The Blast Furnace

1. You need to know about the four raw materials used in the blast furnace.
   Match the **heads** to the correct **tails**, and write out the correct sentences:

heads		**tails**
iron ore	•	• is made from coal, and is nearly pure carbon
limestone	•	• (usually haematite) is mainly iron oxide, Fe_2O_3, mixed with sand
hot air	•	• blasted in at the bottom of the furnace to provide heat and oxygen
coke	•	• is a common rock consisting mainly of calcium carbonate, $CaCO_3$

2. Write down the **formula** for iron oxide, and the **formula** for calcium carbonate.

3. Match the **word equations** to the correct **symbol equations**, and write them down together:

word equations	**symbol equations**
carbon + oxygen → carbon dioxide	$Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(l) + 3CO_2(g)$
calcium carbonate → calcium oxide + carbon dioxide	$C(s) + CO_2(g) \rightarrow 2CO(g)$
carbon + carbon dioxide → carbon monoxide	$CaO(s) + SiO_2(s) \rightarrow CaSiO_3(l)$
iron oxide + carbon monoxide → iron + carbon dioxide	$C(s) + O_2(g) \rightarrow CO_2(g)$
calcium oxide + silicon dioxide → calcium silicate	$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

4. Coke can react with iron oxide to produce iron. However, something else actually reacts with iron oxide to produce iron in the blast furnace. What substance is this?

5. The two reactions involving **calcium oxide** help to purify the iron.

   a) Which **raw material** does the calcium oxide come from?

   b) The common name for silicon dioxide is sand; the common name for calcium silicate is slag. Explain how **limestone** purifies the iron.

6. There is a lot of clever chemistry in the Blast Furnace. Very little is wasted.

   a) What is some of the waste gas used for?

   b) What can the waste slag be used for?

7. Read the information in the box, then answer the question below.

   - oxidation reaction: a chemical reacts with oxygen.
   - thermal decomposition reaction: one chemical breaks down into two or more new chemicals.
   - competition reaction: one substance pushes out (displaces) another from its compound.

   Look at your answers to Question 3. Three of the five reactions fit the descriptions in the box.

   a) Write down the oxidation reaction (this produces heat, too).

   b) Write down the thermal decomposition reaction (this needs heat to work).

   c) Write down the competition reaction.