

Science

Advanced GCE **A2 7885**

Advanced Subsidiary GCE **AS 3885**

Mark Schemes for the Units

January 2007

3885/7885/MS/R/07J

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

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CONTENTS

Advanced GCE Science (7885)

Advanced Subsidiary GCE Science (3885)

MARK SCHEMES FOR THE UNITS

Unit	Content	Page
2841	Science and the Natural Environment	1
2842	Science and Human Activity	7
2844	Science and Environmental Management	13
*	Grade Thresholds	20

**Mark Scheme 2841
January 2007**

Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT= answers which are not worthy of credit () = words which are not essential to gain credit ___ = (underlining) key words which must be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument	
Question	Expected Answers	Marks
2 (a) (i)	incident light bounced back / absorbed and re-emitted at same frequency off surface;	1
(ii)	pixel ;	1
(b) (i)	vegetation (accept forest)	1
(ii)	dry soil / sand (accept desert(s))	1
(c) (i)	reflects only band C or infra red strongly ; because this senses vegetation ;	2
(ii)	reflects all three bands strongly ; blue + red + green makes white light / white contains all colours ; because (terrain is) soil/sand any 2 of 3 points (ie max 2 marks)	2
(iii)	more white (extent or intensity) ora (no mark if reasoning is incorrect, ie apply 'con')	1
(iv)	red (ignore blue since candidates are given no information about the relative sensitivities of the three sensors)	
	dense vegetation and hence intense colour / band C or infrared very strongly reflected	2
(v)	emergent, canopy, sub-canopy (accept shrub layer, understory, undercanopy), forest floor	
	2 marks if all 4 correct 1 mark if 3 or 2 correct 0 if 1 or 0 correct	2
	Total: 13	

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Question	Expected Answers	Marks
3 (a)	Plants/producers, primary consumers/herbivores, secondary consumers/carnivores – all three named 1 mark Feeding relationships between the three 1 mark Any one point from: energy/nutrient flow biomass / stored energy decreases at each level / energy is lost between each level waste / dead material is decomposed /description of other grazing stage 1 mark	3
(b)	phosphorus / nitrogen / potassium / calcium /phosphate / nitrate	1
(c) (i)	identity - electron / e with -1 symbol origin, any 2 points from, up to a max of 2 marks: from a neutron that changed into proton in nucleus (apply 'con' is answer is based on electron shell or ionization)	3
(ii)	Geiger (Muller) tube / Geiger counter / GM tube / scintillation counter / photographic film ;	1
(iii)	$\frac{1}{4}$ / 25% ; 2 half-life steps are involved, stated or indicated by calculation ;	2
(iv)	26 ; 33 ; 26 ; (no ecf given)	3
(d)	magnetic field ; deflects (ion) beam ; smallest mass numbers have greatest deflection ora	3
Total: 16		

Question	Expected Answers	Marks
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4 (a)	leaf / wood / fruit / flowers / roots / stem / bark (2 points from above list)	2
(b)	diagram to show and label, any 3 of the following for 3 marks: dead plant material at site of fungus / spreading process is from dead plant material spreading process with clear connection is towards dead plant material filaments / hyphae ; network / mycelia ; (any 3 of 4 points for 3 marks)	3
(c) (i)	Any 2 of the following 3 points: plant material contains / is source of nutrients fungi break down plant material by enzyme (digestive fluid) release and reabsorption (any 2 of 3 points for 2 marks)	2
(ii)	grazing (eating by animals) disrupts / destroys (formation of) hyphae / network / filaments	1
(d)	<p>scientific content cycle is disrupted output is increased ; explanation of why output is increased mention of one input eg: weathering / fixation / lightning mention of one output eg: leaching / run off / erosion ; uptake from soil by trees ; return to soil as detritus / plants decompose there is no return if trees are removed ; there is no uptake if trees are felled ; physical removal of nutrients (by removal of trees/plants) negative feedback prevents nutrient build-up in soil ; system kept in / returned to steady state; recolonisation (may) take(s) place Or any other valid (non-repetitive) point. Note that description of a process and an account of its cause (ie 'what' and 'why') are two separate points and should be credited as such.</p>	6
	<p>for QWC - organisation & vocabulary 2 marks A answer is clearly and coherently organised throughout and B appropriate specialist vocabulary is used extensively; 1 mark A answer shows a degree of organisation and B some appropriate use of specialist vocabulary is made; 0 mark A answer is not organised and B appropriate specialist vocabulary is not used;</p>	
	(Candidates must satisfy both strands A and B to gain the marks at a particular level. Otherwise the marks for a lower level should be awarded.)	2
	Total: 16	

