OCR
RECOGNISING ACHIEVEMENT

GCSE

Science B

General Certificate of Secondary Education

Unit **B711/02:** Unit 1 Modules B1, C1, P1 (Higher Tier)

Mark Scheme for June 2012

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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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For answers marked by levels of response:

a. **Read through the whole answer from start to finish**

b. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor

c. **To determine the mark within the level**, consider the following:

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

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

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

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

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
	Level 1
	Level 2
	Level 3

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

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

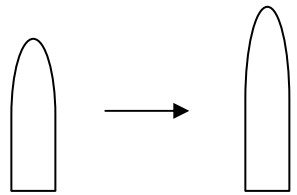
Question			Answer	Marks	Guidance
1	(a)		chromosome(s) (1) XX (1)	2	**ignore** genes / DNA / sex cells / gametes
	(b)		amino acids / polypeptides / peptides (1)	1	**ignore** monomers / hydrocarbons

Question	Answer	Marks	Guidance
(c)	**[Level 3]** Calculates the EAR value and uses both values to compare the risks of suffering kwashiorkor in developing **and** developed countries Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **[Level 2]** Uses the information in the table to compare the protein intake **and** risks of different groups of boys (developing compared to developed countries or 6 to 10 year olds compared to 11 to 18 year olds) **and** calculates the EAR Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** Uses the information in the table to compare the protein intake **and** risk of different groups of boys **or** calculates the EAR 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/A*.** **Indicative scientific points at level 3 may include:** • EAR of 20.4 (g) higher than intake for 10 year old boys in developing countries / Ghana / Mexico **so high risk** • EAR of 40 (g) is higher than the intake 11 to 18 year old boys in Ghana **so risk** • EAR of 40 (g) is less than the intake 11 to 18 year old boys in Mexico **so little or no risk** • EAR of 20.4 (g) and 40 (g) lower than intake for boys (of the corresponding ages) in developed countries / UK / USA **so little or no risk** **Indicative scientific points at level 2 may include:** • 6 to 10 years boys have a low(er) protein intake than 11 to 18 year old boys in developing and/or developed countries • (both age groups of) boys in developing countries / Ghana / Mexico have a lower protein intake than (the same age group) boys in developed countries /UK / USA / ora • EAR: 10 year old = 20.4 (g) **Indicative scientific points at level 1 may include:** • boys in developing countries / Ghana / Mexico have a low(er) protein intake **so** are more at risk / ora • EAR: 10 year old = 20.4 (g)
	Total	**9**	

Question			Answer	Marks	Guidance
2	(a)	(i)	parasite (1) host (1) vector (1)	3	**correct order required**
		(ii)	dehydration / denaturing of enzymes (1)	1	**allow** damage to enzymes or stops enzymes working or affect the way enzymes work (1) **not** kills enzymes **allow** heat exhaustion or heat stroke (1) **ignore** just 'exhaustion' or just 'stroke' **ignore** fainting or dizziness or headache or hyperthermia **ignore** burn or body becomes too hot or overheats **ignore** damage to any part of body or cell eg brain / nerves **ignore** organ failure
	(b)		**double** blind test or **double** blind trial (1) **and any one from:** idea that it removes bias (by the doctor / patient) (1) rules out any psychological improvement (1)	2	**ignore** just blind test or blind trial **allow** idea that the reports or conclusions are based on the data (1) **allow** idea that both groups will be monitored equally (1) **allow** avoids 'the feel good factor' (1) **allow** avoids or reduces the placebo effect (1) **ignore** just, for a fair test / to treat patients fairly / to see if it works / it makes the test unfair
			Total	**6**	

Question			Answer	Marks	Guidance
3	(a)		genetic diagram showing two heterozygotes crossing to produce four correct offspring (1) probability = 0.25 / 25% / ¼ / 1 in 4 / 1 to 3 / 1:3 (1)	2	examples of correct genetic diagrams: F f F FF Ff f Ff ff (1) Ff Ff F f F f FF Ff Ff ff (1) **not** 1:4 or 1 to 4
	(b)		**any two from:** consider whether to keep the foetus / abort the foetus (1) may have ethical / religious objection to abortion or test (1) idea of how the life a child with cystic fibrous may be affected (1) idea of it affecting the lifestyle or career or emotional state of the parent or sibling (1) consider whether the actual test carries a risk (1) the test may carry a risk of a healthy foetus being damaged (1)	2	**allow** concerned that Akinyi feels that she is not wanted / that she should have been aborted (1)
			Total	**4**	

