



Year 10 Science

# Chemistry

**HOMEWORK  
BOOK**



## Find-a-word

A S V Y O N O B L E G A S E S G  
 T W G H V E E L E D N E M R U H  
 O R Q P X B M O T A X A C J F U  
 M H Z X S L A T E M I L A K L A  
 I A N W W P K H K G J V S J E E  
 C L C O M N T S V A E Y J H V V  
 M O I P R E B M U N C I M O T A  
 A G T N O T O R P F D O I R E P  
 S E E U U H U R G F C Q A B U Z  
 S N H Z O Q X E D B T K V I A R  
 M S T G R O U P N K N C H T M O  
 R T N E M E L E N T T O A A L X  
 W L Y F P J S M U S K L U L V D  
 Y F S N O R T C E L E B B S I J

Alkali Metals  
 Atom  
 Atomic Mass  
 Atomic Number  
 Block  
 Electron  
 Element  
 Group  
 Halogens  
 Mendeleev  
 Neutron  
 Noble Gases  
 Orbital  
 Period  
 Proton  
 Synthetic

**Alkali Metals**

Group 1 of the periodic table.

**Atomic Mass**

Relative Atomic Mass: The mass of one atom of an element compared with one-twelfth of the mass of one atom of carbon-12.

**Atomic Number**

The number of protons (and therefore of electrons) in an atom.

**Atom**

A single unit of an element.

**Block**

The periodic table is split up into four blocks, s, d, p and f, based on the element's characteristic orbital.

**Electron**

A negatively charged particle. Electrons orbit the atomic nucleus in energy levels.

**Element**

A substance which cannot be broken down into any simpler substance by chemical means.

**Group**

The elements in a column of the Periodic Table.

**Noble Gases**

Group 8 of the periodic table, low reactivity.

**Mendeleev**

Dmitri Mendeleev is generally noted as the creator of the modern periodic table. His theory was to leave room for elements not yet discovered.

**Orbital**

The region in an atom where an electron is most likely to be found.

**Halogens**

Group 7 of the periodic table.

**Period**

A horizontal row of the periodic table.

**Neutron**

A neutral (uncharged) particle in the atomic nucleus. Its mass is approximately 1 atomic unit.

**Proton**

A positively charged particle in the atomic nucleus. Its mass is approximately 1 atomic unit.

**Synthetic**

An element too unstable to occur naturally on Earth.

# Periodic table 1

- 1 Below is some important data about the physical properties, melting point, boiling point and size of the first twenty elements of the periodic table. Fill in the missing information.

Period	Group	Atomic number	Electronic configuration	Symbol	Element	Melting point (°C)	Boiling point (°C)	Diameter of atom (Angstrom)
1	I	1	1		Hydrogen			0.60
	II	2	2	He				1.86
2	I	3	2.1		Lithium	181	1342	3.04
	II	4	2.2		Beryllium	1278	2970	2.22
	III	5			Boron	2200	3927	1.76
	IV			C		3500	3800	1.54
	V	7			Nitrogen	-211	-196	1.40
	VI				Oxygen	-219	-183	1.32
	VII			F		-220	-188	1.28
	VIII	10				-249	-246	2.24
3	I					98	883	3.72
	II					649	1107	3.20
	III					660	2467	2.86
		14				1410	2355	2.34
		15				44	287	2.20
		16				119	445	2.08
					Chlorine	-101	-35	1.98
					Argon	-190	-186	3.08
4				K		63	760	4.62
		20				839	1484	3.94

- 2 What are the 'family' names normally given to the elements of:
- Group I?
  - Group II?
  - Group VII?
  - Group VIII?
- 3 What does the term 'atomic number' mean?

