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 2016

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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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1. 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

2. 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

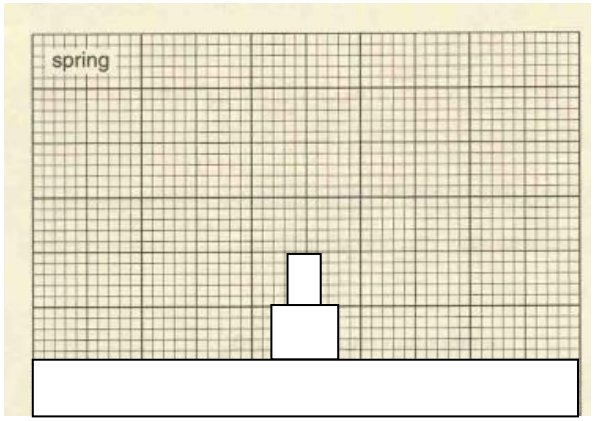
Question	Answer	Marks	Guidance
1 a	**any two from** ideas about climate change / global warming (1) habitat destruction (1) pollution (1) ideas about competition (1) idea of not enough food / famine (1) disease (1)	2	**ignore** hunting by humans or other animals **ignore** environment damage / homes damaged **allow** examples of pollution e.g. litter / oil spills (1) **allow** less prey / no food (1) **allow** idea that there are fewer mates (for breeding) (1) **but ignore** just 'don't reproduce' / don't breed **ignore** natural disasters
b	idea that resource can be taken from the environment without it becoming extinct or endangered (1)	1	**allow** you only take so many (1) **allow** idea of a quota (1) **allow** idea of what is taken must be replenished / maintained (1) **allow** used up at same rate as being produced (1) **allow** still some left (1) **allow** can be hunted without it becoming extinct (1) **allow** does not run out (1) **ignore** can be used again and again

Question	Answer	Marks	Guidance
c	Hunting whales helps us to find out how they survive deep in the ocean. ☐ Hunting should be banned because it is cruel. ✓ Whale hunters can make money. ☐ Whale oil can be used to make lipstick. ☐	1	more than one tick negates a mark
d	(supports statement because) graph shows there are more dolphins in November or March or winter or any named month from November to March / ora (1) (but) does not show the number of fishing boats (1)	2	**assume answer is about November to March unless otherwise stated** **allow** graph shows there are more dolphins in those months (1) **allow** idea of November or March or February having the most sightings (1) **allow** comparison of data e.g. in June there were 20 and November there were 100 (1) **allow** number of dolphins increases in August or September (1) **allow** does not show **why** there are more dolphins (in winter)(1) **allow** only shows one year of data (1) **allow** only shows data from one source (1) **allow** idea that December or January is lower than April or September or October (1) **allow** April or September or October also have high numbers (1)
	Total	**6**	

Question	Answer	Marks	Guidance
2 a	**any two from** herons eat frogs (1) frog population goes down / fewer frogs / no frogs /not many frogs (1) fewer grasshoppers eaten (1)	2	 **allow** fewer grasshopper predators (1) **allow** fewer grasshoppers hunted by frogs (1) **ignore** just ' frogs eat grasshoppers '
b	unreactive (1) nitrates (1)	2	
c	idea of decay / decompose / rot / broken down (1) (decay caused by) bacteria / fungi / decomposers (1)	2	**allow** plants are biodegradable (1) **allow** (plants turns to) compost (1) **ignore** digest / degrade **ignore** detritivores / earthworms /insects / woodlice
	Total	**6**	

