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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Chemistry 3421/F
Specification B

Mark Scheme

2006 examination – June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Chemistry (Specification B)
Foundation Tier 3421/F

3421/F Q1

question	answers	extra information	mark
(a)	sodium fizzes	apply the list principle to additional answers	1
	sodium moves around		1
	sodium sometimes melts		1
		after 3 marks deduct one mark for each additional tick	
(b)(i)	lower than sodium	accept low or very low (owtte) accept any position above Ag and below Na accept comparative reactivity answers do **not** accept at the bottom	1
(ii)	D		1
(c)	sodium nitrate + water	accept in any order accept circled within box do **not** accept sodium + nitrate do **not** accept formulae	2
total			7

3421/F Q2

question	answers	extra information	mark
(a)	B		1
(b)	F		1
(c)	D		1
(d)	E		1
total			4

3421/F Q3

question	answers	extra information	mark
(a)(i)	speeds it up (owtte)	accept answers such as 'lowers activation energy'	1
(ii)	enzymes		1
(b)	lipases proteases		1 1
(c)	work at low temperatures **or** removes <u>stains</u> faster / better **or** removes <u>stains</u> that are difficult to remove by other means (owtte)	if stated must be below 40°C ignore reference to bacteria accept break down stains accept specific stains but **not** dirt do **not** accept gets washing whiter do **not** accept references to pollution / environment / cost	1
total			5

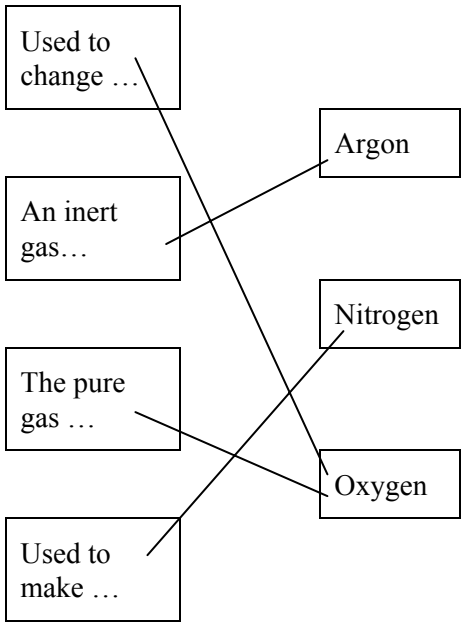
3421/F Q4

question	answers	extra information	mark
(a)(i)	blistering		1
	reddening		1
(ii)	gloves / safety glasses / goggles / visor	ignore: overalls / apron / lab coat	1
(b)	hydroxide		1
(c)(i)	the metal will react / be dissolved / form a solution / gradually corrode away	"it" = saucepan / metal accept answers in terms of production / evolution of H_2 do **not** accept reference to rust (highly) reactive is insufficient ignore breakdown / wears away	1
(ii)	burning splint / flame (owtte)		1
	pops (owtte)		1
total			7

3421/F Q5

question	answers	extra information	mark
(a)(i)	magnesium	after two marks deduct one mark for each additional tick	1
	zinc		1
(ii)	corrode away / react with <u>air</u> and / or <u>water</u> / need to be replaced	accept dissolves "gets smaller" is insufficient ignore wears away / erodes do **not** accept rusts / rots / decays / decompose	1
(b)(i)	high in reactivity series / more reactive	accept high in reactivity (owtte) do **not** accept harder / stronger	1
(ii)	oxide		1
	air	can be in opposite order	1
	water		1
total			7

3421/F Q6

question	answers	extra information	mark
(a)	clockwise from top right argon / Ar nitrogen / N_2 / N oxygen / O_2 / O	**1** mark for <u>all three</u> correctly placed any **one** incorrect – no mark (alphabetical order)(ArNO)	1
(b)		one mark for each correct line	1 1 1 1
total			5

3421/F Q7

question	answers	extra information	mark
(a)	2 **and** 3	both for **1** mark	1
		accept less, more for 1 mark	
	2	accept less for 1 mark	1
	4	accept more for 1 mark	1
(b)(i)	2 electrons on inner circle	accept 2, 1	1
	1 electron on outer circle		
(ii)	sodium	accept Na or circled in box	1
total			5

3421/F Q8

question	answers	extra information	mark
(a)(i)	heat it	accept use a bunsen burner	1
		do **not** accept warm / evaporate	
(ii)	water	accept H_2O	1
(iii)	white	accept circled in box	1
(b)(i)	add liquid / water to anhydrous / white copper sulphate		1
	it will turn blue		1
(ii)	increase		1
total			6

3421/F Q9

question	answers	extra information	mark
(a)	oxygen	must use only words in the box	1
	calcium carbonate		1
	carbon		1
(b)	hard		1
	resists corrosion		1
total			5

