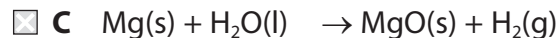
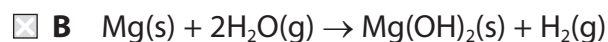
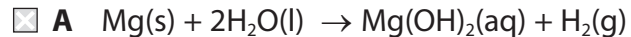


1 Which is the equation for the reaction when steam passes over strongly heated magnesium?



(Total for Question = 1 mark)

2 Which one of the following substances forms when a few drops of concentrated sulfuric acid is added to sodium chloride?



(Total for Question = 1 mark)

- 3 This question is about the reaction between sodium carbonate solution and dilute nitric acid.



(a) What is the **ionic** equation for this reaction?

(1)

- A** $\text{Na}_2\text{CO}_3(\text{aq}) + 2\text{H}^+(\text{aq}) \rightarrow 2\text{Na}^+(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
- B** $\text{Na}^+(\text{aq}) + \text{NO}_3^-(\text{aq}) \rightarrow \text{NaNO}_3(\text{aq})$
- C** $\text{CO}_3^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
- D** $\text{CO}_3^{2-}(\text{aq}) + 2\text{HNO}_3(\text{aq}) \rightarrow 2\text{NO}_3^-(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$

(b) What is the volume of carbon dioxide produced from the complete reaction of 0.10 mol of nitric acid at room temperature and pressure?

[1 mol of any gas occupies 24 dm³ at room temperature and pressure.]

(1)

- A** 1.2 dm³
- B** 1.8 dm³
- C** 2.4 dm³
- D** 3.6 dm³

(c) What volume of sodium carbonate solution of concentration 0.500 mol dm⁻³, would be needed to completely react with 25.0 cm³ of nitric acid of concentration 0.250 mol dm⁻³?

(1)

- A** 6.25 cm³
- B** 12.50 cm³
- C** 18.75 cm³
- D** 25.00 cm³

(Total for Question = 3 marks)

4 In which of the following reactions is sulfuric(IV) acid, H_2SO_3 , acting as an oxidizing agent?

- A $\text{H}_2\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{HSO}_3^-$
- B $\text{H}_2\text{SO}_3 \rightarrow \text{SO}_2 + \text{H}_2\text{O}$
- C $\text{H}_2\text{SO}_3 + 2\text{FeCl}_3 + \text{H}_2\text{O} \rightarrow 2\text{FeCl}_2 + \text{H}_2\text{SO}_4 + 2\text{HCl}$
- D $\text{H}_2\text{SO}_3 + 2\text{H}_2\text{S} \rightarrow 3\text{H}_2\text{O} + 3\text{S}$

(Total for Question = 1 mark)

5 Which of the following is a redox reaction?

- A $\text{Cr}_2\text{O}_7^{2-} + 2\text{OH}^- \rightarrow 2\text{CrO}_4^{2-} + \text{H}_2\text{O}$
- B $[\text{Cu}(\text{H}_2\text{O})_6]^{2+} + 4\text{Cl}^- \rightarrow [\text{CuCl}_4]^{2-} + 6\text{H}_2\text{O}$
- C $4\text{OH}^- + 4\text{MnO}_4^- \rightarrow 4\text{MnO}_4^{2-} + 2\text{H}_2\text{O} + \text{O}_2$
- D $[\text{Fe}(\text{H}_2\text{O})_6]^{3+} + 3\text{OH}^- \rightarrow [\text{Fe}(\text{H}_2\text{O})_3(\text{OH})_3] + 3\text{H}_2\text{O}$

(Total for Question = 1 mark)

6 The oxidation state of nickel is **not** +2 in

- A $[\text{Ni}(\text{CO})_4]$
- B $[\text{Ni}(\text{H}_2\text{O})_4(\text{OH})_2]$
- C $[\text{Ni}(\text{NH}_3)_6]^{2+}$
- D $[\text{Ni}(\text{CN})_4]^{2-}$

(Total for Question = 1 mark)

7 What is the oxidation number of phosphorus in P_4O_6 ?

- A +3
- B +4
- C +5
- D +6

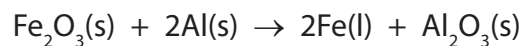
(Total for Question = 1 mark)

8 What is the oxidation number of chlorine in Cl_2O_7 ?

- A -1
- B +1
- C -7
- D +7

(Total for Question = 1 mark)

9 The thermite reaction, shown below, is a useful industrial process.



The iron in this reaction undergoes

- A disproportionation.
- B oxidation.
- C redox.
- D reduction.