Question	Answer	Marks	Guidance
3	**[Level 3]** **Links increase in population to a detailed description of why there is more household waste AND** **suggests at least one adaptation in detail.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Simple link of increase in population to more household waste AND suggests one simple adaptation** **OR** **links increase in population to a detailed description of why there is more household waste** **OR** **suggests at least one adaptation in detail.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Simple link of increase in population to more household waste** **OR** **suggests one simple adaptation.** 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 for detailed links and adaptations include:** **detailed link to increase in population** • **exponential** growth in population has resulted in more household waste • increased use of packaging means more waste • (more) non - biodegradable plastics packaging means need to use (more) landfill **detailed adaptation** • changed their behaviour for hunting strategy so can get more food • move to landfill because food (resources) is in short supply elsewhere in the desert • increased competition because of food shortage • idea that they are hunting prey or rats that may be found in the landfill site / their prey or rats are easier to find in the landfill sites **ignore** just 'spend more time at landfill site' **Indicative scientific points for simple links and adaptations include:** **simple link to increase in population** • **more** waste or **more** rubbish **ignore** more people more landfill sites **simple adaptation** • idea that they are hunting or feeding or scavenging at landfill • idea that they are eating waste or were attracted by waste at landfill **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
4 a	crustacean (1) arachnid (1)	2	 **ignore** spider
b	no (no mark) **and any one from** idea that **C** and **D** (are more closely related because they) are in the same genus (1) idea that **A** and **B** are in different genera / different genus name (1)	1	**if yes then zero for question** **if unclear assume answer refers to A and B** **allow** *Dytiscus marginalis* for **C** throughout **allow** *Dytiscus latissimus* for **D** throughout **allow** *Gyrinus natador* for **A** throughout **allow** *Orectochilus Villosus* for **B** throughout **allow C** and **D** (more closely related) because the first part of their name is the same / both have *Dytiscus* in the name / have similar binomial names (1) **not** same binomial name **allow A** and **B** have different first part of name (1) **allow A** and **B** do not have a similar binomial name (1) **ignore** different binomial names **ignore** references to species

Question	Answer	Marks	Guidance
c i	bars drawn to correct scale +/- half a square and in the correct order (1) bars correctly labelled (1)	2	 order of labels secondary consumers (6 mm) primary consumers (12 mm) producers(100 mm) All bars need to be same height as each other – actual height is not important

Question	Answer	Marks	Guidance
c ii	**difference** **any one from** winter (pyramid) is not a pyramid (shape) / in winter there is less (mass of) producers than consumers / ora (1) winter (pyramid) is smaller (than spring pyramid) / ora (1) identifies any level in winter (pyramid) being smaller than spring (pyramid) (1) **reason** (in winter) less light or less energy for photosynthesis / less light or less energy for growth / ora (1)	2	**If unclear assume answer refers to winter pyramid** **allow** less biomass in winter / ora (1) **examples include** less producers in winter (than spring) / ora (1) less consumers or animals in winter (than spring) / consumers or animals hibernate in winter /ora (1) **ignore** less Sun for photosynthesis **allow** (in winter) lower temperature so less photosynthesis / lower temperature so less growth / ora (1) **allow** idea that more energy is lost as heat (1)
	Total	**7**	

Question	Answer	Marks	Guidance
5 a	3 (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line is blank
b	5 (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line is blank
c	ammonium nitrate or NH_4NO_3 (1)	1	**allow clear indication of correct answer** **allow** correct answer ticked, circled or underlined in list if answer line is blank
	Total	**3**	

Question	Answer	Marks	Guidance
6 a	**any three from** inner core (1) outer core (1) mantle (1) crust (1)	3	**allow** core for inner core or outer core (1) **allow** lithosphere (the upper crust and mantle) (1) **allow** arthenosphere (upper layer of mantle) (1) **ignore** description **ignore** tectonic plates
b	(when Wegener made the proposal) there was little or no evidence or no proof (1) now other scientists have tested the theory (1)	2	**allow** people did not believe him because they could not see it happening (1) **allow** it was hard to collect evidence (1) **allow** it was **just** a theory (1) **allow** examples of why he had no evidence e.g. cannot go below the surface and see what is happening (1) **allow** they did not have the technology (1) **ignore** religion / beliefs **allow** collect data (1) **allow** it takes evidence to prove that a theory is correct (2) **allow specific examples of evidence available now e.g.** **allow** not accepted until sea floor spreading discovered / not accepted until submarines could investigate constructive plate margins under the ocean (2) **allow** the technology to observe plate movements was not available in Wegener's time (2)
	Total	**5**	

