OCR
Oxford Cambridge and RSA

GCSE

Science B

General Certificate of Secondary Education

Unit **B711/02**: Modules B1, C1, P1 (Higher Tier)

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.

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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 i	source 1 **and** (EAR =) 42 (g) (2) **but** 42 (g) with no reference to source 1 (1) **but if answer is incorrect then** source 1 **and** 0.6 x 70 (1)	2	**allow** teenage males **and** (EAR =) 42 (g) (2) **allow** source 1 is 10g more / source 2 is 10g less (2) unqualified reference to source 1 scores 0
a ii	**any two from:** **age** source 1 based on age **or** idea that source 2 or EAR does not take into account age (1) **mass** idea that source 1 does not take into account body mass or weight **or** source 2 or EAR is based on mass or weight (1) **gender** source 1 based on gender **or** source 2 is not based on gender (1)	2	**allow** reference to teenage males instead of source 1 **allow** source 2 or EAR based on body size (1) **ignore** source 2 or EAR is based on height **ignore** source 2 is calculated by EAR if no other mark awarded, **allow** idea that (recommended amounts of protein) vary with age / body mass / gender (1) i.e. without specific mention of source 1 or 2 **ignore** idea that source 1 is only an average as true for both

Question	Answer	Marks	Guidance
b	**any two from:** idea that EAR is only an average /estimate (1) Jake may still be growing **or** the idea that his mother is no longer growing (in height) (1) idea that Jake may need to develop more muscle (1) (Jake is male and) males need more protein in their diet / ora (1)	2	**ignore** EAR is same as they have same mass **ignore** Jake is heavier / different mass / mum is lighter / ages **ignore** Jake is still developing **ignore** idea that Jake is more active
	Total	**6**	

Question	Answer	Marks	Guidance
2 a	**Level 3 (5 – 6 marks)** **Detailed** explanation of how sweating cools the body **AND** provides **detailed** explanation of why process of temperature control is negative feedback. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **Level 2 (3 – 4 marks)** Simple explanation of how sweating cools the body to include ideas about evaporation **AND** attempts to explain negative feedback Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **Level 1 (1 – 2 marks)** Simple explanation of how sweating cools the body to include ideas about evaporation **OR** attempts to explain negative feedback **OR** links the idea of sweating to changes in the data without mentioning evaporation. 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) **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**	6	**This question is targeted at grades up to A*** **Indicative scientific points of detailed explanation at Level 3 may include:** **sweating** • temperature drops because the sweat is evaporating taking heat from the body • idea that between 0- 32 min body is not sweating enough to cool the body by evaporation **negative feedback** • negative feedback is when the temperature goes up the body will react to return it to normal • negative feedback because when temperature reaches 36.6 °C **or** back to normal sweating response will be switched off **To access level two answer must refer to both sweating and negative feedback** **Indicative scientific points at Level 1 and 2 may include:** **explanation of sweating** • temperature goes down because of evaporation of sweat / evaporation of sweat cools the body **negative feedback idea** • negative feedback is when something in the body changes from the normal it is changed back • negative feedback tries to maintain a constant temperature • negative feedback tries keep the temperature close to 36.6°C (allow 37°C) • negative feedback is linked to homeostasis • negative feedback involves the brain detecting the change in temperature / brain sending impulses to start sweating **changes in the data** • idea that sweating is having a cooling effect on the body after 32 min **or** after exercise **allow if no other marks** sweating causes cooling down (Level 1 and 1 mark) **ignore** references to vasodilatation / vasoconstriction

Question	Answer	Marks	Guidance
b	**high** salt intake / stress / **high** alcohol intake / overweight / smoking / **high** fat diet (1)	1	**allow** description of stressful situation e.g. taking exams (1) **allow** adrenalin (1) **allow** high cholesterol (1) **ignore** drinking too much unless alcohol is mentioned **ignore** diet unless qualified **ignore** eating too much / high sugar diet / gaining weight
c i	fatty acids **and** glycerol (1)	1	**both needed** – more than 2 rings scores zero
c ii	around organs / under skin (1) as **adipose** tissue fat (1)	2	**allow** around / on / in skin (1) **allow** stored **around** a named organ (1) **allow** fat is stored in the liver (1) **ignore** around muscle **ignore** fat stored as glycogen or glucose
	Total	**10**	

