

AQA A-Level Chemistry

Redox

Questions only

All 19 redox questions

Questions

19

Total marks

43

Time allowed

56 min

Name

Class or teacher

Date

Instructions

- Answer all questions in the spaces provided.
- Use black ink. Show your working for every calculation.
- You may use a scientific calculator and the AQA Data Sheet.
- Print the separate mark scheme when you are ready to mark your answers.

For marking

Q	Source	Marks	Score
1	2022 AS P1 Q6	5	
2	2017 AS P1 Q20	1	
3	2017 AS P1 Q8	10	
4	2019 AS P1 Q15	1	
5	2025 AS P1 Q1	6	
6	2025 AS P1 Q20	1	
7	2020 A-level P3 Q11	1	
8	2022 AS P1 Q19	1	
9	2023 A-level P3 Q14	1	
10	2023 AS P1 Q18	1	

Q	Source	Marks	Score
11	2023 AS P1 Q16	1	
12	2023 AS P1 Q17	1	
13	2024 AS P1 Q9	4	
14	2020 AS P1 Q21	1	
15	2020 AS P1 Q13	1	
16	2021 A-level P3 Q21	1	
17	2021 AS P1 Q16	1	
18	2021 AS P1 Q3	4	
19	2022 A-level P3 Q10	1	

Total _____ / 43 Percentage _____ %

Questions from AQA past papers, 2017–2025, reproduced for revision. Practise these topics online, with instant marking:

whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions?topics=oxidation-reduction-redox&len=0

Questions

Redox · 19 questions · 43 marks · time allowed 56 min

Q1 · June 2022 · AS Paper 1 · Q6 · [5 marks]

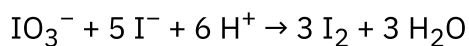
This question also needs Group 7.

Iodide ions can be oxidised to iodine using oxidising agents such as iodate(V) ions (IO_3^-) and concentrated sulfuric acid.

(a) State, in terms of electrons, the meaning of the term oxidising agent.

[1 mark]

In acidic solution, IO_3^- ions oxidise iodide ions to iodine.



(b) Give a half-equation for the oxidation of iodide ions to iodine.

Deduce the half-equation to show the reduction process in this reaction.

[2 marks]

Oxidation half-equation

Reduction half-equation

(c) When iodide ions are oxidised using concentrated sulfuric acid, sulfur dioxide, a yellow solid and a foul-smelling gas are all formed.

Give an equation to show the reaction between iodide ions and concentrated sulfuric acid to form the yellow solid.

Identify the foul-smelling gas.

[2 marks]

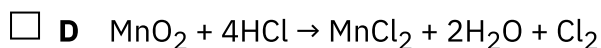
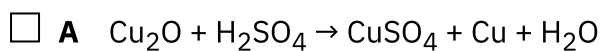
Equation

Identity of foul-smelling gas

Q2 • June 2017 • AS Paper 1 • Q20 • [1 mark]

Which of these is not a redox reaction?

Tick (✓) one box.



Q3 • June 2017 • AS Paper 1 • Q8 • [10 marks]

When an acidified solution of sodium nitrite (NaNO_2) is added to aqueous potassium iodide, iodine

and nitrogen monoxide (NO) are formed.

08.1 Give the oxidation state of nitrogen in the following species.

[2 marks]

NO^{2-}

NO

08.2 Write a half-equation for the conversion of NO_2^- in an acidic solution into NO

[1 mark]

08.3 Write a half-equation for the conversion of I^- into I_2

[1 mark]

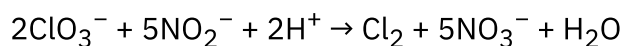
08.4 Write an overall ionic equation for the reaction of NO_2^- in an acidic solution with I^-

[1 mark]

08.5 State the role of NO_2^- in the reaction with I^-

[1 mark]

08.6 In aqueous solution, nitrite ions react with acidified chlorate(V) ions according to the equation



A 25.0 cm^3 sample of an aqueous solution of sodium nitrite required 27.40 cm^3

of a $0.0200\text{ mol dm}^{-3}$ solution of potassium chlorate(V) for complete reaction.

Calculate the concentration, in g dm^{-3} , of sodium nitrite in the sample.

Concentration of sodium nitrite g dm^{-3}

[4 marks]

Q4 • June 2019 • AS Paper 1 • Q15 • [1 mark]

Which equation does not represent a redox reaction?

Tick (✓) one box.

