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 2017

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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 i	positive (1) phototropism (1)	2	**allow** responds positively(1) **ignore** + **ignore** bends towards the light **allow** phototropic (response) (1) **ignore** photosynthesis
a ii	idea that auxin becomes evenly distributed (1) idea that **cell elongation** occurs (on all sides) (1)	2	**allow** auxin spreads out to all sides / both sides (1) **allow** idea that auxin builds up in all parts / on both sides / in whole shoot (1) **allow** auxin does **not** collect on one side (1) **allow** placement of auxin keeps changing / side with more or less auxin keeps changing (1) **ignore** auxin disperses to shaded side / collects on shaded side **ignore** just 'it elongates' or 'shoot elongates'
b	**any two from:** (yes) has the largest (mean) **number** of roots (1) (no) idea that Roo-Ting has a similar (mean) number of roots (1) (no) only the third best (mean) root **length** / Rootz-it or Roo-Ting has higher or better (mean) root **length /**ora (1) compares two sets of data from the table (1)	2	**Assume answer refers to 'Start-Root' unless otherwise stated** **ignore yes or no; just look for explanation** **allow** it has the **most** roots /has the **larger number** of roots (1) **ignore** it has large number of roots / more root growth **ignore just** (yes) it has 12.8 (mean) root number **allow** Roo-Ting has **slightly** less (mean) number of roots (1) **allow** it has **shorter** roots than Rootz-it or Roo-Ting /ora (1) **allow** does not have the highest root length (1) **ignore** just 'Rootz-it or Roo-Ting grow longer '/ ora e.g. (no) Roo-Ting has (mean) root length of 32.4(mm) rather than 28.3 (mm) (1)

			e.g. (no) Roo-Ting has longer roots as its (mean) root length of 32.4(mm) rather than 28.3 (mm) (2) e.g. (no) it has 12.8 (mean) root number but Roo-Ting has 12.5 which is similar (2) e.g. Start Root 4.1mm less root length than Root-Ting (2)
	Total	**6**	

Question	Answer	Marks	Guidance
2 a	avoid using tobacco products / avoid smoking (1) change diet to avoid foods linked with cancer (1)	2	**allow** stop smoking / avoid passive smoking (1) **allow** reduce smoking / smoke less (1) **allow** eat a balanced or healthy diet / improve diet / better diet (1) **allow** sensible examples (1) **e.g**. avoid high fat diet / reduce fat in diet **e.g.** avoid or reduce junk food **e.g.** avoid or reduce processed food or meat / red meat **e.g.** avoid high sugar or salt diet / reduce sugar or salt in diet **e.g.** eat more fruit or veg **ignore** just 'change diet' **ignore** lose weight / drink less alcohol **ignore** references to anti-oxidants **ignore** reference to medical checks **allow as an extra marking point** idea of more exercise (1)
b i	antibodies (1)	1	**ignore** white blood cells / lymphocytes / memory cells **not** antigens (are made) **BUT allow** antibodies are made to attach to the antigens (1)
b ii	(you could have) dizziness or light-headedness / fainting / blurred vision / nausea / rapid, shallow breathing / fatigue / kidney failure (1)	1	**allow** lack of concentration (1) **allow** lack of energy / tiredness /drowsiness (1) **allow** organ failure / organs stop working (1) **ignore** heart attack / heart failure **ignore** make you ill **/** you could die **ignore** reduces blood flow to the brain

c i	16 (1) 53.3 (%) (1)	**2**	 **allow** ecf from first part (answer in first part/30 x 100) **allow** 53 / 53.33333333333333 / 53.3 with a dot above the .3 to show it is recurring (1) **reject** 53.4
c ii	idea that more **women** in Scotland smoke (1)	**1**	**ignore** more **people** in Scotland smoke **ignore** women in Scotland smoke more cigarettes (per day)
	Total	**7**	

