

C2.2.1a Metals and Non-Metals

Chemical Properties

Previous knowledge

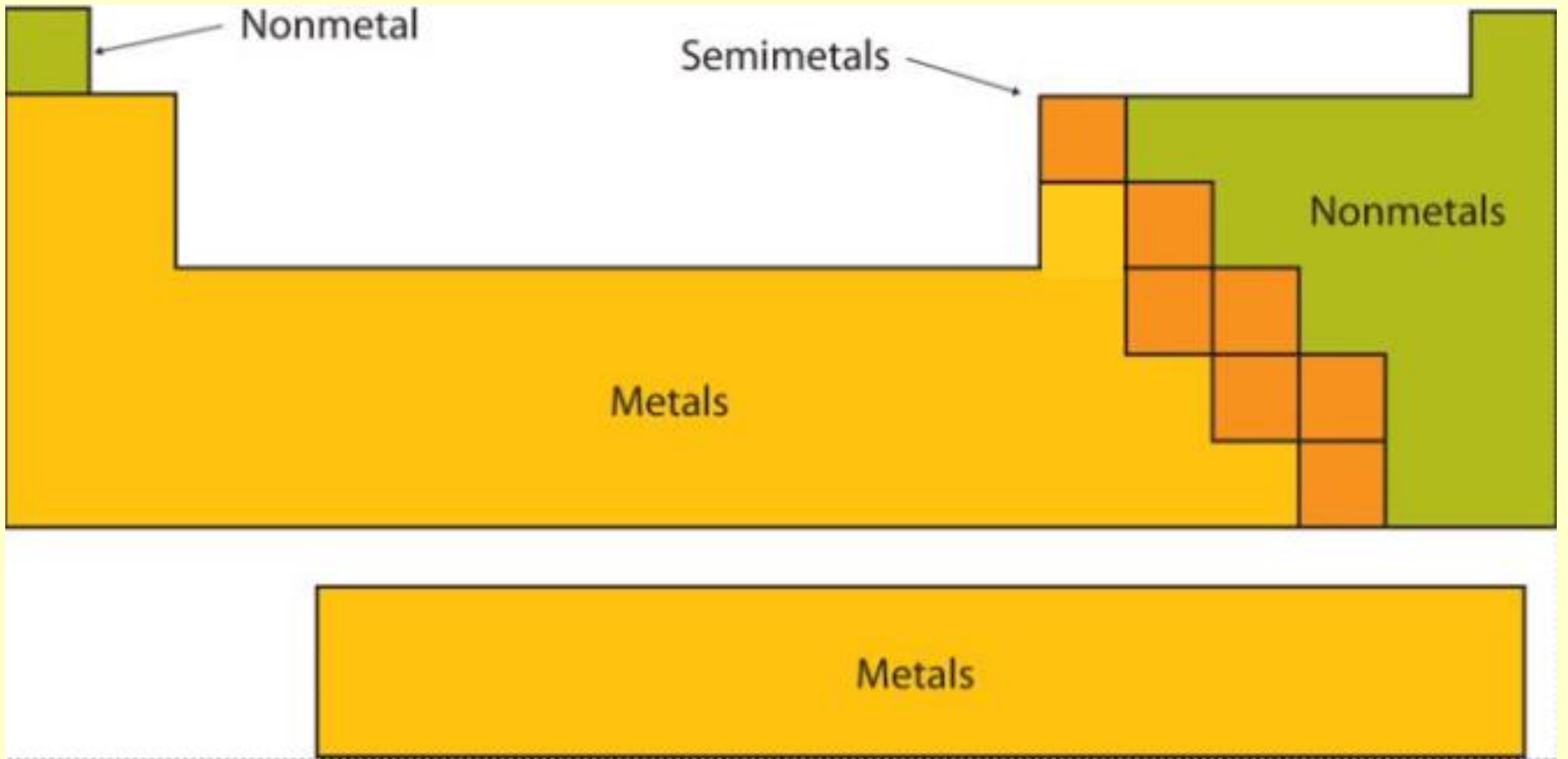
- A chemical change is when a new substance is produced (C1.1.2)
- The periodic table contains all known elements (KS3)
- A molecule is a particle made from more than one atom chemically joined together (KS3)
 - At GCSE this becomes – A molecule is a particle made from more than one atom chemically joined together **by covalent bonds**
 - We will explain what a covalent bond is later in this topic

Learning Objectives

- Describe the properties of metals and non-metals and their position in the periodic table
- Explain how metals and non-metals differ in their reactivity
- Describe the reactions of metals and non-metals with oxygen

The Periodic Table

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57-71	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89-103	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og
		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	



Metals and non-metals have different chemical and physical properties
The semi-metals have a mixture of metal and non-metal properties

TASK1: Find these elements on the periodic table and sort them into metals or non-metals

Easy

- Boron
- Bromine
- Aluminium
- Selenium

Medium

- Iridium
- Palladium
- Radon
- Hydrogen

Hard

Find 2 other metals and 2 other non-metals and put them in the table

Metals	Non-metals

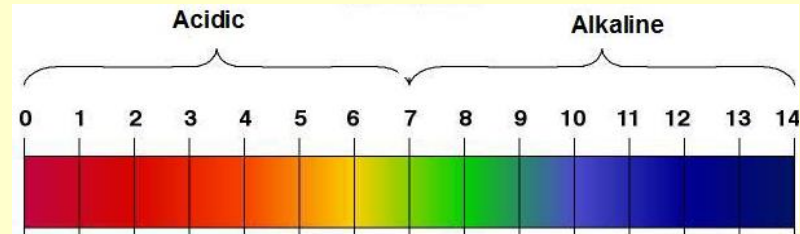
Chemical differences

- **Metals** react with oxygen to give **alkaline** oxides
- **Non-metals** react with oxygen to give **acidic** oxides

- Metals react by losing electrons to become positive ions
- Non-metals react by gaining electrons to become negative ions

- Metals do not react with other metals
- Non-metals can react with other non-metals. When they do this, they form molecules.

