OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry B J644

Gateway Science Suite

General Certificate of Secondary Education

Mark Scheme for the Units

January 2008

J644/MS/R/08J

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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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GCSE Gateway Chemistry B J644

MARK SCHEMES FOR THE UNITS

General advice to Assistant Examiners

1 Correct answers to calculations always gain full credit even if no working is shown. (The 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)

2 Some questions may have a 'Level of Response' mark scheme. Any details about these will be in the rationale.

3 If an answer has been crossed out and no alternative answer has been written then mark the answer crossed out.

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

/ = 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

B641/01 Unit 1: Modules C1, C2 and C3 Foundation Tier

Question			Expected Answers	Marks	Rationale
1	a		chicken (1) potato (1)	2	
	b	i	boiling / poaching / scrambling / microwave / baking / steaming / grilling (1)	1	**allow** other ways of cooking **ignore** frying
		ii	**any two from**: any valid change in appearance eg goes (from transparent to) white (1) any valid change in state eg goes solid / goes hard (1) change in texture (1) flavour changes (1) taste changes (1)	2	full marks can be awarded for two correct points in answer number 1 or number 2 **allow** microbes killed (1) **allow** protein denatured / toxins denatured (1)
			Total	**5**	

2	a		(carboxylic) acid (1) → water / H_2O (1)	2	**not** mineral acids eg hydrochloric acid **allow** RCOOH / RCO_2H or specific formula
	b		**testing / advantage any 2 from:** to check it is safe to use / AW (1) check for side effects / (allergic) reaction (1) does not harm humans / AW (1) **disadvantage any 1 from:** animal suffering / animal rights (1) may not have same effect on humans / AW (1)	3	use ticks a**llow** human life is more valuable than animals (1) **allow** animals will react similarly to humans / animals have the same systems as humans (1) **ignore** references to cost do not award second mark if disadvantage contradicts advantage eg advantage animals react similarly to humans, disadvantage animals react differently to humans scores (1) **but** advantage animals may react similarly to humans, disadvantage animals may react differently to humans scores (2)
			Total	**5**	

Question			Expected Answers	Marks	Rationale
3	a	i	2 (1)	1	
		ii	11 (1)	1	
	b		oxygen / O_2 (1)	1	**ignore** O
	c	i	soot / carbon (1)	1	**allow** C (1) **not** charcoal
		ii	it is poisonous / toxic / kills (humans) (1)	1	**ignore** harmful / dangerous / can't see it / can't smell it / damages lungs **allow** forms carboxyhaemoglobin / reduces ability of blood to carry oxygen / AW (1)
			Total	**5**	

4	a	i	C (1)	1	
		ii	packaging / protecting / insulation / food containers / AW (1)	1	**not** bags
	b		does not rot / does not decompose / does not breakdown (1)	1	**ignore** does not disintegrate / does not break up **allow** takes a long time to rot / takes a long time to decompose / takes a long time to break down (1)
	c		**any two from**: waste of land / landfill full / takes up (valuable) space, fills up landfill (quickly) (1) burning produces toxic gases / burning makes carbon dioxide / burning produces gases that increase global warming (1) difficult to sort / difficult to recycle (1) uses up (valuable) resources / waste of plastic (1) traps animals / wildlife (1)	2	use ticks **ignore** makes dangerous / harmful gases/ pollution **ignore** makes toxic gases / CO_2 if not linked to burning **allow** harms **not** poisons
			Total	**5**	

Question			Expected Answers	Marks	Rationale
5	a		dissolve (oil) (1)	1	**allow** dissolve (pigment) / to thin the paint / keep it a liquid / AW (1)
	b		thermochromic (1)	1	**allow** answer ticked or ringed
	c		phosphorescent (1)	1	**allow** answer ticked or ringed
			Total	**3**	

