OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry B

General Certificate of Secondary Education

Unit **B641/02:** Modules C1, C2, C3 (Higher Tier)

Mark Scheme for June 2011

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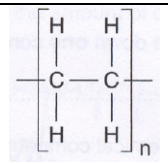
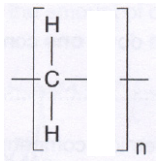
1 The **Abbreviations, annotations and conventions** used in the detailed Mark Scheme are:

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

Question			Expected Answers	Marks	Additional Guidance
1	a		has the lowest boiling point (1)	1	**allow** has a low boiling point **allow** boiling point is small or low
	b	i	paraffin (1)	1	**allow** correct answer indicated in the table if answer line is blank
		ii	cracking converts large hydrocarbons or chains or molecules into smaller ones (1) cracking converts fractions in excess to those in demand (1)	2	**USE TICKS IN THIS QUESTION** **ignore** references to fractional distillation **allow** converts (less useful) fractions into more useful fractions (1) some comparison needed for mark e.g. converts fractions into useful fractions (0), but makes more useful fractions (1) **allow** converts fuel oil into petrol or LPG (1) **ignore** makes more petrol
	c		(hydrocarbons contain) **only** carbon and hydrogen / aw (1)	1	**not** references to carbon molecules / hydrogen molecules **not** a mixture of hydrogen and carbon
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
2	a		B (1)	1	
	b		C_4H_{10} (1)	1	**allow** $H_{10}C_4$ **not** C4H10 / C^4H^{10}
	c	i	contains a (covalent carbon to carbon) double bond (1)	1	**ignore** it does not contain the maximum number of hydrogens
		ii	 (2)	2	1 mark for basic covalent structure 1 mark for brackets and n (1) – mark independently **allow** 2 marks for 2 or more repeat units **but** 0 marks if only 3 bonds on carbon atoms or double bond(s) shown in polymer structure **allow**  (1)
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
3	a		**advantage** no carbon dioxide (which is a greenhouse gas) / no carbon monoxide (which is a poisonous gas) (1) **disadvantage** hydrogen is not widely available / hydrogen is (a gas) which is difficult to store (1)	2	**USE TICKS IN THIS QUESTION** **allow** hydrogen (only) produces water **allow** hydrogen produces no poisonous gases **ignore** hydrogen produces no harmful or dangerous gases **ignore** hydrogen is more environmentally friendly / eco-friendly **ignore** hydrogen will not pollute air **ignore** references to cost **ignore** hydrogen is explosive / flammable **allow** hydrogen is more difficult to transport
	b		octane + oxygen → carbon dioxide + water (1)	1	**allow** air for oxygen **not** and or & for + **allow** = instead of → **allow** correct formulae or mix of words and correct formulae **allow** $C_8H_{18} + O_2 \rightarrow CO_2 + H_2O$ i.e. symbol equation does not have to be balanced **not** '+ energy or + heat' on either side of equation **ignore** 'heat' written above the arrow
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
4	a		B temperature goes down / aw (1)	1	no mark for B – mark is for explanation but no mark unless B is chosen **allow** because it takes in heat or because it takes in energy
	b		100 x 4.2 x 15 (1) **but** 6300 scores (2)	2	**l**ook for correct answer first, 6300 on own scores (2) despite other working out **allow** 6.3kJ (2) **allow** 126(J) or 2 x 4.2 x 15 (1) **allow** 6426 (J) or 102 x 4.2 x 15 (1)
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
5	a		**any two from:** tough (1) keeps UV out (1) flexible (1) lightweight (1)	2	**allow** strong / durable / hardwearing / hard to tear **allow** low density, but **ignore** light **allow** can be coloured **ignore** warm / windproof
	b		holes too small to allow (liquid) water to pass through or (membrane) doesn't allow (liquid) water to pass through (1) but holes big enough to allow (water) **vapour** / **evaporated** sweat to pass through or (membrane) allows (water) **vapour** / **evaporated** sweat to pass through (1)	2	**USE TICKS IN THIS QUESTION** **allow** rain for water **ignore** water molecules or water particles **not** water for water vapour **not** just sweat **allow** big enough to let sweat or water **evaporate**
			Total	**4**	

Question			Expected Answers	Marks	Additional Guidance
6	a	i	**least hard** limestone marble **hardest** granite (1)	1	all three in correct order required for mark
		ii	**any two from:** limestone is a sedimentary rock (1) marble is a metamorphic rock (1) granite is an igneous rock (1)	2	 **allow** limestone is laid down in sediments / layers **allow** marble is made by the action of high pressures or high temperatures on limestone
	b		cools slowly / aw (1)	1	**allow** takes a long time to cool **allow** it is an intrusive rock
			Total	**4**	

Question			Expected Answers	Marks	Additional Guidance
7	a		gives better fuel economy / cheaper to run / aw (1)	1	**ignore** car will be lighter / weigh less / less mass **ignore** references to fuel efficiency **allow** can accelerate quicker / travel faster
	b		**advantage:** aluminium will have a longer lifetime / aluminium corrodes less (than steel) / aw (1) **disadvantage:** aluminium is (more) expensive (than steel) / aluminium is not (as) strong / aw (1)	2	**allow** (steel rusts but) aluminium does not corrode **allow** aluminium does not rust **allow** higher level answers e.g. aluminium forms a protective coat / protective layer / layer of aluminium oxide / protective film (1) **ignore** better fuel economy / car will go faster **allow** ora e.g. steel is strong(er) **allow** aluminium dents easily
	c	i	19.2 (g) (1)	1	**ignore** incorrect units **allow** 0.0192 kg
		ii	rate of reaction increases as catalytic converter warms up / (rate of) reaction is faster at higher temperatures/ aw / (more) incomplete combustion (at the start of the journey) (1)	1	**allow** catalyst does not work (at the start of the journey) / not hot enough for catalytic converter to work **allow** particles have less energy (at low temperatures) / ora **ignore** references to lack of oxygen
		iii	$2CO + 2NO \rightarrow N_2 + 2CO_2$ correct formulae (1) balancing (1)	2	**allow** = instead of $\rightarrow$ **allow** correct multiples **not** and or & instead of + balancing mark is dependent on correct formulae **but** **allow** 1 mark for a balanced equation with a minor error in subscripts / formulae e.g. $2CO + 2NO \rightarrow N_2 + 2CO2$ (1)
			Total	**7**	