Question	Answer	Marks	Guidance
7 a i	**E** (1) its melting point is above 2000 (^{o}C) / is 3410 (^{o}C) (1)	2	**second marking point is dependent on the first** **allow** it will not melt at 2000 (^{o}C) (1) **allow** has a higher melting point than the molten metal (1) **allow** has a higher melting point than metal placed inside (the container) (1) **allow** the others will all melt (1) **ignore** it has the highest melting point **ignore** other irrelevant properties from the table
ii	**C** (1) good (electrical) conductivity / high (electrical) conductivity (1) low density / lowest density (1)	3	**second marking point is dependent on the first** **allow** lightweight (1) but **ignore** light / lighter **ignore** good density **allow maximum 2 marks for** **A / A** and **C** (1) good (electrical) conductivity / high (electrical) conductivity (1) **ignore** just (electrical) conductivity of 64 **ignore** other irrelevant properties from the table

Question	Answer	Marks	Guidance
b	**any two from** strong (1) low density (1) does not corrode (1) malleable (1)	2	**ignore** references to cost **ignore** 'how strong it is' / is it strong or not **allow** lightweight (1) **ignore** light / lighter **ignore** not heavy **allow** does not rust / rusts **slowly** (1) **allow** does not react with water (1) **ignore** 'will it last' i**gnore** will it corrode or not **allow** can be bent into shape (1) **ignore** references to melting point **ignore** can be moulded **Ignore** ductile
	Total	**7**	

Question	Answer	Marks	Guidance
8 a	**Level 3** **Gives a complete description of solution mining <u>AND</u> names at least two products of the electrolysis.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **Level 2** **Gives a rudimentary description of solution mining <u>AND</u> names one product of the electrolysis** **<u>OR</u> names all three products of electrolysis.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **Level 1** **Gives a rudimentary description of solution mining <u>OR</u> names one product of the electrolysis.** 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:** **Solution mining** • water pumped into mine / add water • sodium chloride dissolves in water • sodium chloride or salt (solution) is pumped out **allow** idea of evaporation to get the salt **Products of electrolysis** • chlorine • hydrogen • sodium hydroxide **check for names of gasses labelled correct electrode not required** **on diagram ignore** location of products **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
		6	

Question	Answer	Marks	Guidance
9 a	40(%) (1)	1	
b	decreases / AW (1)	1	**allow** if temp decreases yield increases (1) changes is not sufficient
c	**any two from** $450^{o}C$ / temperature gives a fast reaction (1) $450^{o}C$ / temperature gives a reasonable yield (1) catalyst speeds up reaction (1) low pressure needs less energy to generate (1) low pressure is cheaper (1)	2	**ignore** just 'higher yield' / just 'speeds up reaction' **allow** idea that temperature (of $450^{o}C$) means you will make enough (1) **ignore** $450^{o}C$ / temperature gives a high yield **allow** vanadium or oxide speeds up the reaction (1) **allow** idea of cheaper equipment (can be used) with low pressure e.g. you don't need expensive chamber if use low pressure (1) **allow** idea that these are the compromised conditions (1)
	Total	**4**	

Question	Answer	Marks	Guidance
10 a i	**C** (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line is blank **allow** electric fire / fire (1)
ii	**A** (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line is blank **allow** lamp (1)
b	315 (pence) (2) **but if answer incorrect** 3 x 7 x 15 (1)	2	**allow** £3.15 (£ sign essential) (2) **allow** 3.15 with no £ sign (1) **allow** 3150 (pence) / £31.50 (£ sign essential) (1) **allow** 3000 x 7 x 15 (1) **allow** 315000 (pence) / £3150.00 (£ sign essential) (1)
	Total	**4**	

