

9.1 Redox Processes

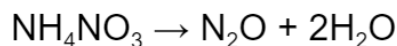
Question Paper

Course	DP IB Chemistry
Section	9. Redox Processes
Topic	9.1 Redox Processes
Difficulty	Hard

Time allowed: 20
Score: /10
Percentage: /100

Question 1

When heated ammonium nitrate, NH_4NO_3 , can decompose explosively.



The nitrogen atoms in NH_4NO_3 have different oxidation numbers.

What are the oxidation numbers for each of the N atoms when this reaction proceeds?

- A** +4, -4 **B** -2, -4 **C** +4, -6 **D** +2, +6

[1 mark]

Question 2

In winemaking, to prevent the oxidation of ethanol by air, sulfur dioxide (SO_2) is added. In order to calculate the amount of SO_2 , a sample is titrated with iodine (I_2). The reaction is a one to one ratio for SO_2 and I_2 to produce H_2SO_4 as well as another product.

What is the change in the oxidation number of sulfur in this reaction?

- A** +2 to +6 **B** +4 to +6 **C** +2 to +4 **D** +4 to +5

[1 mark]

Question 3

20 cm³ of a 0.60 mol dm⁻³ solution of thallium nitrate (TlNO₃) requires 40 cm³ of 0.20 mol dm⁻³ acidified ammonium metavanadate (NH₄VO₃) to produce Tl³⁺_(aq) ions.

Vanadium is the only element reduced in this reaction. What is the oxidation number of the reduced vanadium?

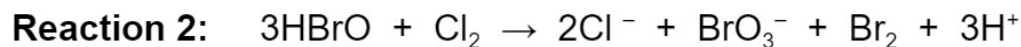
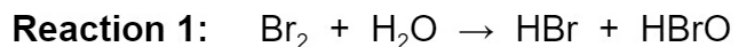
- A** +1 **B** +2 **C** +3 **D** +4

[1 mark]

Question 4

If a solution contains both bromine and chlorine, BrO₃⁻ ions are produced.

The reactions leading to the production of BrO₃⁻ ions are shown below:



- 1 Chlorine is reduced in reaction 2
- 2 Bromine is reduced in both reaction 1 and reaction 2
- 3 Bromine is oxidised in both reaction 1 and reaction 2

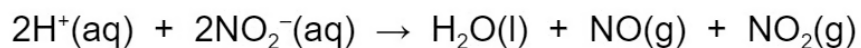
Which statements about these reactions are correct?

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

[1 mark]

Question 5

If a dilute acid is added to an aqueous solution containing nitrite ions, NO_2^- , two different nitrogen compounds are released as gases.



Which of the three statements below correctly describe the process?

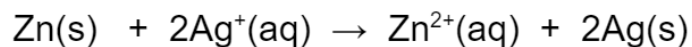
- 1 The $\text{H}^+(\text{aq})$ ion is oxidised by $\text{NO}_2^-(\text{aq})$.
- 2 Some nitrogen atoms are oxidised, and some nitrogen atoms are reduced
- 3 The $\text{H}^+(\text{aq})$ ion acts as a catalyst.

A 1 and 2 only **B** 2 only **C** 2 and 3 only **D** 1, 2 and 3

[1 mark]

Question 6

A voltaic cell consisting of zinc and silver is set up. The following overall reaction takes place:



What are the correct half-equations at each electrode?

	Anode (negative electrode)	Cathode (positive electrode)
A	$\text{Ag(s)} \rightarrow \text{Ag}^+(\text{aq}) + \text{e}^-$	$\text{Zn}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Zn(s)}$
B	$\text{Ag}^+(\text{aq}) + \text{e}^- \rightarrow \text{Ag(s)}$	$\text{Zn(s)} \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{e}^-$
C	$\text{Zn(s)} \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{e}^-$	$\text{Ag}^+(\text{aq}) + \text{e}^- \rightarrow \text{Ag(s)}$
D	$\text{Zn}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Zn(s)}$	$\text{Ag(s)} \rightarrow \text{Ag}^+(\text{aq}) + \text{e}^-$

[1 mark]

Question 7

Below are four descriptions about the movements of electrons in voltaic cells.

Which is the correct statement?

- A** Electrons flow through the external wire from the cathode (positive electrode) to the anode (negative electrode)
- B** Electrons flow through the external wire from the anode (negative electrode) to the cathode (positive electrode)
- C** Electrons flow through the salt bridge from the oxidizing agent to the reducing agent
- D** Electrons flow through the salt bridge from the reducing agent to the oxidizing agent

[1 mark]

Question 8

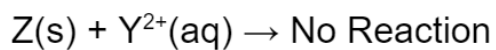
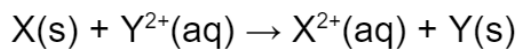
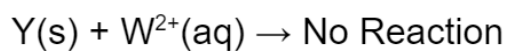
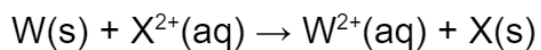
When molten magnesium chloride is electrolysed using graphite electrodes what are the products?

	Product at cathode (negative electrode)	Product at anode (positive electrode)
A	magnesium	chlorine
B	chlorine	magnesium
C	magnesium ions	chloride ions
D	chloride ions	magnesium ions

[1 mark]

Question 9

Use the information given about four reactions of metals to determine the order of reactivity from most reactive to least reactive



- A** $W > Y > X > Z$
- B** $X > W > Z > Y$
- C** $Z > Y > W > X$
- D** $W > X > Y > Z$

[1 mark]

Question 10

Below are three statements about voltaic cells.

- I. A redox reaction takes place which produces electrical energy
- II. At the cathode an oxidation reaction occurs
- III. Electrons move from the anode to the cathode

The correct statements are

- A I and II only
- B I and III only
- C II and III only
- D I, II and III

[1 mark]