3421/F Q10

question	answers	extra information	mark
(a)	yellow		1
(b)	carbon dioxide		1
(c)(i)	iron(III) nitrate	iron(III) ions / Fe^{3+}	1
(ii)	magnesium chloride	chloride ions / Cl^-	1
(iii)	zinc carbonate		1
(d)	white precipitate / milky precipitate	ignore cloudy	1
total			6

3421/F Q11

question	answers	extra information	mark
(a)(i)	decreases	owtte	1
(ii)	0.24 (g)	range 0.24 to 0.25	1
(iii)	0.24 – 0.07 (g) = 0.17 (g)	e.c.f from (a)(ii) 0.17 or 0.18 (g) alone = **2** marks	1 1
(b)	high P and low T (✓)		1
total			5

3421/F Q12

question	answers	extra information	mark
(a)	killer / deadly		1
(b)	no smell / no taste / no colour		1
(c)	air / oxygen	accept ventilation	1
(d)	natural gas		1
(e)	oxygen		1
total			5

3421/F Q13

question	answers	extra information	mark
(a)	rutile sodium argon		1 1 1
(b)	D		1
(c)	e.g. aeroplanes / nuclear reactors / replacement hip joints / bicycles	accept any suitable major use	1
total			5

3421/F Q14

question	answers	extra information	mark
(a)	**Science marks** any **three** from: • inert / unreactive • not broken down / decomposed / non-biodegradable • by micro-organisms • causes litter • problems of waste disposal e.g. landfill • difficult to recycle • incineration / burning causes problems such as (air) pollution	accept flooding (in India) by blocked drains accept does not rot / decay / disintegrate ignore erode and corrode must be linked to not broken-down can be implied must be linked to incineration	3
	QoWC **1** mark which is awarded for the use of **one** of the following scientific words: • (non-) biodegradable • micro-organism / bacteria • inert / unreactive • decomposed • toxic / poisonous	annotate Q✓ or Q✗ word must be used in correct context must be linked to air pollution	1
(b)	any **two** from: • plastic tar is harder (than ordinary tar) • plastic tar has better resistance to water penetration (than ordinary tar) • plastic tar lasts longer (than ordinary tar) • using plastic waste to make plastic tar means less has to be disposed of in other ways i.e. buried / burned • plastic is recycled	ignore cost / strength ignore saving tar or bitumen accept more waterproof accept it causes less pollution accept makes use of a waste product	2
total			6

3421/F Q15

question	answers	extra information	mark
(a)	accurate plotting of points (±½ square)	**2** marks for all points **1** mark for 3 or 4 points accept if points cannot be seen and lines go through points	2
	sensible attempt at a smooth curve	may not be perfect but do **not** accept joining the dots ignore any extension before first point do **not** accept multiple lines that cover more than one large square	1
(b)(i)	75 seconds	accept answers correctly read from their graphs (± ½ square) accept 73 to 77 without reference to graph	1
(ii)	rate doubles (owtte)	accept time halves accept speed doubles do **not** accept just gets faster etc. do **not** accept the rate of reaction takes half the time	1
(iii)	more particles (owtte)	n.b. they / them = particles accept molecules	1
	<u>more</u> collisions	max 1 mark for any reference to particles moving faster / gaining energy ignore reference to 'react'	1
total			7

3421/F Q16

question	answers	extra information	mark
(a)(i)	broken down (owtte)	accept big molecules to small molecules **or** production of smaller molecules do **not** accept separated do **not** accept cracking / breaking down to elements do **not** accept mention of oxygen ignore decompose / decomposed	1
	by heat / high temperature	(owtte)	1
(ii)	carbon dioxide	accept CO_2 do **not** accept CO^2, Co_2 (apply halfway rule for O and $_2$)	1
(iii)	to mix the reactants (owtte)	accept to increase rate of reaction accept idea of movement accept 'so that the reactants are heated evenly' (owtte) accept to ensure complete reaction	1
(b)(i)	coke	accept carbon / C do **not** accept coal / charcoal	1
	iron	accept Fe / pig iron / cast iron do **not** accept FE ignore references to solid / molten etc.	1
(ii)	oxygen removed (owtte)	accept gains electrons accept decrease in oxidation number / state do **not** accept oxide removed	1

Continued

3421/F Q16

question	answers	extra information	mark
(iii)	for any sensible idea e.g. • saves energy • less waste (to dispose of) • less CO_2 / pollution caused • makes use of waste product / slag • two products from one process • saves money • less limestone / clay needs to be obtained / used	answers have to be chemically correct	1
	either explanation of the idea **or** **another** sensible idea	accept "environmentally friendly" as an explanation of a bullet	1
total			9

3421/F Q17

question	answers	extra information	mark
(a)	152	56 + 32 + (4 × 16) for **1** mark	2
(b)	36.8%	accept 37% / 36.84% etc accept error carried forward from (a) accept 36% for **1** mark **or** 56 / 152 × 100 (56 / (a) × 100) for **1** mark	2
(c)	7.3 to 7.4	accept error carried forward from (b) e.g. 36 → 7.2 20 × 36.84 / 100 (20 × (b) / 100) for **1** mark	2
total			6