Question	Answer	Marks	Guidance
11 a	**reason for max one from** less or no carbon dioxide / greenhouse gases (1) does not contribute to global warming (1) no smoke or ash (1) no need to transport fuel to power station (1) it is renewable (1) reduces dependency on fossil fuels (1) **reason against max one from** large numbers needed / need 1000 wind turbines / do not produce much power or enough power(1) idea that it is not always windy (1) idea of visual pollution (1) noise pollution (1) need space / use land that could be used for farming (1) kills birds (1)	2	**ignore** produce no pollution **ignore** references to environmentally friendly / eco-friendly / won't harm the environment **allow** reduces climate change (1) **allow** less lorries needed (to transport fuel) (1) **allow** it will not run out (1) **ignore** it is sustainable **ignore** references to cost **allow** power stations produce more power (1) **ignore** use less power **allow** if there is no wind then no electricity is generated (1) **ignore** not reliable **allow** spoils the view / spoils the scenery / unattractive (1) **allow** (noise) will keep people awake (1) **allow** take up a lot of space (1)

Question	Answer	Marks	Guidance
b	**D** (1) idea of highest current (1)	2	**second marking point is dependent on the first** **allow** idea of highest (total) amps (1) **allow** best current / best amps (1) **ignore** 3 amps unless qualified **Ignore** power /charge / energy
c	larger area (1)	1	**allow** more solar cells (1) **allow** larger panel / more panels (1) **allow** more efficient (conversion) (1) **allow** (use one that) tracking the Sun / always facing the Sun / facing south (1) **allow** (use one) in a place with more sunlight (1) **ignore** larger current
	Total	**5**	

Question	Answer	Marks	Guidance
12	**[Level 3]** **Calculates efficiency** **AND** **detailed description of the generation and distribution of electricity.** Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **[Level 2]** **Attempts to calculate efficiency** **AND** **partial description of the generation and distribution of electricity.** Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** **Attempts to calculate efficiency** **OR** **limited description of the generation and distribution of electricity.** 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 up to C** **Indicative scientific points may include:** **stages in generation and distribution of electricity** • coal is burnt • water is heated • steam produced • turbine turns • generator used for electrical production • transformer changes the voltage / there is a step-up transformer / there is a step-down transformer • (electrical) energy distributed / (electrical) energy goes to consumers or factories or homes **allow** electricity is distributed / electricity goes to consumers or factories or homes **not** if stages are reversed e.g. electrical energy goes to the turbine **Indicative scientific points may include:** **calculation of efficiency** • efficiency = $\frac{\text{useful energy}}{\text{total energy input}}$ • efficiency = $\frac{1110}{3700}$ • **calculate efficiency** = 30 (%) or 0.3 **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
13 a i	**any one from** smoke detectors (1) tracers (1) paper thickness gauges (1) sterilising equipment (1) non-destructive testing (1)	1	**ignore** to treat cancer / detect cancer **allow** to look leaks in a pipe (1) **ignore** paper tracers / medical tracers **allow** sterilising any type of equipment e.g. sterilise hospital equipment (1) **allow** preserving food / cleaning equipment (1) **ignore** X-ray / MRI scan / CAT scan **ignore** power / power stations
ii	**any one from** damages (living) cells / organs (1) (causes) cancer (1) (causes) mutation (1) causes ionisation (1)	1	 **allow** kills (living) cells / organs (1) **ignore** just 'kill you' **allow** makes cells divide uncontrollably (1) **ignore** health problems / brain damage / skin damage / hair loss **allow** radiation poisoning (1) **but ignore** just poisoning **ignore** bombs

Question	Answer	Marks	Guidance
iii	**any two from** (idea of) distant handling / remote handling (1) short exposure time / monitoring badge / AW (1) idea of shielding / protective clothing / lead apron (1)	2	 **allow** use tongs / keep away from body / don't touch / keep your distance / 'stay away from it' / stand away from it (1) **allow** film badge (1) **allow** clothing (thick enough) to stop radiation getting through (to the skin) (1) **allow lead** gloves / **lead** lab coat (1) **allow** protective safety gear e.g. protective gloves(1) **allow** safety screen (1) **ignore** just goggles / gloves / lab coat / safety gear / body suits / masks **ignore** idea about storage in a suitable container