(Total for Question = 1 mark)

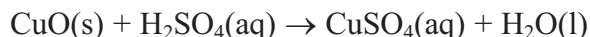
10 In nitric(V) acid, HNO_3 , the oxidation number of the nitrogen is +5

This means that the **nitrogen** in nitric acid

- A has five electrons in its outer shell.
- B is an ion with a charge of +5.
- C would have a charge of +5 if its bonding electrons were transferred completely.
- D forms five covalent bonds in total.

(Total for Question = 1 mark)

11 The equation representing the reaction between copper(II) oxide and dilute sulfuric acid is



The **ionic** equation for the reaction is

- A $\text{Cu}^{2+}\text{(s)} + \text{SO}_4^{2-}\text{(aq)} \rightarrow \text{CuSO}_4\text{(aq)}$
- B $\text{O}^{2-}\text{(s)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{H}_2\text{O(l)} + \text{SO}_4^{2-}\text{(aq)}$
- C $\text{CuO(s)} + 2\text{H}^+\text{(aq)} \rightarrow \text{Cu}^{2+}\text{(aq)} + \text{H}_2\text{O(l)}$
- D $\text{CuO(s)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{Cu}^{2+}\text{SO}_4^{2-}\text{(aq)} + \text{H}_2\text{O(l)}$

(Total for Question 1 mark)

12 The oxidation number of sulfur in sodium hydrosulfide, NaHS, is

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

(Total for Question 1 mark)

13 Which of the following is **not** a disproportionation reaction?

- A $\text{Cl}_2 + 2\text{OH}^- \rightarrow \text{Cl}^- + \text{ClO}^- + \text{H}_2\text{O}$
- B $\text{Cu}_2\text{O} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{Cu} + \text{H}_2\text{O}$
- C $3\text{IO}^- \rightarrow 2\text{I}^- + \text{IO}_3^-$
- D $\text{Cu} + 4\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{H}_2\text{O} + 2\text{NO}_2$

(Total for Question = 1 mark)

14 When solutions of iodine are titrated with aqueous sodium thiosulfate solution, $\text{Na}_2\text{S}_2\text{O}_3(\text{aq})$, the thiosulfate ions are oxidized to

- A $\text{S}_2\text{O}_4^{2-}$
- B $\text{S}_2\text{O}_6^{2-}$
- C $\text{S}_2\text{O}_8^{2-}$
- D $\text{S}_4\text{O}_6^{2-}$

(Total for Question = 1 mark)

15 What is the oxidation number of chlorine in the ClO_3^- ion?

- A -1
- B +4
- C +5
- D +6

(Total for Question = 1 mark)

16 Which of these reactions is **not** a redox reaction?

- A $\text{Mg}(\text{NO}_3)_2(\text{s}) \rightarrow \text{MgO}(\text{s}) + 2\text{NO}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g})$
- B $\text{HCl}(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l})$
- C $\text{Fe}(\text{s}) + \text{CuSO}_4(\text{aq}) \rightarrow \text{FeSO}_4(\text{aq}) + \text{Cu}(\text{s})$
- D $\text{Cl}_2(\text{aq}) + 2\text{Br}^-(\text{aq}) \rightarrow 2\text{Cl}^-(\text{aq}) + \text{Br}_2(\text{aq})$

(Total for Question = 1 mark)

17 Iodine can react with sodium hydroxide solution to form $\text{NaIO}_3(\text{aq})$, according to the equation below.



Which of the statements about the reaction is **false**?

- A The oxidation number of some iodine atoms goes up.
- B At high temperatures $\text{NaIO}(\text{aq})$ also forms.
- C Sodium ions are spectator ions.
- D The oxidation number of some iodine atoms goes down.

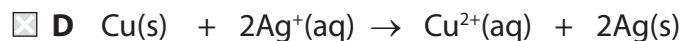
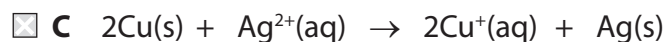
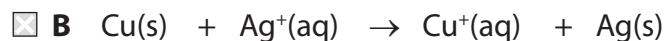
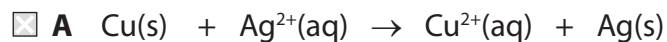
(Total for Question = 1 mark)

18 When aqueous solutions of barium chloride and potassium sulfate are mixed, a white precipitate forms. The ionic equation for the reaction is

- A $\text{K}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{KCl}(\text{s})$
- B $\text{K}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{KCl}_2(\text{s})$
- C $\text{Ba}^+(\text{aq}) + \text{SO}_4^-(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$
- D $\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$

(Total for Question = 1 mark)

19 When 0.635 g of copper (relative atomic mass, RAM = 63.5) is added to an excess of silver nitrate solution, 2.158 g of silver (RAM = 107.9) form. The ionic equation for the reaction is



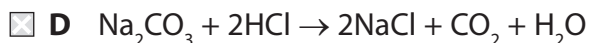
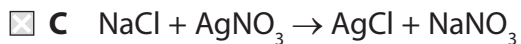
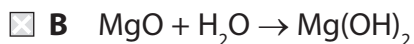
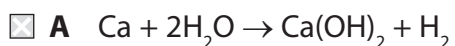
(Total for Question = 1 mark)

20 The oxidation number of sulfur in thiosulfate ions, $\text{S}_2\text{O}_3^{2-}$, is



(Total for Question = 1 mark)

21 Which of the following is a redox reaction?



(Total for Question = 1 mark)

22 What is the oxidation number of oxygen in OF_2 ?

A - 2

B - 1

C +1

D +2

(Total for Question 1 mark)

23 In which of the following reactions is sulfuric(IV) acid, H_2SO_3 , acting as an oxidizing agent?

A $2\text{NaOH} + \text{H}_2\text{SO}_3 \rightarrow \text{Na}_2\text{SO}_3 + 2\text{H}_2\text{O}$

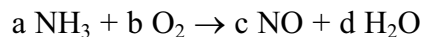
B $2\text{FeCl}_3 + \text{H}_2\text{SO}_3 + \text{H}_2\text{O} \rightarrow 2\text{FeCl}_2 + \text{H}_2\text{SO}_4 + 2\text{HCl}$

C $2\text{H}_2\text{S} + \text{H}_2\text{SO}_3 \rightarrow 3\text{H}_2\text{O} + 3\text{S}$

D $\text{H}_2\text{SO}_3 \rightarrow \text{H}_2\text{O} + \text{SO}_2$

(Total for Question 1 mark)

24 For the oxidation of ammonia



the values of the coefficients in the balanced equation are

A $a=2, b=3, c=2$ and $d=3$

B $a=4, b=7, c=4$ and $d=4$

C $a=4, b=5, c=4$ and $d=6$

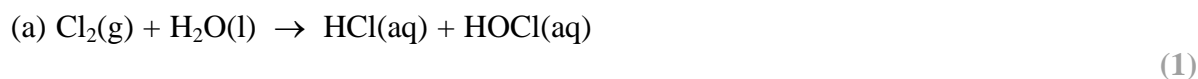
D $a=6, b=7, c=6$ and $d=9$

(Total for Question 1 mark)

25 Chemical reactions may involve

- A oxidation
- B reduction
- C no change in oxidation number
- D disproportionation

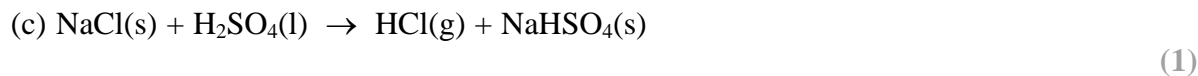
Which of the terms above best describes what happens to the **chlorine** in the following reactions?



- A
- B
- C
- D



- A
- B
- C
- D



- A
- B
- C
- D

(Total for Question = 3 marks)