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 2014

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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.

These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning
BP	Blank Page – this annotation **must** be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	correct response
	incorrect response
BOD	benefit of the doubt
NBOD	benefit of the doubt **not** given
ECF	error carried forward
^	information omitted
I	ignore
R	reject
CON	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	(idea that it) **controls** how much light enters (the eye) / AW (1)	1	**allow** to let through a certain **amount** of light **ignore** to let in light / change the size of the pupil / coloured part of the eye
b	refracted / focused (1) **then one from** (refracted) by the cornea / lens (1) (focused) on the retina or fovea / by lens (1)	2	**allow** bends **not** reflected / bounced **second marking point can only be awarded if no contradiction e.g.** focused by cornea (1) **allow** focused by lens (2) **allow** focused on the retina (2) **allow** rods and cones for retina **if no other mark awarded** **allow** passes through the pupil (1)
c	idea of two images (1) **but** the more similar the images from each eye are the further away prey is / ora (2)	2	**allow** two pictures / two visions (1) **ignore** the idea of images overlapping
	Total	**5**	

Question	Answer	Marks	Guidance
2 a	auxin (1)	1	**ignore** reference to phototropism
b i	shoots in tray B have **more** auxin / **more** hormone **or** shoots grow more because they have **more** auxin / **more** hormone (1) **but** increase in auxin causes **more** cell elongation (in B) / increase in hormone causes **more** cell elongation (in B) (2)	2	**allow** ora e.g. idea that light causes there to be less auxin in shoots in tray A **but not** light destroys auxin in shoots in tray A **ignore** more auxin on shady side **allow** auxin causes **cell** elongation (1)
b ii	(idea that shoots 1 and 2 will) grow less (than the others in container) (1) because hormone / auxin is **made** in the tip (1)	2	**assume answer refers to shoots 1 and 2 unless stated** **allow** they do not grow (1) **allow** top for tip **allow** because meristem have been removed (1) **ignore** root tip **not** auxin inhibits growth
	Total	**5**	

Question	Answer	Marks	Guidance
3	**[Level 3]** **Provides a detailed explanation of how insulin works** **AND** **makes more than one comparison between the two types.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Provides a detailed explanation of how insulin works with no comparisons made** **OR** **provides a simple explanation for how insulin works AND makes more than one comparison between the two types.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Provides a simple explanation for how insulin works** **OR** **makes one comparison between the two types.** 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*** **To reach Level 3 answer must refer to glucose** **Indicative scientific points for detailed explanations of how insulin works may include:** • insulin causes **glucose** in the blood to be stored as **glycogen** • insulin causes **glucose** to be converted to **glycogen** **not** converts glycogen into glucose **not** breaks down glucose into glycogen **Indicative scientific points for simple explanations of how insulin works may include:** • when blood glucose levels increase body needs more insulin • insulin targets liver or muscle • insulin causes liver or muscle to store glucose • insulin removes glucose from the blood **ignore** insulin made in the pancreas **ignore** ways glucose is added to blood **Indicative scientific points for comparison of insulin types at all levels may include:** • insulin A activity is higher/ **ora** • insulin A activity is shorter lived / **ora** • insulin B works all night / **most** of the day • using insulin A and B ensures you always have insulin activity **ignore** insulin B works all day / references to when insulin is taken **allow** blood sugar levels for blood glucose levels at levels 1 and 2 but **ignore** just sugar levels **ignore** insulin regulates blood sugar levels **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
4 a	**any two from:** non-smokers increase (1) smokers decrease (1) (idea that) ex-smokers percentage is the same at start and end (1) percentage of ex-smokers and current smokers very similar (1) there are more non-smokers than smokers (1) there are more non-smokers than ex-smokers (1)	2	**allow** smokers (fall and rise) and then fall (1) **but not** incorrect patterns e.g. rising again at the end **ignore** percentage of ex-smokers has not changed / current smokers has not changed (over the years) / ex-smokers increases / ex-smokers decreases **allow** mark for quoting data to show change over time e.g. smokers have dropped by 8% / smokers have dropped from 29% to 21% (2)
b	**any two from:** more **evidence** or knowledge gathered about the health risks of smoking (1) mention of **named disease** (caused by smoking) (1) (evidence gathered) used to encourage people to give up smoking or not start smoking (1)	2	**allow** now know the (harmful) effects of smoking / are aware of the (harmful) effects of smoking (1) **but** also qualified e.g. now know the (harmful) effects of smoking so fewer people smoke / so more people want to stop (2) **allow** smoking causes lung cancer (1) **but** we now know smoking causes lung cancer (2) **allow** (evidence gathered) is used to introduce smoking laws (1) **ignore** reference to humans not harmed in testing

