Year 8 Science

Chemistry Revision – Atoms

Oxford textbook chapter 4.6 (page 72 – 73)

1. According to the particle model:

- (•) all matter is made of atoms that have no mass and are too small to be seen with the naked eye.
- some matter is made of atoms that have mass and are small, but can be seen with the naked eye.
- all matter is made of atoms that have mass and are small, but can be seen with the naked eye.
- all matter is made of atoms that have mass but are too small to be seen with the naked eye.

2. According to John Dalton's model of atoms, which of the following statements is *incorrect*?

- Atoms cannot be created or destroyed, and are indivisible.
- All matter consists of tiny particles called atoms.
- All atoms of the same element are identical, but different from atoms of other elements.
- (•) Atoms lose their identities when they combine to form compounds.

3. Write a definition for an atom.

The smallest particle of a chemical element that can exist. They are too small to be seen with the naked eye.

4. Name the particles, and the charge of each particle, you would find in an atom.

a) Protons – Positive Charge

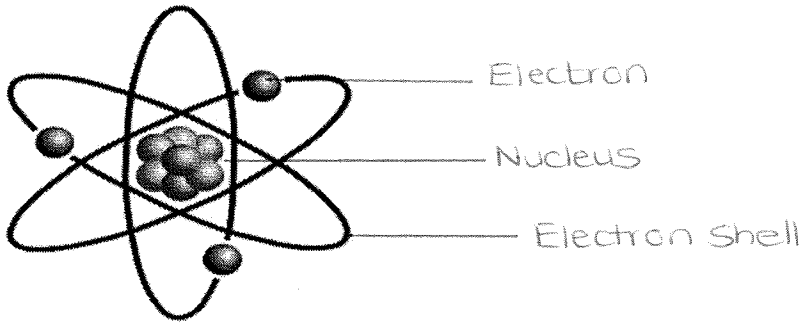
b) Neutrons – No charge

c) Electrons – Negative Charge

5. **What other differences are there between these three particles?**

Protons and neutrons have a similar mass, while electrons have a significantly small mass.

6. **Using the following words as a guide (*nucleus, electron and electron shell)* label the following diagram of an atom.**



7. **Give a definition of atomic number.**

Represents the number of protons in an atom.

8. **Give a definition of atomic mass.**

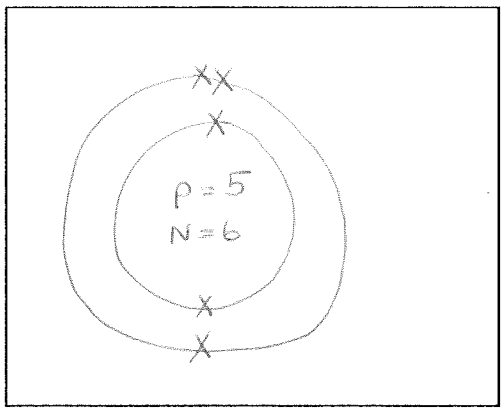
Represents the number of protons and neutrons in an atom.

9. **Complete the following table (note – round your answers to whole numbers)**

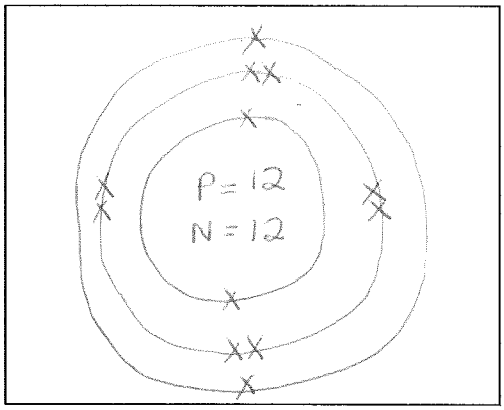
Element	Number of Protons	Number of Electrons	Number of Neutrons	Electron Configuration
Potassium	19	19	20	2,8,8,1
Sulphur	16	16	16	2,8,6
Aluminium	13	13	14	2,8,3
Fluorine	9	9	10	2,7
Argon	18	18	22	2,8,8
Silicon	14	14	14	2,8,4
Oxygen	8	8	8	2,6
Phosphorous	15	15	16	2,8,5
Beryllium	4	4	5	2,2

