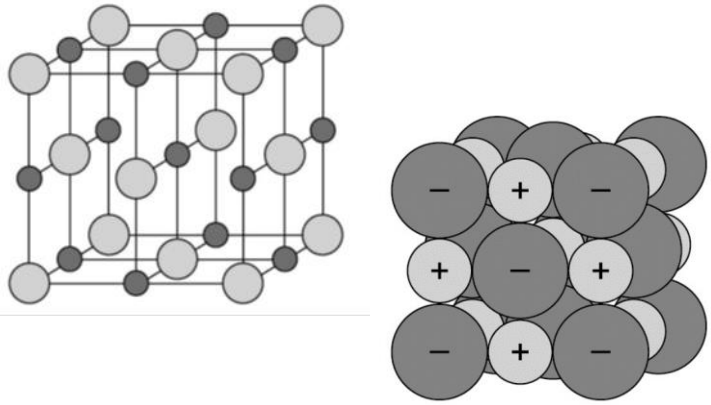
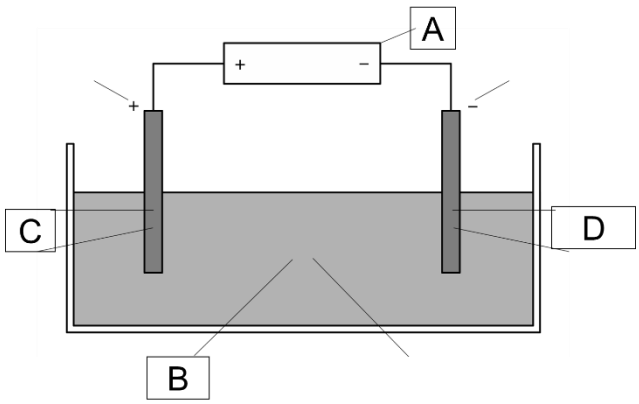
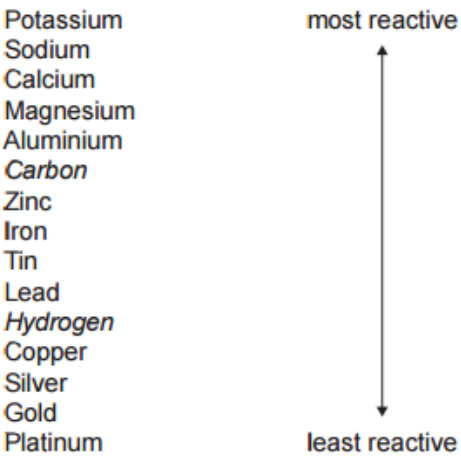
C2 Ionic bonding and electrolysis fact sheet

Making ions	
1. Why do atoms become ions?	**To get full electron shells**
2. How do atoms become negative ions?	**Gain electrons**
3. How do atoms become positive ions?	**Lose electrons**
4. How do metal atoms form ions?	**By losing electrons**
5. What type of ion do metals form?	**Positive**
6. How do non-metal atoms form ions?	**By gaining electrons**
7. What type of ion do non-metal atoms form?	**Negative**
8. When group 1, 2, 6 and 7 atoms have formed ions, they have the same electronic structure as a _____ gas	Noble
9. What type of ions do the atoms in group 1 form?	**+**
10. What type of ions do the atoms in group 7 form?	**-**
11. What type of ions do the atoms in group 2 form?	**2+**
12. What type of ions do the atoms in group 6 form?	**2-**
Ionic bonding	
13. Ionic bonds form between a _____ and a _____ element	**metal and non-metal**
14. Which of the following compounds are ionic: carbon dioxide, lead oxide, potassium chloride, beryllium fluoride, sulphur dioxide	**Lead oxide, potassium chloride, beryllium fluoride (they all have a metal and a non-metal)**
15. How do atoms form ionic bonds?	**1 atom gives electrons to the other atom**
16. Explain how sodium and chlorine bond	• Sodium gives 1 electron • Chlorine gets 1 electron • Sodium becomes a +1 ion • Chlorine becomes a -1 ion • Ionic bond is made

