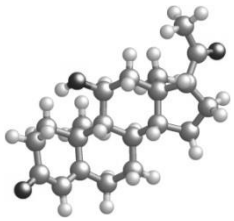

*Chem!stry*

**Name:** …… **(  )**

**Class:** ……

**Date:** …… **/** …… **/** ……

**Introduction to Electrolysis**

**Macroconcepts: Systems and Change**

**Enduring Understanding:** Electrolysis is a system that brings about change.

**Question 1:** What do you understand by the term *system*?

**Question 2:** What is your understanding of the term *change*?

**Question 3:**

Electrolysis is the chemical decomposition of a compound by passing electricity through it. Why is it important for chemists to put a compound into a *system* that causes it to *change* into simpler products?

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• Oxidation = loss of electrons at the anode. Reduction = gain of electrons at the cathode.

**Question 4:**

Define the term *electrolysis*.

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**Question 5:**

**a)** Which types of chemicals can be electrolysed (*i.e.* are electrolytes)?

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**b)** Which types of chemicals cannot be electrolysed (*i.e.* are not electrolytes)?

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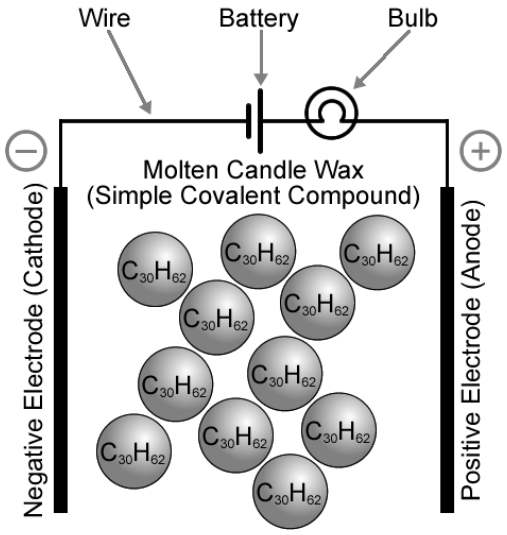
**Question 6:**




Explain why simple covalent compounds cannot conduct electricity and are not decomposed by electricity.

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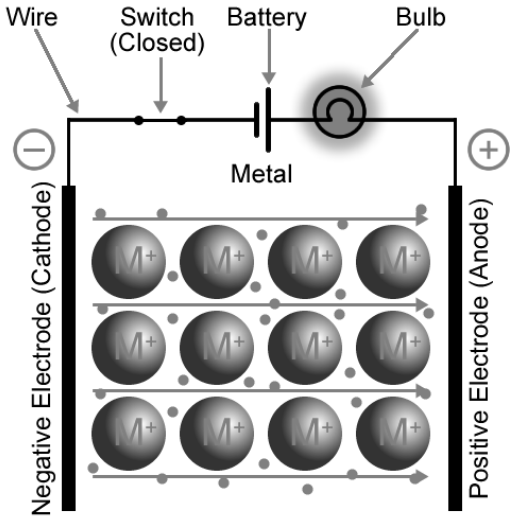
**Question 7:**




Explain why metals are able to conduct electricity in both the solid and molten states without decomposing.

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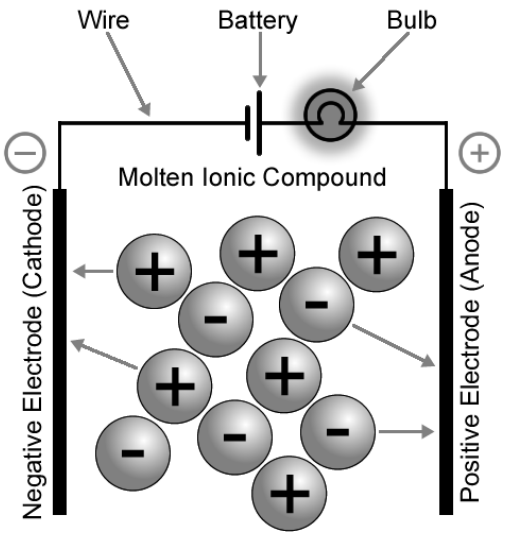
• Oxidation = loss of electrons at the anode. Reduction = gain of electrons at the cathode.

**Question 8:**




Explain why molten and aqueous solutions of ionic compounds decompose when electricity is passed through them.

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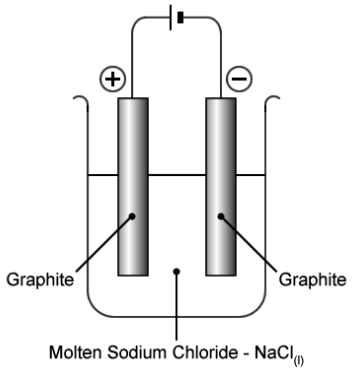
**Question 9:**

Describe what happens when the following ionic compounds, each in its molten state, are electrolysed.




Anode: ……
Cathode: ……
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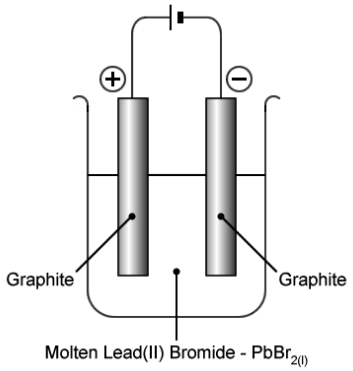


Anode: ……
Cathode: ……
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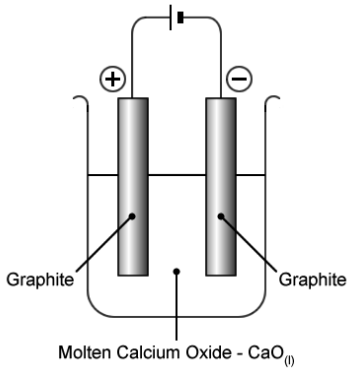


Anode: ……
Cathode: ……
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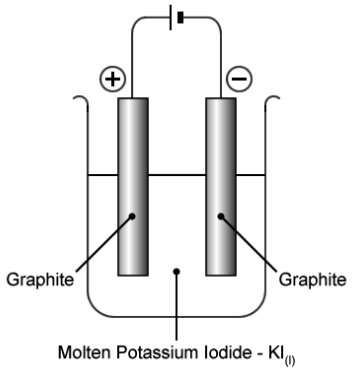


Anode: ……
Cathode: ……
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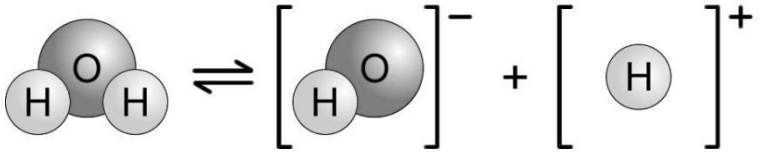
• Oxidation = loss of electrons at the anode. Reduction = gain of electrons at the cathode.

**Question 10:**

$$H_2O_{(l)} \rightleftharpoons OH^-_{(aq)} + H^+_{(aq)}$$




Which four ions are present in an aqueous solution of sodium chloride?

Anion #1: …… Anion #2: ……

Cation #1: …… Cation #2: ……

**Question 11:**

Study the electrochemical series given below. What rules are used to determine which *cation* will be preferentially *reduced* when the aqueous solution of an ionic compound is electrolysed?

Potassium – $K^+$

Sodium – $Na^+$

Calcium – $Ca^{2+}$

Magnesium – $Mg^{2+}$

Aluminium – $Al^{3+}$

Zinc – $Zn^{