OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE **A2 H421**

Advanced Subsidiary GCE **AS H021**

Mark Scheme for the Units

June 2009

H021/H421/MS/R/09

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Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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CONTENTS

Advanced GCE Biology (H421)

Advanced Subsidiary GCE Biology (H021)

MARK SCHEMES FOR THE UNITS

F211 Cells, Exchange and Transport

Question			Expected Answers	Marks	Additional Guidance
1	(a)	(i)	goblet / mucus (secreting) cell ; ciliated (epithelium) ;	2	**DO NOT ACCEPT ‘**globlet**’** **DO NOT ACCEPT ‘**cilia cell’ ‘ciliate’
1	(a)	(ii)	(A / goblet cells) release mucus / AW ; (mucus) traps, dust / particles / named particle ; ciliated cell / B / cilia, wave / waft / move, mucus ; to, top of trachea / back of mouth / AW ;	3 max	**ACCEPT** release / creates / produces / secretes **DO NOT ACCEPT** excrete **ACCEPT** bacteria / microorganisms / pathogens **IGNORE** dirt / germs **DO NOT ACCEPT** ‘combines with’ **ACCEPT** ‘hair like projections’ **DO NOT ACCEPT** ‘hairs’ Idea of up and out of lungs
1	(a)	(iii)	to constrict the bronchus / AW ;	1	example of AW e.g. reduce diameter of bronchus **DO NOT ACCEPT** ‘ref to increasing diameter’ – (note: if ‘increase and decrease diameter’ is used do not allow mark as it is contradiction) **ACCEPT ‘**airways’ **ACCEPT** ‘control flow of air’

Question			Expected Answers	Marks	Additional Guidance
1	(b)	(i)	short, distance / path / AW **;** (so that) diffusion / concentration, gradient is, high / steep **;** high rate of, (gas) exchange / diffusion **;**	**2 max**	**DO NOT ACCEPT** ref to number of cells / cell thickness or short space **DO NOT ACCEPT** short gradient **ACCEPT** high rate of movement of named gas in correct direction **ACCEPT** **'**rapid' / fast / quick **ACCEPT** ref to efficient, gas exchange / diffusion **DO NOT ACCEPT** gas exchange occurs more 'easily'
	(b)	(ii)	recoil / expel air / prevent bursting **;**	**1**	**ACCEPT** exhale more completely / force air out **DO NOT ACCEPT** 'exhale' (if used alone) **DO NOT ACCEPT** 'contract' **DO NOT ACCEPT** 'stretch' on its own **DO NOT ACCEPT** if response includes any ref to bronchus or smooth muscle
			Total	**9**	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	**D** cholesterol **;** **E** protein / glycoprotein / intrinsic protein / protein channel / protein pump / transport protein / carrier protein **;** **F** phospholipid (bilayer) / phospholipid head **;**	3	**ACCEPT** polypeptide chain **DO NOT ACCEPT** amino acid chain **DO NOT ACCEPT** extrinsic protein **DO NOT ACCEPT** lipids / bilayer
2	(a)	(ii)	**D** stabilise the membrane OR maintain / affect / control / AW, fluidity OR reduces permeability to, polar / charged, particles **;** **E** allow communication across membrane OR allow, polar / charged, particles to pass through membrane **;** **F** to act as a barrier (to, polar / charged, particles) / select what enters or leaves cell **;**	3	***mark independently of (a)(i) i.e. NO ecf*** **DO NOT ACCEPT** refs to rigidity / support / strength **ACCEPT** reduces / affects, lateral movement of phospholipids **ACCEPT** cell recognition / receptor site / cell signalling / cell attachment **ACCEPT** (acts as) selectively permeable or partially permeable membrane **ACCEPT** allows small / fat soluble molecules to pass through **DO NOT ACCEPT** separates inside from outside
2	(b)	(i)	communication between cells / AW **;** cell, recognition / identification **;** cells work together / coordination between action of different cells **;** to trigger, response / reaction (inside the cell) **;**	**2 max**	**ACCEPT** example to illustrate the point, e.g. action of hormone / cytokines
2	(b)	(ii)	(receptor) specific shape / described **;** complementary to (shape of), trigger / named trigger / communicating **;** molecule **;** (trigger / AW) binds / attaches to receptor **;**	**2 max**	**ACCEPT** tertiary structure **DO NOT ACCEPT** ref to active site **ACCEPT** fits / idea of lock & key in correct context **DO NOT ACCEPT** 'matches' **DO NOT ALLOW** joins / bonds / links / combines / fits

