1	(a) Chlorir potass					assi	um	broı	mide	e in :	solu	tion	tof	orm	br	omi	ne	and	d		
	(i) Wh	at ty	pe c	of rea	actio	n is	taki	ing p	olace	e?											
	Put	t a cr	oss (⊠) i	n th	e bo	ox ne	ext t	o yo	our a	ınsw	/er.									(-)
	⊠ A	disp	lace	mer	nt.																(1)
	B B	disti			10																
		neu			n																
	_																				
	⊠ D	pred	ipita	atior	1																
	(ii) Sta	te th	e co	lour	of t	he n	nixtı	ure a	at th	e er	nd o	f the	e rea	ctic	n.						(1)
	Which	1 A D	2 B	ost li	kely	pos	itior	n of	c c	elen	nent	X ii	n the	a pe	4	lic t	ab	le?		0	
	Put a c	ross	(⊠)	in th	ne bo	ox n	ext 1	to yo	our a	ansv	ver.										(1)

	(Total for Question 1 = 8 marl	ks)
	percentage by mass of fluorine =	%
		(2)
(0)	(relative atomic masses: $F = 19$; $Na = 23$)	
(e)	Calculate the percentage by mass of fluorine in sodium fluoride, NaF.	
	relative formula mass =	
		(1)
(d)	alculate the relative formula mass of magnesium chloride, $MgCl_2$. (relative atomic masses: $Mg = 24.0$; $Cl = 35.5$)	(1)
	$H_2 + Br_2 \rightarrow \dots$	
		(2)
	Complete the balanced equation for the reaction between hydrogen and bromine forming hydrogen bromide.	
(c)	The halogens react with hydrogen to form hydrogen halides.	

2 (a) Two pieces of metal can be joined by welding them together.



(i)	Complete the sentence by putting a cross (\boxtimes) in the box next to your answer.
	The structure of a metal is a lattice of

(1)

(1)

- **A** anions
- B anions and cations
- **C** cations in a sea of electrons
- **D** molecules in a sea of electrons
- (ii) To join two pieces of metal by welding, they must be melted together.

 State why a high temperature has to be used.

(iii)	(iii) The pieces of metal are welded together in an atmosphere of argon.								
	Explain why an atmosphere of argon is used.								
			(2)						
(b) Sor	me	metals react with halogens.							
Iror	n re	acts with bromine, Br ₂ , to form iron(III) bromide, FeBr ₃ .							
Wri	ite t	the balanced equation for this reaction.							
			(2)						
(c) Cor	mpl	ete the sentence by putting a cross (⊠) in the box next to your answer.							
At ı	roo	m temperature, iodine is a							
	^	la va viva era e	(1)						
×		brown gas							
\times	В	brown liquid							
\times	C	grey solid							
\times	D	purple gas							

(d)) When a halogen is added to a solution containing halide ions a d	isplacement
	reaction may occur.	

In the table

- \checkmark shows a displacement reaction occurs
- $oldsymbol{x}$ shows a displacement reaction does not occur

halagan addad	halide ion in solution						
halogen added	chloride ion	bromide ion	iodide ion				
chlorine		✓	✓				
bromine	*		✓				
iodine	*	*					

(Total for Question 2 = 9 mar	ks)
	(2)
halogens.	

3	The elements ch	nlorine bromin	e and iodine ar	e part of grou	n 7 in the	neriodic table
•	THE CICHICHES CI	mornic, broilin	c and lounte ar	c part or grou	p / 111 tile	periodic table.

(a)	The appearances of chlorine, bromine and iodine at room temperature are shown
	in Figure 10.

halogen	appearance
chlorine	green gas
bromine	red-brown liquid
iodine	grey solid

		100.000		
	iodine	grey solid		
		Figure 10	-	
Astatine is the	e element below iodine	in group 7.		
Predict the ap	ppearance of astatine.			(1)
	eactivity of chlorine, bro	omine and iodine can b	oe determined by	
Explain how o	displacement reactions c	can be used to show th	e reactivity of these	
three elemen				(6)