Question	Answer	Marks	Guidance
b	yes if alpha or beta (1) as it will be stopped (by thick aluminium) (1) **or** no if gamma (1) as it can penetrate (aluminium) or not stopped (by aluminium) (1)	2	**allow** alpha will be stopped (by aluminium) (2) **allow** beta will be stopped (by aluminium) (2) **allow** gamma will penetrate (aluminium) (2) **allow** for gamma (thick) lead is needed (2) **if no other marks awarded ignore yes or no and allow 1 mark from** idea that (some types of) radioactive emissions or radiation can penetrate or be stopped by (aluminium) (1) **ignore** waste or liquid penetrates aluminium beta and gamma get through (aluminium) (1) need to use lead (1)
	Total	**6**	

Question	Answer	Marks	Guidance
14 a	**any two from** moon(s) (1) asteroid(s) (1) comet(s) (1) meteor(s) (1)	2	**ignore** stars and planets **allow** natural satellite (1) **but ignore** (artificial) satellites **allow** meteorite(s) (1) **ignore** black holes / supernova / red giant / white dwarf / other stars / Sun / life / aliens / water / ice / rocks / crystals / dust / red shift / big bang
b	unmanned (no mark) **any two from** long distance / too far away / spacecraft cannot travel that distance(1) will take a long time / takes too long(1) do not need food / water / oxygen / fuel / resources (1) spacecraft does not need to return (1) too much radiation / too hot / too cold (for life) (1)	2	**ignore** manned **allow** humans do not live long enough (1) **allow** spacecraft do not travel at the speed of light (1) **allow** it will take more than 4 (light) years to get there (1) **allow** cannot carry enough or a lot of food / water / oxygen / fuel / resources (1) **allow** (people will) not survive / risk to life / may get killed (1) **ignore** just it will be dangerous / may get harmed / going into the unknown **ignore** cost
	Total	**4**	

Question	Answer	Marks	Guidance
15 a i	67.6 (%) (1)	1	**allow** 68(%) not 67(%)
ii	**any two from** more carbon dioxide or greenhouse gases (1) increase global warming (1) idea of (fossil fuels) running out (1) (need to) use (more) nuclear (1) (need to) use (more) renewable resource / alternative resource / sustainable resource (1)	2	 **allow** increased acid rain (1) **ignore** cause air pollution **allow** causes climate change (1) **ignore** fossil fuels are non-renewable **allow** examples of resources e.g. solar power (1) **ignore** references to cost
b i	 China USA UK Japan Rest of Europe Canada all correct (2) any three on the correct lines (1)	2	**allow** correct numbers i.e. 80 46 30 28 22 14 (all ± 1) all numbers correct (2) any three numbers on the correct lines (1)

Question	Answer	Marks	Guidance
ii	Canada (1) **and one from** more hydro-electricity (1) more solar (1) more tidal (1) more wind (turbines) (1) more nuclear (power) (1)	2	**second mark is dependent on the first mark** **allow** lots of other reserves or resources available (1) e.g. they have lots of wood (1) **allow** fossil fuels or coal or oil or gas not (as) available (1) **but ignore** just uses or produces the least amount of fossil fuels or coal or oil or gas **allow** smaller population (1) **but ignore** it is a smaller country **allow** more concerned about pollution (1) **ignore** uses geothermal energy
iii	USA (1)	1	more than one country = 0 marks **allow** America

Question	Answer	Marks	Guidance
c	**any two from** **total or world electricity** production is increasing (1) **total or world electricity** production decreased in 1997 or 2003 or 2007 or 2008 or 2009 (1) **percentage** increased and then decreased (1) **percentage** increased until 1992 / **percentage** highest in 1992 / **percentage** decreased from 1992 (1)	2	**assume total or electricity or world or TWh refers to bar chart** **assume percentage refers to line graph** **not** any incorrect year e.g. total decreased in 1997 and 2006 (0) **allow percentage** decreased after any year in the range of 1992 – 2004 (1) **not** any incorrect year e.g. percentage increased until 1990 (0) **allow percentage** increased quicker until 1987 (2) **allow** total world production must be increasing if total increasing but percentage decreasing (2) **allow** idea that if percentage of nuclear is decreasing then percentage of other fuels or methods is increasing (1)
	Total	**10**	

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