3421/F Q18

question	answers	extra information	mark
(a)	any **three** sensible properties e.g. transition elements are metals TM high melting points / boiling points TM hard / strong TM conduct electricity TM conduct heat TM sonorous TM ductile TM malleable TM high density TM are catalysts TM form positive ions	they = transition elements ignore references to colours ignore other chemical properties / reactivity if point is not made for TM accept converse for halogens accept halogens are diatomic / molecular / covalent ignore halogens form covalent <u>compounds</u> / bonds ignore electrons ignore solid	3
(b)(i)	hydrogen forms a 1+ ion	accept form a positive ion accept one electron in outer shell	1
(ii)	any **one** from: • can form 1– ion • forms diatomic molecule (owtte) **or** small molecule **or** molecular • (very) low boiling point/ melting point / gas • only needs one electron to fill outer shell • non metal • any other general property of non-metals	accept form a negative ion ignore has covalent bonds	1
total			5

3421/F Q19

question	answers	extra information	mark
(a)(i)	2	accept multiples i.e. 2, 4, 2, 2 any other numbers / symbols lose the mark	1
(ii)	warm / heat acid / mixture	do **not** accept heat MgO	1
	add MgO **or** mix together acid and MgO		1
	until no more will react	accept dissolve	1
	filter (off excess MgO)		1
	QoWC mark: awarded for getting any **two** steps in the correct not necessarily consecutive order	annotate Q✓ or Q×	1
(b)(i)	magnesium / ions / it / they are <u>positive</u> / Mg^{2+}	accept magnesium ions / it / they gain electrons	1
	so are attracted / go / move to the negative electrode / cathode	from the negative electrode	1
(ii)	kill / destroy bacteria / microbes / germs etc.	accept disinfect / sterilise ignore purify / clean / get rid of bacteria n.b. kills bacteria and removes impurities = 0 marks	1
total			9

3421/F Q20

question	answers	extra information	mark
(a)(i)	water / aqueous	accept sugar solution	1
	yeast / enzyme / named enzyme	do **not** accept bacteria	1
	temperature in range 10 – 40 °C	accept warm / gentle heat / room temperature do **not** accept heat on its own	1
	extra point / detail e.g. any **one** from:		1
	• exclusion of air / air lock or from diagram	accept anaerobic (respiration)	
	• exclude bacteria cotton wool plug / sterile conditions	accept cover solution	
	• leave until reaction complete / slows down / no more bubbles / a few days (2+)	accept leave until next lesson	
	• filter / allow to settle and decant / yeast removed		
	• $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$	do **not** accept word equation	
	QoWC mark for linking any **two** correct statements	annotate Q✓ Q×	1
(ii)	carbon dioxide	CO_2 do **not** accept Co_2 (apply half way rule)	1
(b)(i)	fractional	fractionation / fractionating do **not** accept fraction	1
(ii)	ethanol because it has the lower boiling point	comparison needed but it can be implied accept it boils at 78°C accept ethanol is more volatile do **not** accept ethanol is the first to boil / evaporate	1
total			8

3421/F Q21

question	answers	extra information	mark
(a)(i)	water has dissolved (ions)	reference to soluble / solubility accept mark for leach contact with rock is not sufficient	1
	any **one** from: • rocks have different compositions • rocks different or rocks from different places / areas • different time in contact with rocks • different amounts of rock dissolve • different temperatures at source / any variation in conditions e.g. pH	accept minerals for rocks (owtte) water from different sources is insufficient	1
(ii)	More calcium (ions) **and** magnesium (ions) (than the other)		1
(iii)	shake with / add soap (solution) scum / (white) precipitate / (white) solid **or** does not easily form a lather	accept wash hands with soap result linked to first point froth is insufficient do **not** accept (lime)scale	1 1
(b)	forms precipitate / solid / insoluble substance / carbonate therefore removes calcium and/or magnesium (ions) **or** are no longer in solution	accept it reacts with calcium / magnesium / ions accept ions that cause hardness	1 1
(c)	e.g. strong bones / strong teeth (owtte)	less heart illness / disease accept good for bones / teeth good for brewing / tanning do **not** accept good for health / taste	1
total			8

3421/F Q22

question	answers	extra information	mark
	action by water running over the surface (owtte)	currents / waves / tides ignore action of wind	1
	on a beach / mud flats / river / under water etc	any place where water may run over the sediment accept seabed do **not** accept rock	1
total			2

3421/F Q23

question	answers	extra information	mark
(a)	e.g. HCl gives hydrogen ions / H^+	$HCl \rightarrow H^+ + Cl^-$ ignore proton donation	1
	H^+ reacts with OH^- (from NaOH) (to form water)	$H^+ + OH^- \rightarrow H_2O$ = **2** marks $H^+ + OH^-$ = **1** mark	1
(b)	any **one** from the following ideas: • no previously (proven) theory of ion formation • no evidence / proof • lack of communication / technology • lack of information	ignore he spoke a foreign language	1
total			3