## The periodic table 2

alkaline metals I A		alkaline earth metals II A										transition metals										nonmetals										noble gases																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			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## Questions

1 On the periodic table, colour each of the following in different colours:

- a metals
- b non-metals
- c semi-metals (metalloids)

2 Identify which group consists of all gases.

3 What other name is given to the group VII elements?

4 State the atomic number for the following elements:

- a Platinum \_\_\_\_\_
- b Gold \_\_\_\_\_
- c Oxygen \_\_\_\_\_
- d Magnesium \_\_\_\_\_
- e Californium \_\_\_\_\_
- f Bromine \_\_\_\_\_
- g Krypton \_\_\_\_\_

5 State the name for atoms with the following atomic numbers:

- a 6 \_\_\_\_\_
- b 3 \_\_\_\_\_
- c 40 \_\_\_\_\_
- d 13 \_\_\_\_\_
- e 92 \_\_\_\_\_
- f 56 \_\_\_\_\_
- g 1 \_\_\_\_\_

6 a Identify three elements that start with a C. \_\_\_\_\_

b State the symbols for the elements you have chosen. \_\_\_\_\_

c Explain why some elements have one letter for their symbol and others have two. \_\_\_\_\_

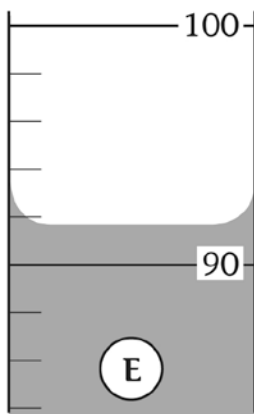
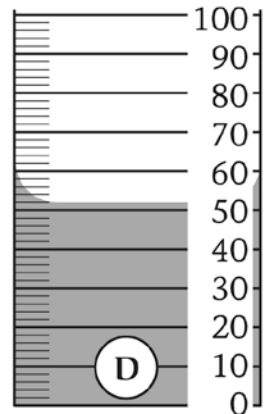
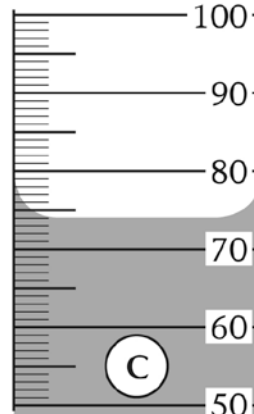
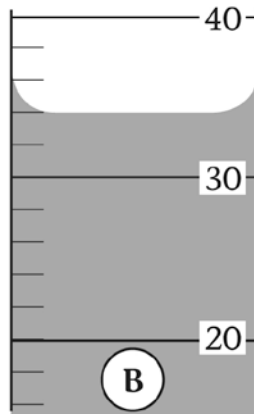
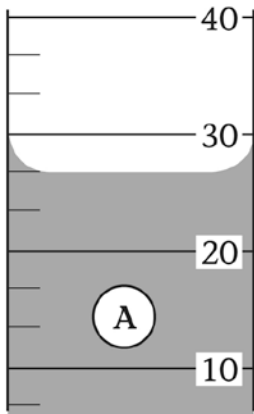
7 Outline a reason why elements are placed in the same group.

