepth ; en water level incl	reases ; [2]
	(c)	(i)	subs	stance that affects growth / development ;		[1]
		(ii)	1. gi 2. de 3. gi 4. m 5. gi 6. m	bberellin causes increase in stem length ; etail of mechanism ; e.g. cell elongation bberellin has greater effect with ethene present ; ore gibberellin could be secreted as water depth increa bberellin could remain constant but have greater effect ecreted ; ore gibberellin could be transported through plant as w	ases ; t because more e vater depth increa	thene ases ;
			7. A'	VP ;		[3 max]

[Total: 14]

Page 5				Mark Sch	eme		Syllabus	Paper
			GCE	A/AS LEVEL -	May/June 20	07	9700	04
6	(a)	A – <u>geri</u> B – <u>Gra</u>	<u>minal epitheliur</u> afian follicle ;	<u>n</u> ;				[2]
	(b)	(i) <u>prir</u>	<u>nary oocyte</u> ;					[1]
		(ii) lab	el to primary oc	ocyte on Fig. 6.2	• ?			[1]
		(iii) P - Q -	<u>mitosis</u> <u>meiosis</u> ; bc	oth required for n	nark			[1]
	(c)	either indeper homolog on equa so segri in daug AVP ; e or crossing	ident assortme gous / materna ator (of spindle) egate randomly hter cells ; .g. occurs durir g over / chiasm	<u>nt</u> ; l and paternal, c) ; y / any combinat ng metaphase 1 ata ;	hromosomes ion of matern	position th al and pate	emselves either	way up / AW ; les can end up
		betweel genetic leads to AVP ; e	n, <u>chromatids</u> c material on ma new combinat .g. breaking es	of homologous cl aternal and pater ion of <u>alleles</u> ; tablished linkage	nromosomes mal chromoso R genes e groups / oco	/ non-siste omes swap curs during	r <u>chromatids</u> ; places / AW ; prophase 1	[3 max] [Total: 8]
7	(a)	<u>both</u> alle ref. mor phenoty	eles, influence re than 2 phenc /pe of heterozy	phenotype / are otypes possible ; gote different fro	e expressed ; om either horr	iozygote ;		[3]
	(b)	son rec Y chron father w daughte daughte	eives Y chromo nosome does n vill pass haemo er will be, a carr er may pass alle	osome from fathe lot carry haemop philia allele to da rier / heterozygo ele to, her son /	er ; philia allele ; aughter(s) ; us / X ^H X ^h ; his grandson	; accept	t on diagram	[3 max]
	(c)	(i)	(male)	C ^B C ^B X ^a X ^a ;	x (fen	nale) C ^v	′C ^w X ^A Y;	
		(ga	metes)	C ^B X ^a		C ^W X ^A	or C^WY ;	
			(male	C ^B C ^W X ^A X ^a ; e, blue, barred)	(fema	C ^B ale, blue, n	C ^w XªY; on-barred)	
		acc if m if o	cept other symbols ale XY and fer ther symbols u	ools but only with nale XX then ma sed but no key ti	n key ark gametes a hen mark to n	nd offsprir nax 2	ng genotypes to r	nax 2 [5]

Pa	ge 6	Mark Scheme	Syllabus	Paper
		GCE A/AS LEVEL – May/June 2007	9700	04
	(ii) bl <u>te</u> w if if	ue colour is heterozygous / C ^B C ^W ; <u>est cross</u> ; ith non-barred female ; <u>all</u> offspring <u>barred</u> , must be X ^A X ^A / homozygous ; some offspring <u>non-barred</u> , must be X ^A X ^a / heterozygous	;	[3 max] [Total: 14]
8 (a)	1. hun 2. app 3. for l 4. cho 5. nan 6. sele 7. repe 8. incr	nan ; lies selection pressure ; benefit of human ; ose / breed, parents with suitable trait ; ned example (species and characteristic) ; ect offspring ; eat over several generations ; reased allele frequency ;		[4 max]
(b)	(i) 14 2 (1	40 (%) ;; marks for correct answer 4/10 x 100 = 1 mark)		[2]
	(ii) ge re er A'	enetic variation ; f. polygenes ; nvironmental variation ; VP ; e.g. sampling / experimental, error		[2 max]
				[Total: 8]

Section B

- 9 (a) 1. action potential / depolarisation, reaches presynaptic membrane ;
 - 2. calcium (ion) channels open / presynaptic membrane becomes more permeable to Ca^{2+} ;
 - 3. Ca^{2+} flood into presynaptic neurone ; **R** membrane
 - 4. this causes vesicles of (neuro)transmitter to move towards presynaptic membrane ;
 - 5. ref. acetylcholine / ACh;
 - 6. vesicle fuses with presynaptic membrane / exocytosis ;
 - 7. ACh released into synaptic cleft ;
 - 8. ACh diffuses across (cleft);
 - 9. ACh binds to receptor (proteins) / AW ;
 - 10. on postsynaptic membrane ; **R** neurone
 - 11. proteins change shape / channels open ;
 - 12. sodium ions rush into postsynaptic neurone ; R membrane
 - 13. postsynaptic membrane depolarised ;
 - 14. action potential / nerve impulse ;
 - 15. AVP ; e.g. action of acetylcholinesterase

[9 max]

