Year 12 Science: Oxidation and reduction: electrons, colours and equations

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. Find the oxidation number of Cr in $Cr_2O_7^{2-}$.

2. Find the oxidation number of N in NO_3^- and in NO_2, and say whether N is oxidised or reduced when NO_3^- becomes NO_2.

3. Balance the half equation for hydrogen peroxide acting as a reductant: $H_2O_2 \rightarrow O_2$.

4. Acidified hydrogen peroxide is added to colourless potassium iodide solution. Write the overall equation and describe what you see.

5. A copper wire is put in colourless silver nitrate solution. Write the overall equation, name the oxidant, and describe two observations.

Fix the mistake

6. Correct this statement: "The oxidant is the substance that gets oxidised."

7. Correct this statement: "$MnO_4^- + 8H^+ + 5Fe^{2+} + 5e^- \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O + 5e^-$"

8. Correct this statement: "Observation: Mn^{2+} ions are formed."

9. Correct this statement: "Mn has an oxidation number of 7+ in MnO_4^-."

Answer key (for parents and tutors)

1. Find the oxidation number of Cr in $Cr_2O_7^{2-}$.
   $2x + 7(-2) = -2$, so Cr = +6.

2. Find the oxidation number of N in NO_3^- and in NO_2, and say whether N is oxidised or reduced when NO_3^- becomes NO_2.
   NO_3^-: $x + 3(-2) = -1$, so N = +5; NO_2: $x + 2(-2) = 0$, so N = +4; N falls from +5 to +4, so it is reduced.

3. Balance the half equation for hydrogen peroxide acting as a reductant: $H_2O_2 \rightarrow O_2$.
   $H_2O_2 \rightarrow O_2 + 2H^+ + 2e^-$.

4. Acidified hydrogen peroxide is added to colourless potassium iodide solution. Write the overall equation and describe what you see.
   $H_2O_2 + 2H^+ + 2e^- \rightarrow 2H_2O$ and $2I^- \rightarrow I_2 + 2e^-$ add to $H_2O_2 + 2H^+ + 2I^- \rightarrow 2H_2O + I_2$; the colourless solution turns brown as iodine forms.

5. A copper wire is put in colourless silver nitrate solution. Write the overall equation, name the oxidant, and describe two observations.
   $Cu + 2Ag^+ \rightarrow Cu^{2+} + 2Ag$; the oxidant is Ag^+; grey-silver crystals grow on the wire and the solution slowly turns blue.

6. Correct this statement: "The oxidant is the substance that gets oxidised."
   The oxidant takes electrons, so it is reduced; the reductant is the one oxidised.

7. Correct this statement: "$MnO_4^- + 8H^+ + 5Fe^{2+} + 5e^- \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O + 5e^-$"
   Electrons must cancel completely; the overall equation never shows e^-.

8. Correct this statement: "Observation: Mn^{2+} ions are formed."
   Describe what you see: the purple solution turns colourless.

9. Correct this statement: "Mn has an oxidation number of 7+ in MnO_4^-."
   Oxidation numbers put the sign first: +7. A charge such as 2+ is written after.