GCSE

Science B

Unit **B712/02**: Modules B2, C2, P2 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2015

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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.

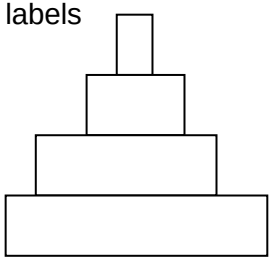
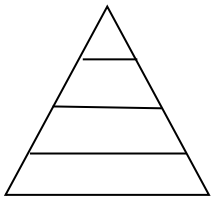
OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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	the tick lives on or feeds on deer / squirrel / mouse (causing them harm) (1)	1	**allow** the tick lives on other organisms or host (causing them harm) **allow tick** sucks or feed on blood **allow** feed on **living** animals or plants **allow** feeds on animals or plants causing them harm **but ignore just** 'feeds on animals or plants' **ignore** tick takes energy from deer / squirrel / mouse
b	competition between (different) species or different **types** of animals(1) example from the web used (1)	2	**allow** when prey has more than one predator (1) **ignore** competition between two different animals e.g. beetle and ant (1) **any two from** caterpillar / deer / squirrel / mouse (1) **but** beetle and ant both feed on caterpillar (2) **any two from** caterpillar / deer / squirrel / mouse feed on oak (2) **allow** any two from mouse / beetle / ant feed on caterpillar (2)
c	draw a pyramid shape (1) **then any one from:** idea oak (is large so) has a large biomass (1) idea that caterpillars are smaller than oak so many can feed on single oak (1) idea that ants will be smaller than caterpillars so have a smaller biomass (1) idea biomass is average mass times the number so a very large mass will make the biomass large (1)	2	**drawn pyramids must have four levels** **ignore** labels   **allow** correct definition of **both** pyramids e.g. (pyramid of) biomass shows the (dry) mass or weight of each level **and** (pyramid of) numbers shows the number of each organism or level (1) **ignore** ideas about transfer of energy

Question	Answer	Marks	Guidance
d	ammonia / nitrites (1) nitrifying (1)	2	**allow** NH_3 / NO_2^- (1)
	Total	**7**	

Question	Answer	Marks	Guidance
2	**Level 3 (5 - 6 marks)** **Describes sustainable fishing** **AND** **detailed evaluation of the process** **AND** **identifies more than one problem with sustainable fishing.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **Level 2 (3 - 4 marks)** **Describes sustainable fishing AND attempts to evaluate the process** **OR** **describes sustainable fishing AND identifies one problem with sustainable fishing** **OR** **attempts to evaluate the process AND identifies one problem with sustainable fishing** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **Level 1 (1 – 2 marks)** **Attempts to evaluate the process** **OR** **identifies one problem with sustainable fishing** **OR** **attempts to describe sustainable fishing** **OR** **a simple description of the changes shown on the graph** 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 A*** **Indicative scientific points at level 3 that may be included:** • some ideas from level 1 and 2 • initially successful as rise in levels above safe stock level • increase in catch in late 80's resulted in fall in population • reducing the catch number in the 90's has allowed the levels to rise again • now above the precautionary level so successful **Indicative scientific points at level 1and 2 that may be included:** **evaluation** • herring numbers are now going up so has been successful • some years are better than others as the population has gone up and down • no real success as numbers keep going up and down **problems** • difficult to manage in North sea as need agreement of all the countries • difficult to manage as large area to police • some fishermen could take more than they should without being caught • different countries may want to set different quotas / catch numbers • idea that difficult to avoid catching herring along with other fish / bycatch • idea that if not catching herring will catch other species • idea that employment drops if quotas set • idea that quotas can reduce income of fishermen • idea that quotas can lead to increased price of herring **description** • sustainable fishing is when you (take enough herring to feed the human population but) leave enough to maintain the herring population **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
3 a i	8 (2) **but if answer incorrect then** 38 (1) 5	2	**allow** 7.6 (1) if answer line blank, mark the answer in the table, answer on line takes precedence
a ii	mean for leech or flatworms or some pollution in water organisms is the highest / more leech or flatworms present (1) so indicates **some** pollution / leech or flatworms can survive in polluted water (1)	2	**allow** very few clean water species (caddis fly and dragonfly) present (1) so **some** pollution must be present (1) / ORA **allow** more polluted water organisms than clean ones (1) **allow** leech or flatworms are indicator species for pollution (1) **but** leech or flatworms are indicator species for **some** pollution (2)
b i	D (1)	1	
b ii	**any two from:** absence of dragon fly or caddis fly numbers or clean water organisms would indicate some pollution (1) numbers of leech or flatworms or some pollution in water organisms show not heavily polluted or shows some pollution (1) numbers of rat-tailed maggots or bloodworms or very polluted water organisms show not heavily polluted or shows not **C** (1)	2	marks are conditional on identifying location **D** **allow** idea of dilution of pollution by the time it gets to **D** (1)
	Total	**7**	

