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 January 2013

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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.

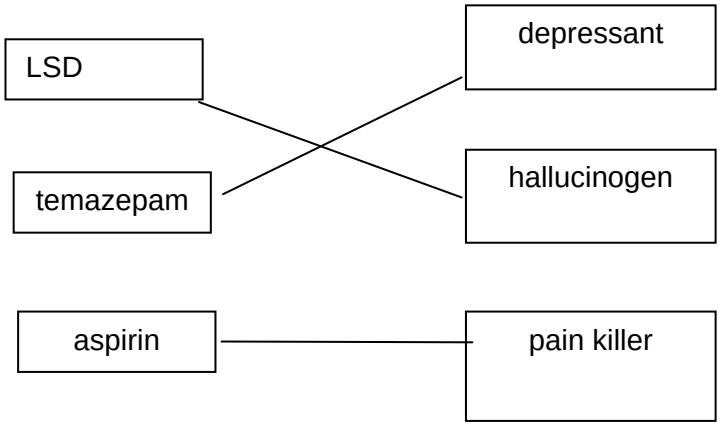
For answers marked by levels of response:
To determine the level – start at the highest level and work down until you reach the level that matches the answer
To determine the mark within the level, consider the following:

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

Annotations

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt **not** given
	error carried forward
	information omitted
	ignore
	reject
	contradiction

/ = 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)			1	all correct for mark
	(b)		(no) drunk 4.45 units (2) **but if answer is incorrect then** 1.5 x 2.3 + 1.0 (1)	2	if yes, 1 mark can be awarded for correct working **allow** he drank 0.45 over the limit (2) **allow** 4.5 (2) **allow** 4.4 (1) **allow** 'adds up to more than 4' (1) **allow** any number over 4 if qualified by the statement that this is over the limit (1)
	(c)		enzymes (in liver) breakdown the alcohol (1) toxins produced by breakdown of alcohol (1)	2	 **ignore** just 'alcohol is a poison or alcohol is toxic' **ignore** harmful substances made by breakdown of alcohol **allow** consequence of damage e.g. cirrhosis, jaundice, liver shrinks, liver swells or enlarges, scarring of liver, kills liver cells (1)
			Total	**5**	

Question			Answer	Marks	Guidance
2	(a)		0.42 (2) **but** 1.68 ÷ 4 or $\frac{0.39 + 0.45 + 0.44 + 0.40}{4}$ (1)	2	
	(b)		**any two from:** idea that males are faster than females (1) idea that older you are the slower reactions get (1)	2	**allow** comparisons – e.g. Diane is twice as slow as Colin (1) **allow** reference to increase in reaction time only if individuals correctly identified e.g. the majority of the times went up at the second attempt except two, Ewan and Freda (1)
	(c)		retina (1)	1	**allow** (rods and) cones (1) **allow** fovea or yellow spot (1) **allow** phonetic spelling
	(d)	(i)	does not show up if dominant allele is present (1)	1	**allow** only shows if no dominant allele (1) **ignore** is not dominant **allow** only expressed if there are two recessive alleles (1) **allow** only present when both alleles are recessive (1) **allow** characteristic that is not expressed in heterozygous genotypes (1)
		(ii)	(alternative / different) version of **a** gene (1)	1	**allow** it is the b or B in Bb (1) **allow** an example of a gene with its alleles named e.g. eye colour gene has alleles that are blue or brown **ignore** different types of gene but **allow** different types of **a** gene (1) **ignore** a gene **ignore** references to chromosomes / DNA / genotypes
		(iii)	bb	1	**allow** homozygous recessive (1)
			Total	**8**	

