OCR
RECOGNISING ACHIEVEMENT

GCE

Science

Advanced Subsidiary GCE

Unit **G642:** Science and Human Activity

Mark Scheme for January 2012

Oxford Cambridge and RSA Examinations

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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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Annotations

Annotation	Meaning
	Unclear
	Benefit of Doubt
	Cross
	Error Carried Forward
	Example Reference
	Ignore
	Not answered question
	Benefit of Doubt not given
	Large Dot
	Reject
	Contradiction
	Error in no. of significant figures
	Tick
	Omission Mark

Question			Answer	Marks	Guidance
1	(a)	(i)	Air rising at equator (arrow shown) Air descending at 30^0N (and / or S) Horizontal air currents shown at top and bottom with directional arrows shown Completes cell	1 1 1	**Cycle must be within troposphere**
		(ii)	Equator: humid, overcast rainy, hot 30^0N: dry, clear, sunny, hot	Any 2	**Need 2 conditions at each location**
	(b)		When air cools particles have less kinetic energy Thus (same mass) occupies a smaller volume Thus air becomes <u>denser</u>	1 1 1	
	(c)		Weather = specific conditions of temp, rainfall etc at a given moment Climate = average conditions over a particular season	1 1	
			Total	**10**	

Question			Answer	Marks	Guidance
2	(a)		A measure of the attractive force of an atom on electron pair In a covalent bond	1 1	
	(b)	(i)	Lone pair labelled	1	
		(ii)	Difference in electronegativity between O and H Results in O end of molecule being negative (H being positive)	1 1	**Lone pairs are at one end of the molecule (1)** **Molecule V shaped so has polarity (1)**
		(iii)	S has lower electronegativity value than O Thus H-S bond is less polar (smaller dipole) Thus intermolecular forces of attraction are weaker Resulting in lower boiling point	1 1 1 1	**Any 3 + 1 for QWC** **Less energy required to break intermolecular bonds (1)**
	(c)		Select Q= mcΔT **and** rearrange to make ΔT subject ΔT= 5.95 Final T = 10 + 5.95 = 15.95 T = 16^0C to 2 s.f.	1 1 1 1	**6^0C gets 2 marks** **16 ^{o}C without working gets all 4** **e.c.f.** **e.c.f.**
			Total	**13**	

Question			Answer	Marks	Guidance
3			Organic Photosynthesis Chemical Combustion Oxygen Acidic 0.04 Infrared Methane	1 1 1 1 1 1 1 1 1	
			Total	**9**	

Question			Answer	Marks	Guidance
4	(a)		Covalent	1	
	(b)	(i)	2,1 and 2	1	**Accept multiples/halves**
		(ii)	(+)4	1	
	(c)	(i)	Acid is a proton donor owtte	1	
		(ii)	Strong acid is completely ionised	1	
	(d)		No more bubbling/fizzing etc	1	
	(e)		Acidic fumes dissolve in water Acidic fumes carried by air currents and fall to ground as rain	1 1	
	(f)	(i)	Heterogeneous is different phase (allow state) from reactants and products Catalyst speeds up a reaction Without being used up	1 1 1	For second mark allow due to lowering E_a / or providing an alternative reaction pathway
		(ii)	Two give it a larger surface area To allow greater frequency of gas/catalyst collisions	1 1	**Uses less catalyst (1) allows air to circulate (1)**
		(iii)	Correctly marks reactants and products Correct profile showing lower hump Activation energy marked	1 1 1	
			Total	**16**	

Question			Answer	Marks	Guidance
5	(a)	(i)	Alpha helix and Beta sheet	1 1	
		(ii)	A biological Catalyst	1 1	Accept description of catalyst
	(b)	(i)	MET-ALA-GLU-GLY-ALA	2	One wrong = 1 more than one =0
		(ii)	(1) The observable Characteristics of an organism (2) Change in amino acid affects shape of protein Eg affects forces holding together secondary/tertiary shape Active site changes so enzyme may not work Non-functioning proteins change organisms characteristics OR Change in amino acid does not change shape of protein So characteristics of organism unchanged	1 1 1 1 1 1 1 1	
			Total	**14**	

Question			Answer	Marks	Guidance
6	(a)	(i)	23km +/- 1 km	1	
		(ii)	Correctly selects AND rearranges c=fλ 240 nm = 2.4 x 10^{-7} m 1.25 x 10^{15} Hz (s^{-1})	1 1 1 1	
		(iii)	A change in a nucleotide base Because uv light breaks bonds (ionises)	1 1	
	(b)		CFCs react with UV light to form radicals Radicals cause O_3 to break down (to O_2 and O) Radicals are regenerated after each cycle Thus one radical can cause many ozone molecules to break down QWC logical sequencing	1 1 1 1	**Subtract QWC if no logical sequencing**
			Total	**11**	

Question			Answer	Marks	Guidance
7	(a)		More reliable, not dependent upon local energy generation	1	
	(b)		Step up transformer raises the voltage So as to minimise energy loss (due to heat dissipation)	1 1	
	(c)	(i)	2000 J or 2 kJ	1	
		(ii)	4 mins = 240 seconds Thus at 2kW total of 2 x 240 = 480 kJ used 480 kJ/ 33000 kJ/kg = 0.014515kg x3 (taking into account 33.3% efficiency) = 0.0436Kg (43.6g)	1 1 1 1	Correct answer = all 4 marks 0.0145kg (14.5g) scores 3 marks e.c.f throughout
		(iii)	Transportation is expensive (it's a solid and cannot be piped to houses)	1	Houses do not have fireplaces (1) coal is dirty (1)
	(d)	(i)	Low current reduces field Three phase transmission cancels field Cables high above ground	Any 2	
		(ii)	Case-control study: People with leukaemia matched with people without leukaemia (control) Data on other variables collected eg close to power lines Weakness retrospective: non randomised limits Cohort study: select individuals based on exposure Should be leukaemia free at start of study Weakness: takes a long time, chance of losing track of individuals costly	 1 1 1 1 1 1	
			Total	**17**	

Question			Answer	Marks	Guidance
8	(a)	(i)	34 and 29, and 36 and 29	1	All needed for 1
	(b)		Nucleus (spontaneously) changes/unstable Emitting radiation	1 1	
	(c)		Radiation can be ionizing/is high energy	1	
	(d)	(i)	X and Y axes correctly labelled using appropriate scale Points correctly plotted Line of best fit is smooth curve	1 1 1	One point wrong = 1 more than 1 = 0
		(ii)	12.5-14 hrs Shows lines indicating half-life on axes	1 1	
	(e)		Identical proton number and electronic structure	1	
			Total	**10**	

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