17. What type of compound do these diagrams show? 	**Ionic compounds**
Properties of Ionic compounds	
18. What holds the ions in a giant ionic lattice together?	• **Strong electrostatic forces** • Between oppositely charge ions • Forces act in all directions in the lattice
19. Describe the melting points of ionic compounds. Why?	• **High** • Lots of energy is needed • To break the strong bonds between ions
20. Describe the boiling points of ionic compounds. Why?	• **High** • Lots of energy is needed • To break the strong bonds between ions
21. Can ionic compounds conduct electricity when they are solid? Why?	• **No** • **Ions cannot move**
22. When do ionic compounds conduct electricity? Why?	• **Melted** • **Dissolved** • **Because ions can move**
Electrolysis	
23. Label the diagram 	**A. Power supply** **B. Electrolyte** **C. Positive electrode (anode)** **D. Negative electrode (cathode)**
24. Name the liquid used in electrolysis	Electrolyte

25. Why do compounds need to be melted or dissolved for electrolysis?	**So ions can move**
26. What happens to the positive ions during electrolysis?	• **Go to the negative electrode** • **Because opposite charges attract**
27. What happens to the negative ions during electrolysis? Why?	• **Go to the anode/positive electrode** • **Because opposite charge attract**
Electrolysis – molten ionic compounds	
28. Which electrode do metal ions go to? Why?	**Negative** because they are positively charged
29. Which electrode do non-metal ions go to? Why?	**Positive** because they are negatively charged
30. What will be formed at each electrode when electrolysis is done on zinc oxide?	Positive: oxygen Negative: zinc
31. What will be formed at each electrode when electrolysis is done on copper chloride?	Positive: chlorine Negative copper
32. What will be formed at each electrode when electrolysis is done on lead oxide	Positive: oxygen Negative: lead
Electrolysis – extracting metals	
33. When is electrolysis used to extract metals?	when the metal is more reactive than carbon
34. What is made at the negative electrode when we do electrolysis of aluminium oxide?	**Aluminium**
35. What is made at the positive electrode when we do electrolysis of aluminium oxide?	**Oxygen**
36. Why does the positive electrode wear away when we do electrolysis of aluminium oxide?	• Electrode made of carbon • Carbon reacts with oxygen • To make carbon dioxide • Which goes into the atmosphere
37. Why is cryolite added to aluminium oxide?	Lower the melting point
38. State 2 reasons why electrolysis is very expensive	• **Uses lots of energy** • **To melt the compound to make the electrolyte** • **To produce the electrical current**

Electrolysis – aqueous solutions	
39. What does aqueous (aq) mean?	Dissolved in water
40. Name the 2 ions produced from water	Hydrogen ions (H^+) Hydroxide ions (OH^-)
41. List the rules for what forms at the positive electrode	• Chlorine/ fluorine/ iodine/ bromine • If none of these are present, then oxygen
42. List the rules for what forms at the negative electrode	• Metal or hydrogen • Whichever is the least reactive
43. How would you be able to tell the metal was formed at the negative electrode?	**It would be covered in a shiny solid**
44. How would you be able to tell hydrogen was made at the negative electrode?	**You would see bubbles**
45. Predict what will be formed at each electrode when an aqueous solution of sodium chloride is used in electrolysis (reactivity series at the bottom of this sheet)	Positive: hydrogen (less reactive than sodium) Negative: chlorine
46. Predict what will be formed at each electrode when an aqueous solution of copper sulphate used in electrolysis (reactivity series at the bottom of this sheet)	Positive: copper (less reactive than hydrogen) Negative: oxygen
SKILLS SECTION – YOU WILL NEED A PERIODIC TABLE	
State the charges on the following ions	
47. Oxygen	**2-**
48. Magnesium	**2+**
49. Lithium	**+**
50. Sulphur	**2-**
51. Iodine	**-**
52. Potassium	**+**
53. Bromine	**-**



HIGHER TIER ON AN EXTRA SHEET

HIGHER TIER	
1. List 3 limitations of the simple particle model	• No forces are shown • All the particles are shown as spheres • The spheres are shown as solid
2. When ions gain electrons we say they are…	Reduced
3. When ions lose electrons we say they are…	Oxidised
4. What happens to the positive ions during electrolysis?	• Go to the negative electrode • Because opposite charges attract • They gain electrons to become atoms • In a reduction reaction
5. What happens to the negative ions during electrolysis? Why?	• Go to the anode/positive electrode • Because opposite charge attract • They lose electrons to become atoms • In an oxidation reaction
6. Write a half-equation to show the production of aluminium at the cathode	$Al^{3+} + 3e^- \rightarrow Al$
7. Write a half-equation for the production of oxygen at the anode	$2O^{2-} \rightarrow O_2 + 4e^-$
8. Write a half-equation for the reduction of sodium	$Na^+ + e^- \rightarrow Na$
9. Write a half-equation for the oxidation of chlorine	$2Cl^- \rightarrow Cl_2 + 2e^-$