GCE Advanced Level

## MARK SCHEME for the June2005 question paper

## 9700 BIOLOGY

9700/04

Paper 4 (Structured Question A2 Core), maximum raw mark 60

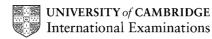
This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. This shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

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*.

• CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the June 2005 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses'.

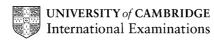


### Grade thresholds taken for Syllabus 9700 (Biology) in the June 2005 examination.

	maximum mark available	minimum mark required for grade:			
		А	В	Е	
Component 4	60	43	37	21	

The threshold (minimum mark) for B is set halfway between those for Grades A and C. The threshold (minimum mark) for D is set halfway between those for Grades C and E. The threshold (minimum mark) for G is set as many marks below the F threshold as the E threshold is above it.

Grade A\* does not exist at the level of an individual component.



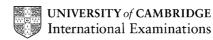
GCE A LEVEL

MARK SCHEME

# MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 9700/04

BIOLOGY Paper 4 (Structured Question A2 Core)



	Page 1	Mark Scheme	Syllabus	Paper	
l		A LEVEL – JUNE 2005	9700	4	
Question					Marks
1 (a)	a nuc	leotide ;			
	with <u>tl</u>	<u>nree</u> phosphate groups ;			
	an or	ganic / nitrogenous base / adenine ;			
	a pen	tose sugar / ribose ;			
	ref. es	ster linkages / covalent bonds ;			3 max
(b)	synth	esized from ADP and $P_i$ ;			
	solub	le molecule ;			
	diffus	es rapidly / transported easily ;			
	on hy	drolysis / removal of (third) phosphate ;			
	energ	y released / 30.5 kJ (mol <sup>-1</sup> ) ;			
	ref.(id	ea) intermediary (between energy yielding and energy req	uiring reaction	ons);	3 max
(c)	oxida	tive phosphorylation ;			
	NADH	$H_2$ to, cristae / inner membrane ;			
	oxidis	ed to NAD ;			
	ref. tra	ansfer of electrons to electron carriers / ETC ;			
	H⁺ pu	mped into intermembrane space ;			
	ref. to	H⁺ gradient ;			
	H⁺ (di	ffuses) through ATP synthase / stalked particle ;			
	result	s in ADP and P <sub>i</sub> to ATP ;			
	ref. cł	nemiosmosis ;			
	ref. sı	ubstrate level phosphorylation ;			4 max

Total: 10

	Pa	ge 2	Mark Scheme	Syllabus	Paper	
			A LEVEL – JUNE 2005	9700	4	
Question						Marks
2 (a)		meta	phase 1 / (late) prophase 1 ; <b>R</b> early / middl	e		1
(b)	1	ref. (h	nomologous chromosomes) pairing / synapsis ;			
	2	ref. to	o chiasma / crossing over ;			
	3	excha	ange of genetic material ;			
	4	betwe	een non-sister chromatids / AW ;			3 max
(c)	1	break	age of linkage groups / ref. new linkage groups ;			
	2	may ł	have different alleles ;			
	3	create				
	4	when	sister chromatids separate ;			2 max
(d)			lea of random orientation at metaphase I and II / ra plogous chromosomes on spindle equator ;	ndom alignment of		
		subse	equently leads to independent assortment ;			
		2 <sup>n</sup> po:	ssible combinations when n is number of chromoso	ome pairs ;		
		ref. to	o chromosome mutation qualified ;			
		extra	detail ;			
		ref. g	ametes haploid (so can fuse) ;			
		rando	om fusion of gametes ; <i>N.B. 3 sets o</i>	f 2/3 marks	т	4 max otal: 10

	Page 3	Mark Scheme	Syllabus	Paper	
		A LEVEL – JUNE 2005	9700	4	
• "					
Question					Marks
3 (a)	idea o	of energy conversion ( linked to receptor) ;			
	Na⁺ ir	n / AW ;			
	depol	larization ;			
	recep	otor / generator potential ;			
	ref. to	o threshold ;			
	(there	efore) action potential / wave of depolarisation ;;			3 max
(b)	(in / fi	rom) CNS / brain / spinal cord ;			
	ref. to	o synapse with intermediate / relay neurone ;			
	ref. to	o neuromuscular junction / (neuro)transmitter released ;			
	ref. re	esponse ;			3 max
(c)	ref. s	synapses ;			
	vesic	les containing transmitter only found on preSM ;			
	recep	otors for transmitter only found on postSM ;			
	ref. to	o refractory period / hyperpolarisation ;			2 max
					Total: 8

