UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education O Level

MARK SCHEME for the November 2004 question paper

5090 BIOLOGY

5090/02 Paper 2 (Theory), maximum mark 80

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It 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*.

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NOVEMBER 2004

GCE O Level

MARK SCHEME

MAXIMUM MARK: 80

SYLLABUS/COMPONENT: 5090/02

BIOLOGY Paper 2 (Theory)



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Pa	ae 1	Mark Scheme Sv	llabus	Pape
	<u>j</u> .	O LEVEL – NOVEMBER 2004	5090	2
ecti	on A			
(a) A -	<u>guard</u> cell		;
	В-	<u>epidermis/al</u> cell (R <u>lower</u> epidermis)		;
	C -	phloem/sieve tube (A companion)		; 3
(b) (i)	allows leaf to float AW/(maximum) exposure to light*		;
		(R support unqualified)		
	(ii)	diffusion/movement/collection/source/provides/gives AW + 0	CO_2	
		OR (maximum) exposure to light* (*once only)		
		(Ignore references to oxygen, but \mathbf{R} O ₂ references if they represent the respiration)	fer to	; 2
		(R absorbs/takes in/references gas exchange)		
	(c)	(Ignore references to leaf stalks and to spaces not interconr	ected)	
		stomata/guard cells (mainly) on upper surface AW		;
		(or v.v.)		
		air spaces/chambers + palisade cells (or pos ⁿ described)		;
		chloroplasts/chlorophyll in epidermis (R upper epidermis)		;
		reference cells in clumps v. cells loosely packed AW/ air chambers v. intercellular spaces/ large spaces v. small spaces (R more/fewer spaces)		:
		no cuticle on <u>lower</u> surface		;
		reference quantity of chloroplasts/chlorophyll in spongy cells	3 I	; max. 3
	(d)	less/no + thickening/lignin/xylem/woody (or v.v.)		;
		(R unqualified references to hard/rigid)		
		no need for support/support from water (or v.v.)		; 2
		(A floats on)		

Page 2		Mark Scheme	Syllabus		er
	0	O LEVEL – NOVEMBER 2004	5090	2	
2	(a) large	(r) diameter at low light intensity/or v.v.		;	
	(A big	gger/inversely proportional or description) (R proportior	nal unqualif	ied)	
	faste slowe	st rate of change around 2 - 4 a.u./ est rate of change/levels off at 7 - 10 a.u.		; 2	2
	(b) reflex	<td></td> <td>;</td> <td>1</td>		;	1
	(R sp	inal/conditioned)			
	(c) light :	sensitive/receptor (cells) or named/retina		;	
	neuro	ones/nerve cells or fibres (A <u>optic</u> nerve)		;	
	impu	lses		;	
	<u>contr</u>	action + circular muscles (R if reference ciliary)		;	
	relax	ation + radial muscles (R if reference ciliary)		;	
	corre	ct reference iris		; max. !	5
	(d) no co	plour/pigment in iris/ <u>choroid</u> (R eye)		;	
	perm eye/r	its internal reflection AW of light/too much light enters eceived by retina (A no shading/shielding/protection fo	r retina)	;	
	dama (R da	age to retina/receptors/light-sensitive + cells/visual impa amage to eyes)	airment AW	; ;	3
			Т	otal 1 ⁴	1
3	(a) one o	chromosome shown - in a string (mark the first)		;	
	gene (the a	s matching in shape and sequence (A reversed) appropriate 4 may be selected from a string of more tha	an 4)	;	
	gene (gene	3 not shaded (all others must be uniform black or white a 2 if the chromosome has been reversed)	e)	; ;	3
	(b) (i) m	nutation (ignore reference chromosome)		;	1
	(ii) m	utagen (or named)/reference change in DNA structure		; '	1
	(/ /เ	A any plausible e.g radiation or named (α -/ γ -/X-rays I.v./ <u>sun</u> light/carcinogens/smoking/viruses))/chemicals	;	
	(F	R heat/infra-red/disease)			

