Answers Elements & Compounds

Year 8 Science Chapter 6

p126

1 An **element** is a pure substance that cannot be separated into a simpler substance.

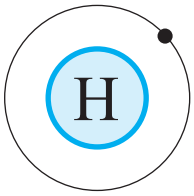
2 An element contains just one type of atom.

3 **Hydrogen** is an element made up of hydrogen atoms only.

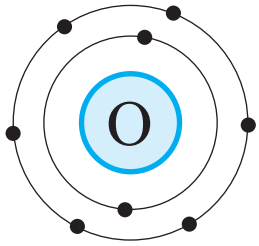
4 **Oxygen** is an element made up of oxygen atoms only.

5 **Water** is **not** an element because it is made up of hydrogen **and** oxygen atoms.

6 Sketch a diagram of a hydrogen atom.



7 Sketch a diagram of an oxygen atom.



p127

1 Electrolysis of water happens when an electric current is passed through water. Oxygen forms at the positive electrode, anode, and hydrogen forms at the negative electrode, cathode.

2 Electrolysis of water show that water is not an element because water is broken up into two different substances.

3 The volume of hydrogen is twice the volume of oxygen during the electrolysis of water because water consists of two lots of hydrogen and one lot of oxygen - H_2O.

p128

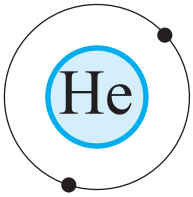
1 An **atom** has a nucleus, made of protons and neutrons, with electrons in orbit around the nucleus.

2 Most of the mass of an atom concentrated in the nucleus.

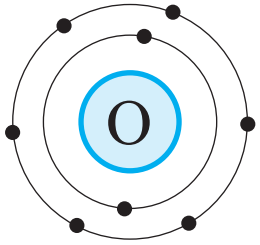
3 An atom has an atomic number of 12. The atom has 12 protons in its nucleus.

4 An atom has 16 protons in its nucleus. Its atomic number is 16.

5 An atom has an atomic number of 2. Draw a sketch of the atom.



6 An atom has an atomic number of 8. Draw a sketch of the atom.



p129

1 A prospector is flame testing a small sample of powdered rock and it gives a green colour. Green suggests copper.

2 A paperclip is put in a flame and there is a change in colour. The paperclip isn't clean.

3 A new paperclip is used for each flame test to ensure that the paperclip is clean.

4 A student is doing flame tests and reports a yellow colour in most of the tests. This possibly suggests that some sodium has contaminated the paperclip and the same paperclip is being used in each of the tests.

p131

1 The three particles in the atom are: protons, electrons, neutrons.

2 These three particles are sometimes called 'subatomic' particles because they are parts of an atom.

3 The subatomic particle with a negative charge is the electron.

4 The subatomic particle with a positive charge is the proton.

5 The subatomic particle with a neutral charge is the neutron.

6 The proton and the neutron particles make up the nucleus.

7 A boron atom has 5 protons and 6 neutrons.

a) Boron has 5 electrons **b)** The atomic number of boron is 5

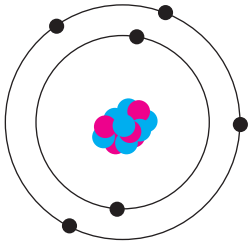
8 The carbon atom has 6 neutrons and 6 protons. Draw a diagram of the carbon atom.

9 White sugar, sucrose, has the formula: $C_{12}H_{22}O_{11}$

a) Carbon (C) has 12 atoms in a molecule of sucrose.

b) Hydrogen (H) has 22 atoms in a molecule of sucrose.

c) The total number of atoms in a molecule of sucrose is 45.



p132

1 The symbol for carbon is C.

2 The symbol for nitrogen is N.

3 Which element is represented by each of the following symbols:

a) Al - aluminium **b)** B - boron **c)** Na - sodium **d)** S - sulphur **e)** Cl - chlorine

4 Write the names of the first 18 elements in increasing order of atomic number.

5 Write the symbols of the first 18 elements in increasing order of atomic number.

Element	Symbol	Atomic number
Hydrogen	H	1
Helium	He	2
Lithium	Li	3
Beryllium	Be	4
Boron	B	5
Carbon	C	6
Nitrogen	N	7
Oxygen	O	8
Fluorine	F	9
Neon	Ne	10
Sodium	Na	11
Magnesium	Mg	12
Aluminium	Al	13
Silicon	Si	14
Phosphorus	P	15
Sulphur	S	16
Chlorine	Cl	17
Argon	Ar	18

p133

1 5 of the first 18 elements are metals.

2 14 of the second 18 elements are metals.

3 The larger the atomic number, the more likely an element will be a metal.

4 Elements in the same group, column, tend to have similar properties. If Argon, Ar, is used to help reduce unwanted reactions in welding, name another element that probably could be used for the same purpose. Other elements in the the same column are Helium (He), Neon (Ne), Krypton (Kr), Xenon (Xe), Radon (Rn), and Ununoctium (Uuo).

p135

1 2 atoms of hydrogen and 1 atom of oxygen are in a molecule of water (H_2O).

2 1 atom of carbon in a molecule of carbon dioxide (CO_2).

