

Combined Science - Chemistry - Key Stage 4

Electrolysis of Solutions

Mr Campbell



Periodic Table of Elements

Key:

relative atomic mass

Name

Atomic symbol

Atomic (proton number)

<div>1</div> <div>H</div> <div>hydrogen</div> <div>1</div>																	<div>4</div> <div>He</div> <div>helium</div> <div>2</div>						
<div>7</div> <div>Li</div> <div>lithium</div> <div>3</div>	<div>9</div> <div>Be</div> <div>beryllium</div> <div>4</div>																	<div>11</div> <div>B</div> <div>boron</div> <div>5</div>	<div>12</div> <div>C</div> <div>carbon</div> <div>6</div>	<div>14</div> <div>N</div> <div>nitrogen</div> <div>7</div>	<div>16</div> <div>O</div> <div>oxygen</div> <div>8</div>	<div>19</div> <div>F</div> <div>fluorine</div> <div>9</div>	<div>20</div> <div>Ne</div> <div>neon</div> <div>10</div>
<div>23</div> <div>Na</div> <div>sodium</div> <div>11</div>	<div>24</div> <div>Mg</div> <div>magnesium</div> <div>12</div>																	<div>27</div> <div>Al</div> <div>aluminium</div> <div>13</div>	<div>28</div> <div>Si</div> <div>silicon</div> <div>14</div>	<div>31</div> <div>P</div> <div>phosphorus</div> <div>15</div>	<div>32</div> <div>S</div> <div>sulfur</div> <div>16</div>	<div>35.5</div> <div>Cl</div> <div>chlorine</div> <div>17</div>	<div>40</div> <div>Ar</div> <div>argon</div> <div>18</div>
<div>39</div> <div>K</div> <div>potassium</div> <div>19</div>	<div>40</div> <div>Ca</div> <div>calcium</div> <div>20</div>	<div>45</div> <div>Sc</div> <div>scandium</div> <div>21</div>	<div>48</div> <div>Ti</div> <div>titanium</div> <div>22</div>	<div>51</div> <div>V</div> <div>vanadium</div> <div>23</div>	<div>52</div> <div>Cr</div> <div>chromium</div> <div>24</div>	<div>55</div> <div>Mn</div> <div>manganese</div> <div>25</div>	<div>56</div> <div>Fe</div> <div>iron</div> <div>26</div>	<div>59</div> <div>Co</div> <div>cobalt</div> <div>27</div>	<div>59</div> <div>Ni</div> <div>nickel</div> <div>28</div>	<div>63.5</div> <div>Cu</div> <div>copper</div> <div>29</div>	<div>65</div> <div>Zn</div> <div>zinc</div> <div>30</div>	<div>70</div> <div>Ga</div> <div>gallium</div> <div>31</div>	<div>73</div> <div>Ge</div> <div>germanium</div> <div>32</div>	<div>75</div> <div>As</div> <div>arsenic</div> <div>33</div>	<div>79</div> <div>Se</div> <div>selenium</div> <div>34</div>	<div>80</div> <div>Br</div> <div>bromine</div> <div>35</div>	<div>84</div> <div>Kr</div> <div>krypton</div> <div>36</div>						
<div>85</div> <div>Rb</div> <div>rubidium</div> <div>37</div>	<div>88</div> <div>Sr</div> <div>strontium</div> <div>38</div>	<div>89</div> <div>Y</div> <div>yttrium</div> <div>39</div>	<div>91</div> <div>Zr</div> <div>zirconium</div> <div>40</div>	<div>93</div> <div>Nb</div> <div>niobium</div> <div>41</div>	<div>96</div> <div>Mo</div> <div>molybdenum</div> <div>42</div>	<div>[97]</div> <div>Tc</div> <div>technetium</div> <div>43</div>	<div>101</div> <div>Ru</div> <div>ruthenium</div> <div>44</div>	<div>103</div> <div>Rh</div> <div>rhodium</div> <div>45</div>	<div>106</div> <div>Pd</div> <div>palladium</div> <div>46</div>	<div>108</div> <div>Ag</div> <div>silver</div> <div>47</div>	<div>112</div> <div>Cd</div> <div>cadmium</div> <div>48</div>	<div>115</div> <div>In</div> <div>indium</div> <div>49</div>	<div>119</div> <div>Sn</div> <div>tin</div> <div>50</div>	<div>122</div> <div>Sb</div> <div>antimony</div> <div>51</div>	<div>128</div> <div>Te</div> <div>tellurium</div> <div>52</div>	<div>127</div> <div>I</div> <div>iodine</div> <div>53</div>	<div>131</div> <div>Xe</div> <div>xenon</div> <div>54</div>						
<div>133</div> <div>Cs</div> <div>caesium</div> <div>55</div>	<div>137</div> <div>Ba</div> <div>barium</div> <div>56</div>	<div>139</div> <div>La*</div> <div>lanthanum</div> <div>57</div>	<div>178</div> <div>Hf</div> <div>hafnium</div> <div>72</div>	<div>181</div> <div>Ta</div> <div>tantalum</div> <div>73</div>	<div>184</div> <div>W</div> <div>tungsten</div> <div>74</div>	<div>186</div> <div>Re</div> <div>rhenium</div> <div>75</div>	<div>190</div> <div>Os</div> <div>osmium</div> <div>76</div>	<div>192</div> <div>Ir</div> <div>iridium</div> <div>77</div>	<div>195</div> <div>Pt</div> <div>platinum</div> <div>78</div>	<div>197</div> <div>Au</div> <div>gold</div> <div>79</div>	<div>201</div> <div>Hg</div> <div>mercury</div> <div>80</div>	<div>204</div> <div>Tl</div> <div>thallium</div> <div>81</div>	<div>207</div> <div>Pb</div> <div>lead</div> <div>82</div>	<div>209</div> <div>Bi</div> <div>bismuth</div> <div>83</div>	<div>[209]</div> <div>Po</div> <div>polonium</div> <div>84</div>	<div>[210]</div> <div>At</div> <div>astatine</div> <div>85</div>	<div>[222]</div> <div>Rn</div> <div>radon</div> <div>86</div>						
<div>[223]</div> <div>Fr</div> <div>francium</div> <div>87</div>	<div>[226]</div> <div>Ra</div> <div>radium</div> <div>88</div>	<div>[227]</div> <div>Ac*</div> <div>actinium</div> <div>89</div>	<div>[267]</div> <div>Rf</div> <div>rutherfordium</div> <div>104</div>	<div>[270]</div> <div>Db</div> <div>dubnium</div> <div>105</div>	<div>[269]</div> <div>Sg</div> <div>seaborgium</div> <div>106</div>	<div>[270]</div> <div>Bh</div> <div>bohrium</div> <div>107</div>	<div>[270]</div> <div>Hs</div> <div>hassium</div> <div>108</div>	<div>[278]</div> <div>Mt</div> <div>meitnerium</div> <div>109</div>	<div>[281]</div> <div>Ds</div> <div>darmstadtium</div> <div>110</div>	<div>[281]</div> <div>Rg</div> <div>roentgenium</div> <div>87</div>	<div>[285]</div> <div>Cn</div> <div>copernicium</div> <div>112</div>	<div>[286]</div> <div>Nh</div> <div>nihonium</div> <div>113</div>	<div>[289]</div> <div>Fl</div> <div>flerovium</div> <div>114</div>	<div>[289]</div> <div>Mc</div> <div>moscovium</div> <div>115</div>	<div>[293]</div> <div>Lv</div> <div>livermorium</div> <div>116</div>	<div>[293]</div> <div>Ts</div> <div>tennessine</div> <div>117</div>	<div>[294]</div> <div>Og</div> <div>oganesson</div> <div>118</div>						