TASK 2: Copy this table into your notes and complete it



Element	Observation before combustion	Observation during combustion	Observation after combustion	pH of oxide
Na				
Mg				
C				
S				

Note: The following is a simplification

In practice the oxide **reacts** with the water to give an alkali or acid

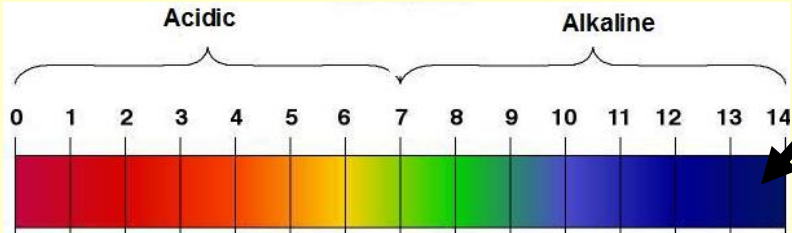
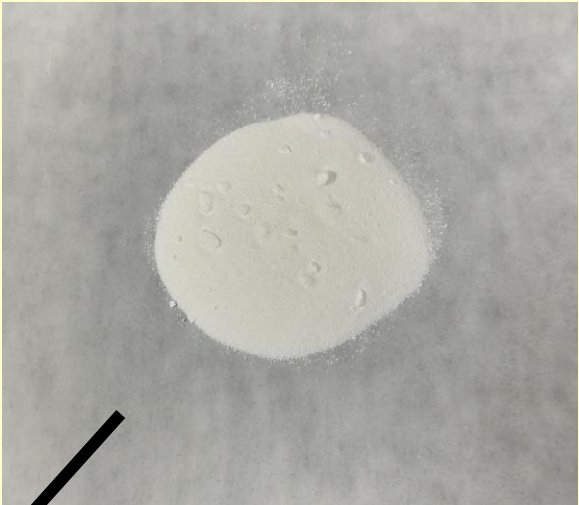
Sodium before



Sodium reacting with oxygen



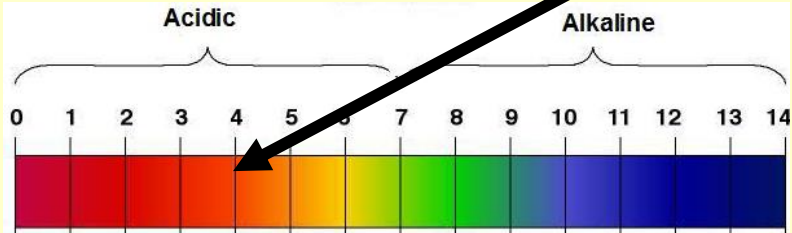
sodium oxide



Carbon before

Carbon reacting with oxygen

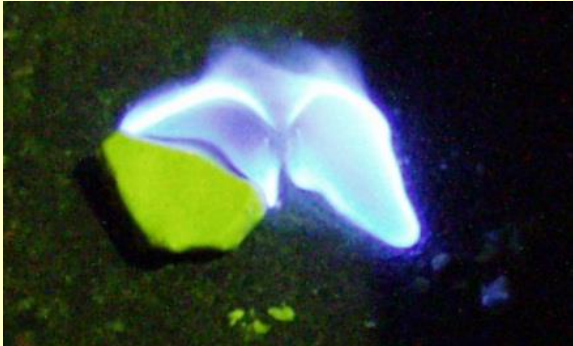
Carbon dioxide



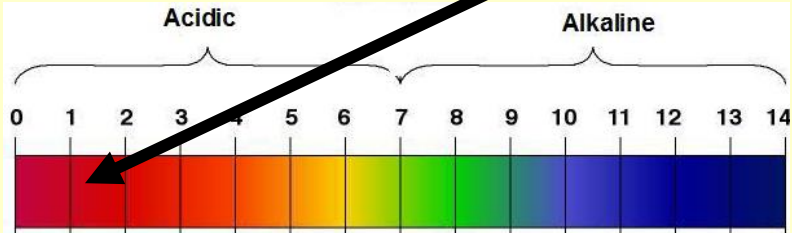
Sulfur before



Sulfur reacting with oxygen



Sulfur dioxide



Extension task: Write word and symbol equations for each of the reactions

An example is:

Aluminium + oxygen \rightarrow aluminium oxide

Just replace aluminium with the element name

To write the symbol equations you will need to look up the chemical formulae of that elements oxide

We will learn how to write formulae without looking them up in later lessons

TASK 3: Exam question

Element Z burns in oxygen to make white clouds of its oxide.
Describe how you could test the oxide to determine if element Z is a metal.

(3 marks)

TASK 3: Exam question

Element Z burns in oxygen to make white clouds of its oxide.
Describe how you could test the oxide to determine if element Z is a metal.

(4 marks)

1 mark each for:

- Dissolve in water
- Test the pH with universal indicator
- (Universal indicator) would turn blue/purple
- This means the pH is greater than 7