6	a		oxygen / nitrogen / carbon dioxide / water (vapour) / neon / krypton / argon / xenon (1)	1	**allow** correct formulae
	b		**any two from**: kills plants / damages plants / harms plants / kills named parts of plants eg kills leaves (1) kills animals / kills fish / kills marine life (1) erodes brickwork / erodes buildings / erodes rock (1) makes lakes acidic (1)	2	use ticks **allow** kills wildlife (1) **allow** damages brickwork or buildings (1) **allow** higher level explanations eg leaching of heavy metal ions
	c		nitrogen monoxide + carbon monoxide → nitrogen + carbon dioxide (1)	1	**allow** correct formula instead of name ie NO + CO → N_2 + CO_2 symbol equation does not need to balance **not** and / & **allow** =
	d		more collisions / greater collision frequency / collisions more often / more collisions per second / more successful collisions / more chance of a collision / AW (1)	1	**allow** more hits (1) **allow** lowers activation energy / AW (1) **not** particles move faster / particles have more energy **not** greater surface area as this is given in the question
			Total	**5**	

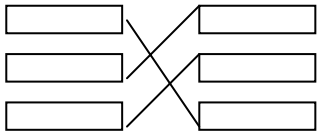
Question			Expected Answers	Marks	Rationale
7	a		brass (1) solder (1)	2	
	b	i	titanium / Ti (1)	1	
		ii	aluminium / Al (1)	1	
		iii	**any two from**: protective layer on surface (1) of (aluminium) oxide (1) which does not flake off (1)	2	use ticks **allow** permanent / impervious / insoluble for protective eg layer that prevents reaction with (moist) air scores (1) **allow** coating / barrier on surface for layer eg permanent coating scores (1)
		iv	advantage – (aluminium) is less dense / car body will be lighter / easier to shape / easier to bend / ora (1) disadvantage - aluminium is weaker than steel / aluminium is more expensive / not easily welded / ora (1)	2	**allow** density / flexibility / malleability (1) **allow** (aluminium) will give good fuel economy / (aluminium) makes the car more efficient to run (1) if reverse argument used then answer must be qualified eg it is more dense scores (0) but steel is more dense than aluminium scores (1) **allow** cost / weak **ignore** references to hardness
	c		saves natural resources / saves energy / reduces waste / reduces litter (1)	1	**ignore** saves money / less pollution
			Total	**9**	

8	a		(gas) syringe (1)	1	
	b	i	20 (1)	1	unit **not** needed
		ii	increases / goes faster / speeds up (1)	1	**allow** ora if specifically stated **not** incorrect references to reaction time
			Total	**3**	

Question			Expected Answers	Marks	Rationale
9	a	i	Na **and** K (1)	1	**both** required **allow** sodium and potassium (1)
		ii	K **and** Ni (1)	1	**both** required **allow** potassium and nickel (1)
		iii	Ni / Ag (1)	1	**allow** nickel / silver (1)
	b	i	blue (1)	1	
		ii	orange (1)	1	
			Total	**5**	

10	a		**any two from**: sterilise water / water purification / kills bacteria (in water) / kills microbes (in water) / water treatment / AW (1) making plastics / making PVC (1) making pesticides (1)	2	**ignore** kills germs / cleans water **ignore** references to swimming pools unless qualified **allow** any other valid use of chlorine
	b		chlorine bromine iodine (1)	1	**allow** Cl, Br, I or Cl_2 , Br_2, I_2 (1)
	c		brown solution (1)	1	**allow** orange / yellow solution (1) **not** reaction
	d		grey / silver (1)	1	**allow** purple-grey / purple-silver (1) **not** purple / black
	e		all have 7 electrons in outer shell (1)	1	**allow** all need one electron (to obtain a stable outer octet) / have the same number of electrons in outer shell (1) **not** missing one electron
			Total	**6**	

11	a	i	nucleus (1)	1	
		ii	negative (1)	1	**allow** answer ticked or ringed
		iii	one / 1 (1)	1	**allow** alkali metals
		iv	(lithium) ion (1)	1	**allow** cation (1) **not** anion
	b		11 (1)	1	
			Total	**5**	