10. Draw a diagram, showing the number of protons, neutrons and electrons for the following atoms.

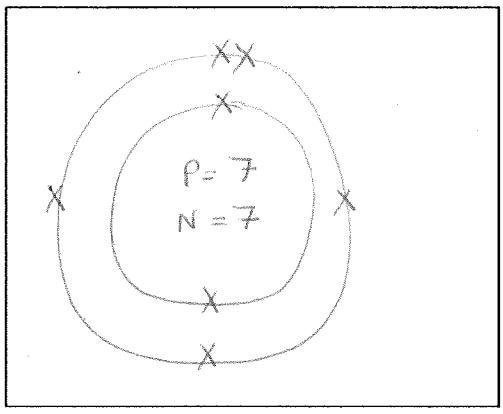
Boron



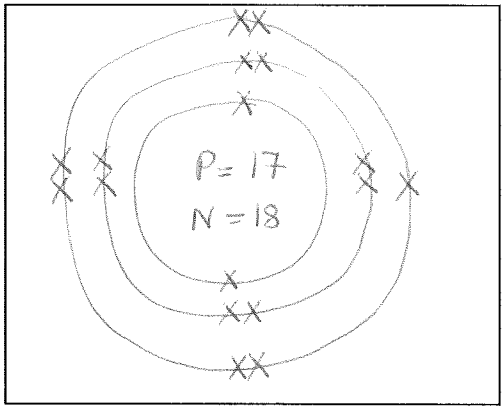
Magnesium



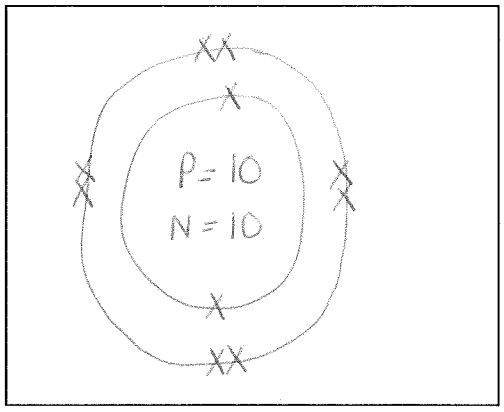
Nitrogen



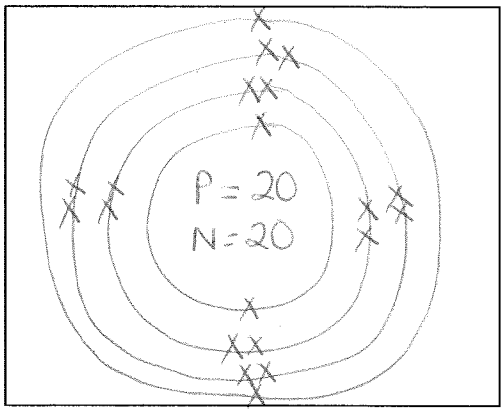
Chlorine



Neon



Calcium



The Periodic Table

Answer the following questions using your notes, textbook, and the periodic table.

1. Define a family (group).

Each column of the periodic table is called a group. All of the elements in the same group have the same number of electrons in their outer shell (valence shell).