	Page 4	Mark Scheme	Syllabus	Paper	
		A LEVEL – JUNE 2005	9700	4	
Question					Marks
4 (a)	<b>A</b> epi	dermal cell ;			
	<b>B</b> gua	ard cell ;			2
(b)	allow	s carbon dioxide into leaf ;			
	as res	st of leaf covered with waxy / waterproof cuticle ;			
	down	concentration gradient / diffuses ; for	either O <sub>2</sub> or	$CO_2$	
	contro	ols water (vapour) loss ;			
	ref. to	o faster diffusion through small pores / edge effect ;			
	oxyge	en out ;			4 max
(c)	ref. to	o chloroplasts ;			
	sausa	age shaped / AW ;			
	joineo	d only at ends ;			
	uneve	enly thickened walls / thick above and below / thin furthest	from the por	e ;	
	ref. va	acuole ;			2 max
					Total: 8

		Page 5	Mark Scheme	Syllabus	Paper	
			A LEVEL – JUNE 2005	9700	4	
Que	estion					Marks
5	(a)	strom	a of chloroplast ;			1
	(b)	comb	ines with <b>(</b> 5C compound) RuBP ;			
		to for	m unstable 6C compound / forms 2 molecules of (3C) GP	į		
		ref. e	nzyme / rubisco ;			2 max
	(c)	reduc	ed NADP and ATP ;			
		(ATP	is) source of energy ;			
		(redu	ced NADP is for) reduction of GP(PGA) to triose phosphate	e (TP) ;		
		ref. u	se of ATP in regeneration of RuBP ;			
		ref. to	source of phosphate / phosphorylation ;			3 max
	(d)	RuBF	P, accumulates / goes up ;			
		due to	o reduced combination with CO <sub>2</sub> / AW ; in either RuBP or	GP, not both		
		GP, g	oes down / not as much being formed ;			
		due to	o conversion to TP ;			3 max
					٦	Fotal: 9

Page 6	Mark Scheme	Syllabus	Paper
	A LEVEL – JUNE 2005	9700	4

#### Question

- - 1 auxin produced in apical bud / AW ;
  - 2 diffuses down stem ;
  - 3 active transport (cell to cell);
  - 4 role of plasmodesmata ;
  - 5 also in phloem ;
  - 6 (auxin) inhibits growth of lateral buds ;
  - 7 plant grows up instead of branching out ;
  - 8 removal of apical bud allows lateral buds to grow ;
  - 9 AVP ; e.g. auxin concentrated in lateral bud / auxin in low amounts in lateral bud
  - 10 AVP ; e.g. correct ref to effect of ABA / cytokinins

### (b) 11 seed absorbs water ;

### 12 by osmosis ;

- 13 gibberellin produced by embryo plant;
- 14 passes to aleurone layer;
- 15 switches on / activation, transcription enzyme genes / AW ;
- 16 storage proteins broken down to amino acids ;
- 17 stimulates synthesis / release of amylase ;
- 18 amylase diffuses / moves into endosperm ;
- 19 breaks down / hydrolyses starch to maltose ;
- 20 maltose to glucose ;
- 21 glucose diffuses / moves into embryo plant ;
- 22 provides source of energy for growth of embryo plant ;

9 max

Total: 15

6 max

[	Ра	ge 7	Mark Scheme	Syllabus	Paper	
Į			A LEVEL – JUNE 2005	9700	4	
Question						Marks
7 (a)	1	ref. co	ontinuous / discontinuous variation ;			
	2	genet	tic / inherited variation ;			
	3	variat	tion in phenotype / characteristics / AW ;			
	4	(can b	be due to) interaction of genotype and environment ;			
	5	e.g. o	f characteristic that influences survival ;			
	6	ref. in	traspecific competition / struggle for existence ;			
	7	those	with favourable characteristics survive / AW ;			
	8	pass	on favourable characteristics to offspring;			
	9	those	with disadvantageous characteristics die ;			6 max
(b)	10	ref. to	definition of species ;			
	11	ref. <u>al</u>	llopatric ;			
	12	geogr	raphical isolation ;			
	13	ref. to	examples e.g. islands / lakes / mountain chains / idea o	of barrier ;		
	14	ref. to	example organism ;			
	15	ref. to	populations prevented from interbreeding ;			
	16	isolate	ed populations subjected to different selection pressures	s / conditions ;		
	17	over t	time sufficient differences to prevent interbreeding ;			
	18	ref. <u>sv</u>	ympatric ;			
	19	ref. to	reproductive isolation ;			
	20	ref. be	ehavioural barriers (within a population) ;			
	21	e.g. d	lay active / night active ;			
	22	correc	ct ref. to gene pool ;			
	23	chang	ge in allele frequencies ;			9 max
					т	otal: 1