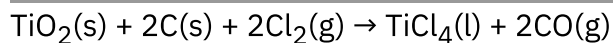
- ☐ **A** $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
- ☐ **B** $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- ☐ **C** $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$
- ☐ **D** $\text{CuO} + 2\text{HCl} \rightarrow \text{CuCl}_2 + \text{H}_2\text{O}$

Q5 • June 2025 • AS Paper 1 • Q1 • [6 marks]

This question also needs Amount of substance.

This question is about the extraction of titanium.

The first stage in the extraction of titanium is the formation of titanium(IV) chloride, TiCl_4



01.1 Calculate the percentage atom economy to form TiCl_4 in this first stage of the extraction.

Percentage atom economy

[2 marks]

01.2 Suggest one economic advantage of using a process with a high percentage atom economy.

The second stage of the extraction is the reaction between TiCl_4 and magnesium.

[1 mark]

01.3 Give the equation for the reaction between TiCl_4 and magnesium.

State the role of magnesium in this reaction.

[2 marks]

Equation

Role of magnesium

01.4 Titanium is an expensive metal because its extraction process uses magnesium.

Suggest why magnesium is expensive.

[1 mark]

Q6 • June 2025 • AS Paper 1 • Q20 • [1 mark]

Which statement about SO_2 acting as a reducing agent is correct?

Tick (✓) one box.

- ☐ **A** SO_2 gains electrons and the oxidation state of sulfur decreases.
- ☐ **B** SO_2 gains electrons and the oxidation state of sulfur increases.
- ☐ **C** SO_2 loses electrons and the oxidation state of sulfur decreases.
- ☐ **D** SO_2 loses electrons and the oxidation state of sulfur increases.

Q7 • November 2020 • Paper 3 • Q11 • [1 mark]

In which conversion is the metal reduced?

Tick (✓) one box.

- ☐ **A** $\text{Cr}_2\text{O}_7^{2-} \rightarrow \text{CrO}_4^{2-}$
- ☐ **B** $\text{MnO}_4^{2-} \rightarrow \text{MnO}_4^-$
- ☐ **C** $\text{TiO}_2 \rightarrow \text{TiO}_3^{2-}$
- ☐ **D** $\text{VO}_3^- \rightarrow \text{VO}^{2+}$

Q8 · June 2022 · AS Paper 1 · Q19 · [1 mark]

In which of these substances is oxygen in the highest oxidation state?

Tick (✓) one box.

- ☐ **A** OF_2
- ☐ **B** H_2O
- ☐ **C** O_2
- ☐ **D** H_2O_2

Q9 · June 2023 · Paper 3 · Q14 · [1 mark]

In which oxide is the named element in its highest oxidation state?

Tick (✓) one box.

- ☐ **A** chlorine in ClO_2
- ☐ **B** magnesium in MgO
- ☐ **C** nitrogen in N_2O_4
- ☐ **D** sulfur in SO_2

Q10 · June 2023 · AS Paper 1 · Q18 · [1 mark]

Which incomplete half-equation is balanced by adding two H^+ ions and one electron to the left-hand side?

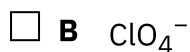
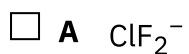
Tick (✓) one box.

- ☐ **A** $\text{CH}_3\text{CHO} \rightarrow \text{CH}_3\text{CH}_2\text{OH}$
- ☐ **B** $\text{VO}^{2+} \rightarrow \text{V}^{3+} + \text{H}_2\text{O}$
- ☐ **C** $\text{HNO}_2 \rightarrow \text{NO} + \text{H}_2\text{O}$
- ☐ **D** $\text{O}_2 \rightarrow \text{H}_2\text{O}_2$

Q11 · June 2023 · AS Paper 1 · Q16 · [1 mark]

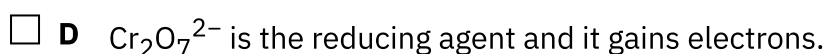
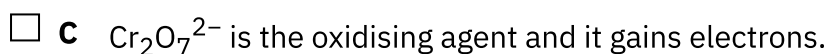
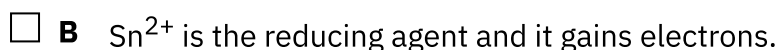
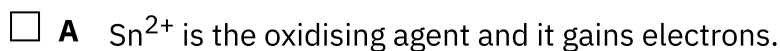
In which species is chlorine in its highest oxidation state?