Question	Answer	Marks	Guidance
4 a	*Syrmaticus* (1)	1	
b	critical (1)	1	**mark answer on line first** **allow** answer ringed, underlined or ticked if no answer on the answer line
c	idea of survival of the fittest (1)	1	**allow** description of survival of the fittest e.g. pheasants without bright colours died out (1) **allow** organism with variation is better adapted to survive (1) **allow** death of offspring without the feature (1)
d	**any two from:** idea the Darwin's ideas are based on genetics or genes or alleles / idea that Lamarck's ideas have no genetic basis (1) Darwin's ideas are based on inherited characteristics / ORA (1) Lamarck's ideas are based on acquired characteristics / ORA (1) **but** idea that we now know inherited characteristics are controlled by genetics or genes or alleles (2)	2	**ignore** references to DNA
	Total	**5**	

Question	Answer	Marks	Guidance
5 a	either CaO or CO_2 on RHS (1) **BUT** $CaCO_3 \rightarrow CaO + CO_2$ (2)	2	**allow** any correct multiple e.g. $2CaCO_3 \rightarrow 2CaO + 2CO_2$ (2) allow $CaCO_3$ + heat $\rightarrow CaO + CO_2$ (1) **allow** heat above arrow **allow** = or ⇆ for arrow **not** 'and' or & for + **allow** one mark for correct balanced equation with minor errors in case, subscript and superscript e.g. $CaCo^3 \rightarrow CAO + CO_2$ (1)
b	break down (of a substance)(using heat) (1)	1	**allow** a reaction which produces two or more substances from one substance (by heating) (1) **allow** (substance) decomposes (with heat) / break up (of a substance)(with heat) (1) **allow** cracking at high temperature (1) **allow** molecules break down (1) **ignore** breaks up bonds **not** heat particles broken down **not** breakdown of heat **not** elements break down **ignore** decay / dissolve
c	(limestone and) clay (1) heated (together) (1)	2	**ignore** other additions e.g. sand or water 2nd mark dependent on clay **not** burn or melt
d	granite marble limestone talc	2	all correct scores 2 but if incorrect then any two adjacent materials in correct order / any two in correct position scores 1
e	granite is an igneous rock (1) limestone is a sedimentary rock (1)	2	**allow** descriptions of how granite and limestone are made or how their structures explain their relative hardness e.g granite is hard because it has interlocking crystals (1) **allow** one is igneous and one is sedimentary (1)
	Total	**9**	

Question	Answer	Marks	Guidance
6 a	crust **and** upper or outer part of the mantle (1)	1	**allow** cold, rigid outer part of the Earth (1) **ignore** between crust and mantle
b	idea that crust is too thick to drill through / idea that need to use seismic waves produced by man-made explosions (1)	1	**allow** too thick to dig through (1) **allow** don't have the technology to go deep into the Earth (1) **allow** idea that it is too hot to reach the core or centre of the Earth (1) **allow** idea that it is difficult to predict and/or measure seismic waves produced by earthquakes (1) **ignore** too hard to drill through **ignore** just 'can't drill through it' **ignore** impossible to reach the centre of the Earth **ignore** mines are only drilled a small amount into the Earth
c	**any two from** (Wegener) continental drift theory (in 1914) (1) idea that tectonic plates once fitted together or coastlines fitted together e.g. Africa and South America (1) (Wegener) found similar earthworms in different continents (1) continuity of fossil record on different continents (1) similar rock layers found in different continents (1) idea that this theory was not accepted by scientists at that time (1) idea of magnetic orientation of ocean floor (1) idea of sea floor spreading e.g. mid Atlantic trough (1) research supported by theory of plate tectonics so slowly accepted by scientists (1)	2	**allow** descriptions of continental drift (1) **allow** different countries **allow different countries** **allow** different countries **allow** Rift Valley (1)
	Total	**4**	