Question			Expected Answers	Marks	Rationale
12	a		**any two from**: to stop reaction with oxygen (1) to stop reaction with water (1) they are very reactive (1)	2	**allow** to stop reaction with air (1) **allow** to stop reaction with moisture (1) **allow** because very reactive with water (2) **allow** because they don't react with oil (1) **ignore** so they can't react
	b		lithium - red sodium - orange potassium - lilac one or two correct (1) all correct (2)	2	
			Total	**4**	

			Overall Total	**60**	

B641/02 Unit 1: Modules C1, C2 and C3 Higher Tier

Question			Expected Answers	Marks	Rationale
1	a		(carboxylic) acid (1) → water / H_2O (1)	2	**not** mineral acids eg hydrochloric acid **allow** RCOOH / RCO_2H or specific formula
	b		**testing / advantage any 2 from:** to check it is safe to use / AW (1) check for side effects / (allergic) reaction (1) does not harm humans / AW (1) **disadvantage any 1 from:** animal suffering / animal rights (1) may not have same effect on humans / AW (1)	3	use ticks a**llow** human life is more valuable than animals (1) **allow** animals will react similarly to humans / animals have the same systems as humans (1) **ignore** references to cost do not award second mark if disadvantage contradicts advantage eg advantage animals react similarly to humans, disadvantage animals react differently to humans scores (1) **but** advantage animals may react similarly to humans, disadvantage animals may react differently to humans scores (2)
			Total	**5**	

Question			Expected Answers	Marks	Rationale
2	a		correct structure for pvc (1) correct structure for tetrafluoroethene (1)	2	must show the free bonds at either end but the bracket and 'n' can be missing **allow** CF_2CF_2 / CF_2==CF_2
	b		hydrocarbon (1)	1	
	c		bromine (water) (1) goes from orange / brown to colourless (1)	2	**allow** Br_2 / bromine solution (1) **not** Br **allow** decolourises / turns colourless / orange colour disappears (1) **not** goes clear / orange to clear **ignore** colour change / discolours
	d		**any two from**: waste of land / landfill full / takes up (valuable) space / fills up landfill (quickly) (1) does not biodegrade / decompose / break down (1) burning produces toxic gases / burning makes carbon dioxide / burning produces gases that increase global warming (1) difficult to sort / difficult to recycle (1) uses up (valuable) resources / waste of plastic (1) traps animals / wildlife (1)	2	**allow** takes a long time to **ignore** makes dangerous gases / makes harmful gases / makes pollution **ignore** makes toxic gases / makes carbon dioxide if not linked to burning **allow** harms (1) **not** poisons
			Total	**7**	

Question			Expected Answers	Marks	Rationale
3	a	i	force between <u>molecules</u> / attraction between <u>molecules</u> (1)	1	**allow** bond between molecules / van der Waals attraction (1) **not** forces between atoms / forces between electrons / forces between particles must be clear that forces are between molecules eg forces holding molecules together scores (0)
		ii	the larger the molecule the greater the strength of the force / ora (1)	1	answer must have a comparison **allow** more force
		iii	the larger the force the higher the boiling point / ora (1)	1	answer must have a comparison **allow** more force
	b		$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ correct reactants and products (1) balanced (1)	2	**allow** any correct multiple of this equation including fractions balancing mark is dependent on correct formulae **not** + heat **allow** =
			Total	**5**	

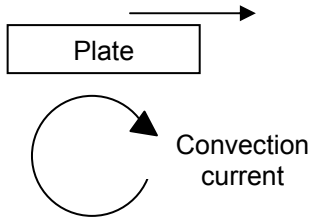
4	a		**any two from**: tough / hard-wearing / durable / strong (1) waterproof (1) flexible (1) does not react with water / does not rot (1) can be made into fibres / easy to cut into shape (1) can be coloured (1) not irritant / doesn't react with skin (1) windproof (1)	2	**allow** impermeable to water (1) **ignore** references to insulation / keeping warm **ignore** references to cost or availability
	b		breathable / allows water vapour out (1)	1	**allow** allows air in and out (1) **ignore** sweat **not** allows water out
			Total	**3**	