Question	Answer	Marks	Guidance
3 a	**[Level 3]** **Identifies that Sam is long-sighted, Ann is short-sighted** **AND** **gives one possible cause AND both correct lenses linked to correct vision problem for both.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Identifies that Sam is long-sighted, Ann is short-sighted** **AND gives one possible cause for each** **AND suggests a correction for one of them.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Identifies that Sam is long-sighted OR that Ann is short-sighted** **AND** **gives one possible cause** **OR** **suggests a correction for each.** 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 1, 2 and 3 may include:** **ANN** **Short-sight caused by** • eye(ball) too long (**ignore** too big) • lens too fat / thick /rounded • idea of light focused in front of retina / (light) rays meet in front of retina • light **refracted** too much **ignore** (light) rays refracted in front of retina / light does not touch retina / do not meet at the back of the eye **Correction** • Short-sight / Ann corrected by **concave / diverging** lens **SAM** **Long-sight caused by** • eye(ball) too short (**ignore** too rounded /small) • lens too thin / narrow • idea of light focused behind retina / idea that (light) rays (would) meet behind retina • light not **refracted** enough **ignore** (light) rays refracted behind retina / light passes through retina / do not meet at the back of the eye / refract further than the eye **Correction** • Long-sight / Sam corrected by **convex / converging** lens **Look for answers on diagrams but answers on lines take precedence** **ignore** cornea surgery / laser surgery **ignore** references to descriptions e.g. Ann cannot see distant objects well e.g. Sam cannot see close objects well **Use the L1, L2, L3 annotations in RM assessor.**

			Do not use ticks.
b	cannot focus on **near** objects / idea that accommodation is harder (1)	**1**	**allow** lens stays in thin shape / lens cannot become fat (1) **allow** won't be able to do accommodation (1) **allow** idea that difficult to **change** from focusing on distant and nearby objects (1) **ignore '**cannot focus on distant objects **and** near objects'
	Total	**7**	

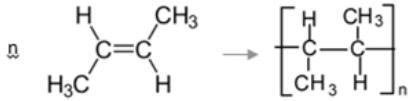
Question	Answer	Marks	Guidance
4 a	anabolic steroid ☐ aspirin ☐ ecstasy ☐ solvent ☑ (1)	1	more than 1 tick is zero
b	alcohol **breakdown** produces or releases toxins /poisons (1) cause cirrhosis (1)	2	**ignore** liver breaks down toxin **ignore alcohol** is a toxin or poison **ignore just** 'liver makes toxins' or 'alcohol makes toxins' **allow** phonetic spelling e.g. serosis (1) **allow** forms hardening / scarring of liver tissue (1) **ignore** rots your liver **ignore** fatty liver
c	**any two from** idea that depressants **affect** synapses (1) depressants block receptor sites or molecules / depressants bind with receptor sites or molecules (1) acetylcholine / neurotransmitter **cannot** bind (to receptor sites or molecules) (1) idea that the next neurone **cannot** be stimulated (1)	2	 **ignore just '**travels to the synapse' **ignore** dopamine receptors **not just** bind with receptors **ignore** less acetylcholine / neurotransmitter released or binding with the receptor sites or molecules **ignore** act like acetylcholine / neurotransmitter **allow** impulse **not** sent along the next neurone / no new impulse

			generated / block transmission of impulse (1) **ignore** slows down or delays transmission of signal or impulse **ignore** slows reaction time / slows reflexes **ignore** chlorpromazine mimics dopamine
	Total	**5**	

Question	Answer	Marks	Guidance
5 a	solvent evaporates / water evaporates (1)	1	**allow** solvent / water becomes a gas or vapour (1) **ignore** just 'evaporation' **ignore** solvent or water dries **ignore** reactions with oxygen **ignore** liquid evaporates
b	**any two from:** idea that **particles / molecules** are mixed or dispersed (within a liquid) (1) **particles / molecules** do **not** settle because bombarded by other particles (1) idea that **particles / molecules** are too small (to settle at bottom of paint) (1)	2	 **allow** idea that pigment (particles) is mixed or dispersed (within a liquid) (1) **allow** particles dispersed in another substance (1) **ignore** just 'mixture of particles' **but allow** mixture of particles in a liquid (1) **ignore** oil droplets dispersed in water **ignore** paint droplets dispersed in water / particles of solvent molecules **ignore** dispersal of paint droplets with a solvent **not** solute spread out in solvent or solvent dispersed in solution **allow** there is charge repulsion between particles (1) **ignore** powder is fine (so does not settle at bottom of paint)
c	**C** (1) (because) it gives off light or emits light (in the dark) (1)	2	**If another pigment chosen then no marks** **allow** glows (in the dark) (1) **ignore** just 'absorbs light' or 'takes in light' **ignore** references to colour and temperature **ignore** energy unless it is clear it is light energy
	Total	**5**	

