

## Electrolysis & Lithosphere online test

### QUESTION 1: MULTIPLE CHOICE

1.1 Which ONE of the following equations represents a REDOX reaction?

- A.  $S + O_2 \rightarrow SO_2$
- B.  $AgNO_3 + KI \rightarrow AgI + KNO_3$
- C.  $NaOH + HCl \rightarrow NaCl + H_2O$
- D.  $Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 + H_2O$

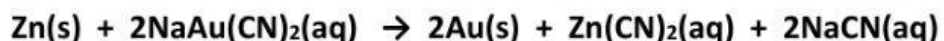
1.2 The stronger the reducing agent, the greater its ability to....

- A. donate protons
- B. donate electrons
- C. combine with protons
- D. combine with electrons

1.3 The oxidation number of phosphorus in  $H_3PO_4$  is....

- A. +3
- B. -2
- C. +2
- D. +5

- 1.4 During the processing of gold ore, zinc is added to the gold cyanide solution to produce gold according to the balanced equation below:

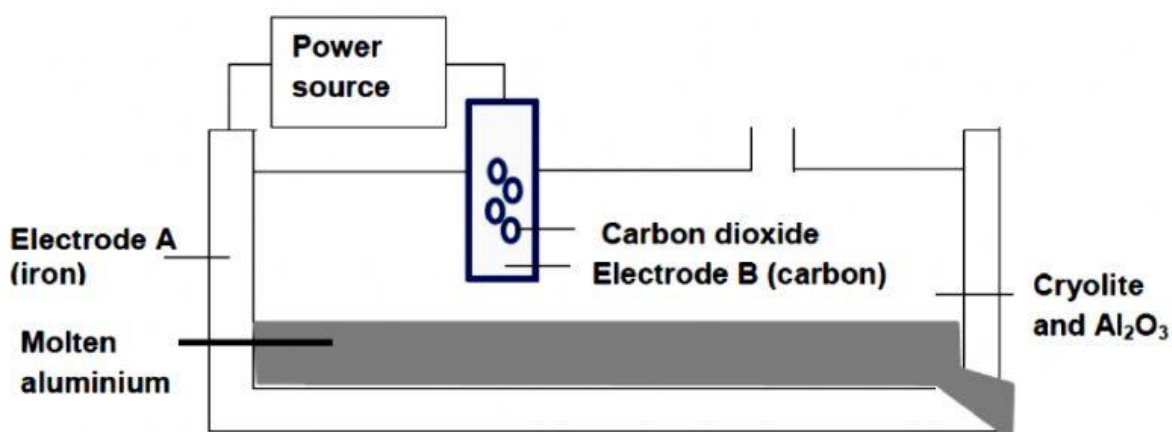


The reducing agent in this reaction is:

- A.  $\text{Na}^+$
- B.  $\text{Au}^+$
- C.  $\text{Zn}$
- D.  $\text{CN}^-$

## QUESTION 2

Bauxite ore is dissolved in molten cryolite and purified to  $\text{Al}_2\text{O}_3$ . From the bauxite, pure molten aluminium is obtained. The cell used for the extraction of the aluminium, is shown in the sketch below:



The net cell reaction for this cell is given as:



- 2.1 Write down the reduction half reaction for this cell (include phase symbols; NO SPACES):

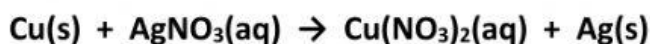
\_\_\_\_\_ + \_\_\_\_\_  $\rightarrow$  \_\_\_\_\_

- 2.2 Which one of **electrode A** or **electrode B** should be connected to the positive terminal of the power source?
- 2.3 Write down the formula of the oxidizing agent in this reaction.
- 2.4 The carbon anode needs to be replaced regularly. Write a chemical reaction to explain why this is so (include phase symbols):

\_\_\_\_\_ + \_\_\_\_\_ → \_\_\_\_\_

### QUESTION 3

A silver Christmas tree can be made by placing copper wire, shaped in the form of a tree, into a silver nitrate solution. The unbalanced equation for the reaction is:



- 3.1 Write down the following for the reaction above:

3.1.1 FORMULA of the reducing agent:

3.1.2 NAME of the oxidizing agent:

3.1.3 Oxidation half reaction (INCLUDE phase symbols):

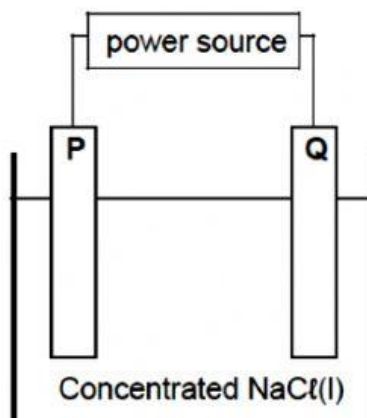
\_\_\_\_\_ → \_\_\_\_\_ + \_\_\_\_\_

3.1.4 Balanced net ionic equation (excluding spectator ions):

\_\_\_\_\_ + \_\_\_\_\_ → \_\_\_\_\_ + \_\_\_\_\_

#### QUESTION 4

The simplified diagram below represents an electrochemical cell used for the electrolysis of a concentrated sodium chloride solution.



4.1 Is the above cell a GALVANIC or an ELECTROLYTIC cell?

4.2 Chlorine gas is released at electrode **Q**. Write down the:

4.2.1 Electrode ( **P** or **Q** ) at which reduction takes place

4.2.2 Half reaction that takes place at electrode **P**.

\_\_\_\_\_ + \_\_\_\_\_ → \_\_\_\_\_

4.2.3 Direction ( **P to Q** or **Q to P** ) in which electrons flow in the external circuit

4.2.4 NAME of the species that acts as the REDUCING AGENT.

4.3 Write down the balanced net (overall) cell reaction that takes place in this cell (excluding spectator ions):

\_\_\_\_\_ + \_\_\_\_\_ → \_\_\_\_\_ + \_\_\_\_\_

### QUESTION 5

The discovery of gold played a significant role in the economic development of South Africa. In 1970 gold mining in South Africa contributed 68% to global production.

- 5.1 Which TWO mining methods are used in South Africa?
- 5.2 List the FOUR processes, in order, that are used to extract gold from the ore (note ONE word only for each answer):
- 5.3 The traditional method of ore extraction used cyanide compounds which are toxic. In addition, this process only gave a 50% extraction yield. Name the chemical which is now used in place of cyanidation (TWO WORDS):

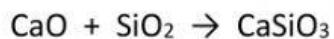
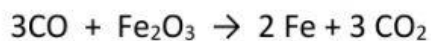
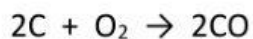
### QUESTION 6

Mining of iron promotes job creation and stimulates the South African economy.

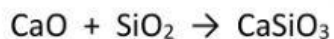
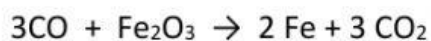
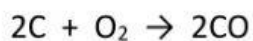
- 6.1 Open-pit mining of iron in South Africa can be found in the provinces of \_\_\_\_\_ and \_\_\_\_\_.
- 6.2 The disadvantages of iron mining include the requirement for large amounts of \_\_\_\_\_ and \_\_\_\_\_ as well as the production of large amounts of \_\_\_\_\_ gas.

6.3 The reactions used in the extraction of iron are listed below. Identify the reaction/s that are:

6.3.1 SYNTHESIS reactions:



6.3.2 DECOMPOSITION reactions:



6.3.3 REDOX reactions:

