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IB Chemistry: SL

9.1 Redox Processes

CHEMISTRY

SL

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

If a solution contains both bromine and chlorine, BrO_3^- ions are produced.
The reactions leading to the production of BrO_3^- ions are shown below:

Reaction 1: $Br_2 + H_2O \rightarrow HBr + HBrO$

Reaction 2: $3HBrO + Cl_2 \rightarrow 2Cl^- + BrO_3^- + Br_2 + 3H$

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 2

When heated ammonium nitrate, NH NO , can decompose explosively.

$$NH_4NO_3 \rightarrow N_2O + 2H_2O$$

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 3

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 to produce H_2SO_4 as well as another product.

A. +2 to +6
B. +4 to +6
C. +2 to +4
D. +4 to +5

[1 mark]

Question 4

20 cm^3 of a 0.60 mol^{-3} dm solution of thallium nitrate ($TlNO_3$) requires 40 cm^3 of 0.20 mol^{-3} dm acidified ammonium metavanadate (NH_4VO_3) to produce $Tl^{3+}_{(aq)}$ 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 5

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 6

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 7

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

$W(s) + X^{2+}(aq) \rightarrow W^{2+}(aq) + X(s)$
$Y(s) + W^{2+}(aq) \rightarrow$ No Reaction
$X(s) + Y^{2+}(aq) \rightarrow X^{2+}(aq) + Y(s)$
$Z(s) + Y^{2+}(aq) \rightarrow$ No Reaction

A. W > Y > X > Z
B. X > W > Z > Y
C. Z > Y > W > X
D. W > X > Y > Z

[1 mark]

Question 8

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]

Question 9

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

$$2H^+(aq) + 2NO_2^-(aq) \rightarrow H_2O(l) + NO(g) + NO_2(g)$$

Which of the three statements below correctly describe the process?

1 The H^+ (aq) ion is oxidised by NO_2^- (aq).
2 Some nitrogen atoms are oxidised, and some nitrogen atoms are reduced
3 The H^+ (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 10

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

$$Zn(s) + 2Ag^+ (aq) \rightarrow Zn^{2+}(aq) + 2Ag(s)$$

What are the correct half-equations at each electrode?

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

[1 mark]