

Year 10 Science 2026

Chemistry

Revision

Student Booklet 1

Name: _____

	Year 10 Chemistry Revision Objectives	
	During this unit represent reactions using word and balanced formula equations, including state symbols.	
Atomic Structure (revision)	Draw and describe the model of an atom using a labelled diagram. Include the terms: protons, neutrons, electrons, nucleus, energy levels (shells) and cloud of electrons.	atom, proton, neutron, electron, shell
	Recall the properties of charge and mass to the atomic structure.	positive, neutral, negative
	Draw an energy level diagram and the electron configuration for the first 20 elements.	electron configuration
	Understand how the electron configuration of an atom determines its position in the Periodic Table and its valency.	
	Describe an isotope and why elements on the Periodic table do not have whole mass numbers.	isotope, mass number, relative atomic mass
Bonding	Understand the difference between an ionic bond and a covalent bond.	ionic bond, covalent bond, ionic compound, molecules

1. Periodic table of the elements

1 H 1.0 hydrogen		atomic number										2 He 4.0 helium	
3 Li 6.9 lithium		symbol of element										9 F 19.0 fluorine	
4 Be 9.0 beryllium		relative atomic mass										8 O 16.0 oxygen	
11 Na 23.0 sodium		name of element										7 N 14.0 nitrogen	
12 Mg 24.3 magnesium		79 Au 197.0 gold										6 C 12.0 carbon	
19 K 39.1 potassium		27 Co 58.9 cobalt										5 B 10.8 boron	
20 Ca 40.1 calcium		28 Ni 58.7 nickel										13 Al 27.0 aluminium	
21 Sc 45.0 scandium		29 Cu 63.5 copper										14 Si 28.1 silicon	
22 Ti 47.9 titanium		30 Zn 65.4 zinc										15 P 31.0 phosphorus	
23 V 50.9 vanadium		31 Ga 69.7 gallium										16 S 32.1 sulfur	
24 Cr 52.0 chromium		32 Ge 72.6 germanium										17 Cl 35.5 chlorine	
25 Mn 54.9 manganese		33 As 74.9 arsenic										18 Ar 39.9 argon	
26 Fe 55.8 iron		34 Se 79.0 selenium										36 Kr 83.8 krypton	
27 Co 58.9 cobalt		35 Br 79.9 bromine										54 Xe 131.3 xenon	
28 Ni 58.7 nickel		37 Rb 85.5 rubidium										86 Rn (222) radon	
29 Cu 63.5 copper		38 Sr 87.6 strontium										88 Ra (226) radium	
30 Zn 65.4 zinc		39 Y 88.9 yttrium										116 Lv (292) livermorium	
31 Ga 69.7 gallium		40 Zr 91.2 zirconium										118 Ts (294) tennessine	
32 Ge 72.6 germanium		41 Nb 92.9 niobium										119 Nh (295) nihonium	
33 As 74.9 arsenic		42 Mo 96.0 molybdenum										120 Ds (285) copernicium	
34 Se 79.0 selenium		43 Tc (98) technetium										121 Nh (296) nihonium	
35 Br 79.9 bromine		44 Ru 101.1 ruthenium										122 Nh (297) nihonium	
51 Sb 121.8 antimony		45 Rh 102.9 rhodium										123 Nh (298) nihonium	
52 Te 127.6 tellurium		46 Pd 106.4 palladium										124 Nh (299) nihonium	
83 Bi 209.0 bismuth		47 Ag 107.9 silver										125 Nh (300) nihonium	
84 Po (210) polonium		48 Cd 112.4 cadmium										126 Nh (301) nihonium	
85 At (210) astatine		49 In 114.8 indium										127 Nh (302) nihonium	
116 Lv (292) livermorium		50 Sn 118.7 tin										128 Nh (303) nihonium	
118 Ts (294) tennessine		51 Sb 121.8 antimony										129 Nh (304) nihonium	
119 Nh (295) nihonium		52 Te 127.6 tellurium										130 Nh (305) nihonium	
120 Ds (285) copernicium		53 I 126.9 iodine										131 Nh (306) nihonium	
121 Nh (296) nihonium		54 Xe 131.3 xenon										132 Nh (307) nihonium	
122 Nh (297) nihonium		81 Tl 204.4 thallium										133 Nh (308) nihonium	
123 Nh (298) nihonium		82 Pb 207.2 lead										134 Nh (309) nihonium	
124 Nh (299) nihonium		83 Bi 209.0 bismuth										135 Nh (310) nihonium	
125 Nh (300) nihonium		84 Po (210) polonium										136 Nh (311) nihonium	
126 Nh (301) nihonium		85 At (210) astatine										137 Nh (312) nihonium	
127 Nh (302) nihonium		86 Rn (222) radon										138 Nh (313) nihonium	
128 Nh (303) nihonium		87 Fr (223) francium										139 Nh (314) nihonium	
129 Nh (304) nihonium		88 Ra (226) radium										140 Nh (315) nihonium	
130 Nh (305) nihonium		89-103 actinoids										141 Nh (316) nihonium	
131 Nh (306) nihonium		90-104 transactinoids										142 Nh (317) nihonium	
132 Nh (307) nihonium		105 Db (262) dubnium										143 Nh (318) nihonium	
133 Nh (308) nihonium		106 Sg (266) seaborgium										144 Nh (319) nihonium	
134 Nh (309) nihonium		107 Bh (264) bohrium										145 Nh (320) nihonium	
135 Nh (310) nihonium		108 Hs (267) hassium										146 Nh (321) nihonium	
136 Nh (311) nihonium		109 Mt (268) meitnerium										147 Nh (322) nihonium	
137 Nh (312) nihonium		110 Ds (271) darmstadtium										148 Nh (323) nihonium	
138 Nh (313) nihonium		111 Rg (272) roentgenium										149 Nh (324) nihonium	
139 Nh (314) nihonium		112 Cn (285) copernicium										150 Nh (325) nihonium	
140 Nh (315) nihonium		113 Nh (286) nihonium										151 Nh (326) nihonium	
141 Nh (316) nihonium		114 Fl (289) flerovium										152 Nh (327) nihonium	
142 Nh (317) nihonium		115 Mc (288) moscovium										153 Nh (328) nihonium	
143 Nh (318) nihonium		116 Lv (292) livermorium										154 Nh (329) nihonium	
144 Nh (319) nihonium		117 Ts (293) tennessine										155 Nh (330) nihonium	
145 Nh (320) nihonium		118 Og (294) oganesson										156 Nh (331) nihonium	
146 Nh (321) nihonium		119 Nh (295) nihonium										157 Nh (332) nihonium	
147 Nh (322) nihonium		120 Nh (296) nihonium										158 Nh (333) nihonium	
148 Nh (323) nihonium		121 Nh (297) nihonium										159 Nh (334) nihonium	
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150 Nh (325) nihonium		123 Nh (299) nihonium										161 Nh (336) nihonium	
151 Nh (326) nihonium		124 Nh (300) nihonium										162 Nh (337) nihonium	
152 Nh (327) nihonium		125 Nh (301) nihonium										163 Nh (338) nihonium	
153 Nh (328) nihonium		126 Nh (302) nihonium										164 Nh (339) nihonium	
154 Nh (329) nihonium		127 Nh (303) nihonium										165 Nh (340) nihonium	
155 Nh (330) nihonium		128 Nh (304) nihonium										166 Nh (341) nihonium	
156 Nh (331) nihonium		129 Nh (305) nihonium										167 Nh (342) nihonium	
157 Nh (332) nihonium		130 Nh (306) nihonium										168 Nh (343) nihonium	
158 Nh (333) nihonium		131 Nh (307) nihonium										169 Nh (344) nihonium	
159 Nh (334) nihonium		132 Nh (308) nihonium										170 Nh (345) nihonium	
160 Nh (335) nihonium		133 Nh (309) nihonium										171 Nh (346) nihonium	
161 Nh (336) nihonium		134 Nh (310) nihonium										172 Nh (347) nihonium	
162 Nh (337) nihonium		135 Nh (311) nihonium										173 Nh (348) nihonium	
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166 Nh (341) nihonium		139 Nh (315) nihonium										177 Nh (352) nihonium	
167 Nh (342) nihonium		140 Nh (316) nihonium										178 Nh (353) nihonium	
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171 Nh (346) nihonium		144 Nh (320) nihonium										182 Nh (357) nihonium	
172 Nh (347) nihonium		145 Nh (321) nihonium										183 Nh (358) nihonium	
173 Nh (348) nihonium		146 Nh (322) nihonium										184 Nh (359) nihonium	
174 Nh (349) nihonium		147 Nh (323) nihonium										185 Nh (360) nihonium	
175 Nh (350) nihonium		148 Nh (324) nihonium										186 Nh (361) nihonium	
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188 Nh (363) nihonium		161 Nh (337) nihonium										199 Nh (374) nihonium	
189 Nh (364) nihonium		162 Nh (338) nihonium										200 Nh (375) nihonium	
190 Nh (365) nihonium		163 Nh (339) nihonium										201 Nh (376) nihonium	
191 Nh (366) nihonium		164 Nh (340) nihonium										202 Nh (377) nihonium	
192 Nh (367) nihonium		165 Nh (341) nihonium										203 Nh (378) nihonium	
193 Nh (368) nihonium		166 Nh (342) nihonium										204 Nh (379) nihonium	
194 Nh (369) nihonium		167 Nh (343) nihonium										205 Nh (380) nihonium	
195 Nh (370) nihonium		168 Nh (344) nihonium										206 Nh (381) nihonium	
196 Nh (371) nihonium		169 Nh (345) nihonium										207 Nh (382) nihonium	
197 Nh (372) nihonium		170 Nh (346) nihonium										208 Nh (383) nihonium	
198 Nh (373) nihonium		171 Nh (347) nihonium										209 Nh (384) nihonium	
199 Nh (374) nihonium		172 Nh (348) nihonium										210 Nh (385) nihonium	
200 Nh (375) nihonium		173 Nh (349) nihonium										211 Nh (386) nihonium	
201 Nh (376) nihonium		174 Nh (350) nihonium										212 Nh (387) nihonium	
202 Nh (377) nihonium		175 Nh (351) nihonium										213 Nh (388) nihonium	
203 Nh (378) nihonium		176 Nh (352) nihonium										214 Nh (389) nihonium	
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206 Nh (381) nihonium		179 Nh (355) nihonium										217 Nh (392) nihonium	
207 Nh (382) nihonium		180 Nh (356) nihonium										218 Nh (393) nihonium	
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235 Nh (410) nihonium		208 Nh (384) nihonium										246 Nh (421) nihonium	
236 Nh (411) nihonium		209 Nh (385) nihonium										247 Nh (422) nihonium	
237 Nh (412) nihonium		210 Nh (386) nihonium										248 Nh (423) nihonium	
238 Nh (413) nihonium		211 Nh (387) nihonium										249 Nh (424) nihonium	
239 Nh (414) nihonium		212 Nh (388) nihonium										250 Nh (425) nihonium	
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242 Nh (417) nihonium		215 Nh (391) nihonium										253 Nh (428) nihonium	
243 Nh (418) nihonium		216 Nh (392) nihonium										254 Nh (429) nihonium	
244 Nh (419) nihonium		217 Nh (393) nihonium										255 Nh (430) nihonium	
245 Nh (420) nihonium		218 Nh (394) nihonium										256 Nh (431) nihonium	
246 Nh (421) nihonium		219 Nh											