2. What is a period?

Each row of the periodic table is called a period. All of the elements in the same row have the same number of electron shells

3. What is the symbol for the following elements?

a. **Mg** b. **K**

c. **Ar** d. **F**

4. What are the names of the following elements?

a. **Carbon** b. **Chlorine**

c. **Beryllium** d. **Lithium**

5. What period are the following elements in?

a. **1** b. **4**

c. **5** d. **5**

6. What group are the following elements in?

a. **16** b. **2**

c. **17** d. **8**

7. What is the atomic symbol for Aluminium? **Al**

8. P is the symbol for what element? **Phosphorus**

9. The element that has the atomic number 17 is? **Chlorine**

10. List the symbols for two transition metals. **Any two symbols from groups 3-12.**

11. Use the words below to fill in the blanks.

corrosion	potassium	malleable	solids	nitrogen
metal-like	better	dull	stretched	brittle
ductile	good	shiny	gases	silicon
poor	worse	hydrogen	boron	calcium

METALS:

- Metals are **good** conductors of heat and electricity.
- Metals are **shiny** in appearance.
- Metals are ductile (can be **stretched** into thin wires).
- Metals are **malleable** (can be pounded into thin sheets).
- When metal reacts with water, it causes **corrosion**.
- Some examples of metals include **potasssium** & **calcium**

NON-METALS:

- Non-metals are **poor** conductors of heat and electricity.
- Non-metals are not **ductile** or malleable.
- Solid non-metals are **brittle** and break easily.
- They are **dull** in appearance.
- Many non-metals exist as **gases**
- Some examples of non-metals include **nitrogen** & **hydrogen**

METALLOIDS.

- Metalloids (**metal-like**) have properties of both metals and non-metals.
- They are **solids** that can be shiny or dull.
- They conduct heat and electricity **better** than non-metals but **worse** than metals.
- They are ductile and malleable.
- Examples of some metalloids include **boron** & **silicon**

Use your periodic table to complete the table below

	Element	Symbol	Group Number	Period Number	# of valence electrons	# of electron shells	Metal, non-metal or metalloid
1	Oxygen	O	16	2	6	2	NM
2	Helium	**He**	**18**	**1**	**8**	**1**	**NM**
3	Carbon	**C**	**14**	**2**	**4**	**2**	**NM**
4	Aluminum	**Al**	**13**	**3**	**3**	**3**	**M**
5	**Calcium**	Ca	**2**	**4**	**2**	**4**	**M**
6	**Sodium**	Na	**1**	**3**	**1**	**3**	**M**
7	**Potassium**	K	**1**	**4**	**1**	**4**	**M**
8	**Nitrogen**	**N**	15	2	**5**	**2**	**NM**
9	**Silicon**	**Si**	14	3	**4**	**3**	**Metalloid**
10	**Neon**	**Ne**	**18**	**2**	8	2	**NM**
11	**Hydrogen**	**H**	**1**	**1**	1	1	**NM**

12. Cu, Ag, and Au are all in what group #? **11**

13. Name two noble gases. **Any two elements in group 18**

14. What is the last element in period 4? **Krypton (Kr)**

15. Write the symbols or the names for each of these elements:

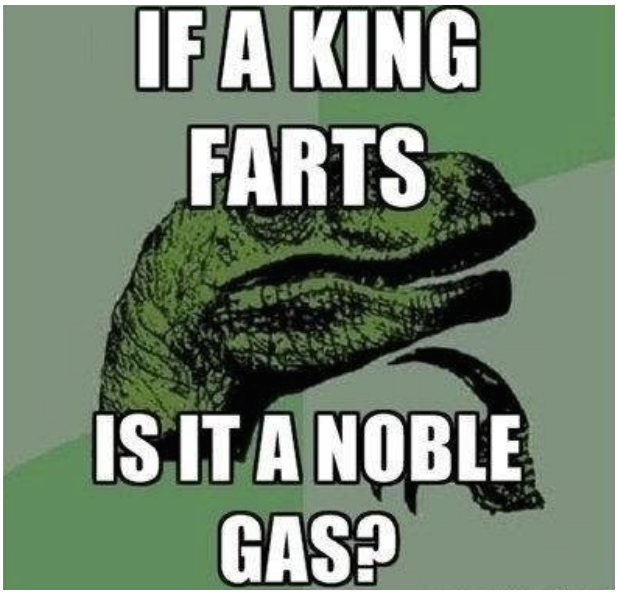
Chlorine **Cl**	Zn **Zinc**
Na **Sodium**	Helium **He**
Potassium **K**	Ne **Neon**

16. What information do the groups on the periodic table give us ?

All of the elements in the same group have the same number of electron their outer shell (valence shell).

