

MARK SCHEME for the May/June 2014 series

9700 BIOLOGY

9700/22

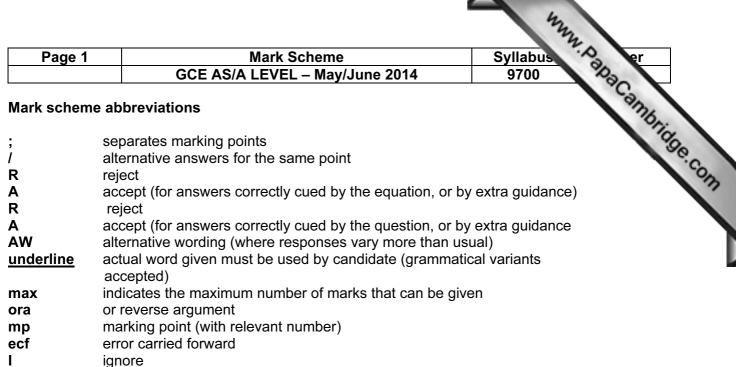
Paper 2 (AS Structured Questions), maximum raw mark 60

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, which would have considered the acceptability of alternative answers.

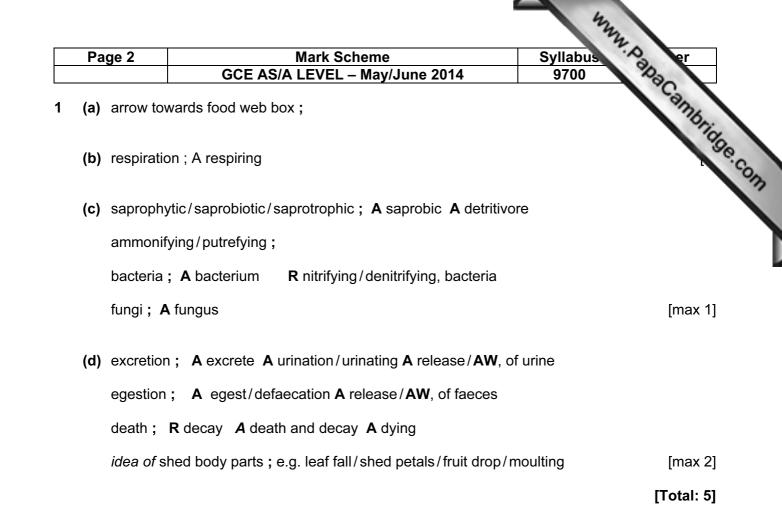
Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

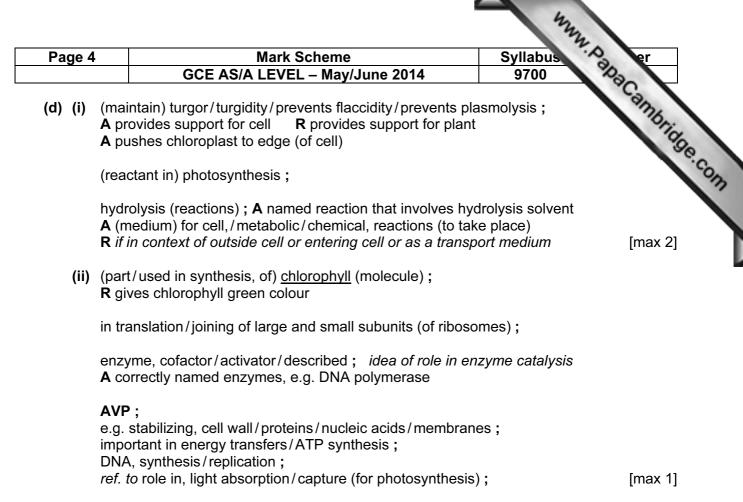
Cambridge is publishing the mark schemes for the May/June 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.