Question			Answer	Marks	Guidance
3			**Level 3 (5–6 marks)** **EITHER** **Two correct evaluations of method to include reference to control of variables** **or how method could be improved to include reference to control of variables** **AND one correct evaluation of a conclusion** **OR** **One correct evaluation of method to include reference to control of variables or how method could be improved to include reference to control of variables** **AND two correct evaluations of the conclusions.** Quality of written communication does not impede communication of the science at this level appropriately. **Level 2 (3–4 marks)** **One correct evaluation of method** **OR how method could be improved** **AND one correct evaluation of a conclusion.** Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** **One correct evaluation of method** **OR how method could be improved** **OR one correct evaluation of conclusion** **OR a correct description of the action of auxin.** 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/A*.** **Relevant points include:** **evaluation of method or changes to method** • needed lamps at both sides or idea that light intensity is unequal on each side • reference to more than one variable being investigated • reference to only one colour tested • reference to small sample size or only one plant tested • idea of need to repeat method • reference to a control variable • reference to not controlling other relevant variables e.g. temperature **evaluation of conclusion** • *idea that Fritz's conclusion is wrong* because colour of light is not the only variable changed • *idea that Carol is correct because* the plant is growing towards the lamp or light • idea that Carol is (more likely to be) correct because one possible theory is auxin moves towards the shady side of a plant • *idea that Carol is not fully correct or Carol is wrong because* they also changed the colour of light • they don't know the intensity is different as not measured **description of action of auxin** • plants are phototropic or auxin causes plants to grow towards the light • auxin is made in the tip of the plant • auxin gathers on shady side • auxin causes cell elongation **Use the L1, L2 and L3 annotations in Scoris. Do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
4	(a)		idea that reduces the number of mosquito or mosquito eggs (1) because mosquitoes lay their eggs in water / larvae develop in the water (1)	2	**allow** stops the mosquitoes reproducing (1) **allow** mosquitoes breed in water (1) **ignore** mosquito is the vector
	(b)	(i)	**any two from**: passive immunisation or diphtheria will be short lived (1) **but** passive immunisation or diphtheria will be **shorter** lived / (2) active immunisation or yellow fever is long lasting (1) **but** active immunisation or yellow fever will last **longer** (2) passive immunisation or diphtheria vaccination involves **receiving** antibodies (1) active immunisation or yellow fever **makes** antibodies (1) passive immunisation or diphtheria vaccination is fast acting / ora (1)	2	**allow** passive immunisation or diphtheria will be temporary (1) **allow** active immunisation or yellow fever is permanent (1) **allow** idea that active immunisation or yellow fever produces memory cells / ora (1) **ignore** references to antibiotics
		(ii)	**any two from:** **harmless** pathogen or virus given or antigen given (1) idea that antigen causes immune response or (white blood cells) produce antibodies (1) idea of memory cells (1)	2	**ignore** harmless bacteria given **ignore** lasts long time **ignore** harmless or weak or dead form of the disease injected **but** allow weak or dead pathogen injected (1)
			Total	**6**	

Question			Answer	Marks	Guidance
5	(a)	(i)	D (1)	1	**allow** green (1) if answer line is blank **allow** correct answer circled, underlined or ticked
		(ii)	C (1)	1	**allow** red (1) if answer line is blank **allow** correct answer circled, underlined or ticked
	(b)		emulsion – solvent or water evaporates (1) oil based – (solvent evaporates) and oil is oxidised (1)	2	**allow** moisture evaporates (1) **allow** solvent is volatile (1) **ignore** liquid evaporates **not** emulsion paint reacts with oxygen **allow** oil reacts with oxygen or air (1) **allow** solvent evaporates from paint (1) if no other mark awarded
	(c)		against animal testing – idea of cruelty (1) for animal testing – idea that scientists need to be sure that nail varnishes are safe (for use on humans) (1)	2	**allow** references to ethical issues (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) **allow** to identify possible (side) effects (1) **allow** safer than testing on humans (1) **allow** may give same result with animals and humans (1)
			Total	**6**	

Question			Answer	Marks	Guidance
6	(a)	(i)	A (1)	1	**allow** arabian heavy (1)
		(ii)	**any three from:** other areas are politically unstable / involved in wars (1) idea of cheaper to transport or get here / idea that less transport needed (1) has the most or a large petrol content (1) has the most or large heating oil content (1) a lot of fuel oil for cracking (1) economic arguments – keeping money closer to home (1), etc	3	 **ignore** easier to transport **ignore** closer so there is less risk of accident or spillage e.g. UK can sell oil to other countries or less oil needs to be imported (1) **allow** idea that more petrol (1) means less need to crack fuel oil (1)
	(b)		converts (fuel oil) into petrol (1) by cracking (1)	2	**allow** converts (fuel oil) into more useful fractions or fractions that are in short supply (1) **allow** makes more petrol (1) **allow** correct description of cracking e.g. breaking down of high b.pt. fractions into lower b.pt. fractions (1) **allow** converts long chain hydrocarbons or alkanes into short chain hydrocarbons (1) **ignore** can separate into more useful fractions by fractional distillation **but** cracking by fractional distillation negates the second marking point
			Total	**6**	