Question	Answer	Marks	Guidance
3 a	smoke (cannabis) without tobacco (1) idea that tobacco causes named effect such as emphysema / cancer (1)	2	**allow** take cannabis as tablet or injection (1) **ignore** make cannabis legal (for MS sufferers) **allow** tobacco produces harmful carbon monoxide / tobacco is addictive (1) **allow** tobacco causes high blood pressure (1)
b	idea that they give some patients cannabis **and** others a placebo (1) idea that patients will not know what they have **or** (only) the doctors / scientists know which patients have the drug (1)	2	**not** patient has both cannabis and the placebo **ignore** reference to taking drugs with or without tobacco **but allow** smoke tobacco with or without cannabis (1) **not** idea that patients **and** doctors will not know what they have **allow** explanation linked to study – e.g. so that patients with placebo may say their symptoms are reduced (1)

Question	Answer	Marks	Guidance
c	35% think you should be able to get cannabis on prescription. [ ] 26% think you should be able to buy cannabis without a prescription. [✓] 9% think you should be able to buy cannabis without a prescription from a licensed outlet. [ ] 26% think you the sale of cannabis should be illegal. [✓] Less than 50% think cannabis should be made legal either with or without a prescription. [ ] (2)	2	each correct tick = 1 mark if three ticks maximum 1 mark four ticks = 0 marks
	Total	**6**	

Question	Answer	Marks	Guidance
4 a	130 tall **and** 130 short (2) **but if answer incorrect then look at diagram** tall plants genotype = Tt **and** short plants genotype = tt (1) **or** correct number of offspring from their diagram or correct ratio from their diagram (1) **or** idea that it is a one to one ratio / 50% chance of each genotype (1) **but** idea that it is a one to one ratio / 50% chance of each genotype with correct diagram (2)	2	**ignore diagram if answer is correct** **T** **t** **t** Tt tt **t** Tt tt e.g. if they have Tt x Tt then numbers will be 195 tall to 65 small in diagram, TT x Tt 260 tall 0 small (1)
b	**any one from:** the other scientists would not have known what Mendel did (1) Mendel could not talk to them as he was dead (1) Mendel's work would have been lost to the other scientists after he died (1) other scientists can compare or check their results (with Mendel's) (1) other scientists can test Mendel's theory (1)	1	**allow** the scientists could improve or develop **Mendel's** investigations / other scientists could learn about his findings (1) **ignore** the scientists could improve their **own** investigations **allow** so other scientists can look at his results / so other scientists didn't steal his ideas (1) **ignore** other scientists can use it to prove their theories **ignore** Mendel got recognition or credit (for his work)
	Total	**8**	

Question	Answer	Marks	Guidance
5 a i	because it contains bromine / does not contain carbon and hydrogen **only** (1)	1	**allow** has Br in the formula (1) **ignore** contains bromine water **ignore** contains a bromine molecule **allow** C and H for carbon and hydrogen **not** does not contain carbon and hydrogen **molecules** only **not** does not contain carbon and hydro
ii	C_2H_3Br (1)	1	**allow** elements in any order **not** C2H3Br / C^2H^3Br
b	idea that (many) alkenes or monomers or (unsaturated) molecules make a polymer **or** idea that (many) alkenes or monomers or (unsaturated) molecules are joined together (1) (conditions are) catalyst / named catalyst e.g. Ziegler-Natta catalyst or triethylaluminium (1) high pressure (1)	3	**not saturated** molecules make a polymer **allow** high level answers e.g. the double bond between carbon atoms splits so the bond can be used to attach to more (creating a chain) (1) **ignore** incorrect catalyst **allow** any pressure above atmospheric pressure (1) **ignore** just 'pressure' **ignore** references to temperature
c	saturated (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line is blank **more than one answer = 0**
	Total	**6**	

Question	Answer	Marks	Guidance
6 a	**(carboxylic) acid** (1) (+ alcohol → ester + water)		**allow** organic acid (1) **not** acid catalyst **not** any named acid other than a named carboxylic acid
b	idea that **attraction** or **force** between water molecules is strong **or** idea that **attraction** or **force** between particles in nail varnish is strong (1) idea that the **attraction** or **force** between water molecules and nail varnish particles is weak (1)	2	**answer must refer to particles or molecules or intermolecular** **allow** the force between water molecules is greater than the force between water molecules and nail varnish particles scores (2) **allow** the force between particles in nail varnish is greater than the force between water molecules and nail varnish particles (2) **allow** bonds for attraction or force **not** intramolecular attraction or force or bond **not** covalent bond
	Total	**3**	

