

Activity 7D: Common oxidants and reductants and their identification

1. Complete the table below.

Substance	Oxidant or reductant	Half-equation	Observation(s)
oxygen gas	O	$O_2 + 4e \rightarrow 2O^{2-}$	none
hydrogen gas	R	$H_2 \rightarrow 2H^+ + 2e$	none
acidified potassium permanganate solution	O	$MnO_4^- + 8H^+ + 5e \rightarrow Mn^{2+} + 4H_2O$	purple → colourless
potassium iodide solution	R	$2I^- \rightarrow I_2 + 2e^-$	colourless → brown
hydrogen peroxide solution	O	$H_2O_2 + 2H^+ + 2e \rightarrow 2H_2O$	none
	R	$H_2O_2 \rightarrow O_2 + 2H^+ + 2e$	bubbles
sodium hydrogen sulfite solution	R	$HSO_3^- + H_2O \rightarrow HSO_4^- + 2H^+ + 2e$	none
potassium dichromate solution	O	$Cr_2O_7^{2-} + 14H^+ + 6e \rightarrow 2Cr^{3+} + 7H_2O$	orange → green
zinc metal	R	$Zn \rightarrow Zn^{2+} + 2e^-$	grey metal → solution
iron(II) sulfate solution	R	$Fe^{2+} \rightarrow Fe^{3+} + e$	pale green soln → orange/red brown
iodine solution	O	$I_2 + 2e \rightarrow 2I^-$	brown soln becomes colourless

2. Identify the solution (in **brown bold text**), stating whether it is an oxidant or reductant, and write the half-equation for this substance acting as an oxidant or reductant.

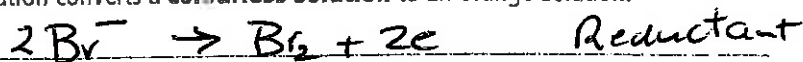
- a. Acidified potassium permanganate solution is decolourised by a **pale-green solution** which goes orange-red brown.



- b. Acidified potassium permanganate solution is decolourised by a **colourless solution** which goes brown.



- c. Acidified hydrogen peroxide solution converts a **colourless solution** to an orange solution.



- d. A colourless solution of potassium iodide converts an **orange-red brown solution** to a black solid (and a very light green solution).

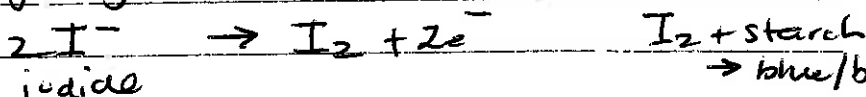


3. Explain the following observations, writing half-equations and an overall equation where appropriate.

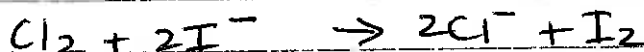
- a. A pale-green gas passed over moist starch-iodide paper produces a blue-black stain on the paper.



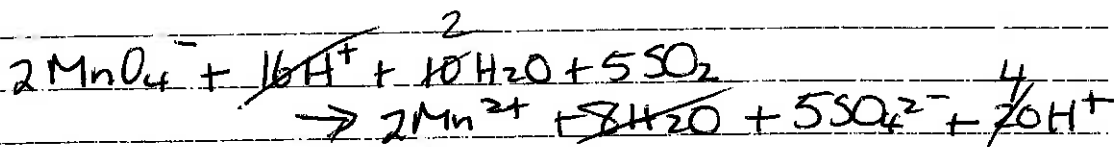
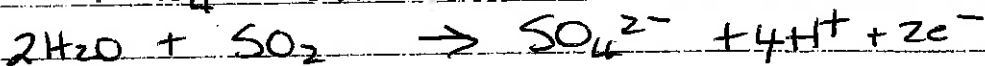
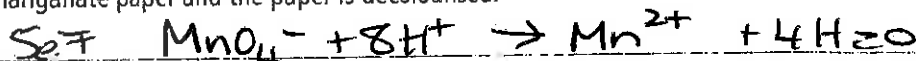
green gas



iodide

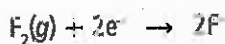


- b. A gas, which appears in the air as white fumes, with a choking smell, is passed over acidified potassium permanganate paper and the paper is decolourised.



Halogens as oxidants

The halogens are the elements of Group 17, namely fluorine, chlorine, bromine and iodine. These elements are oxidants:



The oxidising strength decreases moving down Group 17 (ie as atomic numbers increase):

strongest oxidant $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$ weakest oxidant

Reactions of halogens with other elements

Halogens reacting with metals

Halogens have vigorous/violent reactions with most metals, producing ionic compounds.