OCR
Oxford Cambridge and RSA

GCSE

Science B

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

General Certificate of Secondary Education

Mark Scheme for June 2017

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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.

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

Annotations used in scoris

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

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	**any two from:** habitat destruction / habitat loss / deforestation (1) hunting (by humans) (1) pollution (1) competition (1) idea of not enough food / famine (1) disease (1)	2	**ignore** climate change / global warming / weather changes **ignore** environment damage / homes damaged **allow** poaching (1) **allow** reasons for hunting e.g. (killed) for fur (1) **allow** idea of a **new** (species of) predator (1) **but ignore** just 'hunted by animals or predators' / just more of the same predator **allow** examples of pollution e.g. litter / oil spills / pesticides (1) **allow** less prey / no food (1) **allow** no water / drought (1)**ignore** illness **allow** idea that there are fewer mates (for breeding) (1) **but ignore** just 'don't reproduce' / don't breed / unbalanced breeding **ignore** natural disasters / cannot adapt to change
b i	recycled / used again (by other organisms) (1)	1	**allow** put back or absorbed into the earth or ground or soil or atmosphere (1) **allow** used by plants (1) **allow** idea it fertilises soil (1)**ignore** eaten by other organisms **ignore** decompose / decay /rot **ignore** turned into nutrients **ignore** processes such as nitrification

b ii	**algae** ☐ **bacteria** ☑ **fungi** ☑ **protozoa** ☐ **viruses** ☐ (1)	**1**	**both ticks need to be correct for mark** **more than two ticks zero**
b iii	**Any one from:** idea that the (gum) **trees** can (re-)grow quick**er** or quick**ly** (1) **other** trees or plants have to wait for buds to form (1)	**1**	 **allow more** (gum) trees grow **/ less** other plants or other trees grow (1) **allow** buds give (gum) trees a head start over other plants (1) **allow** idea of **less** competition (for space / minerals) (1) **ignore** compete more **ignore** just 'they grow quicker' or **buds** grow quicker **but allow** they grow quicker than other plants or other trees (1) **allow** other trees or plants may be destroyed completely (1) **allow** other tress or plants (may) need to wait for seeds to grow (1) **allow** buds protected by **soil** or **earth** (1) **ignore** buds above the soil get damaged by fire **ignore** buds are protected below ground **ignore** buds survive the fire / trees more likely to survive
	Total	**5**	

Question	Answer	Marks	Guidance
2 a	(Ben) (no credit) idea that trees are renewable / (can be replanted) so can be sustainably developed / forests are replaced so environment not harmed (1) idea that coal is non-renewable or finite / coal cannot be sustainably developed (1)	2	If Hollie then 0 for question **allow** trees are sustainable (1) **allow** burning trees is carbon neutral (1) **ignore** trees are replanted **allow** coal is not sustainable (1) **allow** coal takes thousands or millions of years to form (1) **allow** coal can't be replaced (1) **allow** burning coal produces sulfur dioxide (1) **allow** coal will run out (1) **ignore** coal is limited **ignore** coal is a fossil fuel **ignore** comments about pollution, acid rain and global warming
b	idea of less mining (1) idea of less pollution (1)	2	**allow** idea that there are less minerals lost (as waste) (1) **allow** saves (valuable) resources (1) **ignore** recycles the metal or mineral **allow** no pollution (1) **allow** idea of preserving habitats (1) **allow idea of** less damage (to the environment or habitat) (1) **allow** idea of less landfill / less (industrial) waste (1) **but allow** idea of less mining so less damage (to the environment or habitat) (2) **ignore** mining causes pollution **ignore** any reference to microbes
c i	50 (%) (1)	1	

c ii	**any two from:** idea that **at the start** (of the 5 year period) actual numbers of tuna caught are increasing (1) catch size is (always) higher than the quota / ora (1) idea that (reducing the quota) brings the catch size down **at the end** or when the quota is small (1)	2	 **allow** demand or estimate is (always) higher than the quota / ora (1) **allow** catch size has started to come down (1) **ignore** from 2005 and 2009 the catch decreases