Question	Answer	Marks	Guidance
6 a	(yes) **(only award these marks if a 'yes' answer is given)** **any two from:** cheapest / **most** cost efficient / **most** cost effective (1) higher energy content than LPG **and** propane / **second** highest relative energy content (per litre) (1) idea that you don't need as much (volume) as LPG **and** propane / **second** lowest volume needed / **only** gas oil requires less volume (1) produces **less** carbon dioxide emissions than gas oil (1)	2	**marks are for explanation which must be comparative** **allow** cost less (than the others) (1) **ignore just '**cost effective or cost efficient' **ignore** 'it is cheap' **ignore** just 'high relative energy content' **ignore** just 'volume needed to heat house per year is low or lowest' **allow** is not the highest producer of carbon dioxide (1) **ignore** produces medium relative mass of carbon dioxide **Max one mark for no answer with explanation** **(only award these marks if a 'no' answer is given)** e.g. no because gas oil requires less or lowest volume / gas oil contains more or the most energy (per litre) / paraffin does not have the high**est** relative energy content / paraffin produces more carbon dioxide than LPG **or** propane (1) **ignore** produces the most carbon dioxide **ignore** does **not** have the most energy content

b	idea that small**er** molecules have weak**er** or few**er** **intermolecular** forces / ora (1) idea that small**er** molecules have low**er** boiling points / ora (1)	2	**comments must be comparative** **allow** small**er** molecules have weak**er** forces **between molecules** / small**er** molecules have few**er** forces **between molecules /** ora (1) **allow** small molecules have weak or few **intermolecular** forces **and** large molecules have strong or many **intermolecular** forces(1) **ignore** smaller or larger intermolecular forces **allow** small molecules have low boiling points **and** large molecules have high boiling points (1) **allow** weak**er** or few**er** intermolecular forces have lower boiling point / ora (1) **allow** the smaller the molecules the less energy or heat is needed to break **intermolecular** forces / forces **between molecules** (1) **allow** IMF / intermolecular bonds / bonds between molecules **not** forces between atoms / in molecules / int**ra**molecular forces **ignore** references to position fractions are in column
c	$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ correct formulae (1) balancing - conditional on correct formulae (1)	2	**allow** any correct multiple, including fractions e.g. $2C_3H_8 + 10O_2 \rightarrow 6CO_2 + 8H_2O$ (2) **allow** = or ⇌ for arrow **not** 'and' or & for + **allow** one mark for correct balanced equation with incorrect use case, superscript or subscript e.g. $C_3h_8 + 5O2 \rightarrow 3Co_2 + 4H2O$
	Total	**6**	

Question	Answer	Marks	Guidance
7 a	**C** (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line is blank
b i	addition (1)	1	**ignore** compound / polymerisation
c	 structure of product (1) balanced equation with correct use of n (1)	2	**The first marking point can be awarded if they only draw the correct product** **reject** a double bond drawn between carbon atoms of product **allow** just the product drawn for one mark **product must have bonds on either side of carbon atoms** **allow** one CH_3 group on each carbon top or bottom **allow** CH_3 group drawn showing bonds between C and 3, H atoms **allow** round brackets marking point is dependent on correct structure of product **and** reactant
	Total	**4**	

Question	Answer	Marks	Guidance
8 a	(evaporates easily) idea that that the perfume (particles) can reach or travel to the nose (1) (does not react with water) idea that otherwise perfume would **react** with perspiration or sweat (1)	2	**allow** so smell can travel to nose (1) **ignore** so you can smell it **allow** so it doesn't **react** with perspiration or sweat (1) **allow** so it doesn't **react** with moisture on the skin (1) **but ignore** so it doesn't react with moisture **ignore** it doesn't react with water on the skin **ignore** doesn't react with rain **ignore** doesn't harm you when you sweat **ignore** so it doesn't react with the skin / irritate the skin / react with atmosphere **ignore** so it doesn't wash off when you sweat or wash **ignore** idea of being able to go near water when wearing the perfume e.g. you can still go swimming
b	against animal testing – idea of cruelty (1) for animal testing – idea that scientists need to be sure that cosmetics are safe (for use on humans) (1)	2	**allow** references to ethical issues e.g. it is **not** ethical / it is **not** morally right (1) **allow** animals suffer / it is cruel / harms animals (1) **allow** idea of animal rights (1) **allow** some have religious beliefs against animal testing (1) **allow** animals cannot choose whether or not they are tested on (1) **allow** may give different result with animals rather than humans (1) **ignore** just 'not fair' or 'not right' **allow** to make sure it is safe (for humans to use) (1) **allow** to identify possible (side) effects / as it may be harmful to humans (1) **allow** safer than testing on humans (1) **allow** may give same or similar result with animals and humans (1) **ignore** humans may benefit from the medication **ignore** just 'animals are similar to humans' **ignore** it is better for animals to suffer than humans