Question			Expected Answers	Marks	Rationale
5	a		oil is oxidised (by air) (1)	1	**allow** solvent evaporates / oil reacts with oxygen / (some) oil evaporates (1) **ignore** references to water
	b		cups / mugs / saucepan handles / temperature strips / bath ducks / kettles (1)	1	**allow** other suitable use if explained eg to show if a drink is too hot scores (1) but on oven door scores (0) to tell you when it's the right temperature scores (0)
	c		idea that it absorbs or stores energy and then releases it (later) (1)	1	**allow** light for energy (1)
			Total	**3**	

6	a		**any two from:** increase in carbon dioxide (1) decrease in oxygen (1) because less photosynthesis (1)	2	use ticks answers must refer to changes in composition of atmosphere eg less carbon dioxide taken in scores (0) eg less plants scores (0)
	b	i	nitrogen monoxide + carbon monoxide → nitrogen + carbon dioxide (1)	1	**allow** correct formula instead of name ie NO + CO → N_2 + CO_2 symbol equation does not need to balance **not** and / & **allow** =
		ii	more collisions / greater collision frequency / collisions more often / more collisions per second / more successful collisions / more chance of a collision / AW (1)	1	**allow** more hits (1) **allow** lowers activation energy / AW (1) **not** particles move faster / particles have more energy **ignore** greater surface area as this is given in the question
			Total	**4**	

Question			Expected Answers	Marks	Rationale
7	a		low density (1) strongest (1)	2	use ticks for standardisation scripts only **allow** less dense than iron (1) **not** just 'density' answer must imply density not weight eg the same aeroplane made from titanium will be lighter than if made from iron scores (1) **allow** stronger than aluminium / stronger than iron (1) **ignore** any references to hardness **not** strong unless qualified eg very strong scores (0) **allow** high melting point to withstand temperature of engine / high temperature to withstand friction with the air (1)
	b		**any two from**: protective layer on surface (1) of (aluminium) oxide (1) which does not flake off (1)	2	**allow** permanent / impervious / insoluble for protective eg layer that prevents reaction with (moist) air scores (1) **allow** coating / barrier on surface for layer eg permanent coating scores (1)
	c		advantage – (aluminium) is less dense / car body will be lighter / easier to shape / easier to bend / ora (1) disadvantage - aluminium is weaker than steel / aluminium is more expensive / not easily welded / ora (1)	2	**allow** density / flexibility / malleability (1) **allow** (aluminium) will give good fuel economy / (aluminium) makes the car more efficient to run (1) if reverse argument used then answer must be qualified eg it is more dense scores (0) but steel is more dense than aluminium scores (1) **allow** cost / weak **ignore** references to hardness
			Total	**6**	

Question			Expected Answers	Marks	Rationale
8	a		$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$ (1)	1	**allow** any correct multiple **allow** =, **not** 'and' in equation
	b	i	**any two from**: increases because particles move faster / particles have more energy (1) more collisions per second / collisions more often / greater collision frequency (1) more energetic collisions / more successful collisions (1)	2	**not** just 'increases' or 'goes faster' or 'speeds up' **allow** more collisions if no other mark has been awarded in this part question **not** faster collisions / colliding faster **allow** harder collisions (1)
		ii	more crowded particles / particles closer together / more particles per cm^3 / ora (1) more collisions per second / collisions more often / greater collision frequency (1)	2	**allow** more collisions if no other mark has been awarded in this part question **not** faster collisions / colliding faster **ignore** more energetic collisions / more successful collisions
			Total	**5**	

9			convection current in magma / AW (1) drags along the tectonic plate (1)	2	the convection current must in the magma or mantle and not in the plate or core **allow** correctly located convection current in words or diagram **allow** idea of plate moving in the same direction as the convection current in words or diagram **allow** both marks from a labelled diagram eg the diagram below scores (2) 
			Total	**2**	