Question			Expected Answers	Marks	Additional Guidance
2	(c)	(i)	cell surface / plasma, membrane damaged ; pigment, released / leaks out ; pigment, absorbs / takes up, the light ;	2 max	**ACCEPT** description of damage e.g. proteins denatured / phospholipids separate / bilayer melts **DO NOT ACCEPT** bilayer becomes 'more fluid' **DO NOT ACCEPT** 'cell membrane' unqualified **ACCEPT** 'cell contents' for pigment **DO NOT ACCEPT** 'no light transmitted' 'solution is opaque'
2	(c)	(ii)	*Mark first response on each numbered line. Only return to extra points on first or second line if no response in line two or three* more samples at each temperature ; same / fixed, volume of water ; all samples same, size / surface area ; ref to further cutting to increase surface area ; pieces, rinsed / blotted, after cutting ; more (intermediate) temperatures ; same beetroot used / same part of beetroot used ;	3 max	 **ACCEPT** repeats **ACCEPT** collect average / mean results **DO NOT ACCEPT** mass **ACCEPT** any method of cutting to provide larger surface area **ACCEPT** list of figures of additional temps between 0-100 **DO NOT ACCEPT** wider range of temperatures / more evenly spaced temperatures **DO NOT ACCEPT** leave for longer **DO NOT ACCEPT** idea of control
			Total	**15**	

Question			Expected Answers	Marks	Additional Guidance
3	(a)		transpiration ; xylem ; osmosis ; stoma(ta) / stomatal pore ;	4	**DO NOT ACCEPT** 'diffusion' alone **ACCEPT** diffusion with osmosis used as qualification **DO NOT ACCEPT** 'pore' or 'guard cells'
3	(b)	(i)	stomata (open to) allow, gaseous exchange / carbon dioxide in / oxygen out / AW ; (gaseous exchange) for photosynthesis ; (photosynthesis) essential for plant to, gain energy / make sugars ; some water lost through cuticle ;	2 max	look for reverse argument **DO NOT ACCEPT** ref to air OR to get gases OR let gases in **ACCEPT** 'gases in and out'
	(b)	(ii)	xerophyte ;	1	**DO NOT ACCEPT** cactus

Question			Expected Answers	Marks	Additional Guidance
	(b)	(iii)	*Allow the first point **once** as further explanation for A1 – A4 in addition to the linked explanation:* reduce water (vapour) **potential gradient** / **diffusion** gradient **;** **[A 1]** hairy leaves **;** trap **water vapour** / moisture **;** **[A 2] stomata,** in pits / sunken **;** pits trap, **water vapour** / moisture **;** **[A 3]** rolled leaves / presence of **hinge cells ;** reduce **surface area** OR (rolled leaves) trap **water vapour** / moisture **;** **[A 4]** high solute concentration in cells **;** reduces water potential inside leaf cells **;** **[A 5]** thick(er) **cuticle ;** (which is) waterproof / (relatively) **impermeable ;** **[A 6]** small leaves / **needles ;** smaller **surface area ;** **[A 7]** fewer **stomata ;** reduces **diffusion** (of water vapour) **;** **[A 8] stomata** close, during the day **;** reduces **diffusion** (of water vapour) **;** **[A 9]** most **stomata** on lower surface **;** less exposure to sun OR cooler OR reduces diffusion (of water vapour) **;**		***MARK FIRST <u>TWO</u> ADAPTATIONS <u>ONLY</u>*** **ALLOW** max 2 for adaptation [A] marks Explanation must be linked to an appropriate statement of adaptation. Allow an explanation mark even if adaptation mark not awarded. **DO NOT ACCEPT ‘**water’ for ‘water vapour’ throughout **DO NOT ACCEPT** ‘transpiration’ for diffusion of water vapour throughout **DO NOT ACCEPT** surface area to volume ratio **ACCEPT ‘**spines’ **DO NOT ACCEPT** surface area to volume ratio

