

# **Mark Scheme for January 2012**

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.














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## Annotations

Annotation	Meaning
	Unclear
	Benefit of Doubt
	Cross
	Error Carried Forward
	Example/Reference
	Ignore
	Not Answered Question
	Large dot
	Reject
	Contradiction
	Error in no. of significant figures
	Tick
	Omission Mark

**12. Subject-specific Marking Instructions**

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
not	= answers which are not worthy of credit
reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant
allow	= answers that can be accepted
( )	= words which are not essential to gain credit
–	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW	= alternative wording
ora	= or reverse argument

Question		Answer	Marks	Guidance	
1	(a)	(i)	Broken down by <u>microbes/bacteria/microorganisms etc</u>	1	Accept any reference to <u>appropriate named type</u> of organism NOT rotting etc alone
		(ii)	Aerobic respiration needs oxygen/air ora	1	Accept: aerobic produces more energy ora alternative products eg lactic acid
		(iii)	methane	1	Accept any correct indication of methane on list
	(iv)	Benefit: could be used as a fuel Problem: could catch fire AW if <u>escapes (into atmosphere)</u> owtte it is a greenhouse gas	2	Accept ecf (within reason) e.g.for CO <sub>2</sub> IGNORE used for photosynthesis etc For problems ACCEPT greenhouse gas if reference to escape into atmosphere ACCEPT toxic if reference to high concentrations / building up in closed system  NOT smells bad (for methane)	
	(v)	Digestion of waste/respiration; produces heat / warming the building	2	ACCEPT any sensible reference to a chemical process occurring in biodigester IGNORE reference to nutrients	
(b)	(i)	<u>Amount / level (owtte)</u> of something / nutrient / element / energy; Remains constant AW input (of something) = output;	2	ACCEPT named nutrient etc IGNORE balanced	
	(ii)	A change occurs ; PLUS up to 3 marks from the following: Gives valid example of factor that changes (e.g. extra <u>named nutrient / factor</u> ) in a reservoir; <b>Explains</b> what has caused the change (e.g. gives possible source of nutrient); System responds to oppose the change / restores balance; Gives correct <b>explanation</b> of how this occurs (e.g. extra growth of trees); Any 3 from 4	1          3	ACCEPT reference to extra / reduced as equivalent to change IGNORE excess / too much /etc  IGNORE references to nutrients etc unless linked to change in some way  Must be linked to opposing change in some way	
(c)	(white) light at the top contains all the wavelengths AND light at the bottom only some AW fewer wavelengths present at bottom AW light at the bottom greener / proportion of green light increases Leaves absorb red & blue/ all colours but green	3	Comparision needed for 1 <sup>st</sup> mark IGNORE comments about intensity of light  credit correct reference to “middle of wavelength range”		

Question		Answer	Marks	Guidance
		Green is <u>reflected/transmitted</u>		
	(d)	Natural rainforest : food chains or webs more varied/no top carnivore /no named trophic level / more different food chains	1	Accept any sensible suggestion implying extra complexity in <b>food chains</b> NOT biodiversity alone ACCEPT smaller
		<b>Total</b>	<b>17</b>	

Question		Answer	Marks	Guidance
2	(a)	Number of (complete) waves (Passing a point) per <u>second</u>	2	Accept correct use of numbers in answer eg $6 \times 10^9$ waves per second IGNORE reference to $c = f\lambda$
	(b)	(i) Ray showing correct direction change Wavefront: parallel lines closer together AND at right angles to ray	2	Ignore reflection Look for all lines to be 7mm or closer ecf from incorrect <b>refracted</b> ray
		(ii) 0.0375 $6 \times 10^9$ x wavelength $2.25 \times 10^8$ (ecf)	3	ACCEPT 2.3 or $2 \times 10^8$ ecf from incorrect conversion to m ( $2.25 \times 10^{10}$ scores 2)
		(iii) (Reflected ray) at correct angle wavefronts the same distance apart as the incident ray	2	Ignore refraction.
	(c)	(Detecting) rain;  Can deduce <b>distance</b> away of the water droplets/rain (from greater reflection) OR <b>intensity</b> of rain/amount of water (from greater reflection)	2	IGNORE clouds  IGNORE reference to forecasting ACCEPT where rain is falling etc (NOT will fall) ACCEPT distance away/density of clouds etc
		<b>Total</b>	<b>11</b>	