Question			Expected Answers	Marks	Rationale
10	a		brown solution (1)	1	**allow** orange / yellow solution (1) **not** reaction
	b		$Cl_2 + 2NaI \rightarrow 2NaCl + I_2$ correct reactants and products (1) balanced (1)	2	**allow** any correct multiple of this equation including any with fractions balancing mark is dependent on correct formulae **allow** =, **not** 'and' in equation
	c		all have 7 electrons in outer shell (1)	1	**allow** all need one electron (to obtain a stable outer octet) / have the same number of electrons in outer shell (1) **not** missing one electron
	d		grey / silver (1)	1	**allow** purple-grey / purple-silver (1) **not** purple / black
			Total	**5**	

11	a	i	blue (1)	1	more than one answer given scores (0)
		ii	orange (1)	1	more than one answer given scores (0)
	b		**any two from**: changes colour / green to black (1) decomposes / breaks down / breaks up (1) a gas / carbon dioxide is given off (1) turns to copper oxide (1) mass goes down / changes (1)	2	use ticks **allow** goes black (1) **not** blue to black **ignore** bubbles / fizzing correct word or symbol equation scores (2) ie copper carbonate → copper oxide + copper carbonate $CuCO_3 \rightarrow CuO + CO_2$ **allow** mix of formulae and words if incorrect statement given then maximum mark is (1) if two incorrect statements given then maximum mark is (0)
	c		$Fe(OH)_2$ (1)	1	**allow** FeO_2H_2 or $(OH)_2Fe$ (1)
	d		nickel (1)	1	**allow** Ni
			Total	**6**	

Question			Expected Answers	Marks	Rationale
12	a		one / 1 (1)	1	**allow** alkali metals
	b		neutrons = 12 (1) electrons = 11 (1)	2	
	c		isotopes (1)	1	
	d		2.8.5 (1)	1	answer on the line takes precedence
			Total	**5**	

13	a		correct electrons Na is 2.8 and Cl is 2.8.8 (1) correct charges Na^+ and Cl^- (1)	2	**allow** one mark for Na^+ being 2.8 / Cl^- being 2.8.8
	b	i	ions not mobile / ions cannot move / ions can only vibrate / ions are in a fixed position (1)	1	**Ignore** electrons
		ii	melt it / dissolve it (in water) (1)	1	**allow** heat it / make the ions move ./ make it a liquid / make it a solution (1)
			Total	**4**	

			Overall Total	**60**	

B642/01 Unit 2: Modules C4, C5 and C6 Foundation Tier

Question			Expected Answers	Marks	Rationale
1	a		potassium (1)	1	**allow** K (1)
	b		7 (1)	1	
	c		174 (1)	1	
	d	i	7 (1)	1	
		ii	so it can be taken in by the roots / AW (1)	1	answer must include roots or osmosis
	e	i	nitric acid (1)	1	**allow** HNO_3 (1)
		ii	burette	1	
		iii	% yield = (actual mass/predicted mass) x 100 (1) **or** (0.45/0.50) x 100 (1) = 90 (1)	2	90 on its own is worth 2 marks % sign not needed **allow** (am/pm) x 100 (1) **note** brackets in this question are mathematical and do not indicate that words inside are not needed for answer
			Total	**9**	

Question			Expected Answers	Marks	Rationale
2	a		**any two from**: salary / wages / workers (1) energy costs / heat / electricity / pressure / power / equipment (1) maintenance (1) health and safety (1) pollution controls / AW (1) rent / rates (1)	2	use ticks **allow** cost of hydrogen / cost of catalyst (1) **ignore** transport / storage / packaging / research and development
	b	i	continuous is made all the time / batch involves making drug many different times / AW (1)	1	
		ii	**any two from**: raw materials are expensive / raw materials are rare / raw materials difficult to extract / AW (1) needs specialised workers / AW (1) needs to be made very pure / AW (1) cannot be easily automated (1) possible government legislation (1) research and development / takes a long time to make (1)	2	use ticks in this question **allow** it needs to be tested / is it safe (1) **allow** transport costs from South America (1)
			Total	**5**	