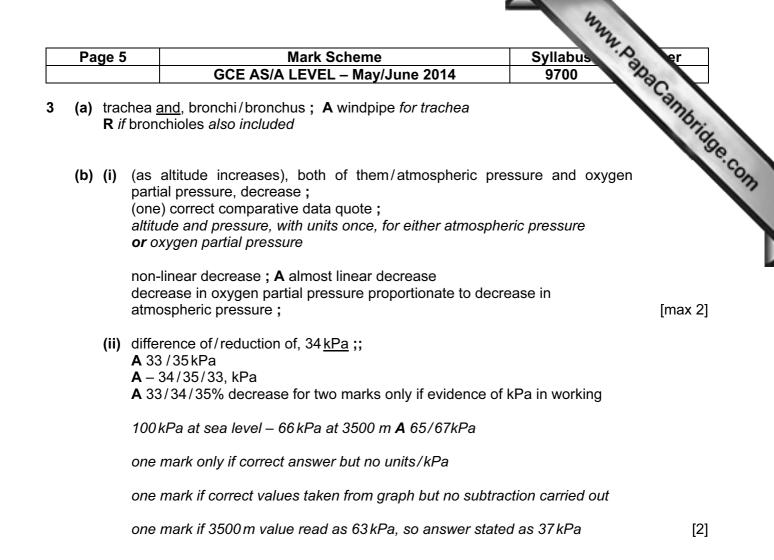
AVP alternative valid point



Page 3 Mark Scheme GCE ASIA LEVEL - May/June 2014 Syllabus 9700 (a) A = nucleus; R nucleolus R nuclear R nuclei B = chloroplast; A chloroplasts C = vacuole; A vacuoles A large/central/AW, vacuole (b) both must be correct microvillus/microvilli centriole/centrioles cilium/cilia flagellum/flagella any two structures for one mark ; A lysosome(s) [1] (c) 1 apoplast = cell wall (and intercellular spaces) (pathway); A between cell walls R if cell wall and, cytoplasm/vacuole/plasmodesmata R if linked to cosmosis/facilitated diffusion/active transport [1] 2 symplast = cytoplasmic (pathway); R if facilitated diffusion/active transport reference to only cytoplasmic/not including vacuoles mps 1 and 2 allow one mark only if no ref. to terms apoplast and symplast e.g.cell wall v cytoplasmic /not including vacuoles 3 osmosis, linked to passage across membranes ; must be in correct context 4 detail of membranes involved ; either tonoplast/vacuolar membrane or cell (surface) membrane of, first cell entered directly from xylem/AW 5 via plasmodesmata ; ignore ref. to mechanism 6 (includes) vacuolar pathway (through) vacuoles ; apoplast 7 non-living pathway ; ora 8 ref. greater volume/higher rate/less resistance/AW ; ora A faster/fastest 9 ref. to, hydrogen bonding/adhesi	Pa	ige 3		Syllabus S	er
 (b) both must be correct microvillus/microvilli centriole/centrioles cilium/filagella (c) 1 apoplast = cell wall (and intercellular spaces) (pathway); A between cell walls R if cell walls R if cell wall and, cytoplasm/vacuole/plasmodesmata R if linked to somosis/facilitated diffusion/active transport 2 symplast = cytoplasmic (pathway); R if facilitated diffusion/active transport 2 symplast = cytoplasmic (pathway); R if facilitated diffusion/active transport 2 symplast = cytoplasmic (pathway); R if facilitated diffusion/active transport 2 symplast = cytoplasmic (pathway); R if facilitated diffusion/active transport 3 osmosis, linked to passage across membranes; must be in correct context 4 detail of membranes involved; either tonoplast/vacuolar membrane or cell (surface) membrane of, 'first cell' entered directly from xylem/AW 5 via plasmodesmata; ignore ref. to mechanism 6 (includes) vacuolar pathway; ora 8 ref. greater volume/higher rate/less resistance/AW; ora A faster/fastest R amount for volume 			GCE AS/A LEVEL – May/June 2014	9700	
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 6 (includes) vacuolar pathway/(through) vacuoles ; <i>apoplast</i> 7 non-living pathway ; ora 8 <i>ref.</i> greater volume/higher rate/less resistance/AW ; ora A faster/fastest R amount <i>for volume</i> 		4			
 apoplast 7 non-living pathway ; ora 8 ref. greater volume / higher rate / less resistance / AW ; ora A faster / fastest R amount for volume 		5	via plasmodesmata; ignore ref. to mechanism		
 7 non-living pathway ; ora 8 ref. greater volume / higher rate / less resistance / AW ; ora A faster / fastest R amount for volume 		6	(includes) vacuolar pathway/(through) vacuoles;		
8 <i>ref.</i> greater volume/higher rate/less resistance/AW ; ora A faster/fastest R amount <i>for volume</i>		_	• •		
A faster/fastest R amount for volume		7	non-living pathway ; ora		
		8	.	a	
9 ref. to, hydrogen bonding/adhesion, to cell walls; [max 4]			A faster/fastest R amount for volume		
		9	<i>ref. to</i> , hydrogen bonding/adhesion, to cell walls ;		[max 4]