Question	Answer	Marks	Guidance
c	(nicotine) increases heart rate (1) **carbon monoxide** reduces 'oxygen-carrying' capacity of the blood / AW (1) **but** **carbon monoxide** reduces 'oxygen-carrying' capacity of the blood so heart rate increases (to compensate) (2)	2	**allow heart** has to work faster (1) **but ignore** heart has to work harder **ignore** make the blood pump faster **allow carbon monoxide** combines with haemoglobin so less oxygen carried (in blood) **ignore** just less oxygen carried round the body **allow** idea of smoking causes the narrowing or blocking of arteries (1) **ignore** smoking damages arteries **not** tar blocks arteries
	Total	**6**	

Question	Answer	Marks	Guidance
5 a	idea less oxygen in their blood (cells) or (sickle) cells cannot carry as much oxygen (1)	1	**allow** may get out of breath easier / more tired / less respiration so less growth / less able to keep warm / less able to concentrate / may cause stroke or heart attack / headaches / sudden pain in joints / higher blood pressure **allow** less oxygen combines with haemoglobin
b	genetic diagram showing Aa crossed with Aa to produce three non-sickle cell and one sickle cell (1) **then probability matching diagram:** 25% / 0.25 / 1 in 4 / 1 to 3 / 1:3 / ¼ (1)	2	parents Aa x Aa gametes A or a x A or a offspring AA Aa Aa aa **ignore** connecting lines Punnet square must show correct gametes and offspring **allow** ecf for second mark if diagram is incorrect
	Total	**3**	

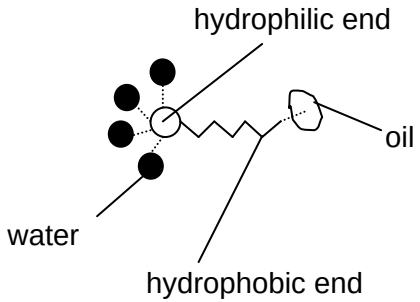
	A	a
A	AA	Aa
a	Aa	aa

Question	Answer	Marks	Guidance
6 a	colloid (1)	1	
b	(A because) solvent evaporates (1) less solvent / not much solvent (1)	2	**marks are for explanation** **if answer B then no marks** **if left blank then mark answer** **not** less pigment / no polymer / less of other ingredients **not** more binding material **allow** ora e.g. the more solvent the longer it takes to evaporate (2)
	Total	**3**	

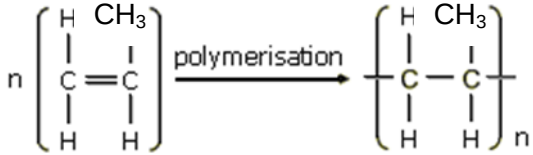
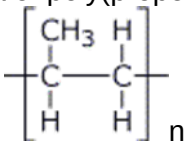
Question	Answer	Marks	Guidance
7 a i	correct plotting for **both** hexane and heptane (1)	1	**allow** ± ½ square 6/69 7/98 **ignore** lines on graph
ii	boiling point within range 26 – 36 (°C) (1)	1	**allow** ecf from clear line on graph if answer not in range
a iii	**any two from:** the larger the (alkane) molecule the higher the boiling point / more carbon atoms the higher the boiling point / ora (1) the larger the (alkane) molecule the more or stronger the **intermolecular** forces / the more carbon atoms the more or stronger the **intermolecular** forces (1) the stronger the **intermolecular** forces the higher the boiling point (1)	2	 **allow** larger molecules have stronger forces **between molecules** / larger molecules have more forces **between molecules** **allow** the larger the molecules the more energy or heat is needed to break **intermolecular** forces / forces **between molecules** **not** forces between atoms / in molecules / intramolecular forces **allow** IMF / intermolecular bonds / bonds between molecules

Question	Answer	Marks	Guidance
b	$2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$ correct reactants and products (1) correct balancing (1)	2	**allow** any correct multiple, including fractions $C_4H_{10} + 6½O_2 \rightarrow 4CO_2 + 5H_2O$ (2) **allow** = instead of → **not** and / & instead of '+' balancing mark is dependent on the correct formulae but **allow** 1 mark for a balanced equation with a minor error in subscripts / case e.g. $2C_4H_{10} + 13O^2 \rightarrow 8CO2 + 10H_2O$ (1)
c	idea that percentage (of naphtha) found in North Sea crude oil is greater than percentage required for use (1) idea that naphtha can be used or cracked to make petrol / naphtha can be used or cracked to make LPG (to match supply with demand) (1)	2	**allow** 10% is found but only 5% is needed (1) **allow** shorter in demand molecules as petrol or LPG **ignore** naphtha can be cracked to make more useful substances or fuels
	Total	**8**	