8 Explain what the atomic number tells us about an element.

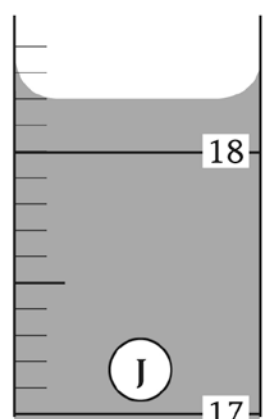
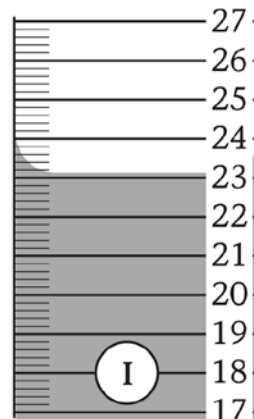
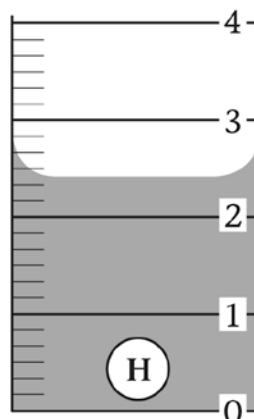
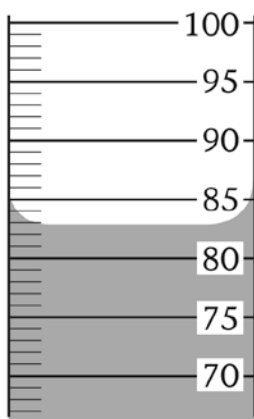
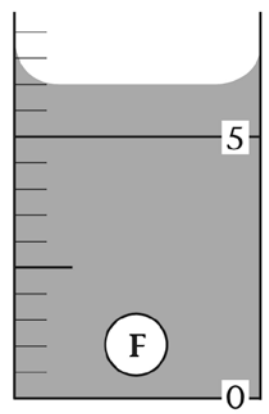
9 Identify three elements that you think are named after famous people, and propose who that person was.

# Reading scales

1 Record the measurement shown by each measuring cylinder in the results table.



Cylinder	Result	Cylinder	Result
A		F	
B		G	
C		H	
D		I	
E		J	



# Comprehension

Read the following article by Dr Karl S. Kruszelnicki. It first appeared in the *Good Weekend* (*The Age* magazine, Saturday 13 October 2001). Use the information contained to answer the following questions.

## Mythconceptions

### Fry me to the moon

One of the great myths about the space program that got us to the moon was that “the only good thing to come out of it was Teflon”. Teflon was in fact discovered, albeit accidentally, much earlier, on April 6, 1938, when a Du Pont chemist, Roy J. Plunkett Jr, was looking for a new gas to use in refrigerators. One gas on his list was tetrafluoroethylene. Plunkett opened the valve of what was supposed to be a full cylinder of it, but none came out.

Most people would have just fetched another cylinder, but Plunkett was curious. He weighed the cylinder and found that it weighed as much as a full cylinder of tetrafluoroethylene, so it wasn't empty. He then proved that the valve was indeed open by running a thin wire into it. There was only one way left to work out what was going on, so he hacksawed the cylinder open, and found the gas had turned itself into a solid, white, slippery, waxy powder which, when analysed, revealed itself as polytetrafluoroethylene, today known as Teflon.

This powder proved to be the most inert plastic Plunkett had ever come across. It was

*Dr Karl S. Kruszelnicki tackles the myths, curiosities and absurdities of everyday life.*

unaffected by low heat. Nothing dissolved it. And it was more slippery than wet ice on wet ice. It was also a terrific electrical insulator. Sadly, it was very expensive to produce, so it had no commercial use.

During World War II, the Manhattan Project saw the first atom bombs made. As part of the manufacturing process, uranium had to be turned into uranium hexafluoride. Unfortunately, this was an incredibly corrosive gas and would eat through metal, a major problem. But the Manhattan Project had money to burn, and once the US military heard about Teflon, it bought huge quantities of it to protect the machinery from the corrosive uranium hexafluoride.

But Teflon would also have applications in other important areas.

The human immune system tends to ignore Teflon, so it's used in artificial heart valves and aortas, as well as for artificial corneas and bones (for ears, chins, fingers, noses, skulls and various joints). Because it's tough enough to withstand the harsh conditions of outer space, Teflon is also used in spacesuits. And, of course, it's there in frying pans.



1 When was Teflon discovered and by whom?

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2 What is the actual chemical name of Teflon?

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3 Describe the appearance of Teflon.

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4 What properties make Teflon an extremely useful material?

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5 Teflon is said to be inert: what does this mean?

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6 What research was the inventor actually doing when he discovered Teflon?