17. What can be determined using the periods on the periodic table ?

All of the elements in the same row have the same number of electron shells



Compounds, mixtures, molecules and elements

1. Which of the following correctly defines a compound?

a) Two atoms of one element that are chemically bonded
b) Two or more atoms of different elements that are chemically bonded
c) A mixture of two or more substances
d) Two elements that are not chemically bonded

2. Provide four examples of common compounds:
Water H_20

Carbon dioxide CO_2

Methane CH_4

Hydrochloric acid HCl

3. All compounds are molecules, but not all molecules are compounds. True or false. Explain you reasoning:

True. A molecule is two or more atoms that are bonded together. The atoms can be the same, or different. If the atoms are different we call it a compound. If they are the same it is not a compound, but it can still be called a molecule. For example O_2 is a molecule, but not a compound.

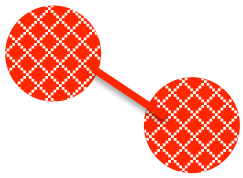
4. Which of the following lists contain compounds only?

a) H_20, N_2, Ar, CH_4
b) HCl, $NaBO_3$, O_2, CaO
c) $NaHCO_3$, CH_4, H_2O
d) O_2, N_2, H_2

5. Describe the difference between an atom and a molecule?
An atom is single. It is not chemically bonded to anything else. A molecule is made up of two or more atoms chemically bonded together. A molecule is bigger than an atom because it is two or more atoms bonded together.

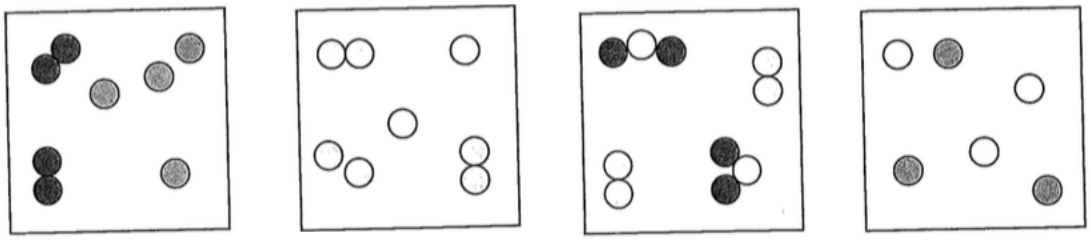
6. In the box below draw an atom and a molecule. Ensure that you label your drawing.

an atom



a molecule
2 or more atoms bonded together

7. Examine the four boxes below. Each circle represents an atom and the different shading pattern represents different types of atoms.



A B C D

Which of the boxes contains the following*:

a) Individual atoms of elements only _____**D**_____

b) Chemical compounds only _____**None**_____

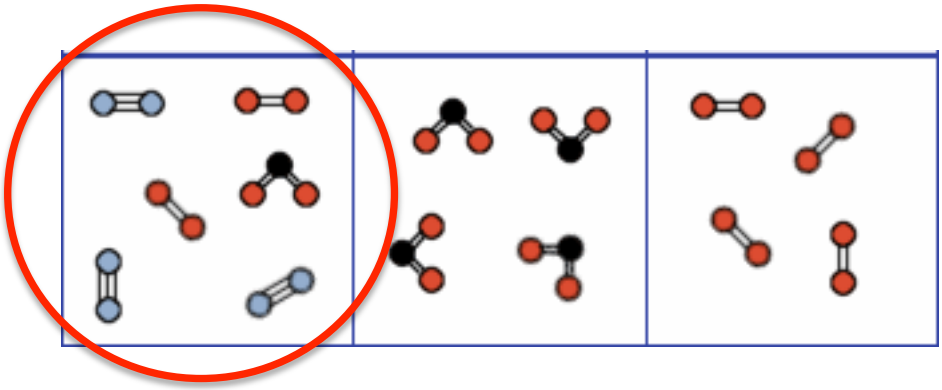
c) Some molecules that are not compounds _____**A, B and C** ____

d) A mixture of compounds and atoms _____**None**_____

e) A mixture of molecules and atoms _____**A and B**_____

*Note: it is possible that none of the boxes contain the requested item – if this is the case then write 'none'. It is also possible that more than one box may contain the requested item.