Question	Answer	Marks	Guidance
7 a	copper – **any one from** best or good heat conductor / malleable (so easy to shape) / not very strong (1) brass – **any one from** worst or poor heat conductor / malleable (so easy to shape) / strongest or high strength (1) zinc – **any one from** poor heat conductor / brittle or poor malleability (so would crack) / lowest strength (1) best choice copper (1)	4	**use ticks in this question** **ignore** references to corrosion and density and melting point
b	**advantage –any one from** idea that it is economically advantageous (1) idea that saves energy (1) idea that saves natural resources (1) **disadvantage – any one from** idea that it is economically disadvantageous (1) difficult to sort (1)	2	**only** award 1 mark for any idea linked to economics **allow** less use of landfill or reduces disposal problems (1) **allow** idea that jobs created in recycling industry (1) **ignore** cheaper **allow** idea that less mining needed (1) **allow** idea that materials are not wasted (1) **ignore** sustainable e.g reduces jobs for miners (1) **ignore** more expensive **allow** idea that recycling is time consuming e.g. takes time to dismantle cars (1)

Question	Answer	Marks	Guidance
	some materials cannot be recycled (1)		**ignore** recycling is less convenient **allow** storage for recycling is needed (1)
	Total	**6**	

Question	Answer	Marks	Guidance
8	**Level 3** **One correct half equation is written** **AND** **a description of what happens at both electrodes.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **Level 2** **A correct description of the electrolysis apparatus** **AND** **a description of what happens at one of the electrodes** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **Level 1** **A simple description of the electrolysis apparatus** **OR** **a description of what happens at <u>one</u> of the electrodes** 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 A/A*.** **Indicative scientific points at level 3 may include:** • some of the points at levels 1 and 2 and in addition • either cathode reaction $Ag^+ + e^- \rightarrow Ag$ • or anode reaction $Ag - e^- \rightarrow Ag^+$ / $Ag \rightarrow Ag^+ + e^-$ • oxidation occurs at the anode • reduction occurs at the cathode • concentration of silver nitrate solution is unchanged **Description of what happens at the electrodes** • cathode gains mass • silver is deposited at cathode • anode loses mass • silver dissolves at anode • impurities fall to the bottom • at anode silver (atoms) lose electrons (to make silver ions) • at cathode silver ions gain electrons (to make silver atoms) **Description of electrolysis apparatus** • cathode is pure silver • anode is impure silver • silver nitrate solution is the electrolyte / conducts electricity • cathode is negative electrode (from diagram) • anode is positive electrode (from diagram) **If anode is stated as pure silver and cathode as impure silver with no other correct statements then 1 mark scored.** **If answer describes copper purification then max level 2.** **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
		6	

Question	Answer	Marks	Guidance
9 a	(Source **A**) gamma / γ (Source **B**) alpha / α (Source **C**) beta / β	2	three correct (2) one or two correct (1)
b	1 (overalls etc) disposed of in landfill (1) 2 (active waste) **encased** in concrete or glass or in storage drums and **buried** (deep underground) (1)	2	**allow** bury them (1) **allow** bury (in containers) underground (1) **allow** underground (1) **ignore** burn them **ignore** put them in the bin **allow** encased in lead and buried (1) **allow** idea of sealed in concrete box or metal box and buried (1) **ignore** sealed in a glass box **ignore** just 'buried' **ignore** idea of buried and then covered in concrete **allow** reprocessed and buried (1) **but** ignore just reprocessed **allow** stored in drums underwater or storage pond (1) but **not** underwater in the sea
	Total	**4**	

Question	Answer	Marks	Guidance
10 a i	(television) 2.5 (kWh) (1)	1	**allow** answer in table if no answer on line answer on line takes precedent
ii	184(p) (2) **but if incorrect** 11.5 x 16 (1)	2	**allow** £1.84 (2) **allow** 1.84 (1) **allow** correct working e.g. (4.0 x 16) + (7.5 x 16) (1)
b	idea that off peak is only available during the night (1) vacuum cleaner is used when off peak not available or is not used at night (1)	2	**allow** only available at inconvenient times (1) **ignore** idea that vacuum uses very little energy so doesn't make much difference to the cost **allow** (idea that) do not want to disturb the neighbours (at night) or makes a lot of noise at night (1) **ignore** Louis would be asleep **allow** he uses the vacuum in the day (only) (1)
	Total	**5**	