Question			Expected Answers	Marks	Additional Guidance
			[A 10] more densely packed spongy mesophyll **;** smaller surface area for evaporation (from mesophyll cell surface) **;** 4 max QWC - technical terms used appropriately and spelt correctly **;** 1	**5 max**	Use three terms from: cuticle, impermeable, water vapour, potential gradient, diffuse / diffusion, stoma(ta), needles, surface area, hinge cells, saturated
			Total	**12**	

Question			Expected Answers		Marks	Additional Guidance
4	(a)		prokaryotic	eukaryotic	4	
				as chromosomes / chromatin OR (genetic material) associated with, proteins / histones ;		**DO NOT ACCEPT** chromatid
				(diameter of cell) 20 – 40 μm ;		Figures must have correct units **ACCEPT** any figure(s) in range 10 – 100 μm
			(ribosomes) 18**nm** ;			**ACCEPT** any figure(s) in range 10 – 20 nm **ACCEPT** 70 S
			cell wall (present) ;			**DO NOT ACCEPT** sometimes or usually present
	(b)	(i)	flagellum / cilium / microtubule / microfilament / undulipodium ;		1	**ACCEPT** plurals
4	(b)	(ii)	(*movement <u>inside cells</u> of*) chromosomes / chromatids (in cell division) ; (cytoplasm in) cytokinesis ; organelles / named organelle ; RNA (in protein synthesis) ; proteins ;		2 max	**DO NOT ACCEPT** mitosis / cell division e.g. centriole / vesicle / lysosome / mitochondrion / chloroplast / ribosome ensure that the proteins are being moved in cytoplasm by microtubules rather than by ER or in vesicles (mark given above)
			Total		7	

Question			Expected Answers	Marks	Additional Guidance
5	(a)		Q, T, P, R **;** **;** **;** **;**	4	Allocate marks for the following pairs: S – Q Q – T T – P P - R
5	(b)	(i)	growth of cell / growth of organelles / increase number of organelles / synthesis of proteins **;**	1	**DO NOT ACCEPT ‘**growth’ unqualified **DO NOT ACCEPT** refs to DNA replication **IGNORE** ref. to respiration **ACCEPT** named steps in protein synthesis
5	(b)	(ii)	mutation / faulty DNA produced / error in copying **;** daughter cells will not receive identical genetic information **;** proteins / (daughter) cells, not made / do not function **;**	2	**ACCEPT ‘**daughter cells will not be clones’ **ACCEPT ‘**proteins / daughter cells function differently’
5	(c)		haploid / half genetic information / chromosome number is n **;** genetic information not identical / produces genetically different cells **;** 4 cells produced **;**	2 max	**ACCEPT** use of comparative chromosome numbers as example **DO NOT ACCEPT** identical / not identical without ‘genetic’ **DO NOT ACCEPT** smaller cells
			Total	9	

Question			Expected Answers	Marks	Additional Guidance	
6	(a)	(i)	cardiac ;	1	**ACCEPT** myogenic	
6	(a)	(ii)	(muscle) contraction / systole ;	1	**ACCEPT** atrial or ventricular systole **DO NOT ACCEPT** atrial or systolic pressure	
6	(b)	(i)	*correct answer = two marks* 75 ; ; *if answer incorrect **ALLOW** one mark for correct working* 60 / 0.8	2		
6	(b)	(ii)	pressure in **ventricle** is below (pressure in) **atrium** ; **bicuspid** / **atrioventricular** valve, open(s) ; blood flows into (atrium and) ventricle ; max 3 QWC - technical terms used appropriately and spelt correctly ; 1	4	ORA **ACCEPT** mitral **DO NOT ACCEPT** pushed or pumped **DO NOT ACCEPT** arterioventricular Use three terms in correct biological context from: ventricle / ventricular, atrium / atrial, bicuspid, mitral, atrioventricular, diastole	
			Total	8		

