

GCSE Chemistry (9 – 1)

Half Equations and Redox Equations

Name:

Group:



Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.

For markers use	
Question	Mark
1	/6
2	/6
3	/3
4	/7
5	/12
6	/10
7	/6
Total	/50
%	
Grade	

Information

- The maximum mark for this paper is 50 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



- 1) Metals can lose electrons to form positive ions (oxidation), and metal ions can gain electrons to form neutral atoms (reduction).

The half-equations below show these processes, which often occur during electrolysis.

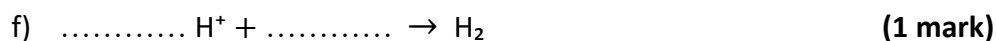
Complete each equation by adding the correct number of electrons (e^-) to the correct side.



(Total for Question 1 is 6 marks)

- 2) Some non-metals, such as hydrogen and the halogens, exist as diatomic molecules, containing **two** atoms. The half-equations for their reactions involve these molecules.

For the questions below, complete and balance each half-equation.



(Total for Question 2 is 6 marks)

- 3) The formation of oxygen gas (O_2) is a common process at the positive electrode (anode) during the electrolysis of some compounds.

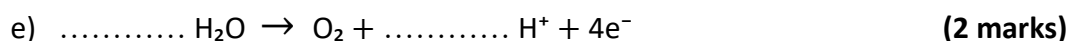
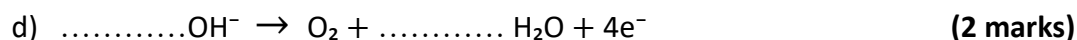
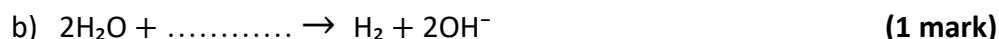
Complete and balance the following half-equations.



(Total for Question 3 is 3 marks)

- 4) When aqueous solutions are electrolysed, water molecules (H_2O) can sometimes react instead of the solute ions. This produces hydrogen gas at the cathode or oxygen gas at the anode.

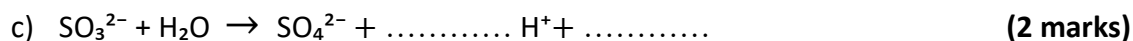
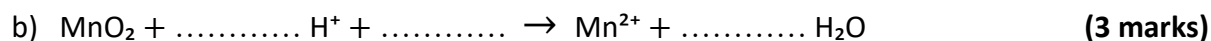
Complete and balance the following half-equations, filling in any missing balancing numbers as well as the electrons.



(Total for Question 4 is 7 marks)

- 5) The following half-equations involve more complex ions and molecules.

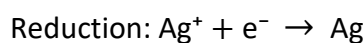
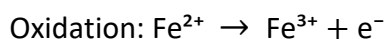
To solve them, you may need to balance multiple elements as well as the charge.



(Total for Question 5 is 12 marks)

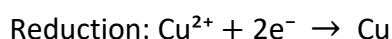
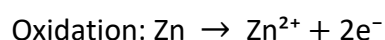
- 6) Question: The following pairs of half-equations have the same number of electrons.
Combine each pair to write the full balanced redox equation.

- a) **Reaction:** Iron(II) ions reacting with Silver ions.



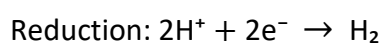
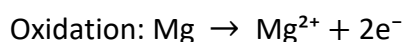
Full Redox Equation:
(2 marks)

- b) **Reaction:** A zinc atom reacting with a copper(II) ion (the basis of the Daniell cell).



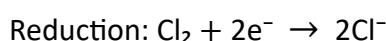
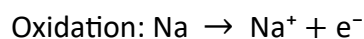
Full Redox Equation:
(2 marks)

- c) **Reaction:** Magnesium metal reacting with hydrogen ions from an acid.



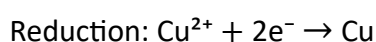
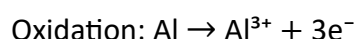
Full Redox Equation:
(2 marks)

- d) **Reaction:** The formation of sodium chloride from its elements.



Full Redox Equation:
(2 marks)

- e) **Reaction:** Aluminium metal reacting with copper(II) ions.

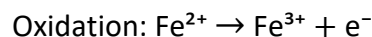


Full Redox Equation:
(2 marks)

(Total for Question 6 is 10 marks)

7. These questions involve more complex reactants, often in acidic solutions (indicated by H^+).
Use the skills you have learned to balance the electrons and combine the provided half-equations.

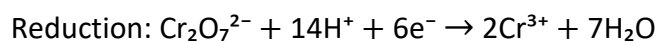
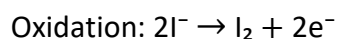
a) **Reaction:** Iron(II) ions (Fe^{2+}) are oxidised by the permanganate ion (MnO_4^-) in an acidic solution.



Full Redox Equation:

(3 marks)

b) **Reaction:** Iodide ions (I^-) are oxidised by the dichromate ion ($\text{Cr}_2\text{O}_7^{2-}$) in an acidic solution.



Full Redox Equation:

(3 marks)

(Total for Question 7 is 6 marks)