

**Group 7 Halogens and Halides Past Paper Answers IGCSE Edexcel**

1.

Question number	Answer	Notes	Mark
(a)	<b>C</b> (fluorine)  A is incorrect as bromine is not the most reactive element. It is not as reactive as fluorine  B is incorrect as chlorine is not the most reactive element. It is not as reactive as fluorine  D is incorrect as iodine is the least reactive element of the four		1
(b)	<b>D</b> (iodine)  A is incorrect as bromine is a liquid at room temperature  B is incorrect as chlorine is a gas at room temperature  C is incorrect as fluorine is a gas at room temperature		1
(c)	<b>D</b> (iodine)  A is incorrect as bromine is brown and not as dark as iodine, which is dark grey  B is incorrect as chlorine is pale green  C is incorrect as fluorine is pale yellow		1

2.

Question number	Answer	Notes	Marks
(a)	<p><b>M1</b> (X) - chlorine</p> <p><b>M2</b> (Y) - potassium hydroxide</p> <p><b>M3</b> (Z) - hydrochloric (acid)</p>	<p>ACCEPT Cl<sub>2</sub> IGNORE Cl</p> <p>ACCEPT KOH</p> <p>ACCEPT HCl</p> <p>In each case, if both name and formula given then mark name only</p>	3
(b) (i)	2Na + I <sub>2</sub> → 2NaI	<p>ACCEPT multiples and halves IGNORE state symbols</p> <p>correct case/subscript required</p>	1
(ii)	<p><b>M1</b> add (dilute) nitric acid</p> <p><b>M2</b> add (aqueous) silver nitrate</p> <p><b>M3</b> yellow precipitate (forms)</p>	<p>ACCEPT HNO<sub>3</sub></p> <p>If no acid then M2 and M3 can be scored If incorrect acid or other incorrect reagent then M2 and M3 can be scored</p> <p>ACCEPT AgNO<sub>3</sub></p> <p>If more than two reagents added penalise extra incorrect reagent(s)</p> <p>ACCEPT usual alternatives to precipitate</p> <p>IGNORE cloudy IGNORE qualifiers such as pale/light/dark REJECT other observations e.g. fizzing</p> <p><b>M3</b> DEP on addition of silver nitrate/ AgNO<sub>3</sub> IGNORE identity of precipitate</p> <p>If use more reactive halogen (solution) ALLOW M1 add chlorine/bromine (solution) M3 turns (reddish) brown</p> <p>OR M1 add chlorine/bromine (solution) M2 (followed by) starch M3 turns blue/black</p> <p>IGNORE references to electrolysis</p>	3

3.

Question number	Answer	Notes												
(a)	<table border="1"> <tr> <td>the elements can be obtained by electrolysis of molten metal halides</td> <td>✓</td> </tr> <tr> <td>the elements with paler colours are lower down the group</td> <td></td> </tr> <tr> <td>the boiling points decrease down the group</td> <td></td> </tr> <tr> <td>the elements form covalent compounds with other non-metals</td> <td>✓</td> </tr> <tr> <td>their molecules contain two atoms</td> <td>✓</td> </tr> <tr> <td>all are gases at room temperature</td> <td></td> </tr> </table>	the elements can be obtained by electrolysis of molten metal halides	✓	the elements with paler colours are lower down the group		the boiling points decrease down the group		the elements form covalent compounds with other non-metals	✓	their molecules contain two atoms	✓	all are gases at room temperature		Award 1 mark for each correct tick If more than 3 ticks then subtract 1 mark for each extra tick
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(b)	$2K + I_2 \rightarrow 2KI$	Accept fractions/multiples Ignore state symbols												
(c)	(hydrogen chloride)      g (hydrochloric acid)      aq													

