9.1 Redox Processes

Question Paper

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

Time allowed: 20

Score: /10

Percentage: /100

Question 1

Oxidation numbers can be used to balance equations. Chlorine and hot aqueous sodium hydroxide react to produce chloride ions, chlorate ions and water.

What are the values of the coefficients **p**, **r** and **s** in the equation?

$$\mathbf{p}Cl_2(g) + \mathbf{q}OH^-(aq) \rightarrow \mathbf{r}Cl^-(aq) + \mathbf{s}ClO_3^-(aq) + \mathbf{t}H_2O(l)$$

	p	r	s
A	3	5	1
B	3	6	2
C	2	5	1
D	2	4	2

[1 mark]

Question 2

The chemistry of the Group VII elements often involves redox processes.
Which of the following statements is correct?

A Bromine can oxidise chloride ions

B Iodide ions are the weakest reducing agent of the first four Group VII ions

C In reactions with water, chlorine is oxidised and reduced

D Fluorine is a weaker oxidising agent than chlorine

[1 mark]

Question 3

Four reactions are shown below. In which reaction is the species shown in bold acting as an oxidising agent?

A $Cr_2O_7^{2-} + 8H^+ + \mathbf{3SO_3^{2-}} \rightarrow 2Cr^{3+} + 4H_2O + 3SO_4^{2-}$

B $Mg + \mathbf{Fe^{2+}} \rightarrow Mg^{2+} + Fe$

C $Cl_2 + \mathbf{2Br^-} \rightarrow 2Cl^- + Br_2$

D $Fe_2O_3 + \mathbf{3CO} \rightarrow 2Fe + 3CO_2$

[1 mark]

Question 4

In which compound are there two different elements with the same oxidation number?

A $Mg(OH)_2$

B Na_2SO_4

C $HClO$

D NH_4Cl

[1 mark]

Question 5

When sulfuric acid and sodium iodide react, one of the reactions that takes place is shown by the equation below:

$$8NaI + 9H_2SO_4 \rightarrow 8NaHSO_4 + 4I_2 + H_2S + 4H_2O$$

Which species has been oxidised in this reaction?

A I^- **B** SO_4^{2-} **C** Na^+ **D** H^+

[1 mark]

Question 6

The following reaction can be used to determine the mass of titanium dioxide in an ore.

$$3TiO_2 + 4BrF_3 \rightarrow 3TiF_4 + 2Br_2 + 3O_2$$

Which element increases in oxidation number in this reaction?

A fluorine

B bromine

C titanium

D oxygen

[1 mark]

Question 7

In which reaction does hydrogen behave as an oxidizing agent?

A $2Na + H_2 \rightarrow 2NaH$

B $N_2 + 3H_2 \rightarrow 2NH_3$

C $H_2 + Cl_2 \rightarrow 2HCl$

D $C_2H_4 + H_2 \rightarrow C_2H_6$

[1 mark]

Question 8

When solid potassium halides are added to concentrated sulfuric acid, the following reactions take place:

reaction 1 $2KBr + 2H_2SO_4 \rightarrow K_2SO_4 + SO_2 + Br_2 + 2H_2O$

reaction 2 $8KI + 5H_2SO_4 \rightarrow 4K_2SO_4 + H_2S + 4I_2 + 4H_2O$

reaction 3 $2KCl + H_2SO_4 \rightarrow K_2SO_4 + 2HCl$

In each reaction, what is the largest change in the oxidation number of sulfur?

	Reaction 1	Reaction 2	Reaction 3
A	1	4	1
B	2	4	0
C	2	8	0
D	4	8	1

[1 mark]

Question 9

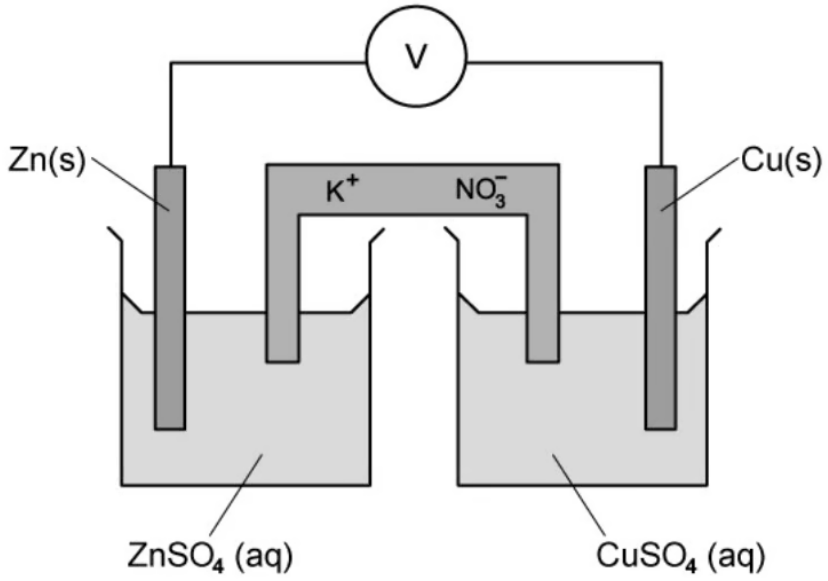
What is formed at the electrodes during the electrolysis of molten potassium iodide?

	Positive electrode	Negative electrode
A	K^+	I^-
B	K	I_2
C	I^-	K^+
D	I_2	K

[1 mark]

Question 10

Below is a diagram of a voltaic cell. When the cell is running, what is happening in the salt bridge?



A K^+ ions flow to the zinc half-cell and NO_3^- ions flow to the copper half-cell

B K^+ ions flow to the copper half-cell and NO_3^- ions flow to the zinc half-cell

C K^+ and NO_3^- ions flow to the copper half-cell

D K^+ and NO_3^- ions flow to the zinc half-cell

[1 mark]