Question	Answer	Marks	Guidance
3 a i	**any two from:** (animal) cells do **not** have a cell wall (1) multicellular (1) feed / nutrition (on other organisms) (1)	2	**Each plant characteristic listed negates one mark e.g. photosynthesis / light** **allow** (need) food / to eat (1) **ignore** hunting / prey / predators **but allow** (hunt for) food (1) **ignore** characteristics of animals groups e.g. fur / feathers **ignore** breathe **allow** two marks from the other characteristic of living things (movement / respiration / sensitivity / growth / reproduction / excretion) so respiration and reproduction = 2 marks
a ii	insects (1)	1	**If answer line is blank allow** answer ticked ringed or underlined answer line takes precedence

Question	Answer	Marks	Guidance
b	**[Level 3]** **Correctly matches all three flowers to each animal with a valid reason for each** **AND** **makes a relevant comment about relationship** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Correctly matches all three flowers to each animal and** **correctly matches at least one flower to animal with a valid reason.** **OR** **Correctly matches all three flowers to each animal and makes a relevant comment about relationship.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Correctly matches at least one flower to animal** **OR** **makes a relevant comment about relationship.** Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C.** **Indicative scientific points that may be include:** **Relationship** i. both flowers and animal benefit from the relationship ii. relationship is called mutualism **Matching A to hummingbird reasons** iii. long tube petals / nectary at base iv. no scent to attract bee or butterfly / no scent and idea that humming bird has no sense of smell v. red seen by hummingbird / red **not** seen by bee or butterfly **Matching B to bee reasons** vi. has scent to attract bee / bee can smell flower vii. blue so can be seen by bee viii. flat petal / nectary near surface **Matching C to butterfly reasons** ix. has scent to attract butterfly / butterfly can smell flower x. long tube petals / nectary at base **Correct matches:** xi. **A** is hummingbird xii. **B** is bee xiii. **C** is butterfly **Look for answers near tables but answer lines take precedence** **Use the L1, L2, L3 annotations in RM. Do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
4 a	**any two from:** Soay has horns / modern does not have horns (1) they are different colours / examples of how they are different colours (1) Soay has thin wool/fleece/fur/hair / modern has thick wool/fleece/fur/hair (1) Soay has (visible) tail / modern does **not** have a (visible tail) (1) Soay has long legs / modern short legs (1) Soay has long necks / modern short necks (1) Soay does **not** have (visible) ears / modern has (visible) ears (1) Soay does **not** have (visible) ears / modern has (visible) ears (1)	**2**	**assume unqualified answers refer to the Soay sheep** **allow** Soay has antlers / modern does not have antlers (1) **allow** Soay is darker (1) **allow** modern sheep are woolly / Soay sheep have less wool/fleece/fur/hair (1)
b	**any two from:** overall increase in population (between 1985 and 2010) (1) idea that it rises and falls (over time) (1) any mention of high or low point with data (1) **BUT** rise and fall results in an overall increase (2)	2	**allow** population gets bigger (between 1985 and 2010) (1) **allow** it is fluctuating (1) e.g. highest in 2009 / lowest in 1986 / lowest in 1989 / in 1985 there was 1250 (1) **allow** population rises more than it falls (2)

			allow high level answers for extra marking point population is **cyclical** (1)
	Total	**4**	

Question	Answer	Marks	Guidance
5 a	7 (1)	1	
b	3 (1)	1	
c	ionic (1)	1	**allow** electrovalent (1) **allow** metallic (1) **ignore** ion bonding / metal bonding / double bonds / single bonds
d	use **universal** indicator (1) **match** colour with a pH / chart (1)	2	**allow** pH paper **ignore** pH meter / pH probe / pH scale **not** litmus paper / single phase indicator / incorrect reagents **allow** correct link between a colour and a pH value e.g. if green pH is 7 (1) **ignore** just 'look for colour' / just match colour **allow** this mark if no indicator is named **but do not** award this mark if the name of the indicator is incorrect
e	hydrogen / hydrogen ions / H^+ (1)	1	**not** H /H_2
	Total	**6**	