57	La	138.9	lanthanum
58	Ce	140.1	cerium
59	Pr	140.9	praseodymium
60	Nd	144.2	neodymium
61	Pm	(145)	promethium
62	Sm	150.4	samarium
63	Eu	152.0	euroium
64	Gd	157.3	gadolinium
65	Tb	158.9	terbium
66	Dy	162.5	dysprosium
67	Ho	164.9	holmium
68	Er	167.3	erbium
69	Tm	168.9	thulium
70	Yb	173.1	ytterbium
71	Lu	175.0	lutetium

89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
(227)	232.0	231.0	238.0	(237)	(244)	(243)	(247)	(247)	(251)	(252)	(257)	(258)	(259)	(262)
actinium	thorium	protactinium	uranium	neptunium	plutonium	americium	curium	berkelium	californium	einsteinium	fermium	mendeleevium	nobelium	lawrencium

The value in brackets indicates the mass number of the longest-lived isotope

Positive ions(cations)					
+ 1		+ 2		+3	
Lithium	Li^+	Calcium	Ca^{2+}	Aluminium	Al^{3+}
Sodium	Na^+	Barium	Ba^{2+}	Chromium (III)	Cr^{3+}
Potassium	K^+	Magnesium	Mg^{2+}	Iron (III)	Fe^{3+}
Hydrogen	H^+	Zinc	Zn^{2+}		
Silver	Ag^+	Iron (II)	Fe^{2+}		
Copper(I)	Cu^+	Copper (II)	Cu^{2+}		
Ammonium	NH_4^+	Mercury (II)	Hg^{2+}		
		Tin(II)	Sn^{2+}		
		Lead(II)	Pb^{2+}		
Negative ions(anions)					
- 1		- 2		- 3	
Fluoride	F^-	Oxide	O^{2-}	Nitride	N^{3-}
Chloride	Cl^-	Sulfide	S^{2-}	Phosphate	PO_4^{3-}
Bromide	Br^-	Sulfite	SO_3^{2-}		
Iodide	I^-	Sulfate	SO_4^{2-}		
Permanganate	MnO_4^-	Carbonate	CO_3^{2-}		
Hydroxide	OH^-	Hydrogen phosphate	HPO_4^{2-}		
Hydrogen sulfide	HS^-	Dichromate	$\text{Cr}_2\text{O}_7^{2-}$		
Hydrogen sulfate	HSO_4^-				
Hydrogen sulfite	HSO_3^-				
Hydrogen carbonate	HCO_3^-				
Dihydrogen phosphate	H_2PO_4^-				
Nitrate	NO_3^-				
Nitrite	NO_2^-				

Learning Objective:

Draw and describe the model of an atom using a labelled diagram. Include the terms: protons, neutrons, electrons, nucleus, energy levels (shells) and cloud of electrons.

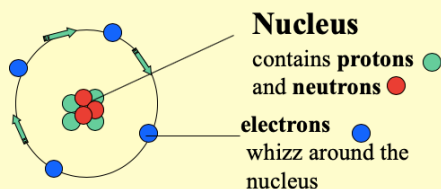
Recall the properties of charge and mass to the atomic structure.

Draw an energy level diagram and the electron configuration for the first 20 elements.

In Chemistry you will be expected to represent reactions using word and formula equations, including state symbols.

Atomic Structure

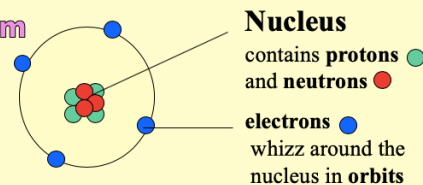
The number of **protons** determines which element the atom is.



Protons have a **positive** charge (+), electrons have a **negative** charge (-), **neutrons** have no charge (**neutral**).