Question number	Answer	Notes	Mark
(d)	M1    effervescence / bubbles / fizzing  M2    (in water hydrogen chloride forms) H <sup>+</sup> ions / forms (hydrochloric) acid  M3    magnesium reacts to form hydrogen/H <sub>2</sub>  <b>OR</b>  M1    magnesium disappears/gets smaller  M2    (in water hydrogen chloride forms) H <sup>+</sup> ions / forms (hydrochloric) acid  M3    magnesium reacts to form magnesium chloride/MgCl <sub>2</sub> /magnesium ions/Mg <sup>2+</sup>	Accept gas formed / evolved / given off Ignore hydrogen Reject extra incorrect observations  Ignore dissociates/ionises if no reference to H <sup>+</sup> / acid  Accept chemical/word equation M3 DEP M2  Allow dissolves Reject extra incorrect observations Ignore magnesium moving  Ignore dissociates/ionises if no reference to H <sup>+</sup> / acid  Accept chemical/word equation M3 DEP M2  Ignore references to solution with HCl dissolved in methylbenzene before water added	3

Question number	Answer	Notes	Marks
(e) (i)	M1 test 2 M2 chlorine does not react with chloride (ions)	Allow description of test Accept chlorine does not displace itself Allow chlorine does not react with itself Accept reference to halogen/halide in place of chlorine/chloride Ignore chlorine does not displace chloride M2 DEP on correct M1 or missing M1	2
(ii)	<b>C (solution becomes darker)</b> <b>The only correct answer is C</b> A is not correct because original sodium iodide solution is colourless but in Test 1 iodine is formed in the solution so the solution becomes darker (red/brown)- no effervescence is seen as no gas being formed B is not correct because original sodium iodide solution is colourless but in Test 1 iodine is formed in the solution so the solution becomes darker (red/brown)- no iodine vapour produced so no purple fumes produced D is not correct because original sodium iodide solution is colourless but in Test 1 iodine is formed in the solution so the solution becomes darker (red/brown)- no white precipitate formed		1

Question number	Answer	Notes	Marks
(f) (i)	$\text{Cl}_2 + 2\text{At}^- \rightarrow \text{At}_2 + 2\text{Cl}^-$	Accept fractions/multiples Ignore 2e on both sides of equation Reject other extra species	1
(ii)	M1 chlorine/ $\text{Cl}_2$ is reduced AND astatide (ion)/ $\text{At}^-$ is oxidised M2 chlorine/ $\text{Cl}_2$ gains electron(s) AND astatide (ion)/ $\text{At}^-$ loses electron(s)	Allow Cl Reject chloride (ions) reduced Allow Cl Ignore references to oxidation numbers Reject use of astatine in place of astatide ions once only in (ii)	2

4.

Question number	Answer	Notes
(a)	<p><b>D</b> (<math>\text{Br}_2</math>)</p> <p><b>The only correct answer is D</b></p> <p>A is not correct because Br is the symbol for bromine</p> <p>B is not correct because the 2 is a superscript not a subscript</p> <p>C is not correct because the 2 is not a subscript</p>	
(b) (i)	<p><b>B</b> (diffusion)</p> <p><b>The only correct answer is B</b></p> <p>A is not correct because condensation is the change of state from a gas to liquid</p> <p>C is not correct because evaporation is change of state from a liquid to gas</p> <p>D is not correct because the change of state from sublimation is solid to gas</p>	
(ii)		<b>ALLOW</b> particles evaporate
	<p><b>M1</b> the bromine/liquid evaporates / the particles escape (from the liquid)</p> <p><b>M2</b> (bromine fills the gas jar because) the (gas) particles move freely/randomly/constantly</p>	<p><b>ALLOW</b> (gas) particles spread</p> <p><b>ALLOW</b> particles move from a high concentration to low (concentration)</p> <p><b>IGNORE</b> references to diffusion</p> <p><b>ACCEPT</b> molecules for particles</p> <p><b>REJECT</b> atoms once only</p>
(c)	<p><b>C</b></p> <p><b>The only correct answer is C</b></p> <p>A is not correct because <math>\text{NH}_3</math> gas diffuses faster HCl gas</p> <p>B is not correct because <math>\text{NH}_3</math> gas diffuses faster HCl gas</p> <p>D is not correct because the position indicated is too close to the right hand end of the tube</p>	

5.