**Mark Scheme 2842
January 2007**

Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit () = words which are not essential to gain credit — = (underlining) key words which must be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument	
Question	Expected Answers	Marks
1 (a) (i)	Oxygen; Nitrogen; Argon; <i>Accept correct formulas</i>	3
(ii)	Burning of fossil fuels / <i>accept named use of fossil fuel eg increased car use</i> ; AW Deforestation / burning of trees	1
(b) (i)	Transmits; Emits; Wavelength; Infra-red; Vibrate; Collide;	6
(ii)	Rising sea levels / melting ice; Cause flooding; AW plants are not adapted to higher temperatures; Some species cannot survive; AW causes change in rainfall patterns; Plants / crops / animals die / flooding / droughts; <i>OVP (1st mark for description of climatic effect 2nd mark for environmental implication)</i>	2 TOTAL: 12

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Question	Expected Answers	Marks
2 (a) (i)	Decreases; AW becomes closer to 7	1
(ii)	Populations of plants / algae / plankton change; AW Fish die; AW shells of shellfish dissolve OVP	1
(b) (i)	It has lost / donated / dissociated / ionised An H ⁺ / hydrogen <u>ion</u> (<i>mention of molecule, atom is CON</i>)	2
(ii)	CO ₃ ²⁻ ;	2
(c)	NO ₂ / nitric acid and SO ₂ / sulphuric acid are strong(er) acids; Produce more H ⁺ ions AW gases are more soluble Higher concentration of H ⁺ in rain water AW lakes are not alkaline / do not have calcium carbonate present Nothing to neutralize the acids	2
(d) (i)	Scrubbers on chimneys Catalytic converters Lime lakes	1
(ii)	(No) Nowhere else to dump CO ₂ except in the sea / Too much CO ₂ to dump / catalytic converters do not remove CO ₂ Too much ocean to lime / ecf from answer to (d) (i) eg increased energy efficiency = (yes) reduces total amount of CO ₂ released	1
		TOTAL: 10

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Question	Expected Answers	Marks
3 (a) (I)	Hydrogen <u>atom</u>	1
(ii)	Double (covalent) bond;	1
(iii)	There are three groups / pairs of electrons; groups of <u>electrons / bonds</u> <u>repel</u> to get as far away as possible; AW 120° gives minimum repulsion / are spaced out evenly	2
(b) (i)	Same number of <u>atoms</u> on each side of the equation (=1 mark) Same number of each <u>type</u> of atom (=2 marks) AW quotes numbers of all types of atoms <i>Mention of molecules is CON</i>	2
(ii)	Oxidation	1
(c)	Activation energy (<i>or equivalent statement</i>) may be too high; Catalyst lowers the activation energy;	2
		TOTAL: 9

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Question	Expected Answers	Marks
4 (a) (I)	Made up of many monomers / smaller molecules bonded together;	1
(ii)	Lighter / less likely to corrode / cheaper / transparent / easier to mould / OVP	1
(iii)	Electron;	1
(b) (i)	$R = V / I$	1
(ii)	$4 / 2 \times 10^{-3}$; $2 \times 10^3 / 2,000$ ecf	2
(c) (i)	Decrease the length and increase the cross-sectional area;	1
(ii)	Resistance increases as resistivity increases; Relationship is proportional; AW gives correct relationship $R = l \sigma / A$ (2 marks)	2
(d) (i)	Region of space; In which a magnetic <u>force / torque</u> is experienced;	2
(ii)	(Particle) with an unpaired electron <i>NOT</i> just “unpaired electron”	1
(iii)	When a current is flowing through it	1
		TOTAL: 13