[Total: 11]



	ge 6	Mark Scheme Syllabus	er er
		GCE AS/A LEVEL – May/June 2014 9700	Da
(c)	low	er, atmospheric pressure/partial pressure of oxygen so	Camp.
	A b	er partial pressure of/less/ AW , oxygen in, alveolar/inspired/inhaled, air; reathed in <i>for inspired</i> ss oxygen goes into lungs	Papacambride
	dec	reased, diffusion/concentration/pressure, gradient;	
	betv	veen, alveolus/alveoli, and capillary;	
	A le	/AW, oxygen, enters/AW (pulmonary) capillaries/the blood ; ess/AW, oxygen, transported/AW, by, haemoglobin/red blood cells/ blo issues)	od
		percentage saturation of haemoglobin is lower;	
		aemoglobin is less saturated wer molecules of/less, oxygen combine with haemoglobin	
		haemoglobin has lower <u>affinity</u> (for oxygen than at sea level) ; AW ef. to effect of 2,3 DPG	
		w correct explanation in terms of oxygen dissociation curve	
	ora	to insufficient red blood cells to compensate ; e.g. more red blood cells, need to be/will be, produced	[max 4]
(d)	(i)	greater concentration of/(proportionately) more/ AW , red blood ce (through pulmonary capillaries per unit time)/ AW ; A haemoglobin for red blood cells	lls
		increases, the haematocrit/the percentage of red blood cells to the total blood volume/AW;	[max 1]
	(ii)		[max 1]
	(ii)	blood volume/ AW ; more, blood/red blood cells, flowing to lungs (per unit time);	[max 1]
	(ii)	<pre>blood volume/AW; more, blood/red blood cells, flowing to lungs (per unit time); A blood flows faster to lungs to maximise oxygen uptake (from alveoli)/takes in more oxygen/AW</pre>	[max 1
	(ii)	<pre>blood volume/AW; more, blood/red blood cells, flowing to lungs (per unit time); A blood flows faster to lungs to maximise oxygen uptake (from alveoli)/takes in more oxygen/AW /compensates for lack of oxygen; more blood pumped through, systemic circulation (per unit time)/rest of body/to tissues/AW; A blood flows faster for more blood compensates for the lowered plasma volume</pre>	[max 1
	(ii)	<pre>blood volume/AW; more, blood/red blood cells, flowing to lungs (per unit time); A blood flows faster to lungs to maximise oxygen uptake (from alveoli)/takes in more oxygen/AW /compensates for lack of oxygen ; more blood pumped through, systemic circulation (per unit time)/rest of body/to tissues/AW ; A blood flows faster for more blood</pre>	[max 1

Page	e 7	Mark Scheme	Syllabus Syllabus
		GCE AS/A LEVEL – May/June 2014	9700
(e) 1		leotide/base, sequence of, <u>DNA</u> / <u>gene</u> , changed/ AW ; ew allele (formed)	
2	СТС	e substitution (mutation)/(DNA) thymine replaced by ad to CAC/CTT to CAT (template codon) ; cannot be used for mp 1 as well	Syllabus 9700 Pho enine / (DNA is)
3		red / changed, mRNA codon; <i>(allow codons)</i> A idea of a tered genetic code	different mRNA
4	(mR	NA codon is) GAG to GUG/GAA to GUA ;	
5	0	amic acid, substituted/replaced/AW, by valine;A gluta u <i>and</i> val	amate
6		A/anticodon, with different amino acid (to ribosome) ; NA with different anticodon	
7	e.g.a valin	P; amino acid substitution at position 6 ne, hydrophobic/ AW (R-group) amic acid, polar/ AW (R-group)	

[Total: 15]

		1	
Page 8	Mark Scheme	Syllabus	er er
	GCE AS/A LEVEL – May/June 2014	9700	De

(a) 5/6 correct = 3 marks3/4 correct = 2 marks 1/2 correct = 1 mark 4 hint: use green blobs for correct