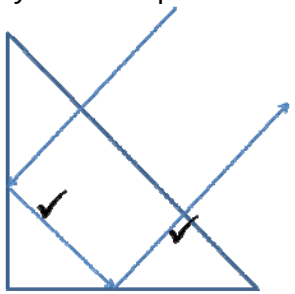
Question			Answer	Marks	Guidance
7			**Level 3 (5–6 marks)** **Candidate correctly deduces information about all three compounds AND there is an explanation of how ethene can be converted into both compound A and compound B.** Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** **EITHER** **Candidate correctly deduces at least three pieces of information about any of the compounds AND correctly explains how ethene can be converted into either compound A or compound B** **OR** **correctly explains how ethene can be converted into BOTH compound A and compound B** Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** **Candidate correctly deduces one piece of information about TWO of the compounds OR TWO pieces of information about one of the compounds OR candidate attempts to explain how ethene can be converted into compound A OR compound B.** 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/A*** **Relevant points include:** • ethene is a hydrocarbon • ethene is an alkene • ethene has a (carbon to carbon) double bond / is unsaturated • ethene is a monomer • compound **A** is an addition compound (of ethene) • compound **A** is a (di)bromo compound • compound **A** is saturated or contains **only** single bonds • compound **A** is **not** a hydrocarbon / contains carbon, hydrogen and bromine • compound **B** is an (addition) polymer / poly(ethene) • compound **B** is a hydrocarbon • compound **B** is saturated • *ethene converted to compound **A*** by reaction with bromine (water) • the conversion of ethene to compound **A** is an addition reaction • *ethene converted to compound **B*** by (addition) polymerisation or correct description of polymerisation • polymerisation needs high pressure • polymerisation needs a catalyst. **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
8	(a)		No (no mark) idea that only C and/or D have acidic pH values / idea that A has alkaline pH value (1) C and/or D attack marble or A does not attack marble (1) C and/or D increase rusting or A does not increase rusting (1)	3	**ignore** yes, but continue marking **allow** idea that C and/or D have low pH or A has high pH (1) **allow** C and/or D damage or effect or react slowly with marble statues or ora (1) **allow** C and/or D cause rusting or ora (1) **allow** C and/or D damage or effect or react slowly with steel or ora (1)
	(b)		$2CO + 2NO \rightarrow N_2 + 2CO_2$ correct formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae **but** **allow** one mark for balanced equation with minor errors of subscripts, superscripts, etc eg 2Co + 2NO → N2 + 2CO2 (1) **not** and or & for + **allow** = instead of → **allow** correct multiples eg $4CO + 4NO \rightarrow 2N_2 + 4CO_2$ (2)
	(c)		**any two from:** idea that air quality is maintained (1) reduce or prevent harm to living organisms (1) control or reduce smog (1) protect buildings and/or metals (1)	2	 **allow** so that air is safe to breathe (1) **allow** reference to reducing asthma (1) **allow** (carbon monoxide) is poisonous or toxic (1) **allow** reduce damage to ozone layer (1) **allow** greenhouse effect or global warming or acid rain (1) **allow** an effect of damage to ozone layer, global warming or acid rain (1) **ignore** damage the environment
			Total	**7**	

Question			Answer	Marks	Guidance
9	(a)		(80) vibrations per second or (80) waves each second or (80) oscillations per second (1)	1	**allow** waves pass a point 80 times per second (1) **allow** 80 per second (1) **allow** (80) cycles per second (1) **allow** (80) wavelengths per second (1)
	(b)	(i)	12 (cm) (1)	1	
		(ii)	1.67 (2) **but if answer incorrect then** 20 / 12 (1)	2	**allow** 1.6 (1) **allow** 1.7 (2) **allow** 1.66 / 1.6′ (2) **allow** ecf from b(i) e.g. 20 ÷ b(i) answer (1) correctly calculated (2) if answer to 9(b)(i) is 24 then 0.83 or 0.8 scores 2 if answer to 9(b)(i) is 6 then 3.33 or 3.3 scores 2 if answer to 9(b)(i) is 3 then 6.66 or 6.67 (2) but 6.6 (1)
			Total	**4**	

