



General Certificate of Secondary Education

Science: Single Award 3463/2H *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.

Single Award (Co-ordinated) Higher Tier 3463/2H

3463/2H Q1

question	answers	extra information	mark
(a)	accurate plotting of points ($\pm\frac{1}{2}$ 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 ($\pm \frac{1}{2}$ 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

3463/2H Q2

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

3463/2H Q2

question	answers	extra information	mark
(iii)	for any sensible idea e.g. <ul style="list-style-type: none"> • saves energy • less waste (to dispose of) • less CO₂/ 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

3463/2H Q3

question	answers	extra information	mark
(a)	<p>Science marks</p> <p>any three from:</p> <ul style="list-style-type: none"> • 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 <p>QoWC</p> <p>1 mark which is awarded for the use of one of the following scientific words:</p> <ul style="list-style-type: none"> • (non-) biodegradable • micro-organism / bacteria • inert / unreactive • decomposed • toxic / poisonous 	<p>accept flooding (in India) by blocked drains</p> <p>accept does not rot / decay / disintegrate</p> <p>ignore erode and corrode</p> <p>must be linked to not broken-down</p> <p>can be implied</p> <p>must be linked to incineration</p> <p>annotate Q✓ or Q✗</p> <p>word must be used in correct context</p> <p>must be linked to air pollution</p>	<p>3</p> <p>1</p>
(b)	<p>any two from:</p> <ul style="list-style-type: none"> • 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 	<p>ignore cost / strength</p> <p>ignore saving tar or bitumen</p> <p>accept more waterproof</p> <p>accept it causes less pollution</p> <p>accept makes use of a waste product</p>	2
total			6

3463/2H Q4

question	answers	extra information	mark
(a)	20000	accept 20 m ³ (must specify unit) (100 / 0.9) × 180 gets 1 mark	2
(b)(i)	full <u>outer</u> / <u>last</u> shell (of electrons) or 8 (electrons) in <u>outer</u> / <u>last</u> shell	accept energy level / ring / orbit for shell do not accept orbital	1
	no need to gain / lose / share electrons	accept no need to form bonds (owtte) accept don't form ions	1
(ii)	prevent oxidation / reaction with oxygen etc. (owtte)	accept reacts with air to form oxides do not accept air only ignore reference to burning	1
total			5

3463/2H Q5

question	answers	extra information	mark																																																		
(a)(i)	catalyst / speed reaction (owtte)	accept lower activation energy	1																																																		
(ii)	any two from: <ul style="list-style-type: none"> break down <u>large</u> molecules / hydrocarbons / alkanes / chains change <u>large</u> molecules into small molecules / hydrocarbons / alkanes / chains (into) more useful products or smaller molecules are more useful or greater demand for products / smaller molecules to give alkenes / petrol 	accept named short alkenes do not accept petroleum	2																																																		
(b)	X marked in the inverted test tube in the portion where gas has collected		1																																																		
(c)(i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr><td></td><td>H</td><td>H</td><td>H</td><td>H</td><td>H</td><td>H</td><td>H</td><td>H</td><td></td></tr> <tr><td></td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td></td></tr> <tr><td>H—</td><td>C—</td><td>C—</td><td>C—</td><td>C—</td><td>C—</td><td>C—</td><td>C—</td><td>C</td><td>—H</td></tr> <tr><td></td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td></td></tr> <tr><td></td><td>H</td><td>H</td><td>H</td><td>H</td><td>H</td><td>H</td><td>H</td><td>H</td><td></td></tr> </tbody> </table>		H	H	H	H	H	H	H	H												H—	C—	C—	C—	C—	C—	C—	C—	C	—H												H	H	H	H	H	H	H	H		do not accept condensed structures	1
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(ii)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr><td>H</td><td>H</td></tr> <tr><td> </td><td> </td></tr> <tr><td>C =</td><td>C</td></tr> <tr><td> </td><td> </td></tr> <tr><td>H</td><td>H</td></tr> </tbody> </table>	H	H			C =	C			H	H	ignore bond angles accept CH ₂ = CH ₂ H ₂ C = CH ₂	1																																								
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total			6																																																		

3463/2H Q6

question	answers	extra information	mark
(a)	enzyme / biological catalyst	accept catalyst accept protein	1
(b)	it / enzyme / lactase is trapped / held / fixed (owtte)	accept cannot move	1
	in the resin / gel / (alginate) bead	accept inert solid do not accept column	1
(c)	avoids losing the lactase / enzyme or helps to stabilise the enzyme / lactase or helps to allow the enzyme to withstand higher temperatures / wider range of pH	accept doesn't have to be separated at end accept don't have to keep adding lactase not left in the milk on its own accept stops decomposition accept it lasts longer or it can be used over and over again	1
(d)	does not have to be stopped after each batch or no breaks in production etc. or faster process / saves time / saves money or less labour intensive	ignore same enzyme used for a long time ignore faster reaction or more products or saves energy ignore comments about purity	1
total			5

3463/2H Q7

question	answers	extra information	mark
(a)	2, 8, 8,1		1
(b)	they both have one electron in the <u>outer</u> shell / same number of electrons in <u>outer</u> shell	accept ring / orbit for shell do not accept orbital for shell	1
(c)		it = potassium	
	outer shell electron further from nucleus or more shells	outer electron must be mentioned once for all 3 marks or converse argument for sodium less reactive provided sodium is specified assume it etc. means potassium	1
	less attraction to nucleus or more shielding		1
	outer electron more easily lost	not potassium reacts more easily	1
(d)	sodium	do not accept symbols or formulae	1
	water	accept sodium hydrogen (phosphate)	1
total			7