	GCE AS/A LEVEL	– May/June 2014	9700 23
5/6 correct = 3 hint: use greer	3 marks 3/4 correc a blobs for correct	ot = 2 marks 1/.	9700 2 correct = 1 mark main mode of transmission
infectious disease	name of causative organism(s)	type of causative organism	main mode of transmission
HIV/AIDS	human immunodeficiency virus (HIV)	virus	sexual contact
cholera	Vibrio cholerae	bacterium A bacteria	ingestion of contaminated water and food
tuberculosis	<i>Mycobacterium, tuberculosis</i> or <i>M. bovis</i>	bacterium	aerosol/droplet infection A described A airborne droplets R air droplets alone
measles	<i>Morbillivirus ;</i> A morbillivirus A Morbilivirus A Morbilli	virus	aerosol/droplet, infection
malaria ;	Plasmodium vivax or P. malariae or P. falciparum or P. ovale	protoctist ; A protozoa A protist(a)	feeding/sucking blood/ AW , by <i>Anopheles/</i> mosquito ; A mosquito/ <i>Anopheles</i> , bite A mosquito/ <i>Anopheles</i> , is vector

[max 3]

- (b) responses do not have to be presented as a table or confined to any one column for <u>each</u> numbered mark point, accept point either in left hand column or right hand column
 - A femidom for condom where relevant A prophylactic for condom

		12
Page 9	Mark Scheme	Syllabus "A
	GCE AS/A LEVEL – May/June 2014	9700

mp	factors to consider	recommendations
1	(geographical) availability of condoms	recommendations condoms should be available (in all relevant locations) ; condoms should be stocked in sufficient
2	where available, insufficient stock of condoms	condoms should be stocked in sufficient quantities ;
3	condoms (available but) unaffordable	free/affordable, condoms (should be provided) ; A condoms should be provided
4	low level/no, advertising campaigns for condom use	<i>ref.</i> advertising campaigns for, condom use/safe sex/protective sex;
5	poor condom storage (idea of deterioration)	safe storage of condom supplies (to avoid deterioration);
6	lack of education in, use of condoms/how HIV is spread/other relevant R low level of awareness of HIV/lack of education about HIV	<i>ref.</i> education ; e.g. should use condoms/proper use of condoms A (should practice) safe sex / protective sex
7	low level of (interest in) condom use or, religious/cultural, objections A few people use condoms	<i>ref.</i> changing perception of people to encourage use (of condoms) ;
8	identifiable, high risk/named high risk, groups e.g. sex workers, (male) homosexuals, multiple partners, IV drug abusers <i>(in context of sexual activity)</i>	idea of targeting, high risk/named high risk, groups ; e.g. sex workers, homosexual males, multiple partners, IV drug abusers IV drug abusers <i>(in context of sexual</i> <i>activity)</i>
9	low rate of male circumcision	encourage circumcision procedure/train health personnel;
10	poor treatment of sexually transmitted infections	treatment of sexually transmitted infections (as risk of contracting HIV increases);
11	no/poor/ AW , antiretroviral therapy	<i>ref.</i> antiretroviral therapy reducing risk of sexual transmission ;
12	ref. extent of contact tracing	ref. to contact tracing;

[max 4]

Page 1	0		N	lark Scheme	Sylla	ibus p er	
		GCE	AS/A L	EVEL – May/June 2014	970	00 100	
(c) (i)	correct se mark seq growth DNA repl mitosis cytokines	<i>uentially</i> ication		est stated process as this is a DNA replication growth mitosis cytokinesis	cycle	andridg [1]	eco
(ii)	this may	ha anaw	orod in	one of two ways ora			

;) (i)	correct sequence ; mark sequentially for growth DNA replication mitosis cytokinesis	t stated process as this is a cycle DNA replication growth mitosis cytokinesis

mp	because normally T _h cells so,	without/with fewer, <i>T_h</i> cells
1	release/ AW , cytokine/lymphokine/ interleukin ;	no/less,cytokine/lymphokine/interleukin ased/ AW ;
2	stimulate/ AW , humoral/B-lymphocyte/B- humoral/B-lymphocyte/B-cell, response n	
		R beta-cells
3	(stimulate B-cell response so) antibodies produced ; A secreted/released R if antibodies from T-cells	poor/AW, antibody production/AW ; A no antibodies A secrete/release R if antibodies from T-cells
4	stimulate/ AW , A (result in) angry macrophages A make macrophages more active (in phagocytosis)	macrophages/phagocytes, not stimulated/AW ; A fewer/no, angry macrophages A macrophages less active (in phagocytosis)
5	remain in circulation for second encounter with antigen ; AW	none remain in circulation for second encounter with antigen ; AW

[max 3]

[Total: 11]