Question	Answer	Marks	Guidance
8 a	the higher the **nitrogen dioxide** levels, the greater the severity of asthma attacks / aw (1)	1	**not** the higher the **nitrogen** levels, the greater the severity of asthma attacks **allow** positive correlation **allow** (directly) proportional **allow** the higher the nitrogen dioxide levels, the worse the asthma attacks **ignore** the higher the nitrogen dioxide levels, the more asthma attacks
b	(Phil is correct) **any one from:** idea that data does not include children / old men / women (1) idea that data does not consider lifestyle (1) idea that data does not include people who live in the country / only includes those living in city (1) idea there may be another reason for asthma / sulfur dioxide may cause asthma (1)	1	**mark is for explanation** **if answer Nick then no marks** **if left blank then mark answer** **allow** different age groups / genders might be affected differently (1) **ignore** only people living in the city are exposed to nitrogen dioxide
	Total	**2**	

Question	Answer	Marks	Guidance
9 a	shape of **protein** (molecule) changes (permanently) / **protein** (molecules) are denatured (1)	1	**ignore** a chemical change takes place **ignore** enzymes are denatured
b	**hydrophilic** end / **hydrophilic** head bonds to water molecules (1) **hydrophobic** end / **hydrophobic** tail bonds with oil molecules (1)	2	**marks can be awarded from a correctly labelled diagram** **allow** surrounded / attracted / holds on to / sticks to / binds to but **ignore** loves / hates **allow** use of head / tail only for one mark e.g. heads bonds to water and tails bonds to oil (1) **but** heads bond to oil and tails bond to water (0) **if no marks scored from LHS:** **allow** idea that the emulsifier molecule has hydrophilic and hydrophobic parts (1) **allow** both marks for a labelled diagram that shows bonding to both water molecules and oil  (2) **allow** hydrophilic tails attached to water and hydrophobic head attaches to oil (1)
	Total	**3**	

Question	Answer	Marks	Guidance
10 a i	contains carbon and hydrogen (1) **but** **only** contain carbon and hydrogen / **just** contains carbon and hydrogen (2)	2	**allow** contains C and H (1) **allow only** contain C and H / **just** contains C and H (2) **not** mixtures of carbon and hydrogen only (0) **not** (compounds containing) carbon and hydrogen molecules only (0)
a ii	C	1	more than one answer scores 0

Question	Answer	Marks	Guidance
b	**[Level 3]** **Answer includes an equation for the polymerisation of propene to make poly(propene).** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Applies knowledge of polymerisation to draw the displayed formula of poly(propene)** **OR** **gives a complete description of polymerisation to make poly(propene) AND gives one of the conditions.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Partially describes polymerisation in terms of the reaction of propene molecules** **OR** **gives one of the conditions.** 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 at Level 3 must include:** equation for polymerisation reaction  **Indicative scientific points at Level 2 may include:** displayed formula of poly(propene)  **allow** more than one repeat unit **allow** CH_3 attached to either C atom **minor errors in displayed formula or equation award lower mark within the level** **Indicative scientific points for a description of: polymerisation may include:** • idea that propene is an alkene • idea that propene is a monomer • idea that propene is unsaturated / has double bond • **many** propene / **many** alkene molecules / **many** monomers react together to form a polymer • idea that double bond breaks in propene • idea that poly(propene) is saturated • reaction is an addition polymerisation reaction **conditions needed may include:** • high pressure • catalyst **ignore** reference to temperature / heat **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**9**	

Question	Answer	Marks	Guidance
11 a i	increasing wavelength (1)	1	more than one answer scores 0 if answer line blank allow correct answer tick, circled or underlined
ii	increasing energy (1)	1	more than one answer scores 0 if answer line blank allow correct answer tick, circled or underlined
b	**any one from:** number of (complete) waves / wavelengths per second (1) number of (complete) cycles / oscillations per second (1)	1	 **allow** number of waves per unit time (1) **allow** number of waves in a particular time e.g. waves per minute (1)
c i	3×10^8 (m/s) (2) **but if answer incorrect** $3 \times 10^2 \times (1 \times) 10^6$ (1)	2	**allow** 300000000 (m/s) (2) **allow** 300 x 1000000 (1)
ii	**any one from:** as the frequency increases, wavelength decreases by same amount (1) same value when frequency and wavelength are multiplied together (1)	1	 **ignore** they are proportional **allow** when multiplied they all give the same result / 3×10^8 / 300000000 (1) **ignore** they all have the same wave speed of 3×10^8 or 300000000
	Total	**6**	