Question number	Answer	Notes	Marks												
(a)	C (halogens)		1												
(b) (i)	<b>M1</b> <u>atoms</u> of the same element  <b>M2</b> with different masses	accept ' <u>atoms</u> with the same atomic number' / ' <u>atoms</u> with the same number of protons'  accept 'different mass numbers' / 'different numbers of neutrons'  ignore references to electrons unless incorrect	1  1												
(ii)	<table border="1"> <thead> <tr> <th>Isotope</th> <th>Number of protons</th> <th>Number of neutrons</th> <th>Number of electrons</th> </tr> </thead> <tbody> <tr> <td><math>^{79}_{35}\text{Br}</math></td> <td>35</td> <td>44</td> <td>35</td> </tr> <tr> <td><math>^{81}_{35}\text{Br}</math></td> <td>35</td> <td>46</td> <td>35</td> </tr> </tbody> </table>	Isotope	Number of protons	Number of neutrons	Number of electrons	$^{79}_{35}\text{Br}$	35	44	35	$^{81}_{35}\text{Br}$	35	46	35		3
Isotope	Number of protons	Number of neutrons	Number of electrons												
$^{79}_{35}\text{Br}$	35	44	35												
$^{81}_{35}\text{Br}$	35	46	35												

	<b>M1</b> first column correct <b>M2</b> second column correct <b>M3</b> third column correct		
(c)	ethane – no change (in colour)  ethene – (orange to) colourless / decolourises	accept '(stays) orange' ignore 'no reaction' / 'nothing happens'  ignore 'discolours' ignore starting colour of bromine	

6.

a	B (red-brown liquid)		1
b	2 (1) 2	Accept multiples and fractions	1
c	i a halogen/an element cannot displace itself  <b>OR</b> no reaction / no displacement (would occur)	Accept a halogen does not react with <u>its own</u> (halide) ions Accept correct reference to a specific halogen/halide ion  Accept nothing happens  Reject any references to a halogen having the same reactivity as a halide (ion)	1
	ii a halogen cannot displace a more reactive halogen  <b>OR</b> a halogen cannot react with the (halide) ions of a more reactive halogen	Reject any references to a halogen having a different reactivity to a halide (ion)  Accept correct reference to a specific halogen/halide ion	1
	iii potassium bromide	Ignore any formula  Reject any other species with corrected name	1

Question number	Answer	Notes	Marks
iv	<b>M1</b> (correct products) KCl AND I <sub>2</sub> <b>M2</b> 2 2	Accept in either order M2 DEP on M1	
c v	(both) reduction <u>AND</u> oxidation occur (in the same reaction)	Accept (both) gain <u>AND</u> loss of electrons occurs (in the same reaction) Accept (both) gain <u>AND</u> loss of oxygen occurs (in the same reaction) Accept (both) increase <u>AND</u> decrease of oxidation states/oxidation numbers (in the same reaction) Ignore incorrect species being oxidised and reduced / losing and gaining electrons	1

vi	<b>M1</b> (species) I <sup>-</sup> / iodide (ion)		1
	<b>M2</b> (reason) loss of electron(s)	Accept increase in oxidation number <b>OR</b> oxidation number changes from -1 to 0  Ignore number of electrons lost <b>M2</b> DEP on <b>M1</b> correct, or near miss e.g. iodine	1

7.