Question			Expected Answers	Marks	Rationale
3	a	i	Wales (1)	1	
		ii	Anglia (1)	1	
	b		lakes / aquifers / wells / springs / canals / streams (1)	1	**not** sea water / tap water
	c		use chlorine / chlorination (1)	1	**allow** use oxygen / use ultra-violet light (1)
			Total	**4**	

4	a		carbon / C (1)	1	**allow** C_{60} (1)
	b		strong (1)	1	
			Total	**2**	

5	a		anode is **Z** (1) cathode is **X** (1) test tube is **V** (1)	3	
	b		oxygen (1) hydrogen (1)	2	**allow** O_2 (1) **allow** H_2 (1)
			Total	**5**	

Question			Expected Answers	Marks	Rationale
6	a		3 (1)	1	
	b		add universal indicator / add pH paper (1) check against colour chart (1)	2	use ticks in this question **allow** check against colour chart even if wrong indicator chosen **allow** put pH probe into acid (1) and measure with a pH meter (1)
	c		hydrogen (1)	1	**allow** H_2 (1) **not** H
	d		carbon dioxide (1)	1	**allow** CO_2 (1)
	e	i	hydrochloric acid because graph is steeper / reaction finishes in a shorter time / more gas is produced in first ten seconds etc. / AW (1)	1	no mark for hydrochloric acid without a correct reason **not** just more gas is produced
		ii	59 - 61 (seconds) (1) 55 (cm^3) (1)	2	
			Total	**8**	

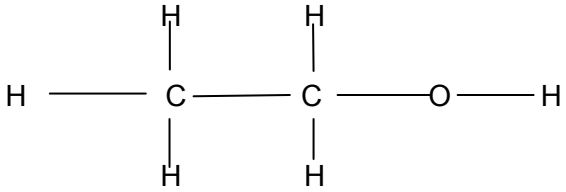
7	a	i	solid / ppt / precipitate (1)	1	
		ii	aqueous / solution (in water) (1)	1	
	b		iodide / I^- (1)	1	
			Total	**3**	

8	a		they are the same (1)	1	
	b		do not change / remain constant (1)	1	**allow** nothing (1)
	c	i	decreases / gets lower (1)	1	**allow** ora if stated
		ii	increases / gets higher (1)	1	**allow** ora if stated
			Total	**4**	

Question			Expected Answers	Marks	Rationale
9	a	i	B (1)	1	
		ii	C (1)	1	
	b	i	calcium sulfate (1)	1	
		ii	calcium hydrogencarbonate (1)	1	
		iii	ethanoic acid (1)	1	
			Total	**5**	

10	a		chlorine, fluorine, carbon all three (2) one or two elements (1)	2	**allow** any order of elements **not** symbols if one or two incorrect elements stated max 1 if three incorrect elements (0)
	b		refrigerant (1)	1	
	c		**any two from**: (increased) skin ageing (1) skin cancer (1) cataracts / damages the eye (1)	2	 **allow** sunburn (1) **allow** skin damage (1)
			Total	**5**	

11	a		subsidence / AW (1)	1	**allow** cracks in buildings / destroys animal habitats (1) **ignore** land slides
	b	i	source of ignition / lighted splint / AW (1) squeaky pop (1)	2	**allow** burns (1) with a squeaky pop (1)
		ii	(moist) litmus paper / indicator paper (1) loses colour / bleaches / (goes red then) white (1)	2	**allow** starch iodine paper (1) goes blue (1)
			Total	**5**	

Question			Expected Answers	Marks	Rationale
12	a		(glucose →) ethanol + carbon dioxide (1)	1	either order **allow** mix of names and formulae **allow** $C_2H_5OH + CO_2$
	b		40°C (1)	1	
	c		fractional distillation (1)	1	
	d		(alcoholic) drinks / solvent / fuel (1)	1	**ignore** alcohol
	e		correct diagram (1) 	1	**allow** -OH instead of -O-H
			Total	**5**	