Question	Answer	Marks	Guidance
c	**Level 3** **Chooses solvent D with three reasons for their choice** **AND** **explains in detail why water will not dissolve nail varnish.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **Level 2** **Chooses solvent D with three reasons for their choice** **OR** **Chooses solvent D with two reasons for their choice AND attempts to explain why water will not dissolve nail varnish.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **Level 1** **Chooses solvent D with one reason for their choice.** **OR** **attempts to explain why water will not dissolve nail varnish.** 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:** **Choice of solvent:** solvent **D** is the best choice because • it is non-toxic • it is non-flammable • idea that it's (reasonably) good or effective at dissolving nail varnish / more effective at dissolving nail varnish than most of the others / **only** E is more effective at dissolving nail varnish (than D) / • evaporates easily **Why water will not dissolve nail varnish at level 1 or 2:** • idea that **attraction** or **force** between water molecules is strong • idea that **attraction** or **force** between particles in nail varnish is strong • idea that the **attraction** or **force** between water molecules and nail varnish particles is weak **Why water will not dissolve nail varnish at level 3:** • the **attraction** or **force** between particles in nail varnish is greater than the **attraction** or **force** between water molecules and nail varnish particles • the **attraction** or **force** between water molecules is greater than the **attraction** or **force** between water molecules and nail varnish particles **allow** bonds for forces or attraction **but not** covalent bond **not intramolecular** attraction or force or bonds **answer must be in terms of particles or molecules** **allow intermolecular forces = forces between molecules** **Use the L1, L2, L3 annotations in RM assessor.** **Do not use ticks.**
	Total	**10**	

Question	Answer	Marks	Guidance
9 a	radio (waves) (1)	1	
b	for total internal reflection (1)	1	**allow** for TIR (1) **not** total internal refraction
c i	3×10^8 (m/s) (2) **if answer incorrect or incomplete then:** 3 000 000 x 100 (1) **or** $3 \times 10^6 \times 100$ (1)	2	**allow** 300 000 000 (m/s) (2)
ii	 3×10^8 (m/s) **or** 300 000 000 (m/s) 1 (m) (1)	1	**both answers correct for 1 mark** **allow** ecf from 9ci but candidate must use the speed calculated in 9ci e.g. if 3×10^7 is the answer in 9ci then the only answers that are correct in 9cii are 3×10^7 **and** 0.1 (1)
d	**one mark for both correct names:** **X** amplitude **and** **Y** wavelength (1) **one mark for both correct descriptions:** **X** is the distance from the centre or middle to the top of the crest / **X** is the distance from zero displacement to maximum displacement **and** **Y** is the distance between a point on one wave and	2	 **allow** answers labelled on the diagram **allow X** is the maximum height of the wave measured from the middle **ignore X** is (just) the height of the wave **ignore Y** is (just) the width of one wave

	the same point on the next wave **/** **Y** is the distance from crest to crest / **Y** is the distance from trough to trough / **Y** is the distance between a start of one wave and the start of the next wave (1)		**IF no other mark scored then allow one mark for correct name and description of either X or Y** e.g. **X** is amplitude **and** the distance from the centre or middle to the top of the crest (1) **Y** is wavelength **and** the distance between a point on one wave and the same point on the next wave (1)
		7	

Question	Answer	Marks	Guidance
10 a i	(£)150 (1)	1	**if** answer line blank **allow** answer in correct place in the table **answer line takes precedence**
ii	2 (years) (1)	1	**if** answer line blank **allow** answer in correct place in the table **answer line takes precedence**
b	**any two from:** option 2 (or draught proofing **and** loft insulation) saves **more money** (each year) / ORA (1) option 2 (or draught proofing **and** loft insulation) takes less time to payback / ORA (1) option 2 (or draught proofing **and** loft insulation) is cheaper (to fit) / ORA (1)	2	**no marks if option 1 or cavity wall insulation chosen** **allow** option 2 saves £150 (per year) / saves an extra £50 (per year) (1) **allow** option 2 is a quicker payback time / paid back sooner (1) **allow** option 2 takes 2.5 years to pay back (1) **allow** ecf from 10aii **allow** option 2 is £225 (to fit) (1)
c i	**any three from:** **less** energy or **less** heat loss across foam or wood / **more** energy or **more** heat loss across plaster or brick (1) foam or wood or air are (good) insulators / foam or wood or air are **poor** conductors (1) air is **trapped** in foam or wood (1) air (in foam or wood) reduces or stops convection	3	**allow** explanations in terms of temperature loss (rather than energy loss) **ignore** just 'there is energy / heat loss across the wall' **ignore** no or little energy loss energy loss across foam or wood **ignore** large amount of energy loss across plaster or brick **ignore just** 'foam or wood are conductors or good conductors' **allow trapped** air reduces convection (currents) (2)