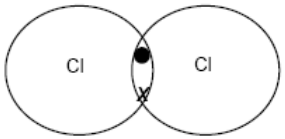
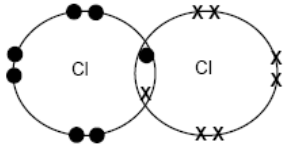
Question			Expected Answers	Marks	Additional Guidance
8	a		amalgam – mercury brass – copper and zinc solder – lead and tin	2	**all three** correct scores (2) **one or two** correct scores (1)
	b		(shape memory means alloy) can change shape at different temperatures / (alloy) can return to original shape (1) **and one from:** (nitinol is) more bendy (than steel) / aw (1) (nitinol is) harder to damage / aw (1)	2	**USE TICKS IN THIS QUESTION**
			Total	**4**	

Question			Expected Answers	Marks	Additional Guidance
9	a	i	A (1)	1	
		ii	0 – 30 (seconds) (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line is blank
		iii	15 ÷ 30 (1) **but** 0.50 (cm³/second) (2)	2	 **allow** 0.5 / ½ (cm³/second) **allow** 2 marks for correct rate with no working out **but** if correct answer not given, look for evidence of working out on graph
	b		particles move faster / particles have more energy / aw (1)	1	**allow** higher level answers e.g. more (frequent) collisions / more (successful) collisions / greater chance of a collision **ignore** faster / quicker collisions **ignore** particles vibrate more
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
10	a		potassium (1)	1	**allow** K
	b		fluorine (1)	1	**allow** F **not** F_2
	c		calcium (1)	1	**allow** Ca
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
11	a		11 / eleven (1)	1	
	b		5 / five (1)	1	
			Total	**2**	

Question			Expected Answers	Marks	Additional Guidance
12	a		chlorine + sodium iodide → iodine + sodium chloride (1)	1	**not** and or & for + **allow** = instead of → **allow** correct formulae or mix of words and correct formulae **allow** Cl_2 + NaI → I_2 + NaCl i.e. symbol equation does not need to be balanced **allow** chlorine + sodium iodide solution → iodine + sodium chloride
	b		orange (1)	1	**allow** red or brown or red/brown or yellow or any combination of these colours e.g. orange/brown or orange-brown **allow** foxy red
	c		2Na + Cl_2 → 2NaCl (2) correct formulae (1) balancing (1)	2	**allow** = instead of → **allow** correct multiples **not** and or & instead of + balancing mark is dependent on correct formulae **but** **allow** 1 mark for a balanced equation with a minor error in subscripts / formulae e.g. 2Na + Cl2 → 2NaCl (1)
	d	i	covalent (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line blank

Question			Expected Answers	Marks	Additional Guidance
12	d	ii	shared pair of electrons between the two chlorine atoms, e.g.  (1) **but** shared paired of electrons between the two chlorine atoms and the rest of the outer shell correct, e.g.  (2)	2	**allow** electrons as dots or crosses or other symbol, e.g. **e** **allow** 2 marks for correctly drawn diagram, with or without inner electrons included **ignore** incorrect inner shells **not** ionic structures if charge put on correct covalent diagram, 1 mark maximum
			Total	**7**	

Question			Expected Answers	Marks	Additional Guidance
13	a		low density (1) high (relative electrical) conductivity / aw (1)	2	**USE TICKS IN THIS QUESTION** **allow** lightweight **ignore** aluminium is light **allow** is flexible / ductile / low corrosion or does not rust (1) **ignore** any comment on relative strength or malleability
	b		idea that electrons move or idea of delocalised or free or sea of electrons (1) **but** **delocalised** electrons move / free electrons move / sea of electrons moves / cloud of electrons moves (2)	2	**allow** electrons free to move / free moving electrons scores 1 **but** free electrons move scores 2
			Total	**4**	

Question			Expected Answers	Marks	Additional Guidance
14	a	i	**anode** oxygen **cathode** aluminium (1)	1	**BOTH REQUIRED FOR MARK** **allow** CO_2 at anode / HF at anode / CO at anode
		ii	(the anodes are) worn away /	1	**allow** anode is destroyed / burns away / disintegrates / breaks down / breaks up / erodes / corrodes **ignore** anode dissolves / melts / breaks **not** reference to heating effect of electrolysis
			anodes are oxidised / react with oxygen /		**allow** anode reacts with air **ignore** production of oxygen at anode
			carbon dioxide / carbon monoxide formed (1)		
	b		reduces the melting point of the aluminium oxide (1)	2	**ignore** reduces the melting point / reduces the melting point of the aluminium **allow** reduces temperature of electrolyte / reduces the operating temperature **ignore** reduces the temperature **allow** dissolves the aluminium oxide **not** it is a catalyst
			(so) less energy / electricity required (1)		
			Total	**4**	

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