Question number	Answer	Notes	Marks									
a	<table border="1"> <thead> <tr> <th>Halogen</th> <th>Colour</th> <th>Physical state</th> </tr> </thead> <tbody> <tr> <td>bromine</td> <td></td> <td>liquid</td> </tr> <tr> <td>iodine</td> <td>black</td> <td></td> </tr> </tbody> </table>	Halogen	Colour	Physical state	bromine		liquid	iodine	black		M1 (bromine) liquid / (l) M2 (iodine) black allow (dark) grey	2
Halogen	Colour	Physical state										
bromine		liquid										
iodine	black											
b	<pre>       ..  xx  ..       : Br x P x Br :       ..  xx  ..           : Br :           ..           </pre>	M1 three bonding pairs of electrons correct M2 rest of electrons correct Accept any combination of dots and crosses Ignore circles	2									
c	PBr <sub>3</sub> + <b>3</b> H <sub>2</sub> O → <b>3</b> HBr + H <sub>3</sub> PO <sub>3</sub>	M1 all formulae correct M2 balanced M2 DEP on M1	2									

8.

Question number	Answer	Accept	Reject	Marks
	<p><b>M1</b> – add (aqueous) chlorine to (aqueous) KBr</p> <p><b>M2</b> – (solution) turns orange</p> <p><b>M3</b> – add (aqueous) bromine to (aqueous) KI</p> <p><b>M4</b> – (solution) turns brown</p> <p><b>M5</b> – <math>\text{Cl}_2 + 2\text{KBr} \rightarrow \text{Br}_2 + 2\text{KCl}</math></p> <p>OR</p> <p><math>\text{Br}_2 + 2\text{KI} \rightarrow \text{I}_2 + 2\text{KBr}</math></p> <p>Ignore state symbols</p>	<p>yellow / brown</p> <p>red-brown / orange</p> <p>correct ionic equations</p> <p>accept <math>\text{Cl}_2 + 2\text{KI} \rightarrow \text{I}_2 + 2\text{KCl}</math> if chlorine is added to potassium iodide</p>	<p>red</p> <p>yellow</p>	5

Question number	Answer	Accept	Reject	Marks
8	<p><b>M1</b> – add (aqueous) bromine to (aqueous) KCl</p> <p><b>M2</b> – no change</p> <p><b>M3</b> – add (aqueous) iodine to (aqueous) KBr</p> <p><b>M4</b> – no change / no change</p> <p>If this route is chosen then <b>M5</b> cannot be scored</p>	<p>orange / yellow / brown solution/colour produced only if it is clear that no reaction has occurred</p> <p>brown / red-brown / orange solution/colour produced only if it is clear that no reaction has occurred</p>	<p>red</p> <p>yellow</p>	5



9.

question number	Answer	Notes	Marks
a	bromine: (red-)brown	Accept red Reject orange / yellow	1
	fluorine: gas AND astatine: solid		1
b	i Mg <sup>2+</sup> Cl <sup>-</sup>	Accept H <sup>+</sup> / H <sub>3</sub> O <sup>+</sup> Ignore OH <sup>-</sup> Award 1 for both ions correct but in wrong order	1 1
	ii hydrogen / H <sub>2</sub> burns with a pop / squeak OR use burning/lit splint/flame to see if pop/squeak	Ignore H Must be reference to test and result Reference to splint/match with no indication of flame is not enough Reject reference to glowing splint Ignore flame extinguished 'Squeaky pop test' alone is not sufficient No ECF from wrong gas M2 DEP on M1 correct or missing	1 1
	iii white precipitate  silver chloride to prevent other precipitates forming	Accept white solid / ppt / ppte / suspension Accept AgCl Accept to react with carbonate (ions) Accept to react with hydroxide (ions) Accept carbonates/hydroxides (also) form (white) precipitates	1 1 1

question number	Answer	Notes	Marks
b	iv hydrogen chloride/HCl does not dissociate / does not <u>form/produce</u> ions OR hydrochloric acid is not formed (in methylbenzene) /HCl is not an acid (in methylbenzene) / no H <sup>+</sup> ions (present/formed) OR only dissociates/forms H <sup>+</sup> ions in water	Accept hydrogen chloride covalent bonds do not break Ignore there is no water Ignore there are no ions (unspecified) Ignore all references to not reacting with methylbenzene	1