Page 7			Mar	k Schem	e		Svlla	ous	Paper	
<u>ge :</u>		GCI	A/AS LE	/EL – Ma	y/June 20	007	970	04		
16. 17. 18. 20. 21. 22. 23. 24. 25.	ensur recep vesicl ref. ac due to ref. in involv due to AVP;	e one-way tor (protein es only in p daptation ; ased range o interconne hibitory syr red in memo o new syna e.g. summa	transmissio s) only in po presynaptic of actions ; ection of ma apses ; ory / learnin oses being ation / discr	n ; ostsynapt neurone any nerve g ; formed ; imination	tic, membr ; <i>ora</i> e pathways	rane / neur	rone ; or	a	[6 max] [Total:15]	
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. <i>acce</i>	bicon 3-10 J double intern flatter arrang hold p ref. cl (mem interg strom lipids conta strom AVP ;	vex disc ; um diamete e, membra al membra ned or fluid- ged in stacl pigments / r usters of pi brane of gr ranal lamel a / ground / starch gra a contains e.g. variati	r; ne / envelo ne system; filled sacs / samed pigm gments / Av ana) hold A lae; substance; substance; ins; s of Calvin ribosomes/ on in shape	pe ; ' thylakoid nent ; N ; .TP synth cycle ; ' DNA etc betweer	ds ; hase ; ; ; n species				[9 max]	
 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 	closel palisa arrang cylind air sp large cell w large chloro chloro AVP;	y packed ide mesoph ged at right rical cells - aces act surface are alls thin s vacuole p plasts on p number of oplasts can oplasts can	to absorb yll near upp angles to le producing as reservoir a for gas o short diff oushes chlo periphery chloroplasts move within move away	more inc per surface af surface air space r of carbo exchang usion pat to absort to absort s to ma n cells r from hig t for 23, 2	ident light ce of leaf - ce to re es betwee on dioxide le ; hway ; to edge of o light mor ximise ligh towards light h light inte 24 and 25	/ AW ; to maxir duce numl n cells ; ; f cell ; e efficientl nt absorpti- ght ; ensity to only	nize light ir ber of light y ; on ; avoid dam	ntercepti absorbir nage ;	on ; ng walls ; [6 max]	
	ge 7 16. 17. 18. 19. 20. 21. 23. 24. 25. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 20. 21. 25. 24. 25. 26. 27. 26. 27. 26. 27. 27. 28. 29. 20. 21. 25. 24. 25. 26. 27. 26. 27. 27. 26. 27. 27. 27. 27. 27. 27. 27. 27	ge 7 16. ensur 17. recep 18. vesicl 19. ref. ac 20. increat 21. due to 22. ref. in 23. involv 24. due to 25. AVP; 1. bicom 2. 3-10 (3. doubl 4. intern 5. flatter 6. arrang 7. hold p 8. ref. cl 9. (mem 10. interg 11. strom 12. lipids 13. conta 14. strom 15. AVP ; accept on 16. closel 17. palisa 18. arrang 19. cylind 20. air sp 21. large 22. cell w 23. large 24. chlord 25. large 26. chlord 27. chlord 28. AVP ; accept chlord	ge 7 GCE 16. ensure one-way 17. receptor (proteins 18. vesicles only in p 19. ref. adaptation ; 20. increased range 21. due to interconne 22. ref. inhibitory syn 23. involved in memo 24. due to new synap 25. AVP; e.g. summa 1. biconvex disc ; 2. 3-10 µm diamete 3. double, membrare 4. internal membrar 5. flattened or fluid-6. arranged in stack 7. hold pigments / m 8. ref. clusters of pig 9. (membrane of gr. 10. intergranal lamel 11. stroma / ground s 12. lipids / starch gra 13. contains enzyme 14. stroma contains in 15. AVP ; e.g. variati accept on labelled dia 16. closely packed17. palisade mesoph 18. arranged at right 19. cylindrical cells20. air spaces act 21. large surface are 22. cell walls thin s 23. large vacuole p 24. chloroplasts can 28. AVP ;	ge 7 Mar GCE A/AS LEV 16. ensure one-way transmission 17. receptor (proteins) only in prospondition) 18. vesicles only in presynaptic 19. ref. adaptation ; 20. increased range of actions ; 21. due to interconnection of mar 22. ref. inhibitory synapses ; 23. involved in memory / learnin 24. due to new synapses being 25. AVP; e.g. summation / discr 1. biconvex disc ; 2. 3-10 µm diameter ; 3. double, membrane / envelo 4. internal membrane system ; 5. flattened or fluid-filled sacs / 6. arranged in stacks / grana ; 7. hold pigments / named pigm 8. ref. clusters of pigments / AV 9. (membrane of grana) hold A 10. intergranal lamellae ; 11. stroma / ground substance ; 12. lipids / starch grains ; 13. contains enzymes of Calvin 14. stroma contains ribosomes / 15. AVP ; e.g. variation in shape accept on labelled diagram 16. closely packed to absorb 17. palisade mesophyll near upp 18. arranged at right angles to le 19. cylindrical cells producing 20. air spaces act as reservoi 21. large surface area for gas 22. cell walls thin so short diff 23. large vacuole pushes chlo 24. chloroplasts on periphery 25. large number of chloroplasts 26. chloroplasts can move away 28. AVP ; 28. AVP ;	ge 7 Mark Schem GCE A/AS LEVEL – Ma 16. ensure one-way transmission ; 17. receptor (proteins) only in postsynapti 18. vesicles only in presynaptic neurone 19. ref. adaptation ; 20. increased range of actions ; 21. due to interconnection of many nerve 22. ref. inhibitory synapses ; 23. involved in memory / learning ; 24. due to new synapses being formed ; 25. AVP; e.g. summation / discrimination 1. biconvex disc ; 2. 23. involved in memory / learning ; 24. due to new synapses being formed ; 25. AVP; e.g. summation / discrimination 1. biconvex disc ; 2. a-10 µm diameter ; 3. double, membrane / envelope ; 4. internal membrane system ; 5. flattened or fluid-filled sacs / thylakoid 6. arranged in stacks / grana ; 7. hold pigments / named pigment ; 8. ref. clusters of pigments / AW ; 9. 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[Total: 15]