OCR
RECOGNISING ACHIEVEMENT

GCSE

Science B

General Certificate of Secondary Education

Unit **B712/01:** Unit 2: Modules B2, C2, P2 (Foundation Tier)

Mark Scheme for January 2013

Oxford Cambridge and RSA Examinations

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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.

For answers marked by levels of response:

a. **Read through the whole answer from start to finish**
b. **Decide the level** that **best fits** the answer - match the quality of the answer to the closest level descriptor
c. **To determine the mark within the level,** consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

d. Use the L1, L2, L3 annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6 mark extended writing questions include:

a. appropriate use of correct scientific terms
b. spelling, punctuation and grammar
c. developing a structured, persuasive argument
d. selecting and using evidence to support an argument
e. considering different sides of a debate in a balanced way
f. logical sequencing.

Annotations

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt **not** given
	error carried forward
	information omitted
	ignore
	reject
	contradiction
	Level 1
	Level 2
	Level 3

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

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

Question			Answer	Marks	Guidance
1	(a)	(i)	caterpillar = 16 (J) (1) maggot = 48 (J) (1)	2	
		(ii)	(just as active as) same (figure) for respiration / both transfer 32J (1) growth **figure**/ growth energy for maggot (much) greater than for caterpillar / 48J is (much) greater than 16J (1)	2	**allow** maggot have less waste (so more available for growth) ORA (1) **allow** ecf as long as supports Tom's statement
	(b)		**any two from:** no legs (1) **but** no jointed legs (2) body not split into 3 section (1) **but** do not have head, thorax and abdomen (2) no wings (1) no antenna(e) (1) no compound eyes (1)	2	assume unqualified answers refer to larvae **ignore** reference to size
	(c)		animal (1) arthropod (1)	2	
			Total	**8**	

Question			Answer	Marks	Guidance
2	(a)		**Level 3 (5–6 marks)** A detailed description of natural selection that covers most of the points **OR** Description of at least one way they have become more streamlined and link it to survival. **AND** At least two stages of natural selection given. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Description of at least one way they have become more streamlined and link it to survival. **OR** At least two stages of natural selection given. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Description of at least one way they have become more streamlined. **OR** Links streamlining to survival. **OR** At least one stage of natural selection given. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C.** **Indicative scientific points about stages of natural selection may include:** • idea of variation within species • some penguins were more streamlined than others • idea of competition • idea of selection / survival of the fittest • idea of passing advantage from one generation to another / inheritance • streamlining is controlled by genes **Indicative scientific points links to survival may include:** • better able to catch food / escape predators / more likely to survive **Indicative scientific points of ways they have become streamline may include:** idea of how they are streamlined e.g. • pointed beak / head • flipper like wings • shorter legs / legs tucked in Use the L1, L2, L3 annotations in scoris. Do not use ticks.

Question			Answer	Marks	Guidance
	(b)		Kevin (1) we can never be sure we have found the earliest fossils (1)	2	if choose either Liz or Paul then no marks **allow** might find older fossils later/not every fossil will ever be found (1) **allow** older fossils may have been destroyed (1) **ignore** don't know how old the fossils are (1)
	(c)		**any three from:** colouration (1) camouflage (1) so hidden from predators (1) **or** eyes on side of head / wide field of view (1) so can see predators approaching (1)	3	max two if only give adaptations with no explanation **allow** insulation / trapped air / fat / feathers / water proofing (1) to keep warm / reduce heat losses (1) **or** rounded body shape / low SA (to vol ratio) (1) to keep warm / reduce heat losses (1) **or** small / sharp / thin beak (1) to catch fish / prey (1) **or** **wings** are small or fin / flipper (like) (1) to steer / move / swim faster(1) **but allow** flipper/fins to help it swim faster / improve swimming (1) **or** webbed feet (1) to swim faster (1) explanation marks can only be awarded if linked to the correct adaptation e.g. legs to swim faster (0)
			Total	**11**	

