

Name: *Donald*

Examiner's notes

1. Name the element that is always involved in oxidation reactions (1)

*Oxygen*

2. What type of chemical reaction is represented by this equation?  
fuel + oxygen → carbon dioxide + water (1)

*Burning*

3. Explain how rust is formed. (2)

*Rust is made when iron gets wet and oxygen gets to it. Rust is called iron oxide (the iron oxide was iron but oxygen has got to it).*

4. Define the term 'displacement' by using an example (3)

*Displacement is when a less reactive metal takes the place of a more reactive metal. For example, magnesium might take the place of a different metal – it kicks out the other metal because its more or less reactive than the one being kicked out displaced.*

5. Propane is a fuel. Write an equation for the combustion of propane. (2)

*Propane + oxygen = carbon dioxide + water*

6. Describe how magnesium oxide and carbon dioxide could be obtained from magnesium carbonate. (3)

*Magnesium carbonate could be put in a test tube and heated. It would then become magnesium oxide and carbon dioxide gas. You could use a Bunsen burner to heat the test tube but you should be careful not to get burnt.*

7. Complete the word equations. (4)

butane + oxygen → carbon dioxide + water

sodium + oxygen → sodium oxide

lithium carbonate → lithium oxide + carbon dioxide

potassium + silver chloride → silver + potassium silver

8. Write word equations for these reactions:

a) The thermal decomposition of lithium carbonate

*Copper carbonate → Copper oxide + Carbon dioxide*

b) The oxidation of magnesium

*Magnesium + Oxygen*

c) The combustion of kerosene

*Kerosene → Carbon dioxide + Water*

d) The reaction between copper and iron chloride

~~*Copper + Iron chloride → Iron + Copper chloride*~~

*Copper + Iron chloride → Copper chloride + Iron*

(8)

9. Use examples to explain the term 'thermal decomposition'.

(6)

*Thermal means heat, so thermal decomposition means chopping things up (decomposition) using heat. Compounds can be broken up into elements using thermal decomposition. For example, sodium carbonate can be heated and it'll become sodium and carbon dioxide.*

Total mark: \_\_\_/30

Positive comments:

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Targets for improvement:

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### Teaching notes

This 'peer-assessment' task is designed to be used by students after they have studied types of chemical reactions. It should be used to consolidate learning.

Students of secondary age are notoriously critical. They take delight in noticing Donald's errors, misconceptions and lack of exam technique. Sometimes however, Donald surprises the students with a great answer!

To stimulate discussion, Donald's work has been most successfully used in pair or small group work, followed by targeted whole class questioning.

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The following marks and comments are expected from students:

1. Donald would score 1 mark.

Donald has correctly recalled that oxidation involves oxygen (being added to a substance).

2. Donald would likely score 0 marks.

To gain the mark, Donald needs to use the term 'combustion' which is the type of reaction where oxygen combines with another substance (fuel) to produce heat and light.

3. Donald would likely score 1 mark.

Donald has recognised the need for oxygen and linked this to the idea of iron becoming iron oxide. However, the actual formation of the iron oxide would best be represented by an equation (iron + oxygen → iron oxide) and this would get Donald the second mark - simply saying 'oxygen has got to it' isn't quite enough.

4. Donald is confused and would score 0 marks.

Donald should have said that a more reactive metal takes the place of a less reactive metal (he said the opposite) for the first mark. Magnesium is a good example to use, but he needs to say that it would 'kick out / displace' a less reactive metal and give an example (he said more *or* less). The third mark could be obtained by illustrating the idea of displacement fully by using an equation.

5. Donald would likely score just 1 mark.

Unfortunately, Donald has made the common error of using an 'equal' sign instead of an arrow in the middle of the equation. The reactants do not equal the products, they simply react together to make them.

6. Donald would likely score 2 marks (at most).

One mark will be scored for the word 'heat' or 'heating' and he may be lucky to get another mark for a procedural comment such as using a test tube or a Bunsen burner. However, Donald should have stated that the type of reaction that needs to occur is thermal decomposition or he could illustrate the process using an equation (magnesium carbonate → magnesium oxide + carbon dioxide).

7. Donald has done quite well and would score 3 marks.

Donald's first three equations are perfect.

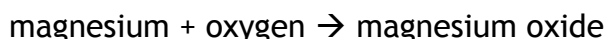
He has got confused in the last equation - potassium as a more reactive metal displaces silver, leaving potassium chloride, not potassium silver (which could not be a compound - it is two metals).

8. Donald seems much less confident writing whole word equations. He would probably score just 3 marks out of a possible 8.

The first equation asked for the thermal decomposition of lithium carbonate, not copper carbonate so it should be:



The second equation gets 1 mark for the reactants, but Donald has not given the product. It should be:



Donald gets 1 mark for the products. However, he has forgotten that combustion involves oxygen combining with the fuel and so it should be:



Donald has correctly written the reactants, so he can have 1 mark for this. However, he has forgotten that displacement will only occur if the metal is more reactive than the one in the compound. In this case, copper is less reactive than iron and so there is no reaction. It could be written in one of these ways:

copper + iron chloride  $\rightarrow$  copper + iron chloride

copper + iron chloride  $\rightarrow$  no reaction

### 9. Donald would likely score 2 marks.

In 6-mark questions at GCSE, responses are marked in bands of 1-2, 3-4, 5-6. In each band, literacy is also considered. The same idea can be used at KS3 to develop understanding of this way of marking.

Donald does make a fairly good explanation of what thermal decomposition means (breaking down using heat) although breaking down would be preferable to chopping up.

However, to get 3-4 marks, he would need to give a correct example, which he has not done. Sodium carbonate can indeed undergo thermal decomposition, but it would become sodium oxide and carbon dioxide.

To get 5-6 marks, the example should be given clearly as a word equation (or even a symbol equation) and it should perhaps be noted that there is one reactant, yet two products.

Students should also note his incorrect spelling of the word 'decomposition'. This is particularly silly because the word is in the question. He would still get 2 marks though as this band does not require accurate spelling.

Overall, Donald would score about thirteen marks. He needs to improve his ability to write word equations and his understanding of scientific terminology (e.g. combustion, thermal decomposition) in order to improve. He needs to review the definition of displacement and use a reactivity series to work out whether elements will displace each other.