Question	Answer	Marks	Guidance
7 a	**D** (1) **then any two from:** no carbon monoxide is produced (1) no soot is produced (1) only carbon dioxide is produced (1) idea that **D** gives the **most** or **more** energy per £ (1)	3	**if more than one or no choice is made max 2** **answer must include reference to both cost and energy output e.g.** **D** gives out a (relatively) high amount of energy more cheaply (1) **allow** correct comparison to fuel **A** e.g. gives similar amount of energy to **A** but costs less(1) **ignore** just '**D** is cheaper than **A**' **ignore** just '**D** gives out 3800J and only costs £3.00 per litre' **if A is chosen then max 2 marks** **any two from** no carbon monoxide is produced (1) no soot is produced (1) only carbon dioxide is produced (1) **if B is chosen then max 1 mark** no soot is produced (1)
b	**x** = 3 **y** = 2 **z** = 3 (1)	1	**all three required for the mark**
	Total	**4**	

Question	Answer	Marks	Guidance
8 a	(Fraction **A** is) LPG **and** (Fraction **B** is) petrol (1)	1	**both required in the correct order for the mark**
b	**any two from:** idea that demand (always) exceeds supply / ora (1) supply of oil decreased (from 2009 to 2012) (1) demand for oil decreased (from 2009 to 2012) (1)	2	 **ignore** demand stays the same from 2009 to 2010
c	Boiling point **low** → **high** (1) Intermolecular forces **weak / low** → **strong / high** (1)	2	**both required for the mark** **both required for the mark**
d	(during boiling) **only** intermolecular forces are broken **or** covalent bonds are not broken (1)	1	**allow** idea that more energy is needed to break the covalent bonds **or** covalent bonds are too strong (to break) (1)
	Total	**6**	

Question	Answer	Marks	Guidance
9	**Level 3 (5 – 6 marks)** **Answer chooses B to make a water pipe and explains why the polymer is suitable, giving at least two relevant reasons** **AND** relates the melting point of A and B to the structure of the polymers. Quality of written communication does not impede communication of the science at this level. Level 2 (3 – 4 marks) **Answer chooses B to make a water pipe and explains why the polymer is suitable, giving at least three relevant reasons** **OR** **relates the melting point of either A or B to the structure of the polymer.** Quality of written communication partly impedes communication of the science at this level. **Level 1 (1 – 2 marks)** **answer chooses B to make a water pipe and explains why the polymer is suitable, giving at least two relevant reasons.** 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 A*** **Indicative scientific points may include:** **B** is used for making water pipes because • it has a relatively low density (so doesn't require heavy lifting equipment to install) • it is strong (so will not break easily) • it is rigid (so pipe will not bend) • idea that its melting point is above boiling water or above the temperature of any liquid that will flow through the pipe / pipes will not melt with hot water Relating melting point of the polymers to their structures • **A** has a low(er) melting point because it has weak (intermolecular) forces between polymer molecules • **B** has a high(er) melting point because it has strong (intermolecular) forces **or** covalent bonds **or** cross-linking bridges between the polymer molecules **allow** comparison as a description for both **A** and **B** e.g. **B** has a higher melting point because it has **stronger** (intermolecular) forces between the polymer molecules marks can be scored from a labelled diagram **If no other marks awarded allow** correct properties of polymer **B** even if polymer **A** is chosen for Level 1 one mark **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
10 a	**any two from** poor (internet) connection / poor (mobile phone) reception / interruption (of signal) / disruption (of signal) / blocking (of signal) / not near a hot spot (1) interference / signals crossing (1) (radiation can be) reflected (1) (radiation can be) refracted (1)	2	 **allow** too many devices connected / devices too far apart / if you are far away it may not work / poor signal or poor coverage / no direct line of sight / poor weather conditions (1) **allow** background noise (1) **ignore** bounces **ignore** diffracted
b	digital (1) different codes / different (sets of) signals / different frequencies / different wavelengths (1)	2	**allow** correct description of digital signal e.g. on and off / 0 and 1 (1) **not** analogue and digital signals used **ignore** just uses signals
	Total	**4**	