	(currents) (1) plaster or brick are **poor** insulators / plaster or brick are (good) conductors (1) conduction is the transfer of **kinetic energy** between **particles** (1)		**allow** plaster or brick pass heat by conduction (1) **ignore** plaster or brick do not insulate **ignore just** 'plaster or brick are insulators'
ii	**any one from:** add another **insulating** layer (1) add reflective foil (to the inside or plaster layer) (1)	1	**allow** add another layer of wood or foam or material that traps air (1) **allow** make the wood or foam (layers) thicker (1) **ignore** cavity wall insulation / double glazing **ignore** the idea of removing brick or plaster (and changing it all to foam or wood) **ignore** adding vacuum between layers **allow** add silver foil or aluminium foil (1) **ignore** just add foil
	Total	**8**	

Question	Answer	Marks	Guidance
11	**Level 3: (5-6 marks)** **Detailed explanation of the advantages of DAB AND** **detailed suggestions about the number of stations and quality of reception** Quality of written communication does not impede communication of science at this level. **Level 2: (3-4 marks)** **Simple explanation of the advantages of DAB AND** **simple suggestions about the number of stations and quality of reception** Quality of written communication partly impedes communication of science at this level. **Level 1: (1-2 marks)** **Simple explanation of the advantages of DAB OR** **simple suggestions about the number of stations and quality of reception** Quality of written communication impedes the communication of science at this level **Level 0: (0 marks)** Insufficient or irrelevant science. Not worthy of credit.	6	This question is targeted up to grade A* Indicative scientific points may include the following: **advantages of DAB** • more broadcasters or more stations or more channels • less interference (than analogue) • less interference with other digital broadcasts • noise is easy to remove / noise can be cancelled • allows wireless communication **ignore** easier to remove interference / no interference **ignore** multiplexing **number of stations** • **A** or **D** have 63 / the most / more / A has 58 plus 5 • **B** has 11 (in total) / 11 stations with **fair** reception / the least / zero stations with **good** reception • **C** has 58 • **A**, **C** or **D** may be in a city or populated area • **B** may be rural or far from a large city or in a less populated area **quality of reception** • **A** or **D** are covered or have good reception or good quality / **B** or **C** may not be covered or have poor reception or poor quality or no reception • **A** or **D** are near a transmitter or mast / **B** or **C** may be far from a transmitter or mast • DAB broadcasts can have poor(er) **audio** quality / FM or AM have better **audio** quality • DAB broadcasts can be affected by refraction **Ignore** references to buildings or obstacles blocking signals **Ignore** reference to the weather **Use the L1, L2, L3 annotations in RM assesor.** **Do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
12 a	microwaves are **absorbed** by water particles or water molecules **or** microwaves are **absorbed** by fat particles or fat molecules (1) this **increases** kinetic energy or KE (1)	2	**ignore** microwaves penetrate fat or water / absorb water / absorb fat **ignore** just food / water / fat absorbs the microwaves (need to use the term particles or molecules correctly somewhere in answer for this marking point) **allow** water or fat **gains** kinetic energy or KE (1) **ignore** kinetic energy passed to food
b i	**any one from:** idea that **transmitter** is a long distance (from the houses or person or ground) (1) low(er) or less frequency (of microwaves used so less harmful to humans) (1)	1	 **allow transmitter** is high (up) or further (away) (1) **ignore** just mast or it is a long distance or high (up) or further (away) **allow** ORA as long as they make it clear that it is the oven that has a higher frequency **ignore** references to power
ii	there is a need to balance risk with benefit / (known) benefits outweigh the (possible) risks / risk is small compared to the benefits of using mobile (1)	1	**allow** examples of how risks can be reduced e.g. risk can be reduced by using hands free or texting (1) **ignore** there is no data or evidence to prove they cause harm
	Total	**4**	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553