			Paper Total	60		

F212 Molecules, Biodiversity, Food and Health

Question			Expected Answers	Marks	Additional Guidance
1	(a)		double helix ; anti-parallel ; sugar-phosphate ; hydrogen ;	4	
1	(b)	(i)	percentages / amount , C & G similar (in all organisms) ; percentages / amount , A & T similar (in all organisms) ; different / named , organisms have different proportions of , bases / named base / AW ; greatest similarity between human and grasshopper ; least similarity between *E coli* and the other three ; *E. coli* has similar proportions of all bases / *E.coli* has slightly more CG than AT / (named) eukaryote has more AT than CG ; comparative figs with units to support any statement ;	3 max	mp 1 & 2 **DO NOT CREDIT** ref to a single organism mp 1 & 2 **IGNORE** ref to complementary **DO NOT CREDIT** statements in context of organism size e.g. statement that human has more A than *E. coli* / human has the most AT / *E. coli* has the most CG This mark is for a general statement e.g. human C = 19.8 % and G = 19.9 % human A = 30.9 % and *E. coli* A = 24.7 % 'human has more A (30.9%) than wheat (27.3%)' **= 2** (mp 3 & 7)

Question			Expected Answers	Marks	Additional Guidance
1	(b)	(ii)	(suggests) A , bonds / pairs / links / connects / joins , to T ; (suggests) C , bonds / pairs / links / connects / joins , to G ; (suggests) purine bonds to pyrimidine ; (evidence for) complementary base pairing / which bases pair with each other / base pairing rules ; suggests bases point 'inwards' rather than 'outwards' ;	2 max	**IGNORE** A – T or A = T unqualified **IGNORE** C – G or C = G unqualified **ACCEPT** 'bond' instead of 'pair'

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td>(c)</td><td></td><td>Award 1 mark per correct row

<table>
<tr><th>feature</th><th>DNA</th><th>RNA</th><th></th></tr>
<tr><td>number of strands</td><td>two / double</td><td>one / single</td><td>;</td></tr>
<tr><td>bases present</td><td>thymine / T
(+ adenine
+ cytosine
+ guanine)</td><td>uracil / U
(+ adenine
+ cytosine
+ guanine)</td><td>;</td></tr>
<tr><td>sugar present</td><td>deoxyribose</td><td>ribose</td><td>;</td></tr>
</table></td><td>3</td><td>If a choice of answers is given, do not credit unless both answers are valid (e.g. two and double strands for DNA / ribose and pentose sugar)

ACCEPT letters instead of names of bases
Names of bases must be unambiguous, so
DO NOT CREDIT adenosine / thiamine / cysteine / etc.
If more bases mentioned than T and U, then all bases must be included

DO NOT CREDIT dioxyribose / oxyribose/ hexose / sugar
IGNORE pentose</td></tr>
<tr><td>1</td><td>(d)</td><td></td><td>carries / transfers, the (complementary DNA) ,
code / genetic information / copy of gene ;
out of the nucleus ;
(transfers it) to the, ribosome / RER / site of translation ;
for, protein / polypeptide, synthesis ;</td><td>2 max</td><td>IGNORE transcription
DO NOT CREDIT ref to the whole DNA code / molecule

ACCEPT ‘to make protein’</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>14</td><td></td></tr>
</table>

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	<u>*Plasmodium*</u> ;	1	Look for correct spelling of generic name but do not penalise the use of lower case initial letter. We are not looking for specific name(s), so **IGNORE** species name. So e.g. *Plasmodium falciparum* should be credited but **NOT** *P. falciparum* / *P. vivax* / *P. ovale* / *P. malariae*
2	(a)	(ii)	<u>female</u> *Anopheles* ;	1	**CREDIT** phonetic spelling but genus must be correct
2	(a)	(iii)	hepatocyte / liver (cell) ; erythrocyte / red blood (cell) ;	1 max	If a choice of answers is given do not credit unless both are valid. **DO NOT CREDIT** 'RBC' as this is not a name