Question	Answer	Marks	Guidance
11	**Level 3** **Describes one advantage and one disadvantage for both types of power station** **AND** **gives an explanation for two of the advantages and/or disadvantages.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **Level 2** **Describes one advantage and one disadvantage for one type of power station** **OR** **describes a total of two advantages and/or disadvantages for either type of power station** **AND** **attempts an explanation for one advantage or one disadvantage.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **Level 1** **Describes one advantage or one disadvantage for either type of power station.** 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 A** **Indicative scientific points may include:** **NUCLEAR ADVANTAGES** • no carbon dioxide produced **ignore** unqualified references to pollution • small quantities of fuel needed / idea of more energy per unit mass • fuel readily available • no need for expensive transport system Explanations • no carbon dioxide produced so will not contribute to greenhouse effect/ global warming • fuel readily available so there will not be a shortage of fuel for the power station • no need for expensive transport system to get fuel to power station **NUCLEAR DISADVANTAGES** • radioactive waste **ignore** toxic or nuclear waste • security of transport of fuel • expensive to build • danger of exposure to radiation • decommissioning is expensive • plutonium is a waste product • risk of accidents and after effects Explanations • radioactive waste which is difficult to dispose of • transport of fuel because it needs high security • danger of exposure to radiation can cause cancer, etc • plutonium is a waste product used to make atom bombs • idea that consequences of accidents are far reaching • could be a terrorist target **COAL ADVANTAGES** • available for hundreds of years / large supplies available • fuel is cheap • no radioactive waste • cheaper to build (than nuclear) • available for hundreds of years so unlikely to run out • fuel is cheap so will keep the cost of electricity low **COAL DISADVANTAGES** • produces carbon dioxide • needs to be transported • a non-renewable source • produces ash • produces sulfur dioxide Explanations • produces carbon dioxide which is a greenhouse gas / causes global warming • a non-renewable source so will eventually run out / is finite • needs to be transported so roads / rail / harbour need to be built • produces ash which needs to be disposed of • sulfur dioxide causes acid rain or smog **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
12 a	doubling the surface area doubles the current (on its own) / doubling the light intensity doubles the current (on its own) (1) **but** (if you double both of them then) the current increases by four / (if you double both of them then) the current increases by more than double (2)	2	**allow** 4 x area = 4 x current (1) **allow** current is (directly) proportional to surface area or light intensity (1) **allow** you only need to double either to double the current (2) **allow** current is (directly) proportional to surface area x light intensity (2) **but** increases by any other incorrect factor max 1 mark
b	18 (%) (2) **but if incorrect** $\frac{60}{333}$ (x 100) (1)	2	**allow** 0.18 % (1) but 0.18 with % rubbed out (2) **allow** 18.02 (%) or 18.018 (%) (2) **but** 18.01 (%) (1)
c i	50 (W) (1)	1	
ii	1.2 million or 1 200 000 or 1.2×10^6 (1)	1	**allow** ecf from (c)(i)
	Total	**6**	

Question	Answer	Marks	Guidance
13 a	samples of the Moon **rock** have been analysed or tested or brought back to Earth / robots can analyse the Moon **rock** (and send information back to Earth) (1) (samples show) similarity in **rocks** between the Earth and the Moon (1)	2	**allow** soil or (moon)dust for rock **ignore** surface **allow** iridium or trace elements in Moon **rock** same as on Earth (1) **allow** similar levels of oxygen in Moon **rock** (1) **ignore** Moon rock less dense **ignore** Moon has no iron core / ora
b	gravity or gravitational pull (1) pulls or attracts the Moon to the centre of its orbit / pulls or attracts the Moon to (the centre of) the Earth (1)	2	**allow** centripetal force (1) **ignore** G-force **not** centrifugal force **ignore** GPE **allow** pulls the Earth to (the centre of) the Moon (1) **allow** gravity **provides** the centripetal force (2) **but** gravity **is** the centripetal force (1) Contradictions score 0 e.g. centripetal force because it opposes gravity scores 0.
	Total	**4**	

Question	Answer	Marks	Guidance
14 a	2.64 or -2.64 scores (2) **if answer incorrect then** $\frac{5.4 + 0.6 + 2.4 + 1.7 + 3.1}{5}$ or $\frac{13.2}{5}$ (1)	2	**ignore** signs **allow** 2.6 or – 2.6 (2) **allow** 264 % (1)
b	sensible choice of scale on y axis so that graph covers at least half of the paper and covers a range between 1.8 and 4.4 (1) all five bars plotted correctly (1)	2	**allow** double width bars **allow** tolerance of ±½ square on plotting
c	player **A** (1) lost most fat **and** gained most muscle (1)	2	second mark dependent on choosing player **A** **both ideas required** **allow** lost most weight **and** gained most muscle (1) **allow** highest difference in muscle **and** body fat (1) **allow** player **D** provided the justification is after the diet player **D** has the lowest body fat percentage and the highest muscle percentage (2).
d	player **A** – contains 120g of protein and 42g of fat (1) player **B** – contains 94g of protein and 42g of fat (1) player **C** – contains 81g of protein and 157g of fat (1) player **A** (1)	4	**check table for answers/working if not given on answer line** **allow** player A has highest protein content and same fat content as player B (1) **allow** ecf on incorrect calculations for last mark
	Total	**10**	

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