

# Testing gases

## Worksheet

Combined Science - Chemistry - Key Stage 4

C8 Chemical Analysis

Mr Robbins



# Periodic Table of Elements

Key:

relative atomic mass →

Name →

Atomic symbol

Atomic (proton number)

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

\* The lanthanides (atomic numbers 58 - 71) and the Actinides (atomic numbers 90 - 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.



## Questions include prior topics

1. In a chemical reaction, a gas is released. It is unknown whether the gas is oxygen or hydrogen. Describe a test that can be used to establish which gas it is.
2. A student conducts electrolysis on liquid sodium chloride. Name the metal and a gas which are produced.
3. Explain why the electrolysis would not work if the sodium chloride was solid.
4. How can the student test for the presence of the gas?
5. The student repeats their electrolysis with a solution of sodium chloride dissolved in water. What is the formula of sodium chloride when dissolved in water? Include a state symbol in your answer.
6. Carbon dioxide does not conduct electricity. Use its structure and bonding to explain why.
7. Carbon dioxide has a low melting point. Using its structure and bonding explain why.
8. The reaction below shows what occurs when water is electrolysed:  $2\text{H}_2\text{O} \rightarrow 2\text{H} + \text{O}_2$   
How can the products be tested for?
9. *Challenge: where do each of the products form?*



# Answers

1. Lit splint goes pop, or glowing splint relights
2. Sodium and chlorine
3. Ions are not free to move
4. Damp litmus paper is bleached white
5. NaCl (aq)
6. Simple covalent molecule has no delocalised electrons
7. Weak forces of attraction/intermolecular forces between molecules so they do not require much energy to separate
8. Hydrogen: Lit splint goes pop, Oxygen: Glowing splint relights
9. Cathode: Hydrogen. Anode: Oxygen



# The standard tests for gases

Gas	How to carry out the test	Describe the positive result
Hydrogen	Insert a lit splint into a tube of the gas	The gas will burn with a squeaky pop
Oxygen	Insert a glowing splint into the tube of the gas	The glowing splint will relight
Carbon dioxide	Bubble some of the gas through limewater	The limewater will go cloudy
Chlorine	Hold damp litmus paper near the gas	The litmus paper will be bleached white



# Independent task

1. Why do we need laboratory tests for gases?
2. Describe how to test for carbon dioxide.
3. What will the positive result be?
4. Describe how to test for hydrogen.
5. What will the positive result be?
6. What paper is needed to test for chlorine?
7. A glowing splint relights when placed near a gas. Which gas is it?



# Independent task

Calcium, Ca, reacts with hydrochloric acid, HCl, to produce hydrogen and a salt.

1. Name the salt.
2. How could we prove it is hydrogen?
3. Write a word equation for the reaction.
4. Write a balanced symbol equation for the reaction.



# Independent task

Sodium carbonate,  $\text{Na}_2\text{CO}_3$ , reacts with nitric acid to produce carbon dioxide, water and a salt

1. Name the salt
2. How could we prove it is carbon dioxide?
3. Write a word equation for the reaction.
4. Write a balanced symbol equation for the reaction, include state symbols.