Question	Answer	Marks	Guidance
11 a	**[Level 3]** **Final temperature calculated** **AND** **an explanation of the results using data from the table.** Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **[Level 2]** **Temperature change calculated** **AND** **describes a result.** Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** **Attempt to calculate final temperature** **OR** **describes a result.** 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*.** **final temperature calculated may include:** • final temperature = 30 (^{0}C) **allow** written in table • energy = mass x specific heat capacity x temperature change **allow** as triangle formula • temperature change = $\frac{\text{energy}}{\text{mass x specific heat capacity}}$. • temperature change = $\frac{8400}{0.2 \times 4200}$. • temperature change = 10 (^{0}C) **allow** written in table **results <u>explained</u> at level 3 may include:** • energy supplied is larger than energy absorbed as not all the energy is used to heat the water • the difference between energy supplied and energy absorbed increases as the final temperature increases because the rate of heat loss increases • the difference between energy supplied and energy absorbed increases as the final temperature increases because greater difference with air temperature **results <u>described</u> at level 1 and 2 may include:** • any correct description e.g. greater temperature change requires more energy / higher final temperature requires more energy • energy supplied is larger than energy absorbed • the difference between energy supplied and energy absorbed increases as the final temperature increases • the difference between energy supplied and energy absorbed increases as the final temperature increases **Use the L1, L2, L3 annotations in scoris. Do not use ticks.**

Question	Answer	Marks	Guidance
b i	**conduction** put material around cup / cover it with insulation (1) **convection** add lid / cover top of cup / cover opening of cup (1)	2	**allow** named suitable insulation material e.g. bubble wrap / foam / polystyrene / paper / cardboard / tin foil **allow** wrap something around the cup (1) **ignore** 'insulates cup' or 'use insulated cup' if no other mark awarded **allow** 'cover **or** wrap the cup' for either conduction or convection
ii	less time needed / quicker / faster (1) **then any one from:** less energy lost or less heat lost (1) (so) less energy needed or less heat needed (1)	2	 **allow** less heat escapes (1) **allow** less convection / less conduction / less radiation (1) **ignore** no heat loss / no energy loss
	Total	**10**	

Question	Answer	Marks	Guidance
12 a	strong waves linked to high level of ozone (1) weak waves linked to low level of ozone (1) **but** strong**er** waves linked to more ozone **or** weak**er** waves linked to less ozone (2)	2	**ignore** ref to more or less long waves
b	**any two from:** CFCs have depleted the ozone layer (1) this lets **more** ultraviolet radiation (reach Earth) (1) ultraviolet causes **skin cancer or** cataracts **or** sunburn (1)	2	 **allow** CFCs have reduced / thinned / damaged or destroyed (in parts) the ozone layer (1) **allow** idea that CFCs make the hole **larger** (1) **ignore** CFCs make the hole large **ignore** CFCs make the hole weaker **ignore** CFCs have made a hole in the ozone **allow** UV for ultraviolet radiation **allow** UV for ultraviolet radiation
c i	**any one from:** idea that whole world being affected (1) idea that without an agreement then hole in ozone layer will get worse (1) idea that many countries are needed to reduce the hole in the ozone layer / just a few countries or one country are not enough to reduce the hole in the ozone layer (1)	1	 **allow** it's a global problem / not just affecting one country or a few countries (1) **allow** to increase the impact of reducing the depletion of the ozone layer / has more effect / impact will be more significant (1) **ignore** to save the planet / stop wars / stop conflict

Question	Answer	Marks	Guidance
c ii	**any one from:** idea that some countries have lots of CFC to dispose of (1) some countries are more reliant on CFCs (1) some have large populations (using CFCs) (1) some countries do not have the money to change CFC use / LEDC problems / country is still developing (1) some countries are small so impact is very small (1) need (time) to find alternatives / no safe alternatives (1)	1	
	Total	**6**	

Question	Answer	Marks	Guidance
13 a	.....into water ☐ ....by body tissue ✓ .....through plastic ☐ ..... absorbs microwaves ✓ .....diffract at all ☐ .....weather conditions ☐ (2)	2	each correct tick = 1 mark if three ticks maximum 1 mark four ticks = 0 marks

Question	Answer	Marks	Guidance
b	.....1cm into food [ ] .....shiny surface [ ] .....surface of food [✓] .....the frequency [ ] (1)	1	more than one tick = 0 marks
c	**C** (1) optical fibres use **total internal reflection or** TIR **and** multiplexing **and** fast(er) (than **A**)(1)	2	**if A B D then 0 marks** **allow** good channel speed or medium channel speed for idea of fast
	Total	**5**	

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