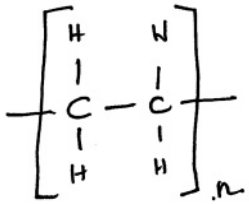
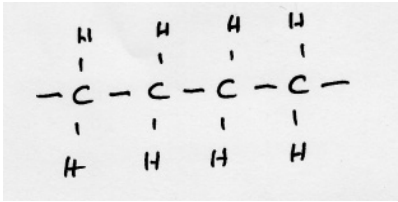
Question			Answer	Marks	Guidance
4			idea that as cholesterol or fatty food increase the chance of a heart attack increases / ora (1) fatty foods or cholesterol cause plaques (in arteries) / cholesterol or plaques narrows (coronary) arteries (1) reduces oxygen **to heart or (heart) muscle cells** (1)	3	 **allow** fatty foods or cholesterol builds up in arteries / cholesterol or plaques block or clogs or restricts blood flow in (coronary) arteries (1) **allow** blood vessels for arteries **not** veins or capillaries **ignore** reduces oxygen to the body
			Total	**3**	

Question			Answer	Marks	Guidance
5	(a)		auxin (1)	1	**allow** IAA / indole acetic acid (1) **allow** phonetic spelling **ignore** ref to tropism
	(b)		**drawing** showing shoot straight up (1) TIBA reduces or stops cell elongation (on the shady side) (1)	2	 (1) **allow** shoot bending less to the right (than diagram above) or bending very slightly to the left (1) **ignore** height of shoot **allow** phototropic response would be inhibited (1) **ignore** TIBA stops auxin diffusing
			Total	**3**	

Question			Answer	Marks	Guidance
6	(a)		made slower than it is used up / AW (1)	1	**allow** a finite resource or the supply will run out and it is no longer being made (1) **allow** a finite resource or the supply will run out and it is being made slowly (1) **allow** being used faster than it is being made (1) **ignore** it takes millions of years to make **ignore** it cannot be used again **ignore** just it will eventually run out **ignore** when 'it's gone it's gone'
	(b)		**any two from:** new reserves may be discovered / AW (1) renewable / alternative fuels may be used more or less (1) more (accurate or up to date) data becomes available (1) idea of impossible to predict the pattern of future use (1)	2	 **allow** human population may change in the future / certain fuel may become more expensive so used less in the future / economic reasons eg recessions or boom (1)
			Total	**3**	

Question			Answer	Marks	Guidance
7	(a)		**any two from:** bigger or longer molecules have stronger (intermolecular) forces (1) bigger or longer molecules have higher **boiling point** (1) stronger (intermolecular) forces will result in a higher **boiling point** (1) more energy is needed to overcome stronger (intermolecular) forces (1)	2	**answers must be comparative** **allow** ora for all marking points **not** bigger or longer molecules have stronger (intermolecular) **bonds** **not** stronger (intermolecular) **bonds** will result in a higher boiling point **not** more energy is needed to overcome stronger (intermolecular) **bonds** (1)
	(b)	(i)	8 (1)	1	**allow** C_3H_8 / H_8C_3 (1)
		(ii)	$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ correct formula for reactants and products (1) balancing – dependent on correct formulae (1)	2	**allow** any correct multiple including fractions **allow** = instead of → **not** and or & for + **allow** one mark for correctly balanced equations with minor errors of case and subscript eg C3h8 + 5O2 → 3Co2 + 4H2O (1) **allow** ecf from wrong formula for propane in (b)(i) eg $2C_3H_6 + 9O_2 \rightarrow 6CO_2 + 6H_2O$ (2) $C_3H_6 + 4\frac{1}{2} O_2 \rightarrow 3CO_2 + 3H_2O$ (2)

Question			Answer	Marks	Guidance
	(c)	(i)	kilometres travelled = 16 x 5 (km) or **80 km** (1) (mass of carbon dioxide made) = 80 x 90 (g) (1)	2	**marks are for the working out not the final answer** **allow** fuel consumption x litres of petrol = 80 (1) **not** 80 km/h **allow** 80 x carbon dioxide emissions (1) **not** if 80 used is clearly from 80 km/h **allow** $\frac{7200}{80}$ = 90 (1) **allow** (mass of carbon dioxide made) = 16 x 5 x 90 (g) (2) **allow 80km** x 90 (g) (2)
		(ii)	**no** idea that the car will not be travelling at 80 km/h all the time / at times incomplete combustion may occur (1) **or** **yes** because the same amount of fuel being burned must give the same amount of carbon dioxide (1)	1	**allow no** because in a town speed limits will be less than 80 km/h / not always travelling at the same speed (1) **allow no** the carbon dioxide levels will change depending on the speed of the car (1) **allow no** if she stops (and starts) **ignore yes** because her fuel consumption is the same
			Total	**8**	