Question			Expected Answers	Marks	Additional Guidance
2	(b)	1	humoral response ;		
		2	(B) cell / lymphocyte , has antigen receptor / carries antibody on its surface ;		
		3	specific to / matches / complementary to , only one antigen ;		
		4	clonal selection ;		
		5	selection / activation , of , appropriate / specific , B lymphocyte / B cell ;		
		6	by , macrophages / antigen presenting cells / dendritic cells / T helper cells / cytokines / interleukins ;		
		7	clonal expansion ;		
		8	(selected cell) divides by mitosis / clones ;		
		9	(B) cells , differentiate / specialise ;		
		10	(B cells) form , plasma / effector , cells ;		
		11	(which) secrete / produce , antibodies ;		**ACCEPT** 'forms antigen-antibody complex'
		12	antibodies are , specific / complementary , to antigen ;		
		13	(B cells) form memory cells ;		
		14	**Either** (memory cells) long-lived / remain in circulation / remain in body / provide immunological memory **or** (provides) secondary response **or** faster / stronger , response to subsequent exposure (of same antigen / pathogen / parasite) ;	7 max	**DO NOT CREDIT** ref to disease alone
			QWC ~ correct sequence ;	1	Clonal selection, then clonal expansion, then differentiation (stages named or described) Use the QWC tool to indicate these in the correct sequence and add 1 mark to the 7max for content when **all 3** stages have been addressed in the correct sequence.

Question			Expected Answers	Marks	Additional Guidance
2	(c)		*Assume that candidates are answering in terms of a person <u>leaving</u> the malarial area (unless otherwise stated).* no repeat infections / no further exposure (to antigen / pathogen / parasite) ; no booster / lose immunological memory ; limited life for memory cells / numbers of memory cells reduce / memory cells lost ; so no , secondary response / secondary response described ;	2 max	**DO NOT CREDIT** disease / malaria / bacterium / virus ***CREDIT*** *converse points if they answer the question in the context of a person <u>staying</u> in the malarial area.* *e.g. repeat infections ;* *maintain immunological memory ;* *memory cells present ;* *secondary response available ;*

Question			Expected Answers	Marks	Additional Guidance
2	(d)		different , strains / species / types (of *Plasmodium*) ; different antigens ; due to , mutation / variation ; more than one stage in the life cycle (within human) ; different stages have different antigens ; so will need , a different vaccine / components of vaccine , for each , strain / stage ; (parasite) concealed / hidden , in cells ; (parasite) only , exposed / in circulation , for short time ; AVP ;	3 max	**DO NOT CREDIT** 'disease' or 'malaria' unqualified **Max 2** if they think it is a virus / bacterium 'different strains will require different vaccines' **= 2** (mp 1 & 6) **CREDIT** antigenic concealment e.g. antigenic , shift / drift eukaryotes have greater capacity for variation antigens (on parasite) change over time when in human
			Total	**16**	

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	**A** hydrogen ; **B** glycosidic ;	2	**DO NOT CREDIT** 'H bond' as this is not a name Correct spelling only. **IGNORE** α or β or numbers
3	(a)	(ii)	hydrolysis / addition of water ;	1	
3	(a)	(iii)	β / beta , glucose ;	1	Must be qualified as β or beta or B or b
3	(b)		enzymes are specific ; the , carbohydrate molecules / substrates , are different shapes ; active site and substrate are complementary ; so that substrate will fit / formation of ESC ; lock and key / induced fit ;	3 max	

Question			Expected Answers	Marks	Additional Guidance
3	(c)	(i)	pH much , higher / less acidic , than optimum (for enzyme 2) ; change in charge of active site ; hydrogen / ionic , bonds break ; tertiary structure / 3D shape / active site shape , altered ; enzyme / tertiary structure , denatured ; substrate no longer fits active site / ESC does not form ;	3 max	Needs idea of much greater or too high **DO NOT CREDIT** just 'higher than' or 'above' **DO NOT CREDIT** too / more , alkaline **DO NOT CREDIT** peptide / disulphide , bonds break **DO NOT CREDIT** in context of heat / vibration **IGNORE** ref to denaturing active site **IGNORE** ref to denaturing active site **DO NOT CREDIT** kill / die 'substrate doesn't bind to enzyme' is not quite enough
3	(c)	(ii)	*Mark 1st response on each numbered line unless no answer on one line, then mark 1st 2 answers* temperature ; substrate concentration ; enzyme concentration ;	2 max	**IGNORE** ref to time