(c) W	hen iron wool is heated in bromine vapour, it reacts to form iron bromide.	
	(i)	In an experiment, 5.60 g of iron reacted exactly with 24.0 g of bromine, Br ₂ .	
		[relative atomic masses: Fe = 56.0, Br = 80.0]	
		Determine, using this information, the balanced equation for the reaction between iron and bromine. You must show your working.	(4)
			(4)
	(ii)	When iron reacts with bromine, bromide ions are formed.	
	(11)	Explain the type of reaction bromine atoms undergo when they are converted	
		to bromide ions.	(2)
			(2)
		(Total for Question 3 = 13 mar	·ks)

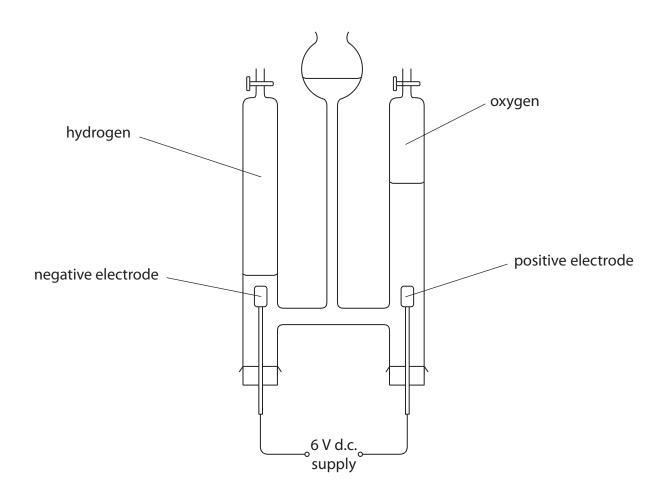
4	(a) A compound of iron and chlorine was formed by reacting 2.80 g of iron with 3.55 g of chlorine.			
		Calculate the empirical formula of the compound. (relative atomic masses: $Cl = 35.5$, $Fe = 56.0$)		
			(3)	
	••••			
		ompirical formula		
	41.5	empirical formula		
	(b)	Sodium reacts with chlorine to form sodium chloride.		
		$2Na + Cl_2 \rightarrow 2NaCl$		
		Calculate the maximum mass of sodium chloride that could be formed by reacting 9.20 g of sodium with excess chlorine. (relative atomic masses: $Na = 23.0$, $Cl = 35.5$)		
			(3)	
		mass of sodium chloride	g	

*(c) Chlorine, bromine and iodine are in group 7 of the periodic table. The order of reactivity of these three elements can be shown by carrying out displacement experiments. You are provided with potassium bromide solution potassium chloride solution potassium iodide solution bromine solution chlorine solution iodine solution Describe how these solutions could be used to carry out experiments to show the order of reactivity of bromine, chlorine and iodine, explaining how the results would show the order of reactivity. You may use equations if you wish. (6)

(Total for Question 4 = 12 marks)

5	Electrolysis occurs when solutions of some compounds are decomposed by passing direct electric current through them. (a) Sodium chloride solution was electrolysed. The reaction produced chlorine and hydrogen. The remaining solution contained sodium hydroxide, NaOH.		
	(i) State a hazard associated with chlorine gas.	(1)	
	(ii) Describe a test that can be used to identify a sample of gas as chlorine.	(2)	
	(iii) State a use of chlorine.	(1)	
	(iv) Complete and balance the equation for the overall reaction taking place when sodium chloride solution is electrolysed.	(2)	
	NaCl + $H_2O \rightarrow$ + +		

*(b) Water was decomposed by electrolysis in the apparatus shown.



The water decomposed into hydrogen and oxygen.

After five minutes, the volumes of hydrogen and oxygen in the tubes were measured.

Two further experiments were carried out changing only one factor in each experiment. All other factors were kept the same.

The table shows the conditions and results of all three experiments.

experiment	time / minutes	current / amps	volume of hydrogen / cm³	volume of oxygen / cm³
1	5	0.50	20.0	10.0
2	10	0.50	40.0	20.0
3	5	0.75	30.0	15.0

volumes of these gases.		(6)
	(Total for Question 5 = 12 ma	rks)

Use these results of electrolysis to compare the volumes of hydrogen and oxygen

formed and to show the effect of changing the time and the current on the