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	Page 3	Mark So	Syllabus	Paper				
		O LEVEL – NOV	/EMBER 2004	5090	2			
	(c) (i) <u>l</u> ^A				;			
	<u>l</u> o	<u>l</u> ° (allow in either order)						
	(ii) O		;					
	<u>A</u> (r		;					
	ا ^A (*		; 3					
				Т	otal 10			
4	(a) ecosy	ystem			; 1			
	(A lig	ht/sun)						
	(b) energ	gy entering producer/plant/tre	ee/leaf (A no arrow head)		;			
	(R un	labelled arrow)	(A unlabelled drawings)					
	plant	/tree/leaf →caterpillar → bird	(arrows must be present (and in correct direction))	; 2			
	(R tre	ee → leaf)						
	(c) (i) co	orrect pyramidal shape (A inv	verted pyramid)		;			
	all levels correctly identified with labels (A tree + leaf here)				; 2			
	(t	rs as labels)					
	(ii) be o	ottom or top block smallest a r largest and labelled leaf	nd labelled tree AW		;			
	W Of	orking away from the tree/lea ther two blocks large then sn	af - nall + correctly labelled		; 2			
	(d) block	of fleas/parasites larger that	n and next to birds		;			
	rest c)	; 2					
	(unle	ss (c) (ii) is wrong and (d) is	correct)					
					Total 9			
5	(a) G o	esophagus/gullet			;			
	H st	tomach			;			
	I co	olon/large intestine/large bov	vel		; 3			
	(b) <u>E/ileum</u> (R small intestine)							

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	Pag	je 4	Mark Scheme	Syllabus	Paper		
			O LEVEL – NOVEMBER 2004	5090	2		
	(c)	(i) 2	h(ours)/120 minutes (units required)		; 1		
		(ii) st	omach/ H		; 1		
	(d)	acid r	esistant coat (R in BI context)		;		
		not af	fected by HCI/acid in <u>stomach</u>		;		
		drug alkalir	not released until duodenum/small intestine AW/leav ne environment (A letters)	es stomac	h/meets ;		
	takes longer for water to enter/drug to dissolve membrane slows down speed of drug release						
					max. 3		
	(e)	refere	nce sticks to mucus + in intestine AW (R oesophagus/	stomach)	; 1		
				т	otal 10		
			Total mark fo	or Section	A = 50		
Se	ctio	n B					
6	(a)	correc	ct reference atria(um)/auricle(s)		;		
		correc	ct reference ventricle(s)		;		
		musc	les/muscular + contract(ion) (R pushing/forcing pumpir	ng - in Q.)	;		
		refere	nce thickness of ventricular compared with atrial walls		;		
		atrio-v	ventricular/identified valve(s) (open) + blood passes		;		
		close	+ to prevent return of blood		;		
		tendo	ns/cords/(R heartstrings) + action/function of		;		
		-					

reference aortic valves + their action (**A** close prevent backtflow) ; cycle repeated/idea of co-ordinated action; ;

; max. 7

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	Page 5	Mark Scheme O LEVEL – NOVEMBER 2004	Syllabus 5090	Paper 2					
	(b) right (ventricle) wall thinner/left (ventricle) wall thicker OR reference les more muscle OR weaker/stronger contractions								
	(A :	(A smaller—Larger)							
	(pu	Imonary) shorter distance to travel (A only to the lungs) (or v.v.)	;					
	little	e work to do against gravity (the idea of) (or v.v.)		;					
	avoidance of damage to lung <u>capillaries</u> /low pressure required in lung								
	(body) high pressure for kidney filtration								
	оху	gen/glucose to brain		; max. 3					
			т	otal 10					
7	(a) any	where – one correct reference stomatal movement + e	ffect	;					
		 (ignore references to water vapour) 							
	(i)	dark/no light + no photosynthesis		;					
		(R night)							
		respiration occurring		;					
		*CO ₂ out/released/produced + O ₂ in/absorbed/used		;					
	(ii)	light/day + photosynthesis		;					
		faster than respiration AW		;					
		*O ₂ out/released/produced + CO ₂ in/absorbed/used		;					
		(* accept on <u>annotated</u> equation)		max. J					
	(b) (i)	reference concentration gradients of CO ₂ /O ₂		;					
		CO_2 is a limiting factor/the more CO_2 the faster the P/S		;					
		more or faster CO_2 in + more or faster O_2 out		;					
	(ii)	wilting/cells flaccid AW (R plasmolysis)		;					
		stomata close		;					
		slower exchange of gases (R no exchange)		;					
		slower rate of P/S (R no P/S)		; may 5					
				mux. J					

