Section A:

1. Which is the correct definition of a limiting reactant?
   Tick one box.
   The reactant that will make less product ☐
   The reactant that will run out first ☐
   The reactant that there is more of ☐

2. How can the reactant that is not the limiting reactant be described?
   Tick one box.
   There is too much of it ☐
   It is in the correct mole ratio ☐
   It is in excess ☐

3. Balance this equation:

$$Ca + O_2 \rightarrow CaO$$

4. Explain why chemical equations have to be balanced.

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5. Carbon reacts with oxygen, which can be represented by the following equation:

$$C + O_2 \rightarrow CO_2$$

   a. Calculate the relative formula mass of $CO_2$.

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   b. If there are 0.5 moles of carbon and 0.1 moles of oxygen present, which is the limiting reactant?

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**For any calculations, round final answers to 2 decimal places.**

Section B

6. A scientist has a mixture of aluminium and iron oxide. It contains 1.5 kg of aluminium and 2.8 kg of iron oxide.
   The equation for the reaction is:

$$2\ Al + Fe_2O_3 \rightarrow 2\ Fe + Al_2O_3$$

   a. Use calculations to identify which is the limiting reactant.

   b. Use your answer to calculate the maximum mass of iron that could be obtained.

7. Magnesium can be used to displace copper from its ore. The equation for the reaction is:

$$Mg + CuO \rightarrow MgO + Cu$$

   a. Use calculations to identify which is the limiting reactant when a reaction mixture contains 750 g of magnesium and 750 g of copper oxide.

b. Use your answer to calculate the maximum mass of copper that could be obtained.

8. Iron can be used to displace copper from copper sulfate solution. The equation for the reaction is:

$$CuSO_4\ (aq) + Fe\ (s) \rightarrow Cu\ (s) + FeSO_4\ (aq)$$

Calculate the mass of iron needed to displace all the copper from 100 $cm^3$ of copper sulfate solution.

The concentration of the copper sulfate solution is 50 $g/dm^3$.

Section C

9. The chemical equation for aerobic respiration is:

$$C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$$

a. Calculate the relative formula mass of glucose.
b. A muscle tissue contains 40 μg of glucose and 75 μg of oxygen. Calculate the number of moles of each present.
c. Identify which is the limiting reactant.
d. Calculate the mass of water that could be made.
e. Explain what happens when the muscle tissue cannot get enough oxygen.
f. Compare the two processes of respiration.