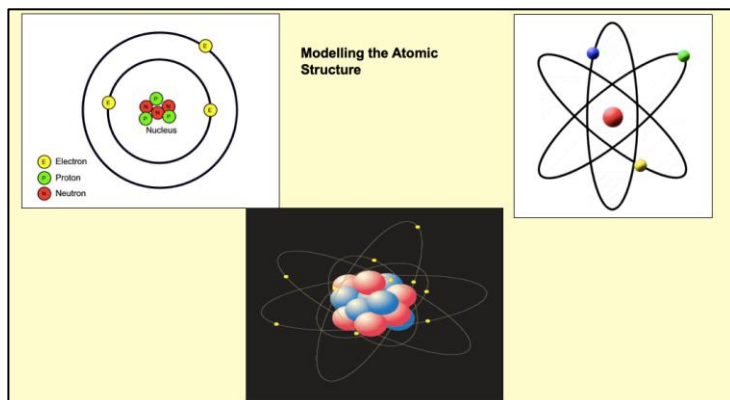
Atoms are neutral (not charged) so the number of protons in an atom is the same as the number of electrons.

Inside an atom



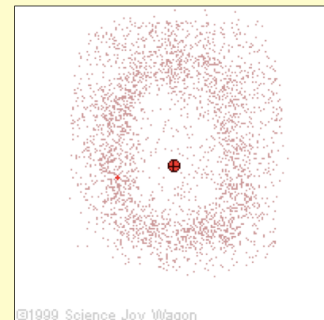
	Charge	Mass
proton	+	1
neutron	0	1
electron	-	Very small

It is therefore the number of protons + neutrons in an atom that determine its mass.



What is the Electron Cloud Model?

This model of the atom pictures the electrons moving around the nucleus in a region called an **electron cloud**. The electron cloud is a **cloud of varying density** surrounding the nucleus. The varying density **shows where an electron is more or less likely to be**.



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Group 1 - Lithium

Li

⁷ — **Mass number** (number of protons and neutrons in the atom)

₃ — **Atomic number** (number of protons in the atom)

Number of protons = 3 (atomic number)

Number of electrons = 3 (same as number of protons)

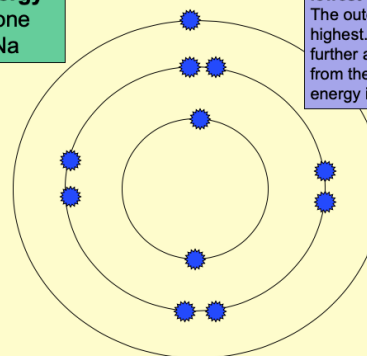
Number of neutrons = 4 (mass number – atomic number)

Electron configuration:
2,8,1

Sodium

Valence energy level - has one electron in Na

The electrons fill each **energy level** first before starting the next. **The inner orbit is the lowest energy level.** The outer orbit has the highest. In other words, the further an electron is away from the nucleus the more energy it has.



A chemical reaction is a chemical change where molecules collide with each other and the atoms are rearranged to form new substances.

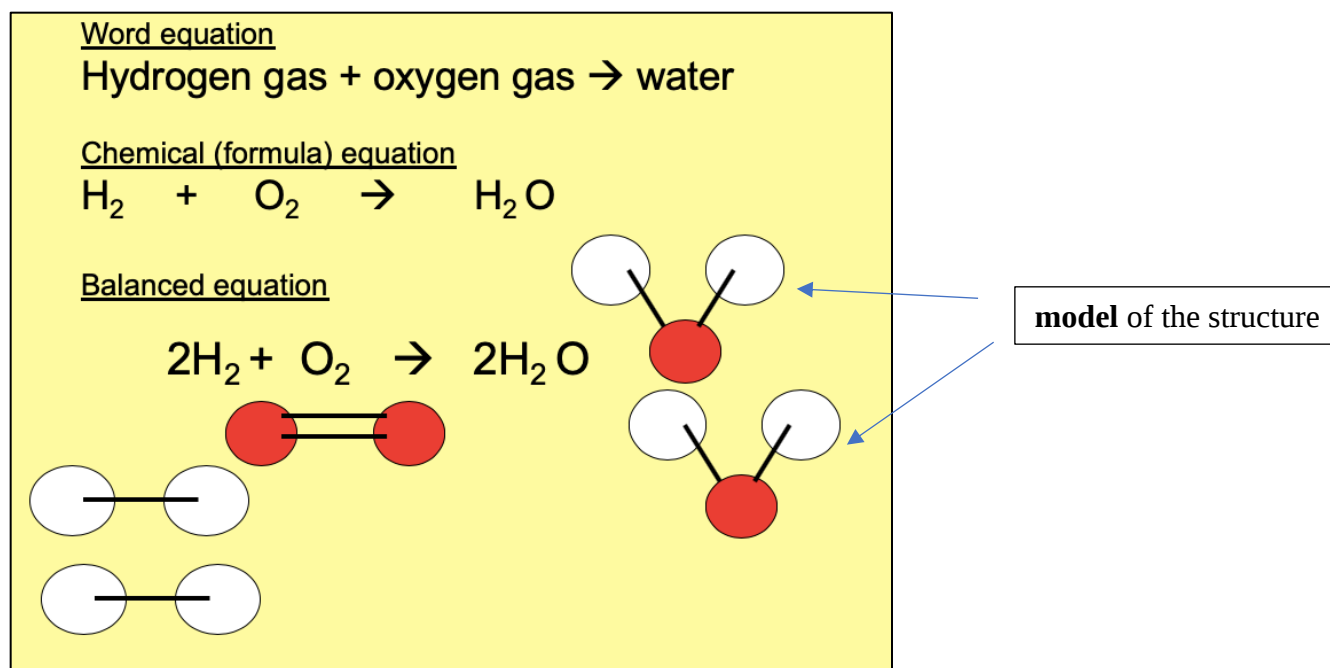
A chemical equation is used to describe the chemical change that occurs in a chemical reaction.

Chemical word equation

reactants $\rightarrow$ products
(what you start with) (what is made)

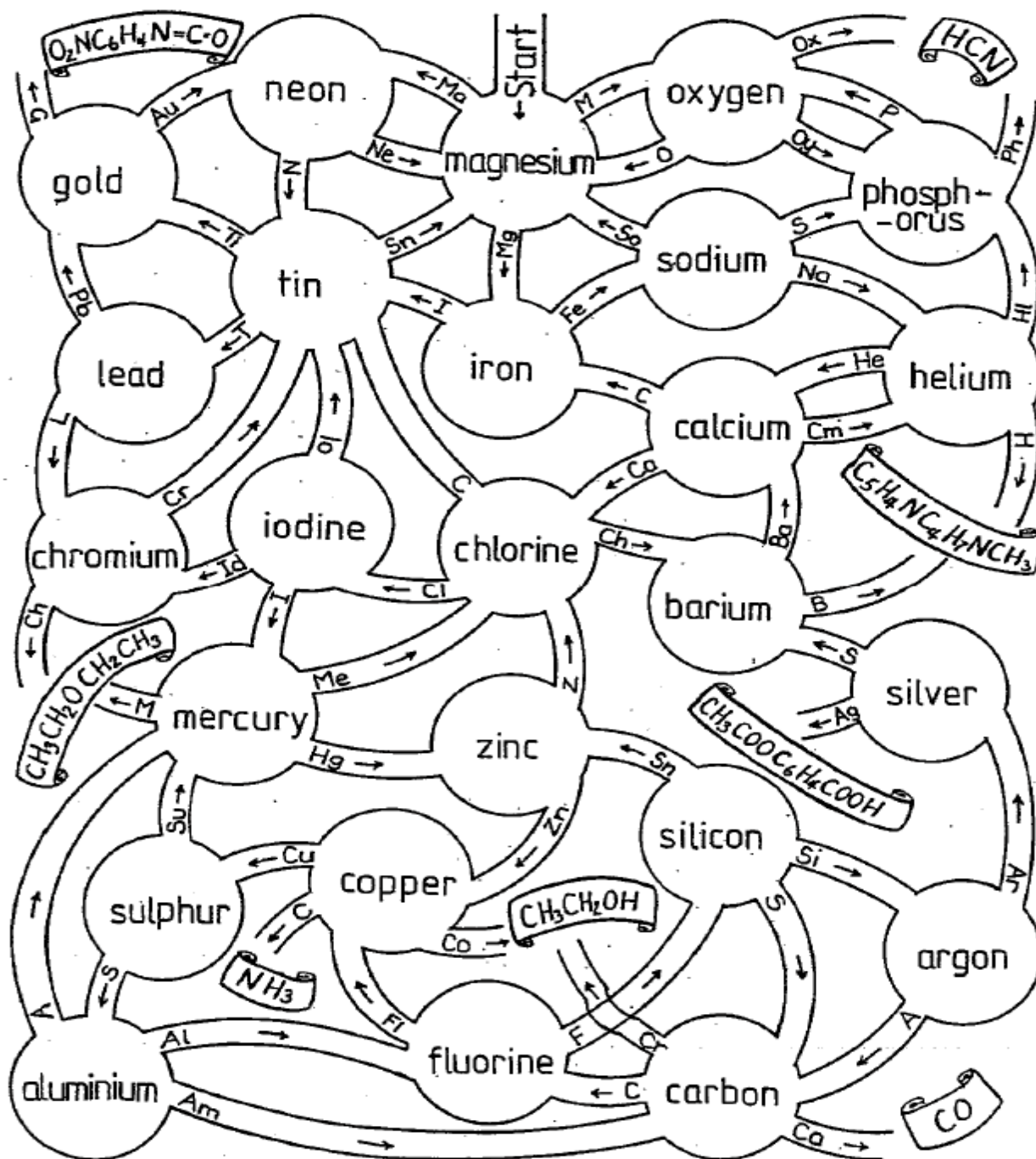
Identify the reactant/s and the product/s in the following equations:

