

5.9 HONORS CLASS WORKSHEET – REDOX REACTIONS II (OXIDIZING AND REDUCING AGENTS)

1. Explain the meaning of the following terms:

OXIDIZING AGENT	electron acceptor
REDUCING AGENT	electron donor

2. For the following reduction half-equations, identify the atom being reduced and state the change in oxidation number

	Reduction Half-Equation	Atom Being Reduced	Initial oxidation number	Final oxidation number
A	$\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$	Cu	+2	0
b	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$	H	+1	0
c	$\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$	Cl	0	-1
d	$\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}$	Fe	+3	+2
e	$\text{O}_2 + 4\text{H}^+ + 4\text{e}^- \rightarrow 2\text{H}_2\text{O}$	O	0	-2
f	$\text{H}_2\text{SO}_4 + 2\text{H}^+ + 2\text{e}^- \rightarrow \text{SO}_2 + 2\text{H}_2\text{O}$	S	+6	+4
g	$\text{HNO}_3 + 3\text{H}^+ + 3\text{e}^- \rightarrow \text{NO} + 2\text{H}_2\text{O}$	N	+5	+2

3. For the following oxidation half-equations, identify the atom being oxidized and state the change in oxidation number

	Oxidation Half-Equation	Atom Being Oxidized	Initial oxidation number	Final oxidation number
a	$\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$	Zn	0	+2
b	$2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$	Br	-1	0
c	$\text{Sn}^{2+} \rightarrow \text{Sn}^{4+} + 2\text{e}^-$	Sn	+2	+4
d	$\text{H}_2\text{O}_2 \rightarrow 2\text{H}^+ + \text{O}_2 + 2\text{e}^-$	O	-1	0
e	$\text{SO}_3^{2-} + \text{H}_2\text{O} \rightarrow 2\text{H}^+ + \text{SO}_4^{2-} + 2\text{e}^-$	S	+4	+6
f	$\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}^-$	H	0	+1

Name:

Section:

Date:

4. Combine the following pairs of half-equations from questions 2 and 3 to make redox reactions:

(i)	2b and 3a
	Answer: $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$ $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$ $\text{Zn} + 2\text{H}^+ \rightarrow \text{Zn}^{2+} + \text{H}_2$
(ii)	2d and 3c
	Answer: $2(\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+})$ $\text{Sn}^{2+} \rightarrow \text{Sn}^{4+} + 2\text{e}^-$ $2\text{Fe}^{3+} + \text{Sn}^{2+} \rightarrow 2\text{Fe}^{2+} + \text{Sn}^{4+}$
(iii)	2f and 3b
	Answer: $\text{H}_2\text{SO}_4 + 2\text{H}^+ + 2\text{e}^- \rightarrow \text{SO}_2 + 2\text{H}_2\text{O}$ $2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$ $\text{H}_2\text{SO}_4 + 2\text{H}^+ + 2\text{Br}^- \rightarrow \text{Br}_2 + \text{SO}_2 + 2\text{H}_2\text{O}$
(iv)	2g and 3e
	Answer: $2(\text{HNO}_3 + 3\text{H}^+ + 3\text{e}^- \rightarrow \text{NO} + 2\text{H}_2\text{O})$ $3(\text{SO}_3^{2-} + \text{H}_2\text{O} \rightarrow 2\text{H}^+ + \text{SO}_4^{2-} + 2\text{e}^-)$ $2\text{HNO}_3 + 6\text{H}^+ + 3\text{SO}_3^{2-} + 3\text{H}_2\text{O} \rightarrow 2\text{NO} + 4\text{H}_2\text{O} + 6\text{H}^+ + 3\text{SO}_4^{2-}$ $2\text{HNO}_3 + 3\text{SO}_3^{2-} \rightarrow 2\text{NO} + \text{H}_2\text{O} + 3\text{SO}_4^{2-}$
(v)	2e and 3f
	Answer: $\text{O}_2 + 4\text{H}^+ + 4\text{e}^- \rightarrow 2\text{H}_2\text{O}$ $2(\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}^-)$ $\text{O}_2 + 4\text{H}^+ + 2\text{H}_2 \rightarrow 4\text{H}^+ + 2\text{H}_2\text{O}$ $\text{O}_2 + 2\text{H}_2 \rightarrow 2\text{H}_2\text{O}$

5. For each reaction in Q4, identify the oxidizing agent and the reducing agent:

Reaction	Oxidizing Agent	Reducing Agent
4 (i)	H^+	Zn
4 (ii)	Fe^{3+}	Sn^{2+}
4 (iii)	H_2SO_4	Br^-
4 (iv)	HNO_3	SO_3^{2-}
4 (v)	O_2	H_2