Question	Answer	Marks	Guidance
12	**[Level 3]** **Makes one correct calculation that identifies safe time or SPF** **AND** **explains why dark skin allows longer safe time in the sun.** Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **[Level 2]** **Makes one correct calculation that identifies safe time or SPF** **OR** **explains why dark skin allows longer safe time in the sun.** Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** **identifies difference in skin colour as important** 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.** **To reach Level 3 answer must refer to pigment or melanin.** **Indicative scientific points at level 2 and 3 may include:** **Calculation** • Anton safe time - Bronzer 75 (minutes) / Toptan 225 (minutes) • Ben safe time - Bronzer 300 (minutes) / Toptan 900 (minutes) • Anton should use SPF 36 • Ben should use SPF 9 **Explanation** • dark skins contain **more pigment** / dark skins contain **more melanin** / ora • pigment or melanin absorbs UV / pigment or melanin stops UV **ignore** pigment or melanin filters UV **Indicative scientific points at level 1 may include:** • dark skin does not burn as much • dark skin can stay in sun longer • dark skin stops UV / dark skin blocks UV • lower spf needs reapplying **allow** ora **Use the L1, L2, L3 annotations in scoris.** **Do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
13 a	30 (^{0}C) (2) **but if answer is incorrect** 3150000 (1) 105000	2	 **allow** 3150000 (1) 25 X 4200 **allow** 3150000 ÷ 25 ÷ 4200 (1)
b	**maximum two marks from:** energy is used to heat the radiator (1) **but** (idea of) energy is **conducted** to the radiator (2) (and then) energy is used to heat the room (1) **but** (idea of) energy is **radiated** to the room (2)	2	 **allow** metal or steel for radiator **allow** energy is 'lost' to metal / energy is 'lost' to the radiator (1) **allow** energy is conducted, convected and radiated to the radiator (1) **allow** energy 'lost' to surroundings / energy is 'lost' to room (1) **allow** energy is conducted, convected and radiated to the room (2)
c i	B (no mark) (oil) has a low(er) specific heat capacity (1) so cools down fast(er) / so cools down quick(ly) (1)	2	**if answer A then no marks** **if left blank then mark answer** **allow** oil contains less energy / oil has less heat or energy to 'lose' / less energy needed to heat the oil (1) **allow** stays hot(er) for a short(er) time / will not cool down slow(er) **/** does not take as long to cool down (1)

Question	Answer	Marks	Guidance
ii	**any one from:** idea of room would stay hotter for long**er** (after the radiator has been switched off) / AW (1) idea of the radiator continuing to keep the room warm for long**er** (after the radiator has been switched off) / AW (1)	1	 **allow** radiator / room reaches a certain temperature fast**er** **allow** radiator reaches a high**er** temperature (in the same time) **allow** can be on for less time **ignore** less energy needed to heat it up **ignore** references to cost
	Total	**7**	

Question	Answer	Marks	Guidance
14 a	(TV) use **digital** signals (1) (idea that) each different remote control uses a different signal (1)	2	 **allow** different frequencies / different wavelengths **ignore** different waves **allow** (idea that) TV remote has a different code / different pattern / different impulses **ignore** just TV remote is specific to TV **allow** TV uses digital and others use analogue (1)
b	**any two from** no data / no evidence / no proof (1) website may be unreliable (1) (ideas of) no information about remote controls / irrelevant information (1) (idea that) 'not as harmful' statement is not very accurate or precise (1) no mention of wavelength or frequency of the infrared radiation (in the information he found) (1) (two) statements give only uses of infrared (and not the dangers) (1)	2	 **allow** not published by scientists (1) **allow** e.g. no evidence about remote controls (2) **allow** does not say how harmful / does not say what the harms are / does not give the specific risks (1) **allow** no mention of intensity / energy (in the information he found) (1)
	Total	**4**	

Question	Answer	Marks	Guidance
15	**any two from:** multiplexing (1) fast**er** (signals) (1) less or no interference / less or no disturbance / less or no interruptions (1) more information can be transmitted (1)	2	 **allow** more than one signal at once **allow** quick**er** **allow** fast**er** connection **ignore** very quick **allow** less signal loss or no signal loss / clear**er** signal / bett**er** quality / no data loss
	Total	**2**	

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