Question	Answer	Marks	Guidance
6 a	yes or partially supports (no marks)	2	**If no then 0 for question**
	contains any two of the **essential** elements (nitrogen, phosphorus, potassium) (1) **but** contains all three **essential** elements (2)		**allow** contains **two** of the named essential elements from nitrogen, phosphorus and potassium (1) **IF OXYGEN mentioned then** **allow** it contains more of two named essential elements e.g. contains less oxygen but more nitrogen and phosphorus (1) **allow** contains nitrogen, phosphorus and potassium (2) **IF OXYGEN mentioned then** **allow** contains **high** levels nitrogen, phosphorus and potassium but **low** levels of oxygen (2) **ignore** any data quoted unless qualified if no other marks awarded award one mark for 'it contains all (three) **elements**' (1) **ignore** just 'has everything in it'
b	ammonia used to make fertilisers / ammonia is a fertiliser (1) (fertilisers) increase **crop** yield (1)	2	**allow** idea that ammonia provides nitrogen or nitrates to the soil / nitrogen is needed to make plant protein (1) **allow** fertilisers contain ammonia (1) **ignore** crops grow better / makes plants grow **allow** to grow more **crops** (1) **allow** to grow bigger **crops** (1) **allow** to grow **crops** faster (1)
	Total	**4**	

Question	Answer	Marks	Guidance
7	**Level 3** **Names and describes the three layers of the Earth in detail** **AND** **gives one explanation why it is not easy to study the structure of the Earth.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **Level 2** **Names the three layers of the Earth** **AND** **describes at least one layer of the Earth** **AND** **gives one explanations why it is not easy to study the structure of the Earth.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **Level 1** **Describes one layer of the Earth** **OR** **names the three layers of the Earth** **OR** **gives one explanation why it is not easy to study the structure of the Earth.** Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0marks)	6	**This question is targeted at grades up to C.** **Indicative scientific points may include:** **Names** • crust • mantle • core / inner core / outer core **Description of layers** **crust** • crust is the outer layer / labelled on diagram • crust made of sedimentary, igneous and metamorphic rock • crust made up of (tectonic) plates • consists of continental and oceanic **mantle** • mantle between crust and core / labelled on diagram • mantle contains (some molten) magma **crust/mantle** • crust and **outer** mantle is called the lithosphere **core** • core is the centre layer / labelled on diagram • core contains iron • core is the hottest part • outer core is liquid / inner core solid **Explanation** • crust is too thick to drill through / distances are too far • mantle is too hot / core is too hot • can only use seismic waves to investigate inner layers **Answer lines take precedence over labels on diagram** **Use the L1, L2, L3 annotations in RM; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
8 a	idea that iron does **not** rust in **nitrogen** (1)	1	**ignore** rusts in moist air or rusts in acidic moist air **not** no rust in dry air
b	idea that iron does **not** rust in dry air (1)	1	**allow** in moist air **and** in moist acidic air both rusted (1) **allow** it rusts in **both** tubes that have **moist air** (1) **allow** iron **only** rusts when in contact with **moist air** (1) **not** no rust in moist nitrogen
c	it is a reaction with oxygen / oxygen is added / an oxide is made (1)	1	**allow** because **iron** loses electrons (1) **allow** it has turned to iron oxide (1) **allow** O_2 gains electrons to form an oxide (1) **allow** uses oxygen (1) **allow** oxygen is a reactant (1) **allow** reacts with oxygen and water (1) **ignore** uses water
d	aluminium + oxygen → aluminium oxide	1	**allow** = or ⇌ instead of arrow **not** and or & instead of + **allow** correct formulae instead of names – the equation does not have to be balanced. $Al + O_2 \rightarrow Al_2O_3$ **allow** a mixture of names and correct formulae **not** aluminium + oxygen + water → aluminium oxide
e	iron is magnetic / is attracted to a magnet (1) aluminium is not magnetic / is not attracted to a magnet (1)	2	**allow only** iron is magnetic / only aluminium is **not** magnetic (2) If no other mark awarded then **allow** one mark for use of magnet or magnetism e.g. use a magnet (1) e.g. one is magnetic the other is not (1) **allow** aluminium is magnetic but iron is not (1)
	Total	**6**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>9</td><td>
<table>
<tr><th rowspan="2">mass of steel wire in g</th><th colspan="3">maximum weight supported by the beam in N</th></tr>
<tr><th>test 1</th><th>test 2</th><th>mean (average)</th></tr>
<tr><td>0</td><td>80</td><td>85</td><td>82.5</td></tr>
<tr><td>1.0</td><td>90</td><td>95</td><td>92.5</td></tr>
<tr><td>2.0</td><td>85</td><td>105</td><td>95</td></tr>
<tr><td>3.0</td><td>120</td><td>120</td><td>120</td></tr>
<tr><td>4.0</td><td>150</td><td>115</td><td>132.5</td></tr>
<tr><td>5.0</td><td>150</td><td>150</td><td>150</td></tr>
</table>
one or two means correct (1)