Question			Answer	Marks	Guidance
8	(a)		contains a double bond (between carbon atoms) (1) contains **only** carbon and hydrogen (1)	2	**allow** contains only carbon and hydrogen atoms (1) **not** a mixture of only carbon and hydrogen **not** contains only carbon and hydrogen molecules
	(b)		colour at start – orange (1) colour at end – colourless (1)	2	**allow** brown / red-brown / orange-brown / red-orange (1) **ignore** yellow or red on its own **allow** decolourised **ignore** clear or transparent
	(c)		 (1)	1	**brackets required** but can be [ ] or ( ) bonds at the sides must be present, but do not need to pass through the brackets **allow** formula without 'n' **allow** formula drawn with an even of carbons with at least 4 carbon atoms (brackets not required) eg  (1)
			Total	**5**	

Question			Answer	Marks	Guidance
9	(a)		**use** **any one from:** (warnings on hot water) cups (1) (to tell if water is hot in a) kettle / pans (1) drink cans / bottle labels (1) thermometers (on babies head or wall strips) (1) (babies) spoons (1) babies bath toys (1) radiators (1) mood rings (1) battery testing (1) T shirts (1) wall paper (1) paint (1) **explanation** **any one from:** (because) change colour when heated (1) (because) change colour when cooled (1)	2	**allow** any other suitable use for a thermochromic pigment (1) **allow** detect temperature changes (1) **ignore** references to cooker hobs / fridges / freezers **not** paint in wrong context eg paint can be spread on walls **allow** colour changes as temperature changes (1)
	(b)		(harmful) radioactive substances were used / (harmful) radioactive substances are not used now (1)	1	**allow** they used to give off harmful radiation (1) **allow** radiation poisoning (1) **ignore** just they give off radiation **ignore** they were toxic
			Total	**3**	

Question			Answer	Marks	Guidance
10			**[Level 3]** Suggests two suitable properties of poly(ethene) **and** links these to its uses **and** discusses an environmental problem **and** an economic problem. Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **[Level 2]** Suggests one suitable property of poly(ethene) linked to its use **or** two suitable properties **and** discusses an environmental problem **or** an economic problem. Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** Suggests one suitable property of poly(ethene) **and** states one environmental problem **or** economic problem. 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 at level 2 and 3 may include:** **suitable properties linked to use (2 required) eg** • flexible so can fold bag up / fit around the shopping • waterproof so will not dissolve in rainwater or can hold wet items / shopping stays dry • strong / tear-proof so does not break when it has shopping in it • non-toxic or not poisonous so food stuffs do not get contaminated • it is light weight so easy to carry • printable or can be coloured to add logos **problem discussed** • land-fill sites - will not rot / get filled up quickly / need for more land-fill site / uses up valuable land • burning - produces greenhouse gases or toxic gases • recycling - difficult to sort / difficult to get everyone to do it • economic problems - costs a lot to recycle / disposal wastes a valuable raw material / buying land-fill sites is expensive / land fill sites could be used for housing or farming / costs of picking up litter **Indicative scientific points at level 1 may include:** **suitable properties eg** • flexible / waterproof / strong / tear-proof / non-toxic or non poisonous / light weight / printable / can be coloured **problems eg** • uses land-fill sites / needs to be recycling / causes litter / costly to dispose of
			Total	**6**	

Question			Answer	Marks	Guidance
11	(a)	(i)	a measure of hotness (on an arbitrary scale or chosen scale) (1)	1	**allow** how hot something is (1) **allow** a measurement of (average) kinetic energy (of particles) (1) **ignore** a measure of heat
		(ii)	**any two from:** (use of) a range of shades of grey or light or dark or white or black (1) a certain shade represents a certain temperature (1) idea that hottest parts are the lightest shades (1) coldest parts are the darkest shades (1)	2	 **allow** (use a) range of colours (1) **allow** a certain colour represents a certain temperature (1) **allow** idea that hottest parts are white / yellow / red (1) **allow** coldest parts are black / dark blue / purple (1)