Tick (✓) one box.

**Q12 · June 2023 · AS Paper 1 · Q17 · [1 mark]**

Which statement about this redox reaction is correct? $3 \text{Sn}^{2+}(\text{aq}) + \text{Cr}_2\text{O}_7^{2-}(\text{aq}) + 2 \text{H}^+(\text{aq}) \rightarrow 2 \text{Cr}^{3+}(\text{aq}) + 3 \text{SnO}_2(\text{s}) + \text{H}_2\text{O}(\text{l})$

Tick (✓) one box.

**Q13 · June 2024 · AS Paper 1 · Q9 · [4 marks]**

This question is about redox reactions.

(a) State, in terms of electrons, the meaning of the term oxidising agent.

[1 mark]

(b) Give a half-equation to show the oxidation of copper to copper(II) ions.

[1 mark]

(c) Give a half-equation to show the reduction of NO_3^- ions in acidic solution to NO_2

[1 mark]

(d) Use your answers to part (b) and part (c) to deduce an overall equation for the reduction of NO_3^- ions by copper.

[1 mark]

Q14 • November 2020 • AS Paper 1 • Q21 • [1 mark]

Which compound contains chlorine in an oxidation state of +1?

Tick (✓) one box.

☐ **A** Cl_2O

☐ **B** KClO_3

☐ **C** ClF_3

☐ **D** CCl_4

Q15 • November 2020 • AS Paper 1 • Q13 • [1 mark]

NO_2^- ions can be reduced in acidic solution to NO How many electrons are gained when each NO_2^- ion is reduced?

Tick (✓) one box.

☐ **A** 1

☐ **B** 2

☐ **C** 3

☐ **D** 4

Q16 · November 2021 · Paper 3 · Q21 · [1 mark]

Which equation does not show the reduction of a transition metal?

Tick (✓) one box.

- ☐ **A** $\text{TiCl}_4 + 2 \text{Mg} \rightarrow \text{Ti} + 2 \text{MgCl}_2$
- ☐ **B** $2 \text{FeCl}_3 + 2 \text{KI} \rightarrow 2 \text{FeCl}_2 + 2 \text{KCl} + \text{I}_2$
- ☐ **C** $\text{MnO}_2 + 4 \text{HCl} \rightarrow \text{MnCl}_2 + \text{Cl}_2 + 2 \text{H}_2\text{O}$
- ☐ **D** $\text{CoO} + 4 \text{HCl} \rightarrow [\text{CoCl}_4]^{2-} + \text{H}_2\text{O} + 2 \text{H}^+$

Q17 · November 2021 · AS Paper 1 · Q16 · [1 mark]

Which compound contains a chlorine atom with an oxidation state of +4?

Tick (✓) one box.

- ☐ **A** KClO_4
- ☐ **B** CCl_4
- ☐ **C** ClO_2
- ☐ **D** ClO_2F

Q18 · November 2021 · AS Paper 1 · Q3 · [4 marks]

This question is about redox reactions.

(a) State, in terms of electrons, the meaning of the term oxidising agent.

[1 mark]

(b) $\text{Cr}_2\text{O}_7^{2-}$ can oxidise SO_3^{2-} in acidic conditions to form Cr^{3+} and SO_4^{2-}

Deduce a half-equation for the oxidation of SO_3^{2-} to SO_4^{2-}

Deduce a half-equation for the reduction of $\text{Cr}_2\text{O}_7^{2-}$ to Cr^{3+}

Deduce the overall equation for the oxidation of SO_3^{2-} by $\text{Cr}_2\text{O}_7^{2-}$

Half-equation for the oxidation of SO_3^{2-} to SO_4^{2-}

Half-equation for the reduction of $\text{Cr}_2\text{O}_7^{2-}$ to Cr^{3+}

Overall equation

[3 marks]

Q19 • June 2022 • Paper 3 • Q10 • [1 mark]

Which of these oxidation states is correct?

Tick (✓) one box.

- ☐ **A** Chlorine in Cl_2 is -1
- ☐ **B** Chromium in $\text{K}_2\text{Cr}_2\text{O}_7$ is $+7$
- ☐ **C** Fluorine in F_2O is -1
- ☐ **D** Hydrogen in NaH is $+1$

Source: AQA A-Level Chemistry past papers. Reproduced for revision at whiteboardchemistry.com.

Mark scheme:

whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions/pdf/oxidation-reduction-redox-mark-scheme.pdf