but

three means correct (2)

the more steel or wire the greater weight can be supported /ora (1)</td><td>3</td><td>allow the more steel the stronger the beam/ ora (1)
allow more steel or wire the higher the mean or average / ora (1)
allow higher the mass (of steel or wire) the higher the mean or average /ora (1)</td></tr>
<tr><td></td><td>Total</td><td>3</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
10 a	(risk of) collision (with Earth) / AW (1)	1	**allow** could hit (Earth) (1) **allow** examples e.g. could destroy(the Earth or part of the Earth) / damage the Earth / destroy cities / destroy habitats / make craters / cause wild fires / dust clouds (1) **ignore just** extinction of animals
b i	ice **and** dust (1)	1	**allow** ice **and** rock (1) **ignore** stones
ii	(visible) tail (1)	1	**allow** trail (1) **ignore** shine bright / light / size / shape
c	rock(s) (1)	1	**allow** any named igneous rock e.g. granite (1) **ignore** stones / gas / fire **not** ice
	Total	**4**	

Question	Answer	Marks	Guidance
11 a	room lights (1) 4.5 (pence) (1)	2	**mark independently** e.g. 4.5 calculated next to table but cooker chosen (1) **Look for answers in the table but answer lines take precedence** **allow** £0.045 but money quoted must have the correct units so 0.45p = zero
b	**Any two from:** (more) power / Watts / kW (1) (more) time / hours (1) price or cost per **unit** (1)	2	any order **ignore** power values quoted **ignore** energy **allow** examples - e.g. leaving TV on for a long time (1) **ignore** time of day
c	**Any two from:** not all parts are used at once (1) not always on full or hottest temperature (1) switches on and off whilst cooking / idea it has a thermostat / AW (1)	2	 **allow** examples e.g. using rings but not oven (1) **allow** might be on a low (setting) (1) **ignore** only switched on for 2 hours
d	2530 (W) (2) **If incorrect or incomplete then:** 11 x 230 (1)	2	**allow** 2.53 kW (2)
	Total	**8**	

Question	Answer	Marks	Guidance
12 a	idea that doubling speed increases current or output / ora (1) idea that halving strength (of the magnet) reduces current or output / ora (1) idea of one effect compensates the other / current stays the same / current is (still) 0.5A (1)	3	**Use ticks on this question** **ignore** references to more or less electricity **allow** output or it for current **ignore** power **allow** any idea that as speed increases the current increases / ora (1) **allow** any idea that as strength (of magnet) decreases the current decreases / ora (1) e.g**.** one doubles current but other halves it (1) **allow** he should have left the strength of the magnet the same (1)
b i	41.6% recurring or 41.67% or 41.7% or 42% or 0.417 or 0.4167 or 0.42 so meets or exceeds target (2) **but** 41.6% recurring or 41.67% or 41.7% or 42% or 0.417 or 0.4167 or 0.42 with no statement about meeting the target (1) **If incorrect or incomplete then:** $\frac{5}{12}$ x 100 (%) (1) **or** 58.3% or 58% (wasted) so meets / exceeds target (1)	2	correct value **and** judgement needed for both marks **allow** 41.6 % or 41.66% or 0.416 or 0.4166 so meets the efficiency target (1)