8. Which of the following boxes represent a mixture?
(circle the correct box or boxes)



Justify your choice (what is it about the box you selected that makes you think it is a mixture?).

The fist box represents a mixture because it contains different molecules. it is not a pure substance, but rather made up of different things. An example of a mixture is air. Air is mostly made up of oxygen, argon, nitrogen and carbon dioxide. The other two boxes only contain one type of molecule, therefore they are not mixtures.

9. Write the following statements into the correct circle below:

Can only be separated chemically
Can be separated physically
Combine chemically forming molecules
Not chemically combined
Combine in set proportions
Can combine in any proportion

Compounds

Can only be separated chemically
Combine chemically forming molecules
Combine is set proportions

Mixtures

Can be separated physically
Not chemically combined
Can combine in any proportion

How are chemical reactions represented?

Chemical changes are changes in which new substances with different properties and chemical compositions are formed and are therefore usually not easily reversed.

A chemical reaction looks like the word equation below;

Reactants → Products

What is a Reactant?
A substance/s that are present at the beginning of a chemical reaction

What is a Product?
A substance/s present at the end of a chemical reaction. (They are new substances).

What is a Chemical reaction?
When bonds of reactants are broken and new bonds are formed to produce new substances.

Why do we use **word** equations?
To show a chemical reaction using the names (eg. hydrogen) of the reactants and products.

Why do we use **formula** equations?
To show a chemical reaction using the chemical (eg. H) formulas of the substances (reactants and products).

Look at the following chemical formula below and answer the following questions;

Number of atoms in that element.

Number of Molecules — $2H_2 + O_2 \rightarrow 2H_2O$

i. What does the large number in front of the $2H_2$ tell you?
There are 2 hydrogen MOLECULES. (tells you how many molecules there are.)

ii. What does the number after the $2H_2$ tell you?
How many atoms are present of that element. (eg. There are 2xH)

iii. How many Hydrogen and Oxygen MOLECULES are there before and after the chemical reaction?

Before = 2xH, 1xO
After = 0 after → because its a new molecule

$2H_2 = 4$ $O_2 = 2$

iv. How many Hydrogen and Oxygen ATOMS are there before and after the chemical reaction?

Before = 2×2 = 4 H atoms, 2 O atoms

After = 2×2 = 4 H atoms, 2 O atoms.

What do the following symbols mean?

- (aq) - Aqueous – the substance has been dissolved in water
- (s) - Solid – the substance is in solid state
- (g) - gas – the substance is in gas state.
- (l) - liquid – the substance is in liquid state.

Answer the following questions about chemical reactions.

1. When a sodium chloride (NaCl) solution is mixed with a silver nitrate ($AgNO_3$) solution, white silver chloride (AgCl) is produced, leaving behind a sodium nitrate ($NaNO_3$) solution.

Identify the reactants.

Sodium chloride = NaCl

Silver Nitrate = $AgNO_3$

Identify the products.

Silver chloride = AgCl

Sodium nitrate = $NaNO_3$

Construct a word equation (use names).

Sodium chloride + Silver nitrate → Silver chloride + Sodium nitrate.

Construct a formula equation (use symbols).

$NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

2. Hydrochloric acid (HCl) reacts with silver nitrate ($AgNO_3$) and converts it into silver chloride (AgCl) and Nitric Acid (HNO_3)

Identify the reactants.

Hydrochloric acid = HCl

Silver nitrate = $AgNO_3$

Identify the products.