			Overall Total	**60**	

B642/02 Unit 2: Modules C4, C5 and C6 Higher Tier

Question			Expected Answers	Marks	Rationale
1	a		15 (1)	1	
	b		132 (1)	1	
			21.2 (%) (1)	1	**allow** 21% (1) **allow** ecf from wrong M_r
	c		so it can be taken in by the roots / AW (1)	1	answer must include roots or osmosis
	d	i	nitric acid (1)	1	**allow** HNO_3 (1)
		ii	pH decreases / gets lower / goes from a number above 7 towards 7 (1) acid neutralises the ammonia / less ammonia present since it has reacted with the acid / the acid has a pH less than 7 (1)	2	mark question as a whole ie a description can be credited within an explanation **ignore** pH goes to 7 / pH goes neutral / pH goes green
		iii	% yield = (actual mass/predicted mass) x 100 (1) **or** (0.45/0.50) x 100 (1) = 90 (1)	2	90 on its own scores two marks % sign not needed **allow** (am/pm) x 100 (1) note the brackets are mathematical and do not indicate words not needed in the answer
			Total	**9**	

Question			Expected Answers	Marks	Rationale
2	a		**any three from:** catalyst increase the rate of reaction / catalyst makes reaction faster (1) high pressure increases the percentage yield / high pressure moves position of equilibrium to the right (1) idea of a compromise temperature so that percentage yield not too low and rate is high enough (1)	3	**allow** catalyst lowers activation energy (1)
	b		**any two from**: raw materials are expensive / raw materials are rare (1) needs specialised workers / AW (1) needs to be made very pure / AW (1) cannot be easily automated (1) possible government legislation (1) research and development / takes a long time to make (1)	2	**allow** it needs to be tested / is it safe (1) **allow** transport costs from South America (1)
	c		demand for drug may vary / drug cannot be stored for long so must be made on demand / only relatively small amounts of drug are needed / need for sterile conditions / AW (1)	1	**ignore** cost unless qualified
			Total	**6**	

Question			Expected Answers	Marks	Rationale
3	a		head labelled as hydrophilic and tail as hydrophobic (1)	1	
	b		idea that tail of detergent surrounds fat (1) idea that water molecules surround the head (1)	2	**allow** marks from a labelled diagram **allow** ecf from wrongly labelled diagram in **(a)**
			Total	**3**	

4	a		C_{60} (1)	1	**not** C60 / C^{60}
	b		catalyst can be attached to nanotube / large surface (area) available (1)	1	
			Total	**2**	

5	a		oxygen (1) hydrogen (1)	2	**allow** O_2 (1) **allow** H_2 (1)
	b		time / seconds / minutes / hours (1) current / amps (1)	2	**allow** concentration / charge (1) **ignore** how much electricity
			Total	**4**	

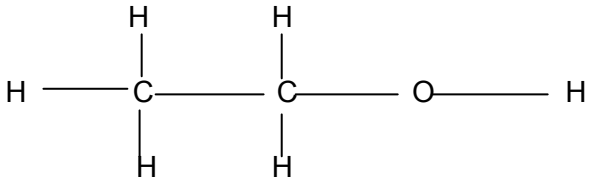
Question			Expected Answers	Marks	Rationale
6	a		$Mg + 2CH_3COOH \rightarrow Mg(CH_3COO)_2 + H_2$ correct formulae of reactants and products (1) balancing (1)	2	**allow** any correct multiple of this equation balancing mark dependent on correct formulae **allow** $Mg + 2CH_3CO_2H \rightarrow Mg(CH_3CO_2)_2 + H_2$
	b	i	55 (cm^3) (1)	1	
		ii	ethanoic acid is a weak acid / hydrochloric acid is a strong acid / ethanoic acid is weaker than hydrochloric acid / ora (1) so fewer hydrogen ions with ethanoic acid / ora with hydrochloric acid (1) so less collisions per second with ethanoic acid / ora with hydrochloric acid (1)	3	assume answer refers to HCl(aq) if not stated **allow** greater concentration of hydrogen ions with hydrochloric acid / ora with ethanoic acid (2) for first two marking points
			Total	**6**	

