

## Topic 9.2 Electrochemical Cells

### Past Exam Questions (Paper 1)

1. [1 mark]

What happens at the negative electrode in a voltaic cell and in an electrolytic cell?

	<b>Voltaic cell</b>	<b>Electrolytic cell</b>
A.	oxidation	reduction
B.	reduction	oxidation
C.	oxidation	oxidation
D.	reduction	reduction

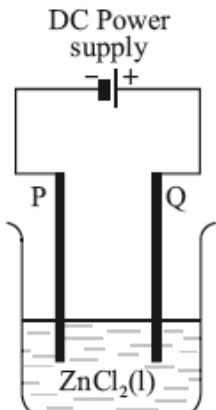
2. [1 mark]

Consider how current is conducted in an electrolytic cell. Which statement is correct?

- A. Electrons move through the electrolyte and the external circuit.
- B. Ions move through the electrolyte and the external circuit.
- C. Electrons move through the external circuit and ions move through the electrolyte.
- D. Electrons move through the electrolyte and ions move through the external circuit.

3. [1 mark]

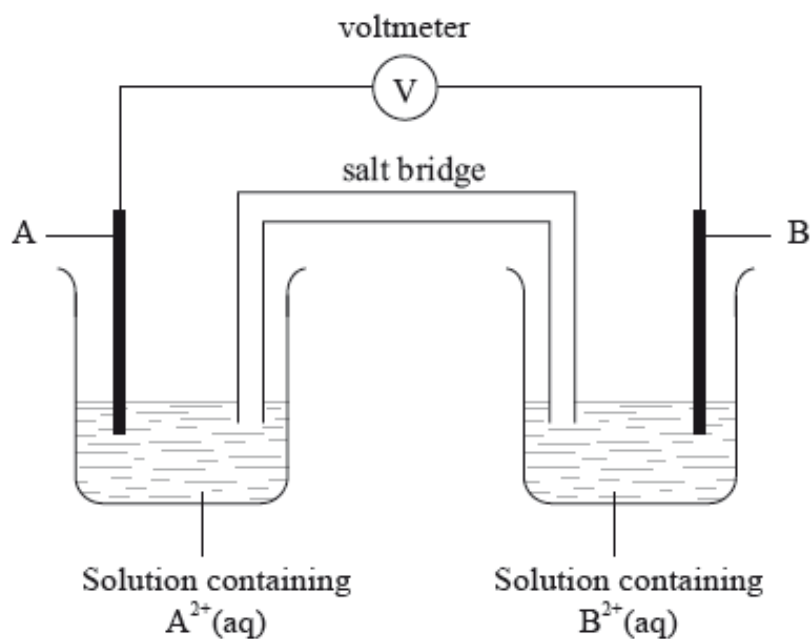
In the electrolytic cell shown, at which electrode will chlorine form, and what is the process taking place there?



	Electrode	Process
A.	P	reduction
B.	Q	reduction
C.	P	oxidation
D.	Q	oxidation

4. [1 mark]

Metal A is more reactive than metal B. A standard voltaic cell is made as shown.



Which statement is correct?

- A. Electrons flow in the external circuit from A to B.
- B. Positive ions flow through the salt bridge from A to B.
- C. Positive ions flow in the external circuit from B to A.
- D. Electrons flow through the salt bridge from B to A.

5. [1 mark]

Which statement is correct for the electrolysis of molten lead iodide,  $PbI_2$ ?

- A. Chemical energy is converted into electrical energy.
- B.  $Pb^{2+}$  ions are oxidized at the negative electrode (cathode).
- C.  $I_2$  is produced at the positive electrode (anode).
- D. Ions are produced at both electrodes.

6. [1 mark]

Which changes could take place at the positive electrode (cathode) in a voltaic cell?

- I.  $Zn^{2+}(aq)$  to  $Zn(s)$
- II.  $Cl_2(g)$  to  $Cl^-(aq)$
- III.  $Mg(s)$  to  $Mg^{2+}(aq)$

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

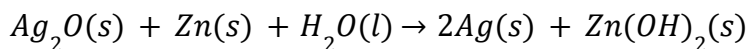
7. [1 mark]

What is produced at the positive electrode (anode) and negative electrode (cathode) during the electrolysis of molten lithium chloride and molten lead bromide?

	<b>LiCl(l)</b>		<b>PbBr<sub>2</sub>(l)</b>	
	+	-	+	-
A.	lithium	chlorine	lead	bromine
B.	lithium	chlorine	bromine	lead
C.	chlorine	lithium	lead	bromine
D.	chlorine	lithium	bromine	lead

8. [1 mark]

Consider the overall reaction taking place in a voltaic cell.



What is the role of zinc in the cell?

- A. The positive electrode and the oxidizing agent.
- B. The positive electrode and the reducing agent.
- C. The negative electrode and the oxidizing agent.
- D. The negative electrode and the reducing agent.