1. magnesium + oxygen $\rightarrow$ magnesium oxide
2. sodium + chlorine $\rightarrow$ sodium chloride
3. aluminium chloride + sodium carbonate $\rightarrow$ sodium chloride + aluminium carbonate



Symbol Search

Professor Ruby thinks that she has discovered a miracle cure for headaches but can't remember in which file she has put the formula. Follow the maze by choosing the correct path at each junction which has the correct symbol for the element. The correct path will lead you to the formula.



Atomic Structure

1. The 3 particles of the atom are:

a. _____
b. _____
c. _____

Their respective charges are:

a. _____
b. _____
c. _____

Using the following words:

percentage same protons

*Neutral atomic mass electrons
negative charge positive charge*

Neutrons Mass number nucleus

2. The number of protons in one atom of an element determines the atom's
3. The atomic number tells you the number of _____ in one atom of an element. It also tells you the number of _____ in a neutral atom of that element. The atomic number gives the "identity" of an element as well as its location on the Periodic Table. No two different elements will have the _____ atomic number.
4. The _____ of an element is the average mass of an element's naturally occurring atom, or isotopes, taking into account the _____ of each isotope.
5. The _____ of an element is the total number of protons and neutrons in the _____ of the atom.
6. The mass number is used to calculate the number of _____ in one atom of an element. In order to calculate the number of neutrons you must subtract the _____ from the _____.

7. Give the symbol and number of protons in one atom of:

Lithium	_____	Bromine	_____
Iron	_____	Copper	_____
Oxygen	_____	Mercury	_____
Argon	_____	Helium	_____

8. Give the symbol and number of electrons in a neutral atom of:

Uranium	_____	Chlorine	_____
Boron	_____	Iodine	_____
Lead	_____	Sodium	_____

9. Give the symbol and number of neutrons in one atom of:

(To get "mass number", you must round the "atomic mass" to the nearest whole number)

Show your calculations.

Barium	_____	Aluminium	_____
Carbon	_____	Hydrogen	_____
Fluorine	_____	Magnesium	_____
Mercury	_____		

10. Name the element which has the following numbers of particles:

- 26 electrons, 29 neutrons, 26 protons _____
- 53 protons, 74 neutrons _____
- 2 electrons (neutral atoms) _____
- 20 protons _____
- 82 electrons, 125 neutrons, 82 protons _____
- 4 neutrons _____

11. If you know only the following information can you always determine what the element is? (Yes/No).

- number of protons _____
- number of neutrons _____
- number of electrons _____

X = element symbol

A = mass number [# of protons (p) + # neutrons (n)]

Z = atomic number [# of protons]

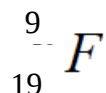
N = # of neutrons

A - Z = N

A typical isotopic symbol takes this form:



ex. The isotopic symbol for Fluorine would be



Fill in the missing items in the table below.

Name	Symbol	Z	A	#p	#e	#n
	Na					
		17				
Potassium						
	P					
Iron						
				53		
Silver						
		36				
	W					

Atoms are all about the mass

1 In the following table, summarise information about the structure of the atom.

	LOCATION	CHARGE	MASS
Protons			
Neutrons			
Electrons			

- 6 Complete the following table using your knowledge of atomic number. Remember: You cannot have a decimal in the neutron column, so you must round off the mass number first.

ATOMIC NUMBER	MASS NUMBER	NUMBER OF ELECTRONS	NUMBER OF PROTONS	NUMBER OF NEUTRONS	CHEMICAL SYMBOL	NAME
3						
	35.45					
21						
						tin
	52.00					

Electron Arrangement

1. Number each group of the Periodic Table that is shown on the diagram.
2. Number each period of the Periodic Table that is shown on the diagram.
3. In each box draw the electron configuration.
4. Undemeath write down any patterns that you notice.
5. Explain why this model is not a true representation of the electron arrangement in an atom.

H								He
Li	Be	B	C	N	O	F	Ne	
Na	Mg	Al	Si	P	S	Cl	Ar	
K	Ca							

2. Number each period of the Periodic Table that is shown on the diagram.

3. In each box draw the electron configuration.

4. Underneath write down any patterns that you notice.

5. Explain why this model is not a true representation of the electron arrangement in an atom.

Revision Questions

Here are some names of some elements and their symbols.

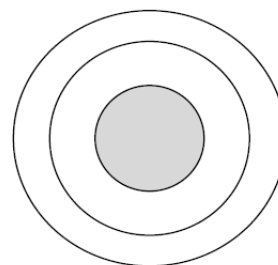
Hydrogen	He	Ca	O	Calcium
Chlorine	Na	Helium	N	Oxygen
Argon	C	Carbon	F	Fluorine
Potassium	Mg	Nitrogen	Fe	Sodium
Iron	H	Ar	K	Magnesium
	Cl			

- Match the names to their correct symbols.
You can either draw lines between them or colour code them.
- After the name of each element write in whether it is a solid, a liquid or a gas. Do not write the full words just **(s)** for solid, **(l)** for liquid or **(g)** for gas.
- Name all the elements above that are **metals**.

- Name all the **non-metals** above that are **solids**.

Part A: Atomic Structure

- Draw five protons in the nucleus of the atom. Label them with their charge.
- Draw six neutrons in the nucleus of the atom.
- Draw two electrons in the first energy level and label them with their charge.
- Draw three electrons in the second energy level and label them with their charge.
- What element is represented by the diagram? _____



Part B: Atomic Calculations

- Label the information provided in the periodic table.

8	←	_____
O	←	_____
Oxygen	←	_____
15.999	←	_____

- What does the atomic number represent?

_____ or _____

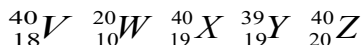
- What does the atomic mass represent?

_____ + _____

Use your knowledge of atomic calculations to complete the chart.

Element	Atomic Number	Atomic Mass	Protons	Neutrons	Electrons
Li	3	7			
P	15	31			
Cl		35	17		
Ni	28			31	
K		39			19
Ag	47			61	
H		1	1		
Si				14	14
W			74	110	
Ne				10	10

The atoms below are written using the letters V to Z instead of their correct chemical symbols. The mass number is also on the top, atomic number on the bottom.

