Oxidation Reactions

Name: _____ Class: _____ Date: _____

Quick Reference

Oxidation is the loss of electrons. OIL RIG: Oxidation Is Loss; Reduction Is Gain. Example: $Mg \rightarrow Mg^{2+} + 2e^-$. The oxidation state of magnesium increases from 0 to +2.

Part A — Multiple Choice (8 marks)

1. What is oxidation?

A. Gain of electrons B. Loss of electrons C. Gain of neutrons D. Loss of protons

2. Which equation represents oxidation?

A. $Cu^{2+} + 2e^- \rightarrow Cu$ B. $Cl_2 + 2e^- \rightarrow 2Cl^-$ C. $Zn \rightarrow Zn^{2+} + 2e^-$ D. $Ag^+ + e^- \rightarrow Ag$

3. When an atom loses electrons, its oxidation state generally:

A. Decreases B. Increases C. Remains unchanged D. Always becomes zero

4. What happens when sodium undergoes oxidation?

A. It gains one electron. B. It loses one electron. C. It gains one proton. D. It loses one neutron.

5. Which substance is oxidised in $Mg + Cu^{2+} \rightarrow Mg^{2+} + Cu$?

A. Mg B. Cu^{2+} C. Mg^{2+} D. Cu

6. What is the oxidation state of oxygen in MgO?

A. 0 B. +1 C. −2 D. +2

7. Which everyday process involves oxidation?

A. Melting ice B. Boiling water C. Rusting iron D. Dissolving sugar

8. In which change does sulfur undergo oxidation?

A. +4 → +6 B. +6 → +4 C. 0 → −2 D. +2 → 0

Part B — Identifying Oxidation (10 marks)

Identify the substance oxidised and its oxidation-state change. (2 marks each)

Reaction	Substance oxidised	Oxidation-state change
1. $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$	_____	_____
2. $2Mg + O_2 \rightarrow 2MgO$	_____	_____
3. $2Na + Cl_2 \rightarrow 2NaCl$	_____	_____
4. $Fe + 2HCl \rightarrow FeCl_2 + H_2$	_____	_____
5. $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$	_____	_____

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Part C — Electron Transfer (10 marks)

1. Complete each oxidation half-equation. (4 marks)

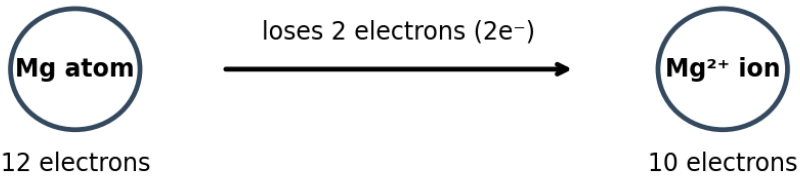
a. $Na \rightarrow Na^{+}$ + _____

b. $Ca \rightarrow Ca^{2+}$ + _____

c. $Al \rightarrow Al^{3+}$ + _____

d. $Fe^{2+} \rightarrow Fe^{3+}$ + _____

2. Use the diagram to answer the questions. (3 marks)



a. How many electrons are lost? _____

b. Write the oxidation half-equation: _____

c. Why is the magnesium ion positively charged?

_____

3. Draw a labelled electron-transfer diagram for $Zn \rightarrow Zn^{2+} + 2e^{-}$. Include the atom, ion, and released electrons. (3 marks)

_____

_____

_____

Part D — Oxidation States (10 marks)

1. Determine the oxidation state of the specified element. (5 marks)

Substance	Element	Oxidation state
NaCl	Na	_____
MgO	Mg	_____
Fe_2O_3	Fe	_____
$CuSO_4$	Cu	_____
H_2O	O	_____

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2. State whether each change is oxidation or reduction and explain using oxidation states. (5 marks)

Change	Oxidation / reduction	Reason
$Fe^{2+} \rightarrow Fe^{3+}$	_____	_____
$Cu^{2+} \rightarrow Cu$	_____	_____
$2Cl^{-} \rightarrow Cl_2 + 2e^{-}$	_____	_____
$Mg \rightarrow Mg^{2+}$	_____	_____
$S(+6) \rightarrow S(+4)$	_____	_____

Part E — Real-World Oxidation (12 marks)

1. Rusting Iron (3 marks)

a. Explain why rusting is an oxidation reaction.

b. Write the half-equation for iron forming Fe^{2+}.

c. Describe one way to prevent rusting.

_____

2. Magnesium Burning (3 marks)

Magnesium burns in oxygen: $2Mg + O_2 \rightarrow 2MgO$

a. Identify the substance oxidised.

b. State its oxidation-state change.

c. Explain what happens to its electrons.

_____

3. Zinc and Copper Sulfate (3 marks)

$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

a. Identify the substance oxidised.

b. Write its oxidation half-equation.

c. Explain why electron transfer occurs.

_____

4. Everyday Oxidation (3 marks)

Choose burning fuel, rusting a bicycle, or metal corrosion. Identify the oxidised substance, explain electron loss, and describe one everyday consequence.

_____

_____

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Teacher Answer Key

Part A (8 marks)

1 B 2 C 3 B 4 B 5 A 6 C 7 C 8 A

Part B (10 marks)

Question	Oxidised	Change
1	Zn	0 → +2
2	Mg	0 → +2
3	Na	0 → +1
4	Fe	0 → +2
5	Al	0 → +3

Part C (10 marks)

1. a. e^- b. $2e^-$ c. $3e^-$ d. e^-

2. a. Two electrons. b. $Mg \rightarrow Mg^{2+} + 2e^-$. c. Loss of two negatively charged electrons leaves a +2 ion.

3. Award one mark each for Zn atom, two released electrons, and Zn^{2+} ion, with appropriate arrows/labels.

Part D (10 marks)

1. Na +1; Mg +2; Fe +3; Cu +2; O −2.

2. $Fe^{2+} \rightarrow Fe^{3+}$: oxidation (+2 → +3); $Cu^{2+} \rightarrow Cu$: reduction (+2 → 0); $Cl^- \rightarrow Cl_2$: oxidation (−1 → 0); $Mg \rightarrow Mg^{2+}$: oxidation (0 → +2); sulfur +6 → +4: reduction.

Part E (12 marks)

1. Iron loses electrons (oxidation state increases); $Fe \rightarrow Fe^{2+} + 2e^-$; painting, oiling, or galvanising can reduce rusting.

2. Magnesium; 0 → +2; each Mg atom loses two electrons.

3. Zinc; $Zn \rightarrow Zn^{2+} + 2e^-$; electrons released by zinc are gained by Cu^{2+} to form Cu.

4. Award one mark each for a correct oxidised substance, electron-loss explanation, and valid real-world consequence.