Question			Answer	Marks	Guidance
	(b)	(i)	**lightweight curtains** 13 (years) **heavyweight curtains** 20 (years) (1)	1	**both correct in correct order for one mark** **if table blank look for correctly indicated answers**
		(ii)	heavyweight curtains (no mark) idea that the heavyweight curtains are saving more money or energy each year (1) **or** idea that the lightweight curtains are saving less money or energy each year (1) **but** idea that once heavyweight curtains are paid back he make a saving on his fuel bill of **£500** (over the next 5 years) (2) **or** idea that once lightweight curtains are paid back he only makes a saving on his fuel bill of **£120** (over the next 13 years) (2)	2	**If candidate writes lightweight curtains** **allow** lightweight curtains would be cheaper to buy / fit (max.1) **allow** higher level answers eg difficult to work out the payback time over long periods of time as based on today's fuel prices / as fuel prices likely to rise in the future (1)
			Total	**6**	

Question			Answer	Marks	Guidance
12	(a)		**any two from:** allows results to be replicated (1) allows further evidence to be collected (1) idea that results can be checked or compared (1) so other scientists know what work they have done (1) so the public is made aware (of possible dangers) (1) so the public can make informed decisions (1) so they can get credit for their work (1)	2	 **allow** so other scientist can develop or further the results (1) **allow** so other scientists can read about their work (1) **allow** named examples of credit eg awards / money for further research (1)

Question	Answer	Marks	Guidance
(b)	**[Level 3]** Explains in detail two problems including at least one emboldened technical term **and** two objections from members of the public. Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **[Level 2]** Explains two problems **and** one objection from members of the public **or** explains one problem **and** two objections from members of the public. Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** Explains one problem **and** one objection from members of the public. 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/A*.** **possible problems with positioning of portable microwave transmitter and reasons** • need space around the dish to reduce **interference** / microwave signals may be interference with other signals • need space around the dish to allow for **diffraction** / there is no diffraction of microwaves around large objects • need transmitters close together or in '**line of sight'** to reduce signal loss • need to be positioned high up (to reduce signal loss) • may have adverse weather conditions affecting the signal • may need to carry the signals over water and not possible to place a transmitter on water • curvature of the Earth a problem if transmitters too far apart **possible objections from members of the public** • issues with traffic / noise / visual pollution • worries over the safety of microwaves (close to homes) • worries over interference with signals / equipment eg TV signals or mobile phone signals • possible issues with the unnecessary overuse of outside broadcasts award L1 (1 mark) for general descriptions about a problem or objection from a member of the public **allow** microwave dishes as idea of microwave transmitters
	Total	**8**	

Question			Answer	Marks	Guidance
13	(a)		amplitude 200 (mm) **and** time 02.15 (hours) (1)	1	**allow** amplitude -200 (mm) **allow** any time in the range 02.10 – 02.20 (hours)
	(b)		P / Primary wave / longitudinal (no mark) fast(er) (1)	1	**no mark for wave but must have P wave / longitudinal somewhere in answer before mark can be awarded for reason**
			Total	**2**	

Question			Answer	Marks	Guidance
14	(a)		**(gamma)** X ray ultraviolet light light (1) **(infrared)** microwave radio (1)	2	 **allow** UV **allow** light / visible spectrum
	(b)		3×10^{13} (Hz) (2) **but if answer incorrect** $\frac{3 \times 10^{8}}{(1 \times) 10^{-5}}$ (1) **or** $\frac{300 \times 10^{6}}{(1 \times) 10^{-5}}$ (1)	2	**allow** correct answer in different forms eg 30×10^{12} (Hz) (2) 30 000 000 000 000 (Hz) (2) 3×10^{10} KHz (2) 3×10^{7} MHz (2) **allow** 3 E13 (1)

Question			Answer	Marks	Guidance
	(c)	(i)	**C** / IR-C (1)	1	**allow** ecf from (b)
		(ii)	any number from 9.0×10^{-21} up to 1.0×10^{-19} (Joules) (1)	1	**allow** any number of decimal places eg $1.224\ 10^{-19}$ (Joules) (1)
		(iii)	as wavelength increases energy decreases / ora (1)	1	**allow** larger or longer wavelength has less energy / ora (1) **allow** inversely (proportional) (1)
	(d)		**ray 1** is refracted (as it moves from glass to air) (1) **ray 2** is (totally internally) reflected (in the glass and then refraction as it moves from glass to air) (1)	2	**allow** refracted twice (1) **not** diffraction **allow** refracted, reflected and then refracted (1) **allow** reflected and then refracted (1) **allow** TIR (1) **not** total internal refraction **not** diffraction
			Total	**9**	

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