Question			Answer	Marks	Guidance
3	(a)	(i)	**any two from:** decay / decomposition / decomposing (1) respiration (1) from microbes / bacteria / fungi / animals / plants (1)	2	 **allow** decomposers (1) **allow** (by) humans (1) **allow** animals (breathe it out) / humans (breathe it out) / we (breathe it out) (1) **allow** living things / organisms / named organism (1) **allow** volcanoes (1) **allow** weathering (1) **ignore** combustion / burning **but allow** combustion / burning of wood (1) **ignore** when trees are cut down **ignore** breathing
		(ii)	photosynthesis (1) by plants / trees (1)	2	**allow** absorbed / dissolved by water (1) **allow** forming carbonic acid / carbonate / limestone (1)
	(b)	(i)	(too) unreactive (1)	1	
		(ii)	nitrate(s) / ammonium (1)	1	**allow** correct formulae NO_3^- / NH_4^+ **ignore** ammonia **allow** example of correct formula eg NH_4NO_3
			Total	**6**	

Question			Answer	Marks	Guidance
4	(a)	(i)	potassium (1)	1	**ignore** K
		(ii)	contains all three essential elements / contains potassium, nitrogen and phosphorus (1)	1	**allow** contains NPK **allow** contains more essential elements **allow** contains nitrogen **or** N / phosphorus **or** P (for growth)
	(b)		**advantages** increases crop yield / will solve food shortages / AW (1) **disadvantage** idea of pollution of water by fertilisers / eutrophication (1)	2	 **allow** idea of speeds up growth (1) **allow** grows bigger (1) **ignore** grows better / healthier growth **allow** examples of affect of eutrophication e.g. kills fish / aquatic life (1) **allow** pollutes water (1) **ignore** just 'causes pollution' **one mark for an advantage, one mark for a disadvantage**
	(c)	(i)	sulfuric acid / H_2SO_4 (1)	1	**allow** hydrogen sulfate
		(ii)	add universal indicator / pH paper (1) if colour goes green it is neutral / match colour with neutral colour (1)	2	**allow** add (red and blue) litmus (1) the litmus does not change colour (1) **allow** use a pH meter (1) and it should be pH 7 (1) **allow** check the pH see if it is 7 (1) **mark for colour change must link correctly to indicator used**
			Total	**7**	

Question			Answer	Marks	Guidance
5	(a)		reversible / AW (1)	1	**allow** forms an equilibrium / reaction goes backwards / products make reactants / reaction reverses / reaction goes both ways
	(b)		catalyst has no effect (1) (percentage) yield increases as temperature increases / ora / AW (1) (percentage) yield decreases as pressure increases / ora / AW (1)	3	**USE TICKS AND CROSSES IN THIS QUESTION** **allow** as temperature gets hotter % goes up / AW / ora **ignore** changing the temperature increases the yield **allow** as pressure goes up % goes down / AW / ora **ignore** changing the pressure deceases the yield
	(c)		**any two from:** cost of energy / cost of temperature / cost of pressure / cost of electricity (1) cost of raw materials / cost of starting materials / cost of CH_4 / cost of H_2O (1) wages / salary / workers (1) cost of equipment (1) cost of catalyst / how quickly it can be made (1) cost of maintaining plant (1)	2	**allow** two marks which give a cost and then give some detail about the cost eg cost of wages (1) which can be reduced by automation (1)
			Total	**6**	

Question			Answer	Marks	Guidance
6	(a)		mixture containing a metal (1)	1	**allow** a mixture of metals **not** a compound containing two metals **not** a metal joined / combined to another element
	(b)		**Level 3 (5–6 marks)** Identifies at least one relevant property of chosen metal and explains why it is needed in building carriages. **AND** Makes a choice between aluminium or steel **AND** Explains why either aluminium or steel is more suited for the use. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Identifies at least one relevant property of aluminium or steel and explains why it is needed in building carriages. **OR** Explains why either aluminium or steel is more suited for the use. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Identifies at least one relevant property of aluminium or steel. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science such as repeating the question. Answer not worthy of credit.	6	**This question is targeted at grades up to C.** **Relevant scientific points include:** **Explanations** • low density so less fuel needed / travel faster • does not corrode so lasts longer • malleable so can be easily shaped • strong to protect in a crash **ignore** strong so last a long time **choices for aluminium** • lower density • does not corrode • malleable **choices for steel** • stronger • malleable • cheaper **Properties needed** • low density • does not corrode • malleable • strong **if references to conduction / magnetism is a property needed for making carriages then treat as poor communication** Use the L1, L2, L3 annotations in scoris. Do not use ticks.