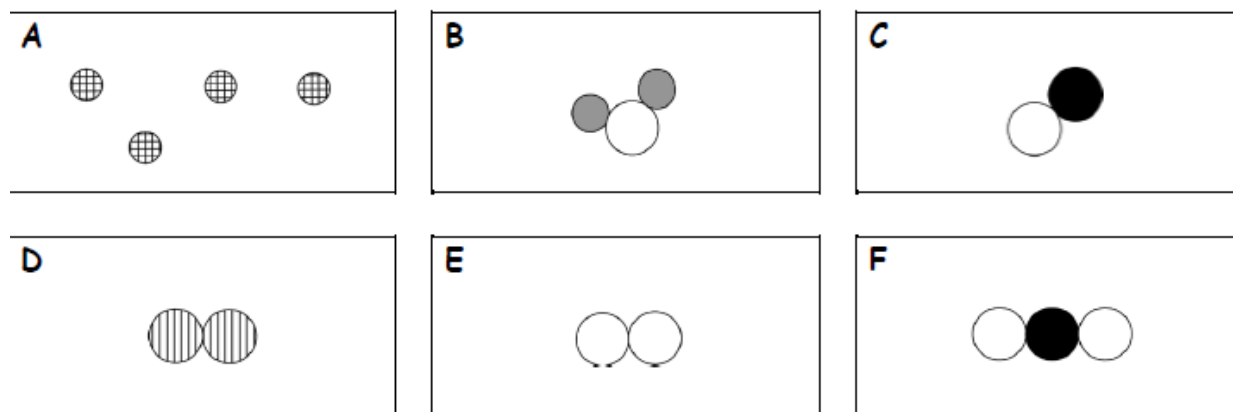


Use the letters to **identify** the following:

- Which two atoms have the same number of neutrons? _____
- Which atom has the smallest mass number? _____
- Which two atoms belong to the same element? _____
- Which atom has the electron configuration 2, 8? _____

Multiple Choice

- One of the particles inside the atom is very much lighter than the others. It is the:
 - electron
 - neutron
 - nucleus
 - proton.
- The fluorine atom has 9 protons, 9 electrons and 10 neutrons. Its atomic number is:
 - 9
 - 10
 - 18
 - 19
 - 28
- The nucleus of the atom contains:
 - only electrons
 - only protons
 - electrons and neutrons
 - Neutrons and protons.
- The columns of the periodic table are called:
 - series
 - families
 - groups
 - isotopes.
- An orbital is a region of space where there is a high probability of finding
 - a proton
 - a neutron
 - a positron
 - an electron
- An atom of carbon-12 and an atom of carbon-14 differ in
 - atomic number
 - mass number
 - nuclear charge
 - number of electrons
- which is the electronic configuration of Mg?
 - 2:7: 3
 - 2:10
 - 2:8: 2
 - 2:8: 12
13. Which pair must represent atoms of the same element?
 - ${}_{6}^{14}\text{X}$ and ${}_{7}^{14}\text{X}$
 - ${}_{6}^{12}\text{X}$ and ${}_{6}^{13}\text{X}$
 - ${}_{1}^{2}\text{X}$ and ${}_{2}^{4}\text{X}$
 - ${}_{6}^{13}\text{X}$ and ${}_{7}^{14}\text{X}$



- a) Which boxes show particle diagrams of elements? _____
- b) Which boxes show particle diagrams of compounds? _____
- c) Helium does not react with anything at all. Atoms of helium do not join up with any other atoms. Which diagram best represents helium? _____
- d) Oxygen gas is in the form of particles which have the formula O_2 . Which two diagrams show this arrangement? _____
- e) Carbon dioxide has the formula CO_2 . Which diagram could represent carbon dioxide? _____
- f) Hydrogen atoms are smaller than any others. Which diagram could represent water? _____ Explain your answer: _____
- g) Which of the following could be the name of the substance in box C? _____
- | | | |
|-------------------|-----------------|-----------------|
| nitrogen | carbon monoxide | sulphur dioxide |
| hydrogen chloride | krypton | |

Explain your reasoning: _____

Elements and Compounds

1. Fill in the blanks by choosing the correct word or phrase from the brackets.

- a) Carbon, oxygen, iron and gold are all _____ (metals/elements/compounds).
- b) Things which contain only one type of atom are called _____ (elements/compounds).
- c) Compounds always contain _____ (one/more than one) type of atom.
- d) The chemical name for common salt is sodium chloride. There are _____ (one/two/three) parts to the chemical name. This means it is _____ (an element/a compound).
- e) Water has the formula H_2O . There are two elements in water. Hydrogen is one and _____ (carbon/oxygen/nitrogen) is the other. Water is _____ (an element/a compound). The full chemical name for water is hydrogen _____ (chloride/oxide/sulphate). The formula tells us that water contains _____ (more/less) hydrogen than oxygen.

Directions: Write the names and symbols of the seventeen nonmetals in the chart below. Then find each nonmetal name in the puzzle that follows and circle it. Answers can go up, down, or diagonally.

ELEMENT	SYMBOL	ELEMENT	SYMBOL	ELEMENT	SYMBOL

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

Naming Compounds

Use the table of ion charges to help.

Name the following ionic compounds:

- | | |
|---|---|
| a <u>NaI</u> _____ | b CaCl_2 _____ |
| c KOH _____ | d $\text{Ca}(\text{OH})_2$ _____ |
| e Al_2O_3 _____ | f NH_4Cl _____ |
| g $\text{Mg}(\text{NO}_3)_2$ _____ | h CaCO_3 _____ |
| i Na_2SO_4 _____ | j CuSO_4 _____ |
| k $(\text{NH}_4)_2\text{CO}_3$ _____ | l Fe_2O_3 _____ |

Name the following ionic compounds. For example, NaCl is sodium chloride and NaClO_3 is sodium chlorate.

- a** NaBr and NaBrO_3
- b** KI and KIO_3
- c** FeS and FeSO_4

Ions

Complete the table below:

NAME AND SYMBOL OF ATOM	ELECTRON CONFIGURATION OF ATOM	HOW MANY ELECTRONS WILL IT GAIN/ LOSE	ELECTRON CONFIGURATION OF ION	CHARGE OF ION	NAME AND FORMULA OF ION	ANION OR CATION?
lithium (Li)						
sodium (Na)	2, 8, 1	lose 1	2, 8	+ 1	sodium	cation
beryllium (Be)						
magnesium (Mg)						
boron (B)						
aluminium (Al)						
nitrogen (N)						
phosphorous (P)						
oxygen (O)	2, 6	gain 2	2, 8	- 2	oxide	anion
sulfur (S)						
fluorine (F)						
chlorine (Cl)	2, 8, 7	gain 1	2, 8, 8	- 1	chloride	anion

Writing Formulas for Ionic Compounds

Use page 4 of this booklet for charges.

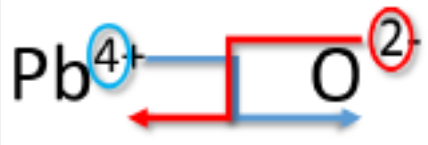
Examples

What to do	Write the formula for aluminium nitride	Write the formula for lithium oxide
1. Write the symbol and charge of the cation (metal) first and the anion (nonmetal) second.	$\text{Al}^{3+} \text{N}^{3-}$	$\text{Li}^+ \text{O}^{2-}$
2. Use a multiplier to make the total charge of the positive and negative ions equal to each other.	total charge of cations = total charge of anions $1(3+) = 1(3-)$ $+3 = -3$	total charge of cations = total charge of anions $2(1+) = 1(2-)$ $+2 = -2$
3. Use the multipliers as subscript for each ion.	Al_1N_1	Li_2O_1
4. Write the final formula. Leave out all charges and all subscripts that are 1.	AlN	Li_2O

The Crisscross Method

Write the formula for lead (IV) oxide.