Question	Expected Answers	Marks
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5 (a)	Sugars / carbohydrates / hexoses / monosaccharides	1
(b) (i)	Points plotted accurately; Smooth curve drawn;	2
(ii)	1; 0;	2
(iii)	Substrate must <u>collide</u> with <u>active site</u> of enzyme; More substrate = more frequent collisions / more chance of collision; At high substrate concentrations all active sites are full / enzyme is saturated / enzyme availability is limiting factor;	3
(c)	Different levels of structure – primary secondary and tertiary; Primary = sequence of amino acids; Secondary = small 3D features / sheet and helix; Tertiary = overall 3-D structure Quaternary = joining together of several protein molecules Amino acids linked by peptide links / covalent bonds Weak forces maintain secondary structure / tertiary structure; High temperature breaks (weak) bonds; Tertiary structure / shape is altered; Protein is denatured; QWC: Legibility and grammar 2 marks: A: Text is clearly legible and B: Spelling, punctuation and grammar are accurate throughout 1 mark: A: Text is untidy but can be read without difficulty and B: Spelling, punctuation and grammar shows some mistakes 0 marks: A: text is difficult to read and B: spelling punctuation and grammar show a high proportion of mistakes	6
		2
		TOTAL: 16

**Mark Scheme 2844
January 2007**

Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit () = words which are not essential to gain credit _____ = (underlining) key words which must be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument	
Question 1	Expected Answers	Marks
a (i)	290 x 10 ⁶ tonnes (+/- 30 x 10 ⁶)	1
a (ii)	Asia rice Europe wheat N America maize 1 mark if all correct	1
a (iii)	Allow specific reasons related to any two of: Climate differences; Economic / political/social differences; Technological advancements; Geographical origins of crops;	2
b	Photorespiration in high light intensity; Build up of oxygen; Which competes with carbon dioxide; Makes photosynthesis less efficient; Sorghum has C4 adaptation; allows high rate of p/s Because carbon dioxide moved to different part of leaf; named; So no competition with oxygen; Any 4 of above points	4
c i)	Irrigation; GM; Availability of drought resistant / heat tolerant varieties ;	2
c ii)	Economic Wheat can be sold/exported ; Wheat more desirable/versatile; Varied diet Alternative crop should other fail	2
d	Hybrid <u>vigour</u> ; Produce varieties that are drought resistant; Pest resistant; Herbicide resistant; Bigger yields; More protein; Any other sensible reason;	2
e	Parts of field dry; shady; less nutrients; competition from weeds ; reference to specific soil differences	2
f i)	More fertiliser leads to Increase yield; No increase in effect after 225 kg/ha;	2
f ii)	pollution of waterways;	1
f iii)	After winter rains so less runoff; Maximum growing season so higher take up of N.	2
	Total	21

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Question 2	Expected Answers	Marks
a (i)	Vector / carries gene into cell	1
(ii)	Restriction enzymes; Cut DNA at <u>specific</u> base sequence;	2
(iii)	Gene also cut with restriction enzyme; Sticky ends; Joined with DNA ligase;	2
b	Antibiotic resistance (or other); Allows selection of bacteria which have taken up plasmid;	2
c	Cells infected by bacteria; Some plant cells take up gene; Testing for plants which contain new gene;	2
d	Produce varieties that are drought resistant; Pest resistant; Herbicide resistant; Bigger yields; More protein; increased shelf-life Any other sensible reason;	2
e	Decrease in biodiversity; Plants may be all susceptible to new diseases; Contamination of other crops by cross fertilisation; Possible unknown dangers to health through eating; expensive	1
f	Grow (a certain distance) away from other crops; Prevents (wind/insect) cross pollination;	2
	Total	14

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Question 3		
a	Pollen from a flower on one variety brushed on stigma of second variety; Prevent self pollination by removing anthers; Plant seed and select for plants with desired characteristics; Repeat	3
b (i)	Potatoes produce tubers; Which are swollen roots / tips of rhizomes; Where food is stored; New plants develop from buds on surface NOT “eyes”	3
(ii)	All plants same genotype / no variation so; All susceptible to new diseases	2
c (i)	Gametes / male and female sex cells;	1
(ii)	Meiosis; 1st cell division produces 2 diploid cells as in mitosis; Followed by second cell division; Where chromosomes not replicated; One chromatid from each pair goes in separate cells; Results in 4 cells; May involve crossing over;	1 3 others
d	Dominant gene mask recessive; Phenotype will reveal dominant trait;	1
e (i)	Starchy;	1
(ii)	Suitable diagram; to show all offspring Aa	2
(iii)	Parents both Aa Correct offspring AA, Aa, Aa, aa; Correct phenotype ratios 75% starchy 25% waxy	3
	Total	20

