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Oxidation and Reduction

For each question, choose the most suitable option and write the letter (A, B, C or D) in the brackets provided.

Level 1

1. Sulfur dioxide is a reducing agent. Which of the following can be used to identify sulfur dioxide?
- A Acidified potassium iodide
 B Acidified potassium manganate(VII)
 C Dilute sodium hydroxide solution
 D Hydrogen peroxide ()

Level 2

2. What are the oxidation states of hydrogen and oxygen in hydrogen peroxide, H_2O_2 ?

	Oxidation State of Hydrogen	Oxidation State of Oxygen
A	+1	-1
B	+1	-2
C	-1	-1
D	-1	-2

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3. Which of the following is an example of a redox reaction?

- A $\text{AgNO}_3 + \text{KBr} \longrightarrow \text{KNO}_3 + \text{AgBr}$
 B $\text{CH}_4 + 2\text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
 C $\text{CuO} + \text{H}_2\text{SO}_4 \longrightarrow \text{CuSO}_4 + \text{H}_2\text{O}$
 D $\text{HCl} + \text{NaOH} \longrightarrow \text{NaCl} + \text{H}_2\text{O}$

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4. Determine the oxidation state of vanadium in $\text{K}_2\text{V}_2\text{O}_5$.

- A +1
 B +2
 C +4
 D +5

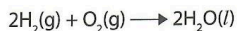
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5. In which reaction are I^- ions acting as the **reducing agent**?

- A $\text{Ag}^+ + \text{I}^- \longrightarrow \text{AgI}$
 B $\text{Cl}_2 + 2\text{I}^- \longrightarrow \text{I}_2 + 2\text{Cl}^-$
 C $\text{I}_2 + 2\text{Na} \longrightarrow 2\text{NaI}$
 D $2\text{I}^- + 2\text{H}^+ \longrightarrow 2\text{HI}$

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6. The formation of water from its elements can be represented by the following equation.



Which of the following is **true** of this redox reaction?

- A Hydrogen gains electrons to form water.
 B Oxygen loses electrons to form water.
 C The oxidation state of hydrogen increases from hydrogen gas to water.
 D The oxidation state of oxygen increases from oxygen gas to water. ()

7. Which of the following reactions shows the greatest **decrease** in oxidation state of the underlined element?

- A $\text{Cl}_2 + \text{H}_2\text{O} \longrightarrow \text{HCl} + \text{HOC}$
 B $2\text{MnO}_4^- + 8\text{H}^+ + 5\text{Fe}^{2+} \longrightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O} + 5\text{Fe}^{3+}$
 C $2\text{NaClO} \longrightarrow \text{NaClO}_2 + \text{NaCl}$
 D $\text{S} + \text{O}_2 \longrightarrow \text{SO}_2$ ()

8. Hydrogen peroxide is added to separate solutions of acidified potassium manganate(VII) and acidified potassium iodide.

Which of the following would be observed?

	Acidified Potassium Manganate(VII)	Acidified Potassium Iodide
A	Colourless solution turns purple.	Colourless solution turns brown.
B	No change is observed.	Brown solution decolourises.
C	Purple solution decolourises.	Brown solution decolourises.
D	Purple solution decolourises.	Colourless solution turns brown.

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9. When some iron filings are added into a solution of iron(III) chloride, the iron filings dissolved and the yellow solution turned green.

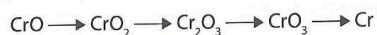
Which of the following are **true** of the reaction?

	Equation	Oxidised Species	Reduced Species
A	$\text{Fe} + 2\text{Fe}^{3+} \longrightarrow 3\text{Fe}^{2+}$	Fe^{2+}	Fe^{2+}
B	$\text{Fe} + 2\text{Cl}^- \longrightarrow \text{FeCl}_2$	Cl^-	Fe
C	$\text{Fe} + 2\text{Fe}^{3+} \longrightarrow 3\text{Fe}^{2+}$	Fe	Fe^{3+}
D	$\text{Fe} + \text{Cl}_2 \longrightarrow \text{FeCl}_2$	Fe	Cl_2

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Level 3

10. Chromium compounds can undergo the several stages of changes in a reaction.

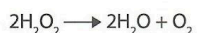


In how many stages was chromium **oxidised** and what is the greatest **increase** in the oxidation state of chromium?

	Number of Stages Where Chromium was Oxidised	Greatest Increase in Oxidation State of Chromium
A	1	2
B	2	3
C	2	6
D	3	2

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11. The following equation shows the decomposition of hydrogen peroxide.

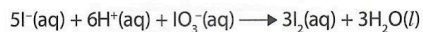


Which of the following statements about the reaction is **correct**?

- A** Hydrogen is oxidised to form water.
B Oxygen is only oxidised to form oxygen gas.
C Oxygen is oxidised to form oxygen gas and reduced to form water.
D The decomposition of hydrogen peroxide is not a redox reaction.

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12. Potassium iodide reacts with sodium iodate(V) according to the following ionic equation.



Which of the following statements are **true**?

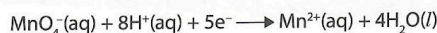
- 1 H^+ is reduced.
 2 I^- is oxidised.
 3 IO_3^- is the reducing agent.
 4 The oxidation state of iodine decreases from +5 in IO_3^- to 0 in I_2 .
 5 The pH of the solution increases after some time.

- A** 1, 2 and 4 only
B 1, 3 and 5 only
C 2, 3 and 5 only
D 2, 4 and 5 only

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13. Iron(II) sulfate can be oxidised by acidified potassium manganate(VII).

The half-equations involved in this reaction are as follows.



Which of the following statements is **incorrect** about the reaction?

- A The colour of acidified potassium manganate(VII) changes from colourless to purple.
- B The number of moles of electrons lost during oxidation is the same as the number of moles of electrons gained during reduction.
- C The final colour of the reaction mixture is yellow.
- D The overall ionic equation is

$$5\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^{-}(\text{aq}) + 8\text{H}^{+}(\text{aq}) \longrightarrow 5\text{Fe}^{3+}(\text{aq}) + \text{Mn}^{2+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l}).$$

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14. When oxygen combines with Group 1 metals, oxides of different formulae can be formed.

Arrange the following oxides of rubidium in **ascending** order of the oxidation state of oxygen.

- A RbO_2 , Rb_2O , Rb_2O_2
- B RbO_2 , Rb_2O_2 , Rb_2O
- C Rb_2O , Rb_2O_2 , RbO_2
- D Rb_2O , RbO_2 , Rb_2O_2

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15. The following equations below represent the reactions between different Group 17 gases and their compounds.



Which of the following statements is **correct**?

- A Bromine is a stronger oxidising agent than chlorine.
- B Chlorine acts as a reducing agent when it forms KCl .
- C Chlorine is a stronger oxidising agent than bromine.
- D Potassium iodide cannot be oxidised by chlorine.

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