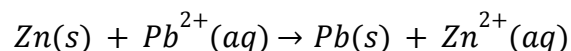
**9.** [1 mark]

Which statement about the electrolysis of molten sodium chloride is correct?

- A. A yellow-green gas would be produced at the negative electrode.
- B. A silvery metal is produced at the positive electrode.
- C. Chloride ions are attracted to the positive electrode and undergo oxidation.
- D. Sodium ions are attracted to the negative electrode and undergo oxidation.

**10.** [1 mark]

A voltaic cell is made by connecting zinc and lead half-cells. The overall equation for the reaction occurring in the cell is shown below.



Which statements are correct when the cell produces electricity?

- I. The zinc is oxidized.
- II. Electrons move from zinc to lead in the external circuit.
- III. The mass of the lead electrode increases.

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

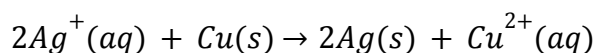
**11.** [1 mark]

Which process occurs during the electrolysis of molten sodium chloride?

- A. Oxidation occurs at the positive electrode (anode).
- B. Electrons move through the electrolyte.
- C. Sodium ions move through the electrolyte to the positive electrode (anode).
- D. Chloride ions move through the electrolyte and are reduced at the negative electrode (cathode).

12. [1 mark]

What occurs during the operation of a voltaic cell based on the following overall reaction?



	External circuit	Ion movement in solution
A.	electrons move from Cu(s) to Ag(s)	Ag <sup>+</sup> (aq) move towards Cu(s)
B.	electrons move from Ag(s) to Cu(s)	Ag <sup>+</sup> (aq) move towards Ag(s)
C.	electrons move from Cu(s) to Ag(s)	Ag <sup>+</sup> (aq) move towards Ag(s)
D.	electrons move from Ag(s) to Cu(s)	Cu <sup>2+</sup> (aq) move towards Cu(s)

13. [1 mark]

Which statements are correct for the electrolysis of molten lead(II) bromide,  $PbBr_2(l)$ ?

- I.  $Pb^{2+}$  is reduced at the negative electrode (cathode).
  - II.  $Br^-$  is oxidized at the positive electrode (anode).
  - III. Bubbles of a brown gas are observed at the negative electrode (cathode).
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III

14. [1 mark]

Which are correct statements about a voltaic cell?

- I. A spontaneous redox reaction occurs which converts chemical energy to electrical energy.

- II. Oxidation occurs at the negative electrode (anode).
  - III. Electricity is conducted by the movement of electrons through the salt bridge.
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III

**15. [1 mark]**

Which statement about an electrolytic cell is correct?

- A. Chemical energy is converted to electrical energy.
- B. Electrons move through the electrolyte.
- C. The cathode is the negative electrode.
- D. The negative ions move towards the negative electrode.