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7 How did he know the cylinder of tetrafluoroethylene wasn't empty?

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8 What stopped Teflon from being produced commercially in the early days?

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9 Teflon's name shows it to be a polymer. What would be the name of the Teflon monomer?

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10 Is Teflon a metal or a plastic? Give one piece of evidence.

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11 Is tetrafluoroethylene a solid, liquid or gas?

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12 Is Teflon a solid, liquid or gas?

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13 Complete the following table, about the uses of Teflon.

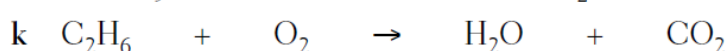
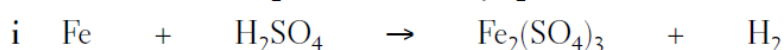
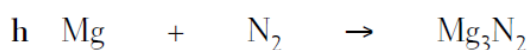
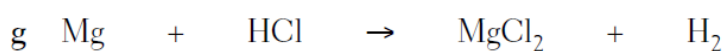
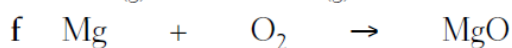
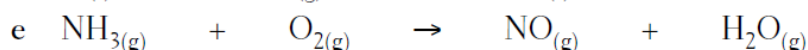
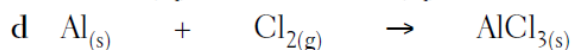
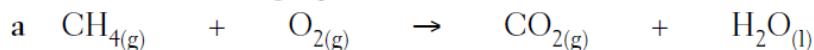
Location	Use	Property related to uses
Body		
Space		
Kitchen		



# Chemical Equations

## Skills: Interpreting, numeracy, knowledge

1 Balance the following equations:



2 Equations must be balanced so that the Law of Conservation of Mass holds true. State this law in your own words.

3 Use the information below to help answer the following questions.

Compound name	Compound formula	Compound name	Compound formula
Hydrochloric acid	HCl	Carbon dioxide	$\text{CO}_2$
Nitric acid	$\text{HNO}_3$	Calcium carbonate	$\text{CaCO}_3$
Sulfuric acid	$\text{H}_2\text{SO}_4$	Calcium nitrate	$\text{Ca}(\text{NO}_3)_2$
Magnesium chloride	$\text{MgCl}_2$	Magnesium hydroxide	$\text{Mg}(\text{OH})_2$
Barium sulfate	$\text{BaSO}_4$	Barium nitrate	$\text{Ba}(\text{NO}_3)_2$
Sodium sulfate	$\text{Na}_2\text{SO}_4$	Sodium hydroxide	NaOH
Water	$\text{H}_2\text{O}$	Sodium carbonate	$\text{Na}_2\text{CO}_3$

Write balanced chemical equations, including subscripts, for each of the following reactions.

*Hint:* follow these steps:

- Write the word equation for the reaction.
- Directly underneath the word equation, write the unbalanced formula equation.
- Add subscripts—(s), (l), (g) or (aq).
- Balance the equation.

*Note:* 'Dilute' means a water solution, and therefore the appropriate subscript is (aq).

- a Dilute hydrochloric acid is added to solid magnesium hydroxide, producing water and the soluble salt magnesium chloride.

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- b Dilute nitric acid is added to solid calcium carbonate, producing bubbles of carbon dioxide, water, and the soluble salt calcium nitrate.

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- c When dilute sodium sulfate solution is added to dilute barium nitrate solution, barium sulfate precipitates, leaving sodium nitrate in solution.

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- d Dilute sodium hydroxide is added to dilute sulfuric acid, producing water and the soluble salt sodium sulfate.

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- e Dilute sulfuric acid is poured over solid sodium carbonate, producing carbon dioxide, water and the soluble salt sodium sulfate.

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- 4 Write balanced equations, including subscripts, for the following reactions. This time you will need to write formulas first.

- a Iron metal reacts with chlorine gas to produce iron chloride.

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- b Sodium chloride solution is mixed with silver nitrate solution, producing a precipitate of solid silver chloride.

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- c Lead nitrate solution is added to sodium sulfate solution, producing lead sulfate precipitate.

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- d Sulfur dioxide gas reacts with oxygen to produce sulfur trioxide gas.

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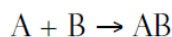
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# Chemical Reactions

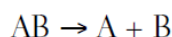
## Skills: Knowledge, interpretation

You should know the following reaction types. For more information about each type of reaction, revise *Science Focus 3*, Unit 2.3 Reaction types.

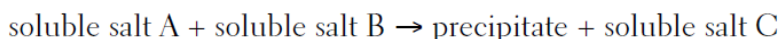
- Combination:** Two or more compounds combine to form one compound.



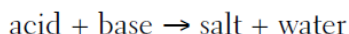
- Decomposition:** The opposite of a combination reaction—a complex molecule breaks down to make simpler ones. These reactions have the general form:



- Precipitation:** Two solutions of soluble salts are mixed, resulting in an insoluble solid (precipitate) forming.



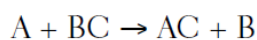
- Neutralisation:** An acid and a base react with each other. Generally, the product of this reaction is a salt and water:



- Combustion:** Oxygen combines with a compound to form carbon dioxide and water. These reactions are exothermic, meaning they give out heat.



- Displacement:** One element trades places with another element in a compound. These reactions have the general form:



- Using the above information, classify the following reactions according to their type.

Equation	Reaction type
$2Fe_{(s)} + O_{2(g)} \rightarrow 2FeO_{(s)}$	
$H_2O_{(l)} \rightarrow H_{2(g)} + O_{2(g)}$	
$AgNO_{3(aq)} + NaCl_{(aq)} \rightarrow AgCl_{2(s)} + NaNO_{3(aq)}$	
$Na_2CO_{3(s)} \rightarrow Na_2O_{(s)} + CO_{2(g)}$	
$Mg_{(s)} + ZnCl_{2(aq)} \rightarrow MgCl_{2(aq)} + Zn_{(s)}$	
$NaOH_{(aq)} + HNO_{3(aq)} \rightarrow NaNO_{3(aq)} + H_2O_{(l)}$	
$HCl_{(aq)} + NaOH_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$	
$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)}$	
$Pb_{(s)} + O_{2(g)} \rightarrow PbO_{2(s)}$	
$2Ag_{(s)} + CuSO_{4(aq)} \rightarrow Ag_2SO_{4(aq)} + Cu_{(s)}$	
$NH_4OH_{(aq)} + HCl_{(aq)} \rightarrow H_2O_{(l)} + NH_4Cl_{(aq)}$	
$Pb(NO_3)_{2(aq)} + CuSO_{4(aq)} \rightarrow PbSO_{4(s)} + Cu(NO_3)_{2(aq)}$	
$Ca(OH)_{2(aq)} + HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(l)}$	
$C_{10}H_{8(l)} + 12O_{2(g)} \rightarrow 10CO_{2(g)} + 4H_2O_{(g)}$	

- 2 Two of the above equations are not balanced. Identify the unbalanced equations, copy them into the space below and balance them.

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- 3 For each of the following reactions:

- i Identify the type of reaction taking place
- ii Write a word equation for the reaction
- iii Write a balanced formula equation for the reaction

- a Sulfuric acid reacts with potassium hydroxide to form water and a salt.

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- b Silver is placed in zinc chloride solution and causes zinc metal to form.

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- c Sulfur reacts with iron to form iron sulfide.

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- d Calcium nitrate solution is added to sodium carbonate solution and a precipitate of calcium carbonate is formed.

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- e Hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) breaks down to form oxygen gas and water.

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- f Barbeque gas (butane,  $\text{C}_4\text{H}_{10}$ ) burns in oxygen in an exothermic reaction.

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