Source: Oak



Electrolysis of solutions

At the anode

If the non-metal ions is a halide ion (group 7) chloride Cl^- , Br^- , I^- .

Then the halogen will form chlorine Cl_2 , Br_2 or I_2 .

If the non-metal ion is not a halide ion then oxygen forms O_2 .

At the cathode

If the metal is more reactive than hydrogen then hydrogen forms.

If the metal is less reactive than hydrogen (copper, silver, gold, platinum) then the metal forms.

Increasing Reactivity

Potassium
Sodium
Calcium
Magnesium
Aluminium
Zinc
Iron
Tin
Lead
Hydrogen
Copper
Silver
Gold
Platinum



Independent task

Compound	Molten or aqueous	Positive ions present	Negative ions present	Formed at the anode	Formed at the cathode
Sodium bromide	molten				
Potassium sulfate	aqueous				
Copper chloride	aqueous				
Aluminium iodide	molten				
Copper nitrate	aqueous				



Independent task

Compound	Molten or Dissolved	Positive ions present	Negative ions present	Formed at the anode	Formed at the cathode
Sodium bromide	molten	Sodium/ Na^+	Bromide/ Br^-	Bromine/ Br_2	Sodium/Na
Potassium sulfate	aqueous	Potassium/ K^+ & hydrogen/ H^+	Sulfate/ SO_4^{2-} & hydroxide/ OH^-	Oxygen/ O_2	Hydrogen/ H_2
Copper chloride	aqueous	Copper/ Cu^{2+} & hydrogen/ H^+	Chloride/ Cl^- & hydroxide/ OH^-	Chlorine/ Cl_2	Copper/Cu
Aluminium iodide	molten	Aluminium/ Al^{3+}	Iodide/ I^-	Iodine/ I_2	Aluminium/Al
Copper nitrate	aqueous	Copper/ Cu^{2+} & hydrogen/ H^+	Nitrate/ NO_3^- & hydroxide/ OH^-	Oxygen/ O_2	Copper/Cu



Independent task

During the electrolysis of sodium chloride solution hydrogen is formed at the cathode. Explain why hydrogen is formed not sodium.

Hydrogen is formed at the cathode because _____ is more _____ than hydrogen.



Independent task

During the electrolysis of sodium chloride solution hydrogen is formed at the cathode. Explain why hydrogen is formed not sodium.

Hydrogen is formed at the cathode because sodium is more reactive than hydrogen.