3 4 atoms of hydrogen in a molecule of acetic acid (CH_3COOH).

4 3 atoms of oxygen in a molecule of sodium bicarbonate ($NaHCO_3$).

5 4 atoms of hydrogen in a molecule of cream of tartar ($KHC_4H_4O_6$).

6 HCl - hydrogen, chlorine H_2SO_4 - hydrogen, sulphur, oxygen HF - hydrogen, fluorine NH_3 - nitrogen, hydrogen C_2H_6O - carbon, hydrogen, oxygen $KMnO_4$ - potassium, manganese, oxygen KOH - potassium, hydrogen, oxygen NaOH - sodium, oxygen, hydrogen

p136

1 The mercury atom would need to lose 1 proton and 4 neutrons to change to a gold atom.

2 The lead atom would need to lose 3 protons and 7 neutrons to change to a gold atom.

3 Potassium-40 has a total of 40 particles in its nucleus (19 protons and 21 neutrons).

4 Potassium-40 has one more neutron in the nucleus than potassium-39.

p137

1 Atoms of carbon in Adenine = 5, Thymine = C, Guanine = C, and Cytosine = 4.

2 The same sequence of 5 chemical bases are indicated in each of the following.

a) TTG**AGAGA**CT **GCGTA** CCT

b) ATCGATGTCT *GAGAC* ACT

c) GTCTT **A*GAGAC* GCGTA** GA

p140

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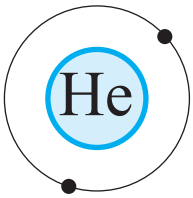

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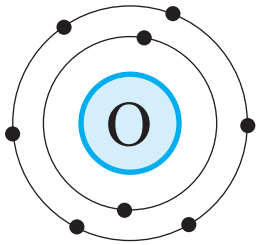

p140

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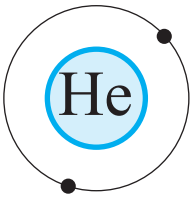

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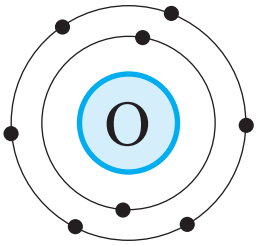

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p141

1 Lymphocyte, neutrophil, basophil. eosinophil, monocyte

2 Democritus lived for about 70 years.

3 Solution 1
1 lump of sugar in cup 1, 1 lump of sugar in cup 2, 12 lumps of sugar in cup 3 - 12 lumps of sugar is a very odd number of lumps of sugar to put in a cup of tea.

Solution 2
5 lumps of sugar in cup 1, 5 lumps of sugar in cup 2, 4 lumps of sugar in cup 3.
then put cup 3 in cup 2.

p142

1 The three particles in the atom are: protons, electrons, neutrons.

2 **Electrons** have a negative charge, are much smaller than the proton, and move at speeds close to the speed of light. **Protons** have a positive charge and are 2000 times the size of electrons. **Neutrons** have no charge and are the same size as a proton.

3 The proton and the neutron particles make up the nucleus.

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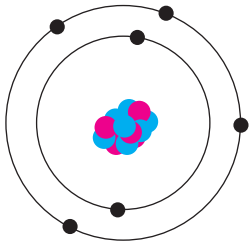

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p143

1 b) **2** d) **3** c) **4** c)

p144

1 A compound is a molecule made of atoms from different elements.

a) Water considered a compound and not an element because water is composed of two elements hydrogen and oxygen.

b) When water is being boiled, it isn't being broken down into its elements but is changing state from liquid water to water vapour ie., from a liquid to a gas.

2 The burning of wood can be summarised by the following equation:
$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

a) The chemical formula of cellulose is $C_6H_{12}O_6$
b) The elements in cellulose are carbon, hydrogen, and oxygen.
c) The two compounds produced by the burning of wood are carbon dioxide and water.

3 **a)** The elements in the air that we breathe are nitrogen, oxygen, argon.

b) The compounds in the air that we breathe are carbon dioxide.

c) Given 100 L of air, approximately 75% of the air is nitrogen. Approximately 20% of the air is oxygen.

4 'Some elements are made up of atoms, some elements are made up of molecules.'

An element contains just one type of atom.
A molecule is a group of two or more atoms bound together.

For example, carbon (C) is an element made up of only carbon atoms. Hydrogen gas (H_2) is an element and a molecule made up of hydrogen atoms.

5 The element einsteinium has the symbol Es, an atomic number of 99 (the number of protons) and an atomic mass number of 254 (the total number of protons and neutrons).

6 The diagram above shows an acetic acid (vinegar) molecule.

a) A molecule is a group of two or more atoms bound together.
b) There are 8 atoms in the molecule.
b) The formula for acetic acid is $C_2H_4O_2$.

7 The atomic mass number is the total number of protons and neutrons.

8 An element has an atomic number of 44 and an atomic mass number of 101.

a) The number of protons = 44
b) The number of electrons = 44
c) The number of neutrons = 57

9 When an atom changes the number of neutrons, but keeps the same number of protons, it is called an isotope.

carbon-12 has 6 neutrons
carbon-13 has 7 neutrons
carbon-14 has 8 neutrons