Question			Answer	Marks	Guidance
	(c)		**any two from:** saves natural resources / saves a finite resource (1) saves energy (1) reduces litter / reduces disposal problems (1)	2	**ignore** saves money **allow** saves metal / material which is running out / saves mining for new metal (1) **allow** (uses less energy) so less carbon dioxide / greenhouse gasses released (1) **allow** less landfill needed (1)
			Total	**9**	

Question			Answer	Marks	Guidance
7	(a)		$2NaCl + 2H_2O \rightarrow 2NaOH + H_2 + Cl_2$	1	**allow** any correct multiple including fractions **allow** = instead of → **allow** balanced equation on the line or on the original equation. If there is a **contradiction** take the answer on the answer line. **not** & **or** and instead of + **ignore** poor use of case or subscript
	(b)		ammonia (1)	1	**allow** any other way of indicating the answer eg ticking, circling or underlining but answer on the answer line takes precedence
	(c)		household bleach (1)	1	**allow** any other way of indicating the answer eg ticking, circling or underlining but answer on the answer line takes precedence
			Total	**3**	

Question			Answer	Marks	Guidance
8	(a)		direct current (dc) (1)	1	
	(b)		double the size of the panels (1)	1	**allow** make bigger / add more photocells / add more (solar) panels
	(c)		**two marks from:** idea of passive solar heating (1) **traps / absorbs** heat (1) which can be used in the house / to heat water (1) **or** wind turbines (1) generate electricity (1)	2	**allow** idea of solar thermal **ignore** solar panels unless qualified **allow** description of passive solar heating e.g. sunlight / passes through windows and warms rooms (2) e.g. takes in heat from the sun to warm water (2)
			Total	**4**	

Question			Answer	Marks	Guidance
9	(a)		0.375 (2) but if incorrect 300 (1) 800	2	**allow** 0.38 / 0.37 (2) **allow** 38% or 37.5% or 37% (2) 0.375% (1) 37.5 or 38 or 37 (1)
	(b)		power station B is more efficient / ora	1	**allow** B uses same amount coal to produce **more** electrical energy than A **ignore** B uses 800 joules to produce 350 joules
			Total	**4**	

Question			Answer	Marks	Guidance
10	(a)		**Level 3 (5–6 marks)** States, with a reason for each one, how to dispose of all three types of radioactive waste. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** States, with a reason, how to dispose of one type of radioactive waste AND states how to dispose of the other two types of radioactive waste. **OR** States, with a reason for each one, how to dispose of two of the types of radioactive waste. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** States how to dispose any two of the types of radioactive waste. **OR** States, with a reason, how to dispose of one of the types of radioactive waste. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C.** **Relevant scientific points for uranium could include** • store in (steel) drums / sealed in glass / buried deep underground • as only alpha emitted / radiation not very penetrating • long half-life / needs long term storage • very radioactive so may generate heat / need cooling **Relevant scientific points for iodine could include** • store in very thick walled containers / buried deep underground / behind several meters of concrete • as gamma is emitted / radiation is highly penetrating • as it has a short half-life it can be stored on the surface until most of the radiation has decayed • very radioactive so may generate heat / need cooling **Relevant scientific points for mixed waste could include** • can be placed in a land fill since it is not very radioactive • could be stored in very thick walled containers / buried deep underground / behind several meters of concrete • as gamma is emitted / radiation is highly penetrating • (but as it has a) short half-life it can be stored on the surface until most of the radiation has decayed Use the L1, L2, L3 annotations in scoris. Do not use ticks.