Solution

Crisscross Method	Write the formula for lead (IV) oxide
1. Write the symbol and charge of the cation (metal) first and the anion (nonmetal) second.	$\text{Pb}^{4+} \text{O}^{2-}$
2. Swap the number of the positive charge to become the subscript of the nonmetal and the number of the negative charge to become the subscript of the metal.	
3. Reduce to the lowest ratio.	Pb_2O_4
4. Write the final formula. Leave out all subscripts that are 1.	PbO_2

Complete the formulas for the following:

potassium chloride	
calcium chloride	
iron(III) chloride	
potassium iodide	
calcium iodide	
iron(III) iodide	
potassium oxide	
calcium oxide	
iron(III) oxide	

sodium nitrate	
magnesium nitrate	
copper(II) nitrate	
aluminium nitrate	
ammonium nitrate	
sodium sulphate	
magnesium sulphate	

copper(II) sulphate	
aluminium sulphate	
sodium hydroxide	
magnesium hydroxide	
copper(II) hydroxide	
aluminium hydroxide	
ammonium hydroxide	

Spot the errors

Tick any formula that is correct. If it's not correct then write the correct formula in the box below.

Name of compound	Iron (III) chloride	Potassium oxide	Magnesium hydroxide
Ionic formula	FeCl_2	K_2O	$\text{Mg}(\text{OH})_2$

Name of compound	Calcium carbonate	Iron (III) carbonate	Lead chloride
Ionic formula	CaCO_3	$\text{Fe}_2(\text{CO}_3)_3$	PbCl_2

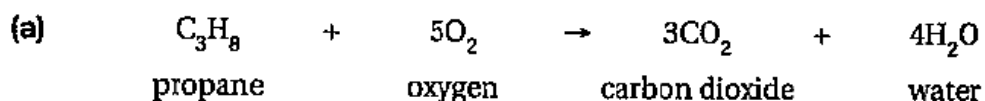
Name of compound	Copper (II) chloride	Potassium nitrate	Hydrogen sulfate
Ionic formula	CuCl	KNO_3	HSO_4

Name of compound	Copper sulfate	Lead oxide	Hydrogen nitrate
Ionic formula	CuSO_4	PbO	HNO_3

Balancing Equations

Atoms are not created or destroyed in a chemical reaction. Therefore, there must be the same number of atoms in the reactants as in the products of a chemical reaction. This law of science is known as the conservation of mass and is shown by the use of balanced chemical equations.

- 1 State the number of each type of atom in the reactants and products of the following equations. Identify if the equations are balanced.



Reactants:

Carbon (C) = _____

Hydrogen (H) = _____

Oxygen (O) = _____

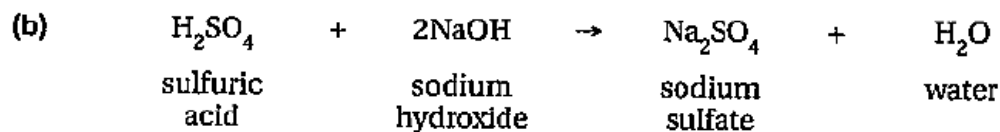
Products:

Carbon (C) = _____

Hydrogen (H) = _____

Oxygen (O) = _____

Balanced/Unbalanced: _____



Reactants:

Hydrogen (H) = _____

Sulfur (S) = _____

Oxygen (O) = _____

Sodium (Na) = _____

Products:

Hydrogen (H) = _____

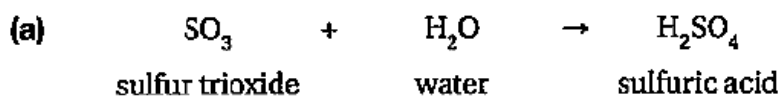
Sulfur (S) = _____

Oxygen (O) = _____

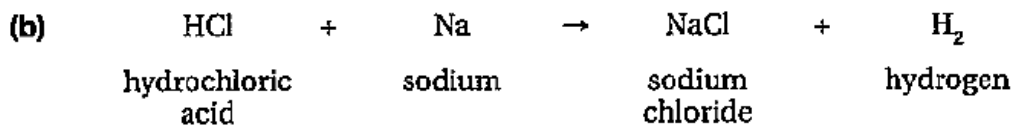
Sodium (Na) = _____

Balanced/Unbalanced: _____

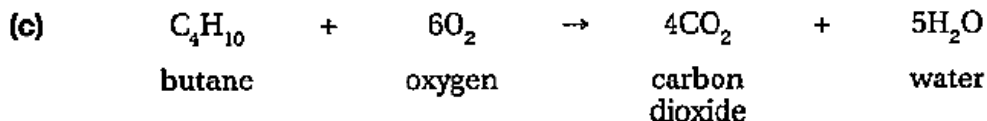
2 State whether the following chemical equations are balanced or unbalanced.



Balanced/Unbalanced: _____

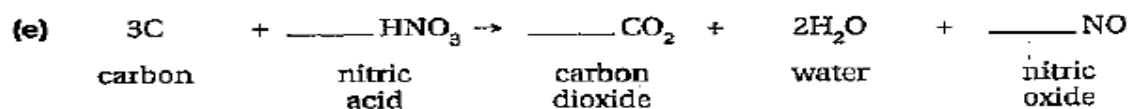
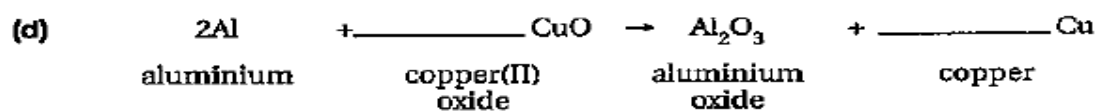
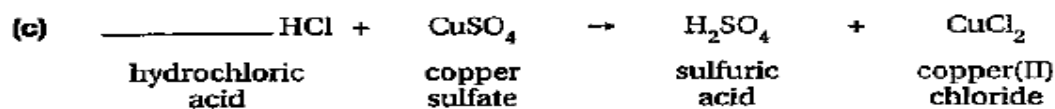
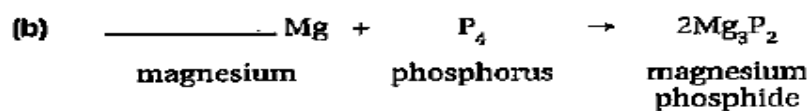
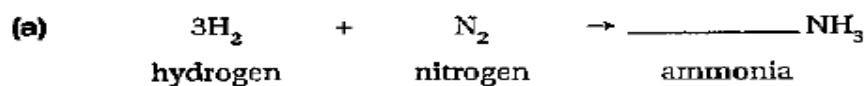