Question			Answer	Marks	Guidance
10	(a)		0.24 (kg) (3) **but** 0.238 (2) **or** $\frac{2000}{4200 \times 2}$ **or** $\frac{2000}{8400}$ (2) If calculation or substitution incorrect then 2 ºC rise **or** energy (per second) = mass (per second) x SHC x temperature change **or** mass (per second) = $\frac{\text{energy (per second)}}{\text{SHC x temperature change}}$ (1)	3	**allow** 0.23 (2) **allow** use of 4.2 instead of 4200 to score up to 2 marks if everything else is correct **allow** 240 (2)
	(b)		liquid entering at higher temperature / faster flow rate / AW e.g. more than 10(a) answer flows through **per second** (1)	1	**allow** higher temperature change / idea of liquid leaving radiator at lower temperature / larger temperature difference between liquid entering and leaving (1)
			Total	**4**	

Question	Answer	Marks	Guidance
11	**Level 3 (5–6 marks)** **Gives a detailed explanation of how insulation reduces one method of heat loss to include a particle level explanation AND offers a correct reason why Oliver's energy bills are not halved.** Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** **Gives an explanation of how insulation reduces heat loss AND offers a sensible reason why Oliver's energy bills are not halved.** Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** **Gives a rudimentary description of how insulation reduces heat loss OR offers a simplistic explanation of why Oliver's energy bills are not halved OR attempts to describe the relationship between the thickness of loft insulation and the saving.** 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/A*.** **Indicative scientific points at level 3 may include some at levels 1 and 2, and in addition:** • during conduction there is a transfer of KE between particles • when gas is heated it becomes less dense and rises – (trapped air reduces this) • top surface of insulation at a lower temperature so reducing radiation • named other places where energy is lost e.g. through the walls, draughts, through the windows, etc. **Indicative scientific points at level 2 may include:** • trapped air reduces convection • air is a poor conductor so reducing conduction • energy is lost in other places than through the roof. **Indicative scientific points at level 1 may include:** • reduces energy loss by conduction and/or convection and/or radiation • insulation contains **trapped** air • air is a good insulator • idea that energy is lost in other places than through the roof. • as the thickness of insulation increases so does the saving **If answer mentions heat particles then max level 2** **Reference to stops conduction or stops convection max level 2** **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
	Total	**6**	

Question			Answer	Marks	Guidance
12	(a)		remote control uses digital signals (1) idea encoded and code related to specific channel / function (1)	2	**allow** signal is (series of) on or off (1) **allow** signal carries a command or instruction (1)
	(b)		**up to two from** idea that microwaves: penetrate (1cm) into potato (1) **absorbed** by water and/or fat or excites or increases the KE of water and/or fat (molecules) (1) walls of oven reflect microwaves / walls of oven do not get hot / walls of oven do not absorb energy(1) energy transferred (to centre of potato) by conduction or convection (1) **up to two from** idea that infra red: needs to heat air and oven (1) **absorbed** by surface of potato (1) energy takes longer to reach centre (1) energy transferred (to centre of potato) by conduction or convection (1)	3	**max 3** **ignore** references to power of ovens **ignore** heats or cooks from the middle **ignore** cooks 1cm into the potato **ignore** heats up the water and/or fat **allow** microwaves bounce off walls (1) **ignore** merely heats or cooks the surface of the potato **mark for description of energy transfer by conduction or convection can only be awarded once**
	(c)		light reflected off the first surface parallel to the hypotenuse (1) light reflected at second surface parallel to the incident ray (1)	2	by visual inspection 
			Total	**7**	

Question			Answer	Marks	Guidance
13	(a)		✓ ✓ ✓ (2)	2	**all 3** correct (2) 1 or 2 correct (1) deduct 1 mark down to zero for each tick in excess of 3
	(b)		15 (1)	1	**mark answer on line first** **allow** answer ringed, underlined or ticked on diagram if no answer on the answer line
	(c)		idea that dark colour or dark skin or melanin absorbs the radiation **or** idea that less UV reaches underlying body tissue / AW (1)	1	**allow** more melanin or more pigment (1) **ignore** just skin contains melanin or pigment **ignore** melanin filters out UV
			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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