GCSE Chemistry B (Twenty First Century Science)

J258/01 Breadth in Chemistry (Foundation Tier)

Question Set 33

Multiple Choice Questions

1 Titanium is used for hip replacements.

(a) Which term describes titanium?

Put a (ring) around the correct answer.

Group 1 metal **Group 7 element** **alloy** **transition metal**

[1]

(b) Titanium, Ti, can be made from titanium oxide by **two** methods.

Method 1 uses magnesium which reacts with titanium oxide:

$$2Mg + TiO_2 \rightarrow Ti + 2MgO$$

Complete the sentences below, by putting a (ring) around the correct answers.

Use the symbol equation in **Method 1** to help you.

Magnesium is more reactive than

titanium oxide / **titanium** / **magnesium oxide**.

Magnesium reduces **titanium oxide** / **titanium** / **magnesium oxide**

to **titanium oxide** / **titanium** / **magnesium oxide**.

[3]

(c) Calculate the relative formula mass of magnesium oxide (MgO).

Use the Periodic Table.

Relative formula mass =..... **[1]**

(d) Calculate the percentage of magnesium in magnesium oxide (MgO).

Use relative formula mass of magnesium = 24.

Percentage of magnesium = ...% **[2]**

(e) (i)

Method 2 uses electrolysis to make titanium:

$$TiO_2 \rightarrow Ti + O_2$$

Method 2 has a higher atom economy than **Method 1**.

Some relative formula masses are given in the table.

Formula	Ti	O_2	TiO_2
Relative formula mass	47.9	32.0	79.9

Calculate the atom economy for **Method 2**.

Use the data from the table.

Use the formula: atom economy $= \frac{\text{mass of atoms in desired product}}{\text{total mass of atoms in reactants}} \times 100\%$

Give your answer to **1** decimal place.

Atom economy = ... % **[3]**

(ii) Look at the equations again for **Method 1** and **Method 2**.

Method 1: $2Mg + TiO_2 \rightarrow Ti + 2MgO$

Method 2: $TiO_2 \rightarrow Ti + O_2$

Explain why **Method 2** has a higher atom economy than **Method 1**.

[2]

(f) Magnesium oxide (MgO) is formed in **Method 1**.

(i) **Fig. 1.1** shows the 'dot and cross' diagrams for a magnesium (Mg) atom and an oxygen (O) atom.

Atoms

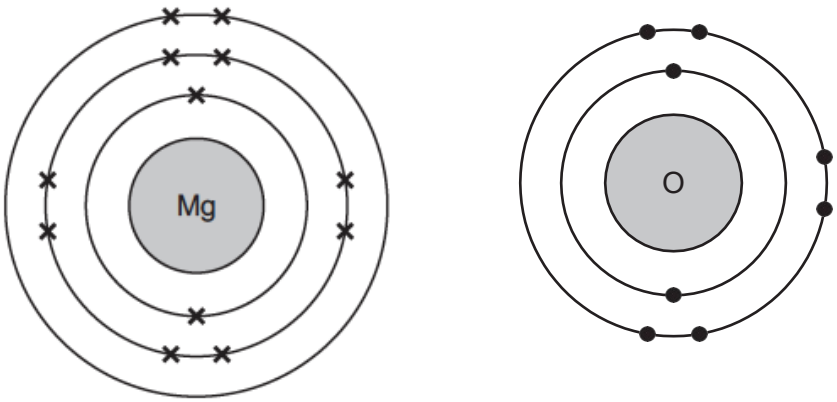

Fig. 1.1

Complete **Fig. 1.2** to show the 'dot and cross' diagrams for an Mg^{2+} ion and an O^{2-} ion.