Question			Expected Answers	Marks	Additional Guidance
3	(d)		***Marking points 2 – 6 can be applied to the standard solutions or the sample***		
		1	using **,** standard / known , concentrations (of reducing sugar) **;**		e.g. serial dilutions
		2	heat with **,** Benedicts (solution) / $CuSO_4$ + NaOH **;**		**ALLOW** boil / > 80^oC **DO NOT CREDIT** warm
		3	(use of) same volumes of solutions (each time) **;**		**DO NOT CREDIT** amount / quantity
		4	(use of) excess Benedicts **;**		
		5	changes to **,** green / yellow / orange / brown / (brick) red **;**		
		6	remove precipitate / obtain filtrate **;**		**CREDIT** description of method e.g. filtering / centrifuging & decanting
		7	calibrate / zero **,** colorimeter **;**		
		8	using **,** a blank / water / unreacted Benedicts **;**		
		9	use (red) filter **;**		
		10	reading of **,** transmission / absorbance **;**		**ACCEPT** 'measure how much light **,** does / does not **,** pass through'
		11	more transmission / less absorbance **,** of filtrate = more sugar present **;** **ora**		If precipitate is **clearly indicated** as being present in sample, **ALLOW** **'**less transmission / more absorbance **,** = more sugar present'
		12	(obtain) calibration curve **;**		
		13	plotting **,** transmission / absorbance **,** against (reducing) sugar concentration **;**		
		14	use reading of unknown sugar solution and read off graph to find conc. **;**	**6 max**	
			Total	**18**	

Question			Expected Answers	Marks	Additional Guidance
4	(a)	(i)	likely to become extinct / on the verge of extinction / numbers are not sustainable / numbers too low for survival of species / numbers drop below 10% of (original) population ;	1	**DO NOT CREDIT** 'may' / 'might' / 'could' become extinct **CREDIT** 'die out' or 'wiped out' instead of extinct
4	(a)	(ii)	133 333 ; ;	2	Award 2 marks for a correct answer, even if no working shown. **ALLOW** 1 mark for seeing 133 333.3333... if answer is incorrectly rounded or not rounded to a whole number. If the answer is incorrect **ALLOW** 1 mark for $\frac{4000 \times 100}{3}$
4	(b)	(i)	painkiller still being used ; *in captivity – allow reverse argument for in the wild* fed uncontaminated food / keep away from painkiller ; health of individuals monitored / treated for disease ; eggs (artificially) incubated / young hand reared ; reduced mortality of young ; provision of mate / females breeding can be manipulated ; protection , from hunting / predation ; competition reduced (between , individuals / species) ;	4 max	**IGNORE** ref to controlling diet or nutrition e.g. hormones / artificial insemination / artificial selection 'safer environment' is not quite enough

Question			Expected Answers	Marks	Additional Guidance
4	(b)	(ii)	maintain / increase **,** genetic variation / gene pool **;** reduce risk of **,** inbreeding / breeding between related birds **;** different 'races' of vulture in different areas / geographical variation / different subspecies **;** less likely **all** contaminated with painkiller **;** less risk of losing all individuals due to **,** disease / natural disaster / human action **;**	**3 max**	In the context of the vultures**,** rather than 'biodiversity' **CREDIT** different alleles **DO NOT CREDIT** different genes **CREDIT ora** for idea of promoting outbreeding **ALLOW** ref to types of (white-backed) vulture
4	(c)		reason **or** explanation **; ; ;** *Suitable examples include but are **not** limited to:* • maintains biodiversity • part of food chain / part of ecosystem / part of food web / scavengers • have a right to existence / moral reason • specific religious reason • give pleasure / beautiful creatures • ecotourism • useful product / source of medicine / medical research • genetic resource • saves clearing up / remove carcasses • prevents disease • keeps **,** rat / dog **,** population down	**3**	**CREDIT any three valid suggestions**. *Ignore the numbers on the answer lines.* *Mark as prose and award points as they arise.* The idea of research must be qualified