Question			Answer	Marks	Guidance
	(b)		**any two from:** use tongs / remote handling / AW (1) use protective clothing / gloves AW (1) limit exposure time / AW (1) storage in lead lined containers (1)	2	**ignore** do not touch **allow** (teacher)keep your distance (1) **ignore** keeping students away **ignore** lab coat **allow** wear an indicator badge (1)
			Total	**8**	

Question			Answer	Marks	Guidance
11	(a)		lamp (1)	1	mark answer on line first **allow** answer ringed, underlined or ticked on diagram if no answer on the answer line **allow** 60W
	(b)		used for a longer length of time (1)	1	**allow** used for 1 hour **allow** used for more time **but not** used more / more times / more often
	(c)		184 (W) (2) but if incorrect 230 x 0.8 (1)	2	
	(d)		toaster has more power / 800 Watts (1)	1	**allow** uses more Watts **ignore** idea that it generates more heat
			Total	**5**	

Question			Answer	Marks	Guidance
12	(a)		they are very hot (1)	1	**allow** nuclear (fusion) reaction **ignore** fission **allow** (balls of) burning gas
	(b)		**ignore** yes or no answer **any two from:** ideas that conditions are hostile to man AW (1) idea it would take too long / AW (1) unable to carry sufficient food / water / oxygen or fuel (1)	2	**ignore** people might die **allow** value for large number of years even if incorrect value e.g. takes 22.5 years (1) **allow** idea cannot get the space ship back / people back alive (because it takes so long) (1)
	(c)		**any two from:** craters (1) dust storms (1) climate change (1) fires / hot rocks (1) species extinction (1)	2	**allow** large holes (1) **allow** drop in Earth's temperature but ignore temperature change **allow** dinosaurs became extinct **allow** killed most living organisms (1) **but not** all living organisms
			Total	**5**	

Question			Answer	Marks	Guidance
13	(a)	(i)	292 – 298 / (ppm)	1	**allow** any answer within this range
		(ii)	**any two from:** idea that rise at **start** / between 140 (000) and 130 (000) (1) idea of overall fall in the **middle** / 130 (000) years and 20 (000) years (1) gradual increase during last 20 (000) years / at the **end** (1)	2	They must make some reference to a specific section of the graph but describing the whole pattern scores 1if no other mark scored e.g. it goes up then down then up (1) but e.g. it goes up then down (0)
		(iii)	**either** as carbon dioxide levels increase so does the Earth's temperature / ora (1) idea that peaks broadly coincide (1) **or** no direct link between Earth's temperature and carbon dioxide levels (1) idea that peaks do not coincide exactly (1)	2	no mark for yes or no on its own **allow** correct use of data from the graphs e.g. both graphs have their highest peaks at about 135 (thousands of years before present day) **allow** as carbon dioxide levels increase so does the change in the Earth's temperature / ora **allow** graphs follow a similar pattern / graphs have similar fluctuations **allow** no exact match between surface temperature but the peaks or troughs broadly coincide (2) **allow** other gases contribute towards global warming

Question			Answer	Marks	Guidance
	(b)	(i)	Botswana and Ghana and Mozambique (1) all are developing countries (1)	2	**If countries incorrect reason must match countries chosen** **allow** they are poor countries / less industry / less fuel burned (1) **allow** LEDC / LED countries (1) **allow** idea of the lowest population AW (1)
		(ii)	5729 x 100 scores (1) 24983	1	**allow** calc of 5721.107 / close value e.g. 24983 x 0.229 (22.9) = 5721.107 (100)
		(iii)	**any two from:** idea that USA uses more than its fair share of resources (1) idea that producing more pollution than they should (1) idea that they have a relatively low population (compared to the emissions) (1) USA should contribute 4.6% of carbon dioxide emissions (1)	2	**allow** small percentage population but large percentage World pollution / carbon dioxide emissions (2)
			Total	**10**	

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