Ions

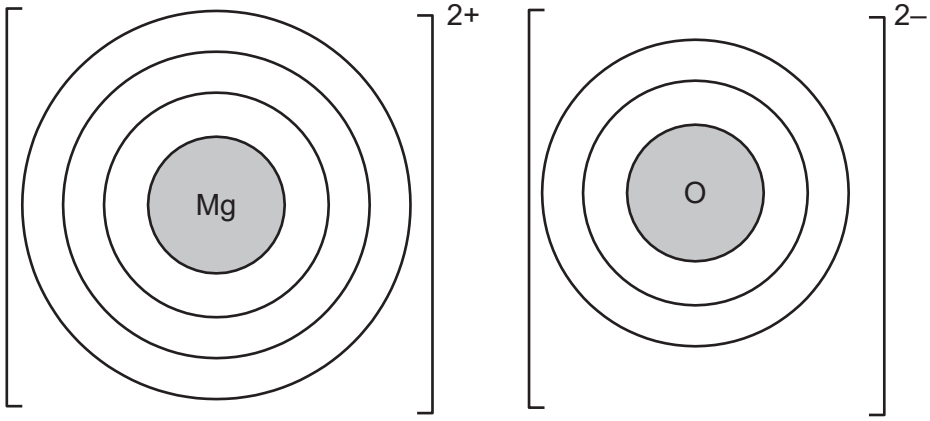

Fig. 1.2

[2]

(ii) Magnesium oxide can be formed by burning magnesium in oxygen.

Complete the balanced symbol equation for this reaction.

.....Mg + O_2 $\rightarrow$ .....MgO

[1]

Total Marks for Question Set 33: 15

Resource Materials

Question Set No: 33

The Periodic Table of the Elements

(1)	(2)											(3)	(4)	(5)	(6)	(7)	(0)
1																	18
1 **H** hydrogen 1.0	2											13	14	15	16	17	2 **He** helium 4.0
3 **Li** lithium 6.9	4 **Be** beryllium 9.0											5 **B** boron 10.8	6 **C** carbon 12.0	7 **N** nitrogen 14.0	8 **O** oxygen 16.0	9 **F** fluorine 19.0	10 **Ne** neon 20.2
11 **Na** sodium 23.0	12 **Mg** magnesium 24.3	3	4	5	6	7	8	9	10	11	12	13 **Al** aluminium 27.0	14 **Si** silicon 28.1	15 **P** phosphorus 31.0	16 **S** sulfur 32.1	17 **Cl** chlorine 35.5	18 **Ar** argon 39.9
19 **K** potassium 39.1	20 **Ca** calcium 40.1	21 **Sc** scandium 45.0	22 **Ti** titanium 47.9	23 **V** vanadium 50.9	24 **Cr** chromium 52.0	25 **Mn** manganese 54.9	26 **Fe** iron 55.8	27 **Co** cobalt 58.9	28 **Ni** nickel 58.7	29 **Cu** copper 63.5	30 **Zn** zinc 65.4	31 **Ga** gallium 69.7	32 **Ge** germanium 72.6	33 **As** arsenic 74.9	34 **Se** selenium 79.0	35 **Br** bromine 79.9	36 **Kr** krypton 83.8
37 **Rb** rubidium 85.5	38 **Sr** strontium 87.6	39 **Y** yttrium 88.9	40 **Zr** zirconium 91.2	41 **Nb** niobium 92.9	42 **Mo** molybdenum 95.9	43 **Tc** technetium	44 **Ru** ruthenium 101.1	45 **Rh** rhodium 102.9	46 **Pd** palladium 106.4	47 **Ag** silver 107.9	48 **Cd** cadmium 112.4	49 **In** indium 114.8	50 **Sn** tin 118.7	51 **Sb** antimony 121.8	52 **Te** tellurium 127.6	53 **I** iodine 126.9	54 **Xe** xenon 131.3
55 **Cs** caesium 132.9	56 **Ba** barium 137.3	57–71 lanthanoids	72 **Hf** hafnium 178.5	73 **Ta** tantalum 180.9	74 **W** tungsten 183.8	75 **Re** rhenium 186.2	76 **Os** osmium 190.2	77 **Ir** iridium 192.2	78 **Pt** platinum 195.1	79 **Au** gold 197.0	80 **Hg** mercury 200.6	81 **Tl** thallium 204.4	82 **Pb** lead 207.2	83 **Bi** bismuth 209.0	84 **Po** polonium	85 **At** astatine	86 **Rn** radon
87 **Fr** francium	88 **Ra** radium	89–103 actinoids	104 **Rf** rutherfordium	105 **Db** dubnium	106 **Sg** seaborgium	107 **Bh** bohrium	108 **Hs** hassium	109 **Mt** meitnerium	110 **Ds** darmstadtium	111 **Rg** roentgenium	112 **Cn** copernicium		114 **Fl** flerovium		116 **Lv** livermorium		

Key
atomic number
Symbol
name
relative atomic mass