	Alternatively 40% of 12 = 4.8 so 5 is greater than 4.8 so power station meets the efficiency target (2)		
ii	**any two from:** **water** is heated / boiled / turned into steam (1) **steam** turning turbine / **steam** spins or turns or drives the turbine (1) turbine spins or turns or drives the generator (1)	2	 **ignore** fuel burned or heated **ignore** just steam enters the turbine **allow** turbine spins dynamo (1) **ignore** electricity generated
	Total	**7**	

Question	Answer	Marks	Guidance
13	**[Level 3]** **Reference to two simple differences between the models** **AND** **two descriptions of how new evidence has challenged a previous model.** Quality of written communication does not impede communication of the science at this level. **(5 – 6 marks)** **[Level 2]** **Reference to two simple differences between the models** **OR** **two descriptions of how new evidence has challenged a previous model** **OR** **reference to a simple difference between the models AND a description of how new evidence has challenged a previous model.** Quality of written communication partly impedes communication of the science at this level. **(3 – 4 marks)** **[Level 1]** **Reference to a simple difference between the models** **OR** **a description of how new evidence has challenged a previous model.** Quality of written communication impedes communication of the science at this level. **(1 – 2 marks)** **Level 0: (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted up to grade E** **Indicative scientific points may include:** **differences** • Ptolemy /135 linked to Earth at centre / planets orbit the Earth • Copernicus / 1543 linked to Sun at centre / planets orbits the Sun • 2017/ now / present day linked to stars not fixed / other planets / there are 8 planets / Uranus / Neptune / Pluto (dwarf planet) / Sun not the (exact) centre / expanding universe / other solar systems / other galaxies **suggestions as to why the models have changed** • new evidence / research / study • space exploration / probes • telescopes / technology / red shift **Use the L1, L2, L3 annotations in RM; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
14 a i	1500 (thousand tonnes) (1)	1	
ii	generating electricity (1)	1	**allow** generating / electricity (1)
iii	**any two from:** less electricity generation (1) idea that more renewable fuels or renewable sources or nuclear fuels used to generate electricity / less fossil fuels burned (1) less energy used for heating / idea of better home insulation (1) reduced manufacturing industry (1) idea of more efficient car engines (1) more electric or hybrid cars (1) better control of emissions (1)	2	**allow** more efficient electricity generation (1) **allow** people are using less electricity / more energy saving technology (1) **allow** less coal or gas or oil is used (1) **allow** named renewable used (1) **ignore** fuel used to make sulfur dioxide could have run out **allow** less factories(1) **allow** removal of sulfur from petrol (1) **allow** idea of more use of catalytic converters (1) **ignore** fewer cars on the road e.g.(climate change) legislation / filters or scrubbers in factories to reduce sulfur dioxide emissions (1) **ignore** cleaner car engines **ignore** people have become more eco-friendly
b i	700 (thousand tonnes) (1)	1	**allow** answers in the inclusive range 680 - 720 (thousand tonnes) (1)
ii	idea that it stays the **same** / does not change (1)	1	**allow** all the same level(1) **allow** all any value from 240 to 260 inclusive e.g. they are all 240 (1)

iii	**any two from:** idea that it is decreasing (1) amount made by road transport is decreasing (over time) (1) household heating is (broadly) the same (1) idea that electricity generation shows no pattern (1) transport is always the high**est** (1) household heating is always the low**est** (1)	2	 **allow** road transport has decreased (1) **allow** generating electricity goes up and down / fluctuates (1)
c	**any two from:** more oxides of nitrogen in total are made (than sulfur dioxide) / ORA (1) idea that main contributor to NO_x is road transport / household heating is the smallest contributor to NO_x (1) idea that main contributor to SO_2 is electricity generation / road transport is the smallest contributor to SO_2 (1) any correct comparison of an individual contributor to the amount of NO_x produced compared to SO_2 produced (1) amount of SO_2 being produced is decreasing the most (1)	2	**Must be clear in answer if they are referring to NO_x or SO_2** **allow** bar chart or table **2** for NO_x **allow** bar chart or table **1** for SO_2 **allow one mark for EACH correct comparison** e.g. **more** NO_x from cars (than SO_2) (1) e.g. **more** manufacturing in 1990 in bar chart **1** (than **2**) (1)
	Total	**10**	

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