Question			Expected Answers	Marks	Additional Guidance
4	(d)		ban / make illegal **,** use of **this** painkiller **;** provide alternative painkillers (that do not have the same ecological impact) **;** no hunting / no killing / legal protection **,** of white-backed vultures **;** protected areas / sanctuary / reserves **;** provide breeding sites **;** prevent habitat destruction **;** monitoring (of vultures) / tagging **;** feeding programme (for released birds) / provide uncontaminated carcasses **;** qualified ref. to education **;** promotion of ecotourism **;** in case the population falls again **,** sperm and egg banks / frozen embryos **;**	**3 max**	e.g. to farmers / local people (on importance of vultures)
			Total	**16**	

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	nucleus / nuclei ;	1	*If more than 1 answer given = 0*
5	(a)	(ii)	*mildew ...* (usually) chitin / not cellulose (cell) , wall ; external digestion / secretes enzymes externally ; heterotrophic / saprophytic / saprotrophic / saprobiont ; no , plastids / chloroplasts / amyloplasts ; spores ; hyphae / mycelium ; multi-nucleate / coenocytic / aseptate ;	2 max	*If 1st statement INCORRECT, max 1* Must be external or outside or equivalent **CREDIT** syncytium / syncytial
5	(a)	(iii)	*pear tree ...* cellulose cell walls ; multicellular ; has , chloroplasts / plastids / chlorophyll / photosynthetic pigment ; (photo)autotrophic / performs photosynthesis ;	2 max	*If 1st statement INCORRECT, max 1* **IGNORE** any references to vacuoles or other organelles 'makes its own food' is not enough
5	(a)	(iv)	Prot**oct**ista / Prot**oct**ist(s) ; Animalia / animal(s) ;	2	**CREDIT** in either order **DO NOT CREDIT** Protista / Protist *look for the **'c'***

Question			Expected Answers	Marks	Additional Guidance
5	(b)	(i)	discontinuous ; single / few , genes ; qualitative ; discrete categories / either low or high resistance / no intermediates ; no / small / little , environmental effects ;	1 2 max	**CREDIT** at any point in the answer **IGNORE** genetic **CREDIT** a description of **discontinuous** variation (to max 2) even if the type of variation given is incorrect. **CREDIT** 'large / only , genetic effect'
5	(b)	(ii)	artificial selection / selective breeding ; cross / breed , Iranian / resistant , wheat with , high yield / UK , wheat ; method to prevent self , pollination / fertilisation ; select , best offspring / offspring with good yield and resistant ; (back) cross to high yield (UK) wheat / interbreed best offspring / interbreed offspring with both characteristics ; idea of breeding (and selecting) for many generations ;	3 max	**IGNORE** country incorrectly linked to characteristic as long as the correct cross has been described e.g. removing anthers / bag stigma

Question			Expected Answers	Marks	Additional Guidance
5	(c)		genetic variation ;		**IGNORE** 'survival of the fittest' as this is not an explanation
			(due to) mutation ;		
			(mutation is) spontaneous / random / pre-existing ;		
			(due to) sexual reproduction ;		
			mildew fungus produces large numbers of , spores / gametes / offspring ;		
			wheat resistance acts as a selection pressure ;		
			(individuals that overcome resistance) have selective advantage / are more likely to survive ;		**CREDIT ora** for those with selective disadvantage
			pass on , mutation / (mutated) allele (to offspring) ;		**ALLOW** gene **DO NOT CREDIT** characteristic / ability
			increase in allele frequency (of allele to overcome resistance) ;		
				4 max	
			Total	**17**	