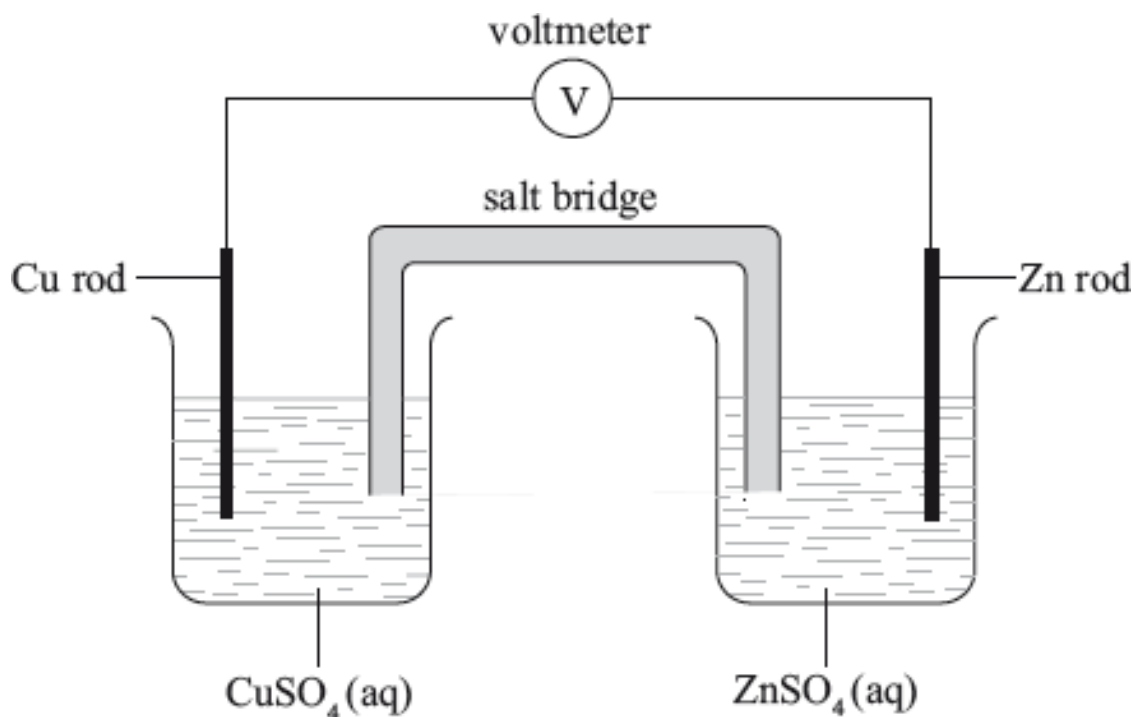
**16. [1 mark]**

At which electrodes does oxidation occur in a voltaic cell and in an electrolytic cell?

	<b>Voltaic cell</b>	<b>Electrolytic cell</b>
A.	positive	positive
B.	positive	negative
C.	negative	positive
D.	negative	negative

17. [1 mark]

Zinc is more reactive than copper. In this voltaic cell, which species is reduced and in which direction do negative ions flow in the salt bridge?



	Species reduced	Direction of negative ion flow in salt bridge
A.	$\text{Cu}^{2+}$	from copper half-cell to zinc half-cell
B.	$\text{Cu}^{2+}$	from zinc half-cell to copper half-cell
C.	$\text{Zn}^{2+}$	from copper half-cell to zinc half-cell
D.	$\text{Zn}^{2+}$	from zinc half-cell to copper half-cell

18. [1 mark]

Which process occurs when a molten salt is electrolysed?

- A. The metal ion is oxidized and deposited on the negative electrode (cathode).
- B. The metal ion is reduced and deposited on the negative electrode (cathode).
- C. The metal ion is oxidized and deposited on the positive electrode (anode).
- D. The metal ion is reduced and deposited on the positive electrode (anode).

19. [1 mark]

Which species are produced at each electrode during the electrolysis of molten lead(II) bromide,  $PbBr_2(l)$ ?

	Negative electrode (cathode)	Positive electrode (anode)
A.	$Br^-(l)$	$Pb^{2+}(l)$
B.	$Pb^{2+}(l)$	$Br^-(l)$
C.	$Br_2(g)$	$Pb(l)$
D.	$Pb(l)$	$Br_2(g)$

20. [1 mark]

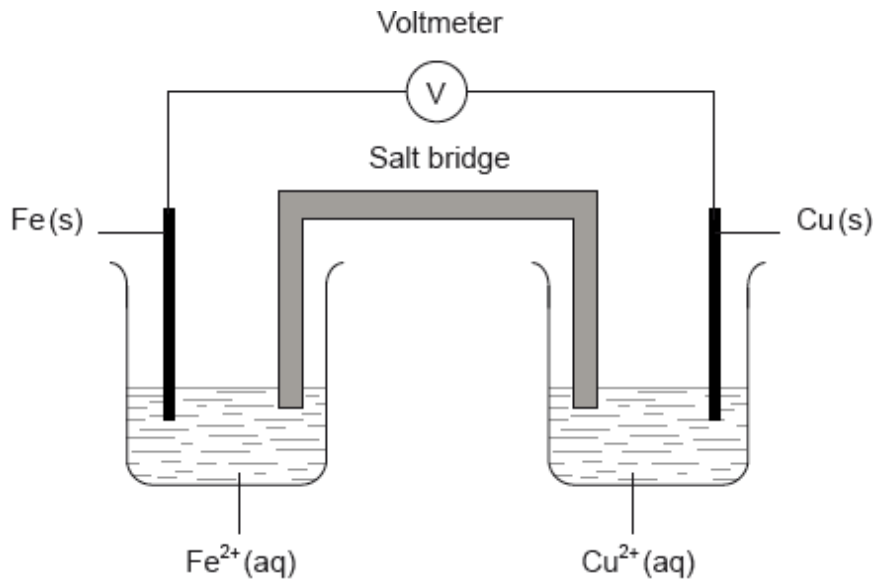
Two half-cells are connected via a salt bridge to make a voltaic cell. Which statement about this cell is correct?

- A. Oxidation occurs at the positive electrode (cathode).
- B. It is also known as an electrolytic cell.
- C. Ions flow through the salt bridge.
- D. It requires a power supply to operate.

21. [1 mark]

A voltaic cell is made by connecting a copper half-cell,  $Cu(s)|Cu^{2+}(aq)$ , to an iron half-cell  $Fe(s)|Fe^{2+}(aq)$ .

Which combination correctly identifies the positive electrode and the species being oxidized?



	Positive electrode	Species oxidized
A.	copper	iron
B.	copper	copper(II) ions
C.	iron	copper
D.	iron	copper(II) ions