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Question 4	Expected Answers	Marks
a	Polar / charged groups/ions	1
b	Polar/charged groups in components; Attracted to oppositely charged groups in components.	1
c (i)	Capillary / carried by solvent	1
(ii)	Some components highly soluble (in the mobile phase/solvent); Some components highly attracted to the stationary phase; The equilibrium is toward the mobile phase in the highly soluble components (or reverse argument for polar components); Movement of solvent (mobile phase) causes movement of molecules; Components more highly attracted to stationary phase move more slowly;	4
D (i)	Distance moved by component; divided by distance moved by solvent front;	2
(ii)	Distance depends also on temperature/ solvent/ length of time ; So would not be the same in all assays/may be different	2
(iii)	R _f 0.55; R _f the same	2
e(i)	Silicone oil / oily liquid; Inert gas / CO ₂ /helium / Nitrogen	2
(ii)	Keep sample vaporised / temp constant	1
(iii)	More volatile = more rapid/faster	1
	Total	17

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Question	Expected Answers	Marks
5 a	Root cell membranes semi permeable; Water molecules small so can move through semi permeable membrane; Ions etc too big so cannot move through; All molecules moving; Hitting both sides of semi permeable membrane; Water moves in and out of cells; If cell needs water, concentration of ions higher inside cell than outside / Water potential of cell higher inside / concentration of water higher outside; Net movement of water from high concentration of water to low concentration of water / from low to high water potential / from less concentrated solution of ions to less concentrated; So water moves into cell: Pressure of water; Pushes against cell walls ;	7

QWC	<p>organization & vocabulary 2 marks A answer is clearly and coherently organized throughout and B appropriate specialist vocabulary is used extensively;</p> <p>1 mark A answer shows a degree of organization and B some appropriate use of specialist vocabulary is made;</p> <p>0 mark A answer is not organized and B appropriate specialist vocabulary is not used;</p> <p>legibility & grammar 2 marks A text is clearly legible and B spelling, punctuation, grammar are accurate throughout;</p> <p>1 mark A text is untidy but can be read without difficulty and B spelling, punctuation, grammar show some mistakes;</p> <p>0 mark A text is difficult to read; and B spelling, punctuation, grammar show extensive mistakes;</p> <p>(Candidates must satisfy both strands A and B to gain the marks at a particular level. Otherwise the marks for a lower level should be awarded.)</p>	4
b (i)	Reduced transpiration; wilting; close stomata; leaf firing; leaf rolling ie a rapid response	1
b ii)	Longer/deeper roots; small spiny leaves; leaf firing; leaf rolling; waxy cuticle 2 from above	2
C (i)	Too high concentration of; Sodium/chlorine/magnesium/calcium/sulphate ions; (allow one mark for too much salt)	2
C(ii)	Distillation; MED; multi stage flash distillation; reverse osmosis; freeze – melt; or any other method; NOT desalination	2
	Total	18

**Advanced GCE Science 3885/7885
January 2007 Assessment Series**

Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u
2841	Raw	60	46	41	36	31	26	0
	UMS	90	72	63	54	45	36	0
2842	Raw	60	46	41	36	31	26	0
	UMS	90	72	63	54	45	36	0
2844	Raw	90	69	61	53	45	37	0
	UMS	90	72	63	54	45	36	0

Specification Aggregation Results

Overall threshold marks in UMS (i.e. after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
3885	300	240	210	180	150	120	0
7885	600	480	420	360	300	240	0

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

	A	B	C	D	E	U	Total Number of Candidates
3885	0.0	50.0	50.0	83.3	100.0	100.0	6
7885	100.0	100.0	100.0	100.0	100.0	100.0	1

7 candidates aggregated this series

For a description of how UMS marks are calculated see;

http://www.ocr.org.uk/exam_system/understand_ums.html

Statistics are correct at the time of publication

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