Balanced/Unbalanced: _____



Balanced/Unbalanced: _____

3 Balance the following chemical equations by filling in the blanks.



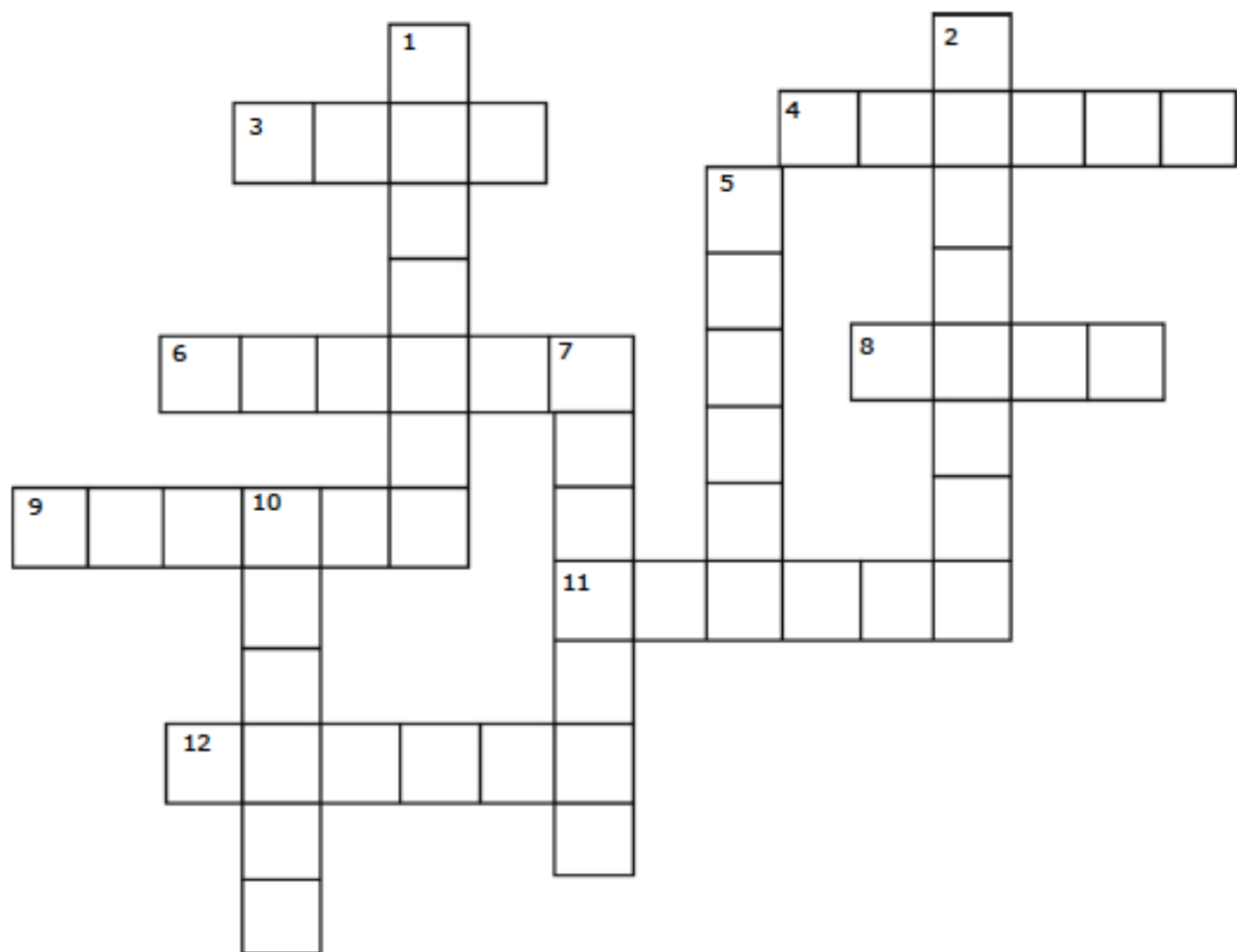
Balance the following Chemical Equations:

1. AgI + Na₂S $\longrightarrow$ Ag₂S + NaI
2. Na₃PO₄ + HCl $\longrightarrow$ NaCl + H₃PO₄
3. Ba₃N₂ + H₂O $\longrightarrow$ Ba(OH)₂ + NH₃
4. TiCl₄ + H₂O $\longrightarrow$ TiO₂ + HCl
5. CaCl₂ + Na₃PO₄ $\longrightarrow$ Ca₃(PO₄)₂ + NaCl
6. NaBr + Cl₂ $\longrightarrow$ NaCl + Br₂
7. Mg(OH)₂ + HCl $\longrightarrow$ MgCl₂ + H₂O
8. FeS + O₂ $\longrightarrow$ Fe₂O₃ + SO₂
9. PCl₅ + H₂O $\longrightarrow$ H₃PO₄ + HCl
10. C₂H₆O + O₂ $\longrightarrow$ CO₂ + H₂O

Challenge!: Balance the following

- 1) ____ Na_3PO_4 + ____ KOH $\rightarrow$ ____ NaOH + ____ K_3PO_4
- 2) ____ MgF_2 + ____ Li_2CO_3 $\rightarrow$ ____ MgCO_3 + ____ LiF
- 3) ____ P_4 + ____ O_2 $\rightarrow$ ____ P_2O_3
- 4) ____ RbNO_3 + ____ BeF_2 $\rightarrow$ ____ $\text{Be}(\text{NO}_3)_2$ + ____ RbF
- 5) ____ AgNO_3 + ____ Cu $\rightarrow$ ____ $\text{Cu}(\text{NO}_3)_2$ + ____ Ag
- 6) ____ CF_4 + ____ Br_2 $\rightarrow$ ____ CBr_4 + ____ F_2
- 7) ____ HCN + ____ CuSO_4 $\rightarrow$ ____ H_2SO_4 + ____ $\text{Cu}(\text{CN})_2$
- 8) ____ GaF_3 + ____ Cs $\rightarrow$ ____ CsF + ____ Ga
- 9) ____ BaS + ____ PtF_2 $\rightarrow$ ____ BaF_2 + ____ PtS
- 10) ____ N_2 + ____ H_2 $\rightarrow$ ____ NH_3
- 11) ____ NaF + ____ Br_2 $\rightarrow$ ____ NaBr + ____ F_2
- 12) ____ $\text{Pb}(\text{OH})_2$ + ____ HCl $\rightarrow$ ____ H_2O + ____ PbCl_2
- 13) ____ AlBr_3 + ____ K_2SO_4 $\rightarrow$ ____ KBr + ____ $\text{Al}_2(\text{SO}_4)_3$
- 14) ____ CH_4 + ____ O_2 $\rightarrow$ ____ CO_2 + ____ H_2O
- 15) ____ Na_3PO_4 + ____ CaCl_2 $\rightarrow$ ____ NaCl + ____ $\text{Ca}_3(\text{PO}_4)_2$
- 16) ____ K + ____ Cl_2 $\rightarrow$ ____ KCl
- 17) ____ Al + ____ HCl $\rightarrow$ ____ H_2 + ____ AlCl_3
- 18) ____ N_2 + ____ F_2 $\rightarrow$ ____ NF_3
- 19) ____ SO_2 + ____ Li_2Se $\rightarrow$ ____ SSe_2 + ____ Li_2O
- 20) ____ NH_3 + ____ H_2SO_4 $\rightarrow$ ____ $(\text{NH}_4)_2\text{SO}_4$