Total 10

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-	Page 6		Mark Scheme O LEVEL – NOVEMBER 2004	Syllabus 5090	Paper 2
8	Either (a)	) (i)	sperms + ova/eggs [anywhere in (a)]		;
			smaller/larger/correct size reference of either		
			(ova – 120 to 150μm, sperm 60μm with head dia 3μm)	meter 2.5µ	m x ;
			many can be released/sperm is only nucleus + ta	ail	
			OR ovum carries some nutrition/cytoplasm/yolk (	or v.v.)	;
			sperm small enough to enter egg		;
		(ii	) ratio – large numbers : one/few (A lifetime numbe	ers)	;
			(A 1 000 minimum)		
			greater wastage/chance of fertilisation/sperms		
			(A more die) reaching ovum		;
			limited space for embryo/fetus/baby/room only for fetuses/babies	or a few em	bryos/ ;
			fixed number of eggs (ova)/ova present from birth produced continuously	h/sperms	;
		(iii	)sperms have tail/flagellum/swim/motile (R move)		;
			to reach egg/ovum/reference fertilisation + in ovi	duct	;
			( <b>A</b> Fallopian tube)		
			ova experience only passive movement (or desc	ribed)	; max. 8
	(b	) (i)	copulation AW + when no ovum in system/at i time in cycle ( <b>A</b> any time outside 5 days before after)/ [#] withdrawal method explained/*abstinence	nfertile time ovulation to 1	e/stated 7 days ; <b>1</b>
			( <b>R</b> rhythm method unqualified)		
		(ii)	(linked to <b>(i)</b> above, but can score if <b>(i)</b> is left blan	ık)	
			cycle variable or irregular/description of irregular misinterpretation of raised temperature/	ity/miscalcı	ulation/
			[#] some sperms released before ejaculation/		
			*lack of control – (BUT <b>A</b> this IS the safest metho	od)	; 1
			(if they say it)		

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	Page 7		Mark Scheme S	yllabus	Paper 2
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8	OR	(a) (	( <b>i)</b> ( <b>female</b> ) one per <u>ovule</u>		;
			comparatively few ovules/gametes (per plant or flov	ver)	;
			parent must supply space/food for developing seed		;
			( <b>male</b> ) millions/lots of male gametes/pollen (grains)	)	;
			( <b>A</b> 1 000 minimum)		
			great wastage/many may die/pollination is very cha	ncy	;
		(	(ii) female gamete does not move/is attached to ovule/	ovary	;
			already positioned where it will develop AW		;
			male gamete/pollen is moved by <u>named</u> agent		;
			gamete is inside pollen grain		;
			described adaptation of pollen grain for dispersal		;
			to carpel/stigma		;
			then moves within/by growth of the pollen tube	n	; nax. 7
		(b) క	same (properties) as parent/genetically identical AW		;
		c f	only one parent needed/no need for gametes/no agents aster	s needed/	;
		ļ	ess wastage/more certain		;
		C	offspring bound to be in suitable environment AW		;
		۱ د	well-developed before separation from parent/allows (racolonisation	apid) n	; nax. 3

Total 10

Total mark for Section B = 30