		2.
Page 11	Mark Scheme	Syllabus er
	GCE AS/A LEVEL – May/June 2014	9700

- 5 (a) (gives) flexibility / described, e.g. *ref. to*, changing orientation / movement antigen / allows binding when two antigens are apart / allows each antigen binding move independently;
 A (acts as) hinge region
 - (b) (i) antigen binding sites / bind to antigen / both bind to same (type of) antigen ;
 A other terms for binding e.g. attaches to antigen ignore ref. to receptor
 - (ii) binding to phagocyte / monocyte / macrophage / neutrophil / B-lymphocyte / named cell type with Fc receptor;
 A gives class of antibody / determines the class of antibody;
 - (c) secreted

(antibodies need to be) soluble (to function) ; **AW** e.g. needs to be transported in, aqueous / watery plasma

located on surface

(X is region required to) hold / anchor / AW, (antibody), in membrane / phospholipid bilayer;

ref. hydrophobic core / fatty acid tails of phospholipids hydrophobic ;

interaction provides, stability / anchorage / AW ;

ref. hydrophobic region of antibody will have tendency to move back into membrane as repelled by, hydrophilic / watery, exterior solution ; [max 2]

- (d) (i) one / 1;
 - (ii) folding / coiling (to form tertiary structure);

ref. interaction of, side chains / R groups (of amino acids) ; R react

two of ionic / electrovalent, bond hydrogen bond disulfide bonds hydrophobic interaction Van der Waal's (forces) ; *one mark only for any two*

hydrophobic, side chains / R-groups / amino acids, in centre / **AW** ; **A** hydrophobic region faces, towards centre / **AW or** amino acids with hydrophilic R groups face, outwards / watery environment / **AW** ; **A** hydrophilic amino acids *for hydrophilic R groups*

[max 2] [Total: 8]

[1]

[1]

Page 1	12		Mark Scheme	Syllabus	er er
		GCE A	S/A LEVEL – May/June 2014	9700	No.
(a) sm ora			a to volume ratio / SA:V (compared to surface area	ounicellular);	Ann, papacambrida
A :	as organis	ms increase	e in size, surface area to volume ratio	/ SA:V, decrea	ises
	• • •	•	o reach cells / tissues) ; ces diffusion distance <i>(as it takes ma</i> i	terials close to	cells)
A	transport s	ystem decr	w / insufficient / unable to satisfy need eases time to supply cells ostances diffusing	ds / AW ;	
	f. efficient / utrients / h		y (to cells) of, glucose / amino acids /	dissolved food	• 3
Α	<i>idea of</i> gre	ater volume	e (containing required materials) or hig ransport in mammals	gher concentra	tion of materials
			llatory system; <i>must have all three</i> bod transport system / blood vessels		[max 3]
					[]
(b) (i)					
(b) (i)	P = atria	/ atrium / a	uricle, Q = ventricle / ventricles ;		[1]
	P = atria	/ atrium / a			
(ii)	P = atria	/ atrium / a	uricle, Q = ventricle / ventricles ;		
(ii)	P = atria any sequ	/ atrium / a	uricle, Q = ventricle / ventricles ; ters within each row		
(ii)	P = atria any sequ stole	/ atrium / a	uricle, Q = ventricle / ventricles ; ters within each row V Y ;		
(ii)	P = atria any sequ stole astole assimilat A more r	/ atrium / a uence of let	uricle, Q = ventricle / ventricles ; <i>ters within each row</i> V Y ; W X Z ; e, lowers water potential ; ecreases, water potential		[1]
(ii) sys dia	$P = atria$ $any sequesite seques astole asstole assimilat A more r A \Psi for v$	/ atrium / a uence of let	uricle, Q = ventricle / ventricles ; ters within each row V Y ; W X Z ; e, lowers water potential ; ecreases, water potential tial		[1]
(ii) sys dia (c) 1	P = atria any sequ stole astole assimilat A more r A Ψ for v water en (increase	/ atrium / a uence of let ues / sucros negative / d vater poten ters by osn	uricle, Q = ventricle / ventricles ; ters within each row V Y ; W X Z ; e, lowers water potential ; ecreases, water potential tial		[1]
(ii) sys dia (c) 1 2	$P = atria$ $any sequ $ stole $assimilat$ $A more r$ $A \Psi for v$ water en (increase ref. to hy	/ atrium / a uence of let uence of let ues / sucros negative / d vater poten ters by osn ters by osn ed volume)	uricle, Q = ventricle / ventricles ; ters within each row V Y ; W X Z ; e, lowers water potential ; ecreases, water potential tial nosis ; increases hydrostatic pressure ;		[1]
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