7	a		they are the same (1)	1	
	b		do not change / remain constant (1)	1	**allow** nothing (1)
	c		increases / gets higher (1)	1	**allow** ora if stated
	d		one mole of ethene makes one mole of ethanol (1) BUT 28 grams of ethene makes 46 grams of ethanol (2) BUT so 5.6 tonnes of ethene makes 9.2 tonnes of ethanol (3)	3	**allow** full marks for correct answer on answer line **allow** 9.2 (3) **allow** 9 200 000 grams (3) **allow** 9 200 000 (2) **allow** ecf from wrong M_r values **allow** M_r of ethene = 28 and of ethanol = 46 for one mark if no other marks scored
			Total	**6**	

Question			Expected Answers	Marks	Rationale
8	a		copper sulphate + barium chloride → barium sulphate + copper chloride (1)	1	**ignore** omission of oxidation states **allow** = **allow** mix of formulae and names **allow** $CuSO_4 + BaCl_2 \rightarrow BaSO_4 + CuCl_2$ (1) **allow** $Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$ symbol equations do not have to balance
	b		$Cu^{2+}(aq) + 2OH^-(aq) \rightarrow Cu(OH)_2(s)$ correct formulae of reactants and products (1) balancing (1) correct state symbols (1)	3	**allow** any correct multiple of this equation balancing mark dependent on correct formulae state symbols mark dependent on correct formulae
			Total	**4**	

9	a	i	calcium sulfate (1)	1	
		ii	calcium hydrogencarbonate (1)	1	
	b		$CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO_3)_2$ (1)	1	
	c		calcium ions removed (1) replaced with sodium ions (1)	2	
			Total	**5**	

10	a		subsidence / AW (1)	1	**allow** cracks in buildings / destroys animal habitats (1) **ignore** land slides
	b	i	$2H^+ + 2e^- \rightarrow H_2$ (1)	1	
		ii	$2Cl^- \rightarrow Cl_2 + 2e^-$ / $2Cl^- - 2e^- \rightarrow Cl_2$ (1)	1	
		iii	remaining ions give sodium hydroxide / ions left are sodium and hydroxide / AW (1)	1	
			Total	**4**	

Question			Expected Answers	Marks	Rationale
11	a		glucose → ethanol + carbon dioxide (1)	1	either order **allow** CO_2 + H_2O not balanced
	b		fractional distillation (1)	1	
	c		enzyme denatured / enzyme loses shape / yeast dies (1)	1	**not** enzyme dies / enzyme killed / yeast denatured
	d		correct diagram 	1	**allow** -OH instead of -O-H
	e	i	C_3H_7OH (1)	1	**allow** C_3H_8O (1) any order of symbols numbers must be subscript
		ii	$C_nH_{(2n+1)}OH$ / $C_nH_{(2n+2)}O$ (1)	1	any order of symbols numbers must be subscript
			Total	**6**	

12	a		contains a double bond (between carbon atoms) (1)	1	**allow** has a C==C bond present **not** it has a carbon-oxygen double bond
	b		test - bromine (water) (1) result - decolourised / turns colourless / orange to colourless (1)	2	**allow** iodine **not** goes clear / discoloured **not** colourless must state goes colourless
	c		saponification (1)	1	
	d		reacted with hydrogen / hydrogen added (to double bond) / hydrogenation / making it saturated / AW (1)	1	
			Total	**5**	

			Overall Total	**60**	

Grade Thresholds

General Certificate of Secondary Education
Chemistry B (Specification Code J644)
January 2008 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
B641/01	Raw	60	-	-	-	34	28	23	18	13	0
	UMS	69	-	-	-	60	50	40	30	20	0
B641/02	Raw	60	43	35	27	19	14	11	-	-	0
	UMS	100	90	80	70	60	50	40	-	-	0
B642/01	Raw	60	-	-	-	34	28	23	18	13	0
	UMS	69	-	-	-	60	50	40	30	20	0
B642/02	Raw	60	45	37	29	22	15	11	-	-	0
	UMS	100	90	80	70	60	50	40	-	-	0

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

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