Silver chloride = AgCl

Nitric Acid = HNO_3

Construct a word equation (use names).

Hydrochloric Acid + Silver nitrate → Silver chloride + Nitric Acid.

Construct a formula equation (use symbols).

$HCl + AgNO_3 \longrightarrow AgCl + HNO_3$

3. Zinc reacts with oxygen and converts it into zinc oxide.

Identify the reactants.

Zinc = Zn
Oxygen = O

Identify the products.

Zinc oxide = ZnO

Construct a word equation (use names).

Zinc + Oxygen → Zinc oxide

Construct a formula equation (use symbols).

$Zn + O \longrightarrow ZnO$

4. CH_4 reacts with O_2 and converts it into H_2O and CO_2.

Identify the reactants.

CH_4 = methane
O_2 = oxygen

Identify the products.

H_2O = water or Hydrogen dioxide
CO_2 = carbon dioxide

Construct a word equation (use names).

Methane + oxygen → water + carbon dioxide

5. Ammonium Nitrate reacts to yield Nitrous Oxide and Water

Identify the reactants.

Ammonium nitrate = NH_4NO_3

Identify the products.

Nitrous Oxide = N_2O
Water = $2H_2O$

Construct a formula equation (use symbols).

$NH_4NO_3 \longrightarrow N_2O + 2H_2O$

Construct a word equation (use names).

Ammonium nitrate → Nitrous oxide + water

6. Magnesium + Oxygen → Magnesium Oxide

Identify the reactants.

Magnesium = Mg
Oxygen = O

Identify the products.

Magnesium oxide = MgO

Construct a formula equation (use symbols).

$Mg + O \longrightarrow MgO$

7. In plants carbon dioxide reacts with water and sunlight (chlorophyll) to yield Glucose ($C_6H_{12}O_6$) and oxygen.

Identify the reactants.

Carbon dioxide = CO_2
Water = H_2O

Identify the products.

Glucose = $C_6H_{12}O_6$
Oxygen = O_2

Construct a word equation (use names).

Carbon dioxide + water $\xrightarrow[\text{CHLOROPHYLL}]{\text{SUNLIGHT}}$ Glucose + oxygen

Construct a formula equation (use symbols).

$CO_2 + H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + O_2$

8. C_2H_4 reacts with H_2 to yield C_2H_6.

Identify the reactants.

C_2H_4 = Ethylene
H_2 = Hydrogen

Identify the products.

C_2H_6 = Ethane

Construct a formula equation (use symbols).

$C_2H_4 + H_2 \longrightarrow C_2H_6$

Construct a word equation (use names).

Ethylene + Hydrogen ⟶ Ethane

9. Cu + S → CuS

Identify the reactants.

Copper = Cu
Sulphur = S

Identify the products.

Copper sulfide = CuS

Construct a word equation (use names).

Copper + Sulphur ⟶ Copper Sulfide

10. $Fe_{(s)} + CuSO_{4(aq)} \rightarrow FeSO_{4(aq)} + Cu_{(s)}$

Identify the reactants.

Fe = Iron
$CuSO_4$ = Copper sulfate

Identify the products.

Iron Sulfate = $FeSO_4$
Copper = Cu

Construct a word equation (use names).

Iron + Copper sulfate ⟶ Iron sulfate + Copper

11. Nitrogen + Oxygen → Nitric Oxide

Identify the reactants.

Nitrogen = N
Oxygen = O

Identify the products.

Nitric Oxide = NO

Construct a formula equation (use symbols).

$N + O \longrightarrow NO$

12. $3AgNO_{3\,(aq)} + Al_{(s)} \rightarrow Al(NO_3)_{3(aq)} + 3Ag_{\,(s)}$

Identify the reactants. Silver Nitrate = $3AgNO_3$
Aluminium = Al

Identify the products. Aluminium Nitrate = $Al(NO_3)$
Silver = $3Ag$

Construct a word equation (use names).

Silver nitrate + Aluminium ⟶ Aluminium nitrate + Silver