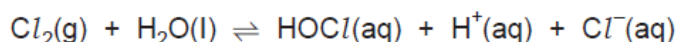


## Electrochemistry – 2023 AS Chemistry 9701

1. **Nov/2023/Paper\_9701/11/No.11**

HOCl(aq) is the molecule that kills bacteria when chlorine is added to water.

The following reaction produces this molecule.

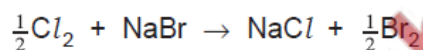


Which statement about this reaction is correct?

- A Chlorine is both oxidised and reduced.
- B Chlorine is oxidised but **not** reduced.
- C Hydrogen is both oxidised and reduced.
- D Hydrogen is oxidised but **not** reduced.

2. **Nov/2023/Paper\_9701/12/No.12**

Chlorine reacts with sodium bromide.

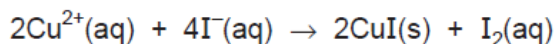


Which words correctly describe this reaction?

- 1 redox
  - 2 displacement
  - 3 disproportionation
- A 1, 2 and 3  
B 1 and 2 only  
C 1 only  
D 2 only

3. **Nov/2023/Paper\_9701/12/No.13**

The equation for the reaction between aqueous copper ions and aqueous iodide ions is as follows.



What is the change in oxidation state of copper?

- A +2 to -1      B +2 to 0      C +2 to +1      D +4 to +2

4. Nov/2023/Paper\_9701/21/No.3(a)

Potassium chlorate,  $KClO_3$ , is widely used as an oxidising agent and to make  $O_2(g)$ .

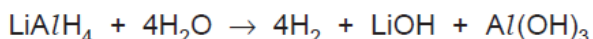
(a) Define oxidising agent.

.....  
..... [1]

5. June/2023/Paper\_9701/12/No.11

$LiAlH_4$  contains  $AlH_4^-$  ions in which aluminium has an oxidation state of +3.

$LiAlH_4$  reacts with water, as shown.



In this reaction, each of the four water molecules produces one hydroxide ion. It does this by losing one  $H^+$  ion, which reacts with the  $LiAlH_4$ .

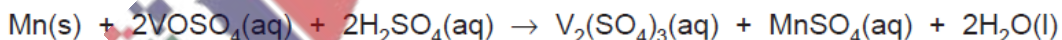
Which changes in oxidation number occur in this reaction?

- A Al increases by 1 and H decreases by 1.
- B H decreases by 2 and also increases by 1.
- C H increases by 1 and also decreases by 1.
- D O decreases by 1 and H increases by 1.

6. June/2023/Paper\_9701/12/No.12

The vanadium salt,  $VO_2^+$ , is soluble in water and reacts readily with powdered manganese in dilute sulfuric acid.

The equation for the reaction is shown.

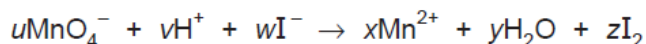


Which statement about this reaction is correct?

- A Hydrogen is oxidised in the reaction.
- B Manganese is the reducing agent in this reaction.
- C Sulfuric acid is the oxidising agent in this reaction.
- D The oxidation state of the vanadium changes from +5 to +3.

7. June/2023/Paper\_9701/13/No.2

The ionic equation shows iodide ions reacting with manganate(VII) ions in acidic solution.



The letters  $u$ ,  $v$ ,  $w$ ,  $x$ ,  $y$  and  $z$  all represent whole numbers. Two or more of  $u$ ,  $v$ ,  $w$ ,  $x$ ,  $y$  and  $z$  are the same as each other.

What is the lowest possible value of  $v$ ?

- A 2                      B 8                      C 10                      D 16

8. June/2023/Paper\_9701/13/No.6

Electronegativity differences can be used to help determine the oxidation number of an atom in different species. A number of rules are used which include:

- The more electronegative atom is given a negative oxidation number.
- Hydrogen is more electronegative than Group 1 metals.
- Oxygen is more electronegative than hydrogen.

Which row is correct?

	equation of reaction	redox reaction	disproportionation reaction
A	$2\text{CrO}_4^{2-} + 2\text{H}^+ \rightarrow \text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{O}$	✓	X
B	$\text{NaH} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2$	✓	✓
C	$3\text{MnO}_4^{2-} + 4\text{H}^+ \rightarrow \text{MnO}_2 + 2\text{MnO}_4^-$	✓	✓
D	$\text{VO}_3^- + 2\text{H}^+ \rightarrow \text{VO}_2^+ + \text{H}_2\text{O}$	✓	X

9. June/2023/Paper\_9701/13/No.14

Which particle contains nitrogen in the same oxidation state as in the ion  $\text{N}_2\text{O}_2^{2-}$ ?

- A  $\text{NH}_2\text{F}$               B  $\text{N}_2\text{O}_4$               C  $\text{NO}_3^-$               D  $\text{HNF}_2$

10. March/2023/Paper\_9701/12/No.6

The ore psilomelane may be considered to have the general formula  $\text{Ba}(\text{Mn}^{x+})(\text{Mn}^{y+})_8\text{O}_{16}(\text{OH})_4$ .

In this general formula,  $x+$  and  $y+$  are the two different oxidation states of manganese in psilomelane.

What could be the values of  $x$  and  $y$ ?

	$x$	$y$
<b>A</b>	2	4
<b>B</b>	6	4
<b>C</b>	6	3
<b>D</b>	7	3

11. March/2023/Paper\_9701/12/No.7

Silicon reacts with a mixture of calcium oxide and magnesium oxide at  $1200\text{ }^\circ\text{C}$ .



Which statement about this reaction is correct?

- A** Calcium is reduced and silicon is neither oxidised nor reduced.
- B** Magnesium is reduced and calcium is neither oxidised nor reduced.
- C** Magnesium is reduced and silicon is neither oxidised nor reduced.
- D** Silicon is reduced and calcium is neither oxidised nor reduced.