Question		Answer	Marks	Guidance
3	(a) (i)	Fertilisers/farm (waste)/sewage / (agricultural) land AW	1	Accept any reasonable suggestion NOT leaching etc without reference to source Reference to other incorrect sources e.g. atmosphere is CON
	(ii)	<u>Eutrophication</u> Increase growth of <u>algae</u> AW <u>algal bloom</u> Block sunlight (plants) Die and <u>decompose</u> <u>Bacteria/microbes</u> (owtte) use up oxygen Fish (etc) die/AW decrease in biodiversity (must be linked to lack of oxygen) any 4	4	NOT just plants  If used the following words should be spelled correctly (1 mark lost if not): Eutrophication Algae / algal Decompose / decomposer / decomposition Biodiversity
	(b)	Interferes with oxygen carrying capacity of the blood/ blue baby syndrome / increases <u>risk</u> of cancer	1	NOT toxic alone without justification IGNORE reference to nitrites
	(c) (i)	nitrogen	1	
	(ii)	To kill any bacteria present/sterilize the water	1	IGNORE purify / clean / reference to algae To remove nitrates is CON
	(d) (i)	Anaerobic/ waterlogged / boggy	1	ALLOW warm NOT hot / high temperature etc IGNORE wet, moist, presence of bacteria, nitrates etc
	(ii)	Wastes fertiliser/ decreases yield / crops won't be healthy	1	NOT just "plants won't grow", or "helps crops to grow"
<b>Total</b>			<b>10</b>	



Question		Answer	Marks	Guidance
4	(a)	<p>Geographical isolation : <u>populations / members of same species</u> owtte that have become separated by (physical) <u>barrier</u> owtte/ gives example of physical barrier</p> <p>Populations unable to interbreed (because of isolation) (beneficial) mutation / variation within population / example of characteristic that varies; Conditions are different (on two sides of the barrier); Populations / species adapt <b>differently</b> / natural selection favours <b>different</b> characteristics; Biodiversity increased / New species (plural) arise;</p> <p>Any 5 from 7</p>	5	<p>NOT just isolation; separation mark requires reference to how they have become separated</p> <p>ALLOW idea that some individuals may possess different characteristics</p> <p>Must be linked to valid explanation of isolation of species and consequent <b>divergent</b> evolution</p>
	(b)	(i)	2	1 mark for 4 organisms in correct sequence (ALLOW reverse order), 1 mark for correct direction of arrows (ALLOW one organism missing)
		(ii)	1	60
		(iii)	2	ACCEPT named energy requiring process e.g. active transport NOT heat alone biosynthesis is CON
	(c)	(i)	2	IGNORE "absorbs heat" ALLOW infra-red  "Black absorbs light" =2 "Black absorbs all colours / wavelengths" = 2
			1	(Energy is) <u>converted</u> owtte to heat which warms up the chameleon
		(ii)	1	<u>Camouflage</u> owtte /doesn't get too hot / has reached a suitable temperature / keeps steady temperature
<b>Total</b>			<b>14</b>	

Question		Answer	Marks	Guidance
5	(a)	Respiration / decomposition / decay combustion deforestation volcanic activity owtte	2	NOT burning QWC: If used, the following words must be spelled correctly: Combustion respiration decomposition deforestation
	(b) (i)	General trend upwards Dips <u>and peaks periodically</u> / every <u>year</u> owtte  Peaks in spring / May / early summer / dips in autumn / Sept / over a period of one year	3	NOT rapid increase ACCEPT increases and decreases every year NOT if reference to just one year ACCEPT falls after May / in summer / rises after autumn / in winter NOT increases in summer ora Accept : correct references to quarters of the year e.g. CO <sub>2</sub> peaks in 2 <sup>nd</sup> quarter.
	(ii)	Increase year on year through burning more fossil fuels  Dip (summer) because more CO <sub>2</sub> is <u>taken in by plants</u> By photosynthesis <b>ora:</b> Rise (in winter) because less CO <sub>2</sub> is <u>taken in by plants</u> By photosynthesis	3	ALLOW increased deforestation OVP NOT global warming / greenhouse effect etc  ALLOW Rise in autumn / winter because more CO <sub>2</sub> is given out By decomposition / burning of fuels for heating ALLOW reference to photosynthesis in context of deforestation
<b>Total</b>			<b>8</b>	

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