Question			Expected Answers	Marks	Additional Guidance
6	(a)	(i)	named component of cigarette smoke (correctly linked to a stated problem) ;		e.g. 'tar destroys cilia' = 2 (1 for this mark, linking the component with a stated problem, and also the mark for destroying cilia) **DO NOT CREDIT** tar more than once **IGNORE** nicotine
			*tar, hydrogen cyanide, carbon monoxide (but **NOT** in context of Hb), ammonia, sulphur dioxide* destroy / paralyse , cilia ; mucus not removed ;		
			tar over-active goblet cells / extra mucus produced ; (accumulation of mucus) leads to , infections / bronchitis ;		
			neutrophils / phagocytes / macrophages / monocytes (invade) ; secrete , enzyme / elastase ; elastin / elastic fibres , digested / destroyed ; low(er) level of , elastase inhibitor / α antitrypsinase ; alveoli fail to <u>recoil</u> ; constriction of (terminal) bronchioles ; (so) coughing / forced expiration , causes alveoli to burst ; reduced surface area ;	**5 max**	**ALLOW** white blood cells **DO NOT CREDIT** lymphocytes **CREDIT** formation of scar tissue / fibrosis
			QWC ;	**1**	**Award** if at least 1 mark has been given from each of the mark scheme sections for this question. Use the QWC symbol and add to the content mark(s).

Question			Expected Answers	Marks	Additional Guidance
6	(a)	(ii)	shortness of breath / shallow breathing / strained breathing / hard to breathe out / wheezing ; barrel chest ; fatigue / extreme tiredness / cannot exert themselves ; pulmonary hypertension / high blood pressure to lungs ; enlargement of right side of heart ; heart failure / congestive cardiac failure / fluid buildup in lungs ; cyanosis / skin with blue tinge ;	2 max	**DO NOT CREDIT** difficulty in breathing / heavy breathing / hard to breathe in e.g. cannot walk far **DO NOT CREDIT** heart attack / MI / CHD / COPD **ALLOW** grey / ashen **DO NOT CREDIT** pale unqualified
6	(a)	(iii)	long term / lifelong / persistent ; slow onset / takes time for the symptoms to show ; (usually) degenerative / gets (progressively) worse ;	2 max	**ALLOW** no cure / irreversible **IGNORE** ref to death
6	(b)	(i)	rises in both , initially / until age 15 ; (always) lower in smoker / higher in non smoker ; gap / difference , increases with age ; in non smoker , plateaus / flattens / increase slows , after 17 / at 18 or 19 ; in smoker falls after , 15 / 16 ; in smoker , trough / fall then rise / minimum / anomaly , at 17 ; figs to compare ;	4 max	Two sets of x and y figures with **units for peak flow rate at least once** – **must** compare **either** peak flow of smoker and non-smoker at same stated age **or** peak flow at two different stated ages for same person Could be in the same place or in different parts of the answer

Question			Expected Answers	Marks	Additional Guidance
6	(b)	(ii)	(initial increase as) lungs grow with age ; loss of , elastin / elastic fibres , in alveoli ; reduced / no , recoil ; decreased diameter of / thicker smooth muscle in / scar tissue in / inflammation of / blockage due to mucus of , (named) airways ; increase in resistance to air flow ; suitable explanation for , low / anomalous , reading at 17 ;	2 max	e.g. infection / unreliable (procedure) / asthma **IGNORE** ref to increased smoking
6	(b)	(iii)	more individuals (male) should be used ; replicates / repeat measurements (at one time) ; calculate , mean / average ; identify / deal with , anomalous results ; take measurements at more frequent intervals; controlled variable ;	3 max	e.g. every 6 months Suitable examples include but are **not** limited to *make sure that …* • same number of cigarettes smoked • same type of cigarette • similar level of fitness • similar , build / body size • exclude individuals with other respiratory problems (e.g. asthma / bronchitis) • same exposure to , passive smoking / environmental pollution **DO NOT CREDIT** ref to females / (general) health / occupation unqualified / lifestyle
			Total	**19**	

Grade Thresholds

Advanced GCE (Biology) (H021 H421)
June 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A	B	C	D	E	U
F211	Raw	60	42	37	33	29	25	0
	UMS	90	72	63	54	45	36	0
F212	Raw	100	66	59	52	45	38	0
	UMS	150	120	105	90	75	60	0
F213	Raw	40	33	30	27	25	23	0
	UMS	60	48	42	36	30	24	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
H021	300	240	210	180	150	120	0

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
H021	16.0	30.8	47.4	64.9	80.0	100.0	20698

20698 candidates aggregated this series

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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