Crossword 1



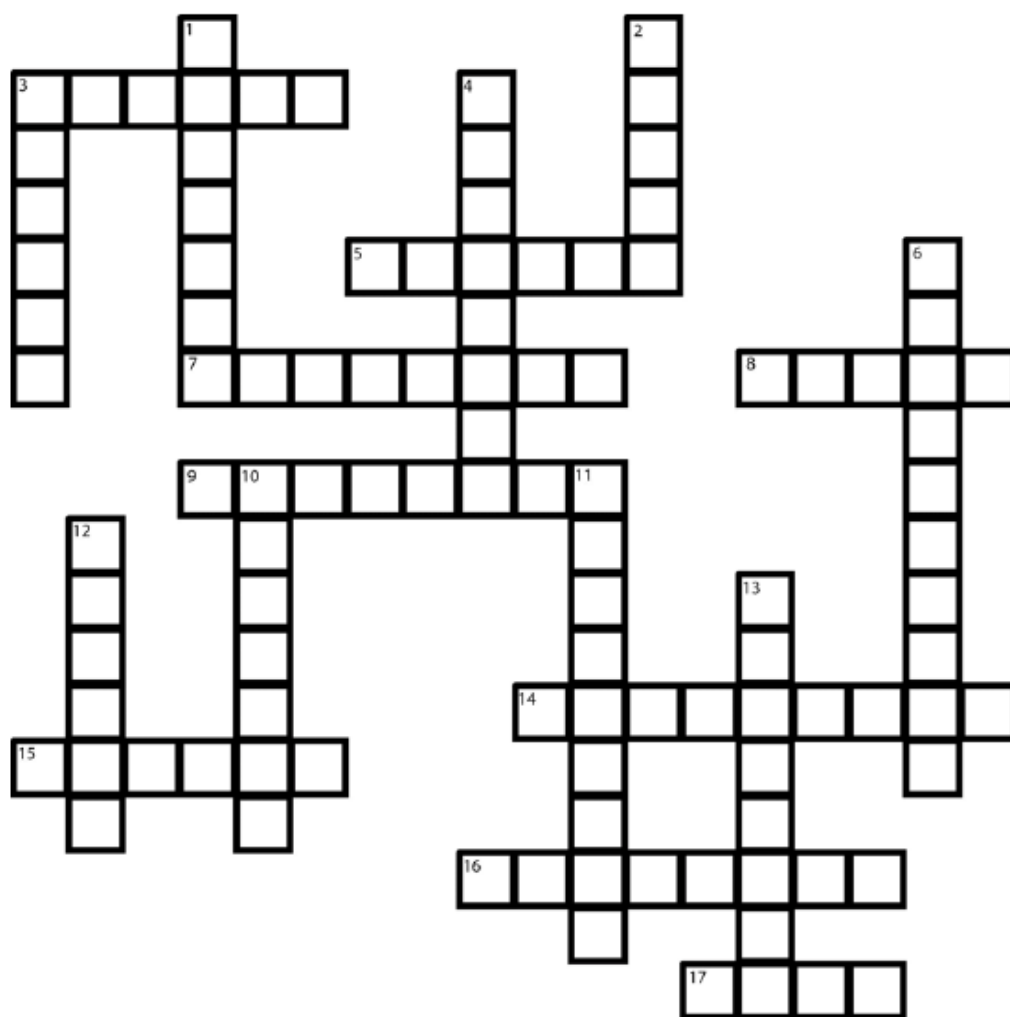
DOWN

- 1. Ca
- 2. H
- 5. S
- 7. Hg
- 10. I

ACROSS

- 3. Pb
- 4. O
- 6. He
- 8. Au
- 9. Na
- 11. C
- 12. Ag

Crossword 2



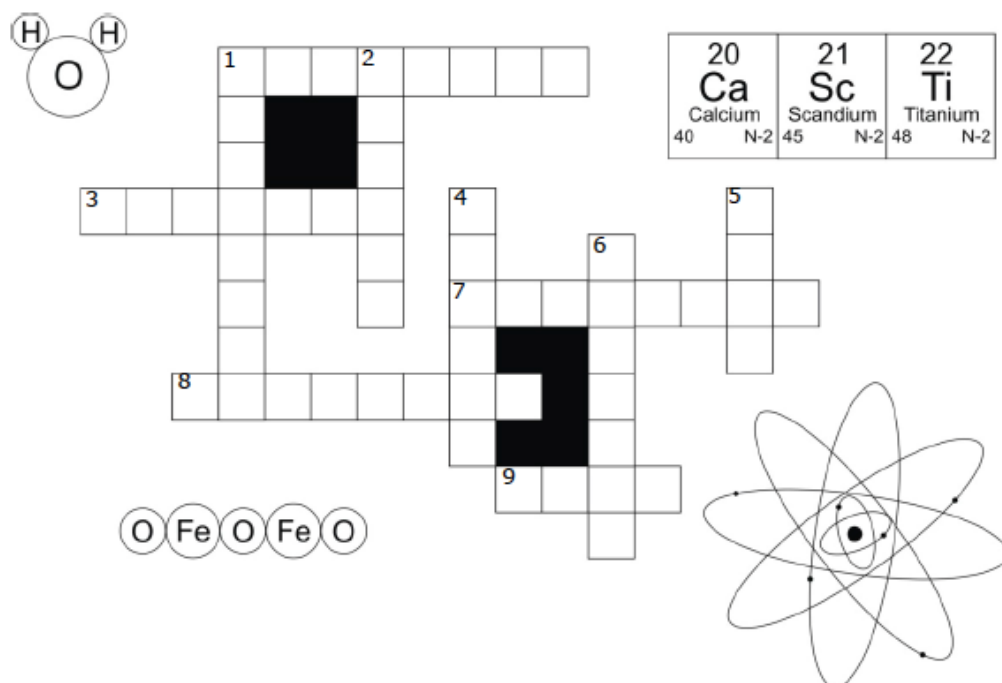
Across

- 3 Na
- 5 C
- 7 N
- 8 B
- 9 Al
- 14 Be
- 15 He
- 16 F
- 17 Ne

Down

- 1 Si
- 2 Ar
- 3 S
- 4 H
- 6 P
- 10 Li
- 11 Mg
- 12 O
- 13 Cl

Crossword 3



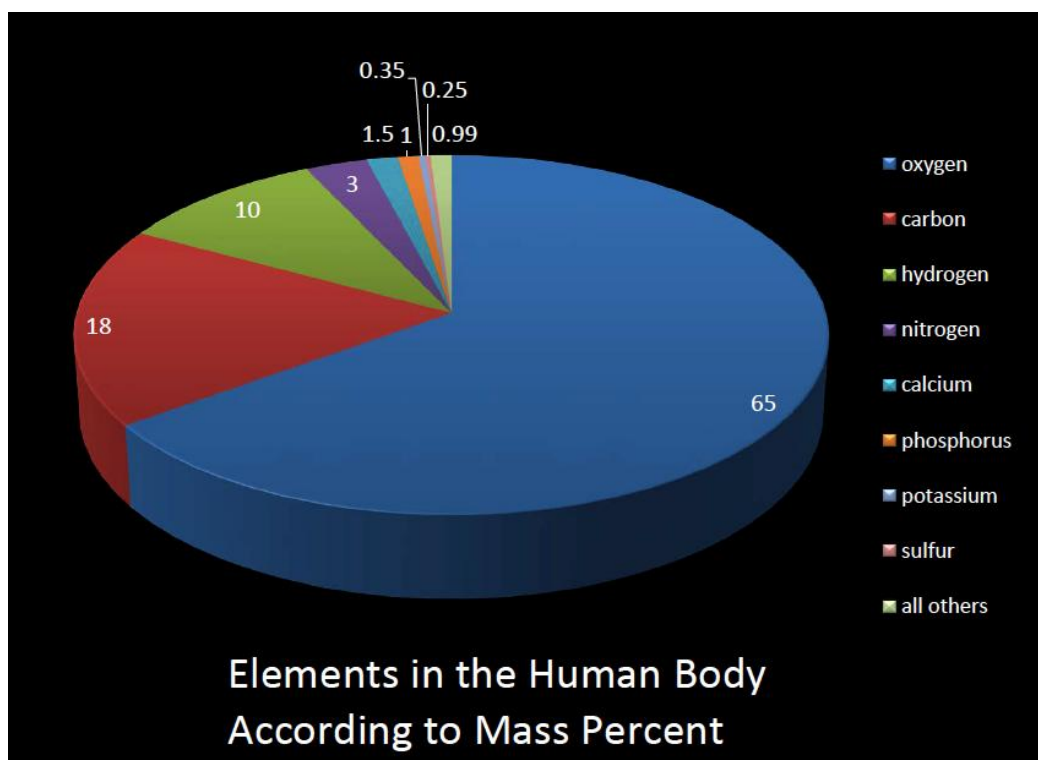
Across

1. A substance containing two or more elements bonded together.
3. A substance made entirely a single type of atom.
7. The smallest unit of matter that displays the physical and chemical properties of a compound.
8. A negatively charged particle either found free or orbiting a nucleus.
9. The smallest unit of an element.

Down

1. Any substance used in or obtained by a chemical process.
2. A positively charged particle either found free or in a nucleus.
4. Term for the one or two letter representation of an element.
5. Au is the symbol for _____.
6. A neutrally charged particle either found free or in a nucleus.

Research



Find out the names of 10 compounds that are found in the human body. Write the name of the compound, along with their formula.