

Mark Scheme for June 2010

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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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Question			Expected Answers	Marks	Additional Guidance
1	a	i	May combine best properties of both varieties /avoids inbreeding depression	1	
		ii	(Layout 1) Pollination between two varieties is made easier / bees have less distance to travel between pollinator and fruit-producer	1	
	b	i	7 (12 th -18 th May)	1	
		ii	Affected by temperature /sunlight / rainfall	1	
		iii	$2.2 \times 10^6 \times (5 / 100)$ 110,000	2	ALLOW 220,000 (i.e. taking account of the fact that each pollination may requires 2 visits to flowers
	c	i	$110,000 / 650 =$ (169) days Any answer with working to 2 s.f. e.g. 170	2 1	Ecf from b iii
		ii	Bees may visit same flower twice Bee may visit other orchards Each pollination requires 2 flowers to be visited so number must be doubled	2	Any two
		iii	$169/7 = 24$	1	Ecf from c i
	d		$2 \times 10^4 / 24 = 834$	1	Ecf from c iii
	e		All workers are genetically identical If one bee is affected by disease then all will be	2	
			Total	15	

Question			Expected Answers	Marks	Additional Guidance
2	a	i	The air	1	
		ii	Equilibrium / Forward and backward reactions occur	1	
	b	i	20%	1	
		ii	Decrease the temperature Increase the pressure	2	
		iii	(For e.g. increase the pressure) Equilibrium shifts to reduce pressure Favours side with fewest molecules This is product side	3	
		iv	A: lower temperature: rate will be too slow B: reaction may be unsafe / risk of explosions OR cost of high pressure vessels may be too great / cost of maintaining pressure is too great	2	NOT simply too expensive without justification
	c	i	Carbon dioxide taken in when crops grow Carbon dioxide released when fuels are burnt These amounts are equal	3	
		ii	Fuel must be burnt to produce high T and P Extra fossil fuel results in CO ₂ being released to atmosphere	2	second mark requires some indication of the source of the energy
			Total	15	

Question	Expected Answers	Marks	Additional Guidance
3	Sun emits visible light High frequency (10^{14} Hz) Not absorbed by O_2 and N_2 This is absorbed by Earth Earth heats up to <u>285K</u> Emits infra-red Lower frequency than visible light (10^{13} Hz) Absorbed by C=O bond Which vibrates <u>Wavenumber</u> of 2150 cm^{-1} Thermal energy of CO_2 is then passed onto rest of atmosphere by collision / returned to surface by re-radiation		<p><i>Award this mark if greenhouse effect described in terms of other gases e.g. methane</i></p> <p><i>Award this mark if greenhouse effect described in terms of other gases e.g. methane</i></p>
	Total	10	

Question			Expected Answers	Marks	Additional Guidance
4			Type of radiation used: Thermal infra-red Near infra-red Sound waves Type of remote sensing Passive Passive Active	2	1 mark for 1 or 2 correct
				1	
			Instrumental technique: e.g. Colorimetry Light passed through a solution Amount of light absorbed is measured Absorbance = $\lg I_0/I$ Calibration curve plotted Concentration of coloured pollutants can be deduced	6	
			Total	10	

Question	Expected Answers	Marks	Additional Guidance
5	<p>Evaporation Liquid water turns into vapour Intermolecular bonds are broken e.g. H-bonds High temperature provides energy to break bonds Greater proportion of molecules have sufficient energy to break H-bonds at higher T</p> <p>Acidity Acids donate H⁺ ions Strength of acid depends on fraction of molecules which lose H⁺ ions Dissolved CO₂ forms a weak acid Carbonates are bases so react with acids</p> <p>Rock cycle Sediments in sea settle to bottom Pressure causes rocks to form These are part of oceanic crust /plate Oceanic plates move (apart)</p> <p>Volcanoes Oceanic plates sink beneath continental plate At destructive boundary / subduction zone Because it has a higher density Friction / contact with mantle heats up the rocks Rising molten rock forms volcanoes CO₂ released from hot rock and released as volcanic gases</p> <p>Negative feedback A process which opposes a change Increases temperature increases evaporation So increases rainfall Washes CO₂ out of atmosphere so less greenhouse effect Decreased temperature decreases rainfall</p>	16	

		More CO ₂ remains in atmosphere so more greenhouse effect The process described would operate on a long time-scale		
		QWC: organization & vocabulary 2 marks A answer is clearly and coherently organized throughout and B appropriate specialist vocabulary is used extensively; 1 mark A answer shows a degree of organization and B some appropriate use of specialist vocabulary is made; 0 mark A answer is not organized and B appropriate specialist vocabulary is not used legibility & grammar 2 marks A text is clearly legible and B spelling, punctuation, grammar are accurate throughout; (at least 4 sentences) 1 mark A text is untidy but can be read without difficulty and B spelling, punctuation, grammar show some mistakes; (at least 4 sentences) 0 mark A text is difficult to read; and B sp, punct, gram show a high proportion of mistakes	4	
		Total	20	

Question	Expected Answers	Marks	Additional Guidance
6	<p>Structure of water and properties Draws or describes V-shaped structure with central O atom Bond angle 109° O atoms are more electronegative than H atoms O-H bonds are polarised O is δ-, H is δ- (or shown on diagram) Whole molecule has an overall dipole H atoms form hydrogen bonds to O atoms Charged atoms bond to charged solutes e.g. O bonds to + ions etc.</p> <p>Photosynthesis Sunlight energy is absorbed by chlorophyll Red and blue light absorbed, green reflected Water is split into oxygen And hydrogen atoms / H⁺ ions and electrons ATP also produced Light-dependent stage CO₂ and H atoms combine To produce glucose Form of chemical energy ATP used in this step Light-independent step</p> <p>Energy transport system Water is warmed at the equator Energy transferred towards the poles Transport of energy only possible in fluids Causes climate to be warmer in high latitudes Sub-tropical gyres formed(in tropical latitudes) Affected / caused by wind direction And rotation of the Earth Other currents takes heat into high latitudes / e.g. North Atlantic current Driven by sinking of water off Greenland</p>	17	

Question	Expected Answers	Marks	Additional Guidance
	<p>QWC:</p> <p>organization & vocabulary</p> <p>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</p> <p>2 marks A text is clearly legible and B spelling, punctuation, grammar are accurate throughout; (at least 4 sentences)</p> <p>1 mark A text is untidy but can be read without difficulty and B spelling, punctuation, grammar show some mistakes; (at least 4 sentences)</p> <p>0 mark A text is difficult to read; and B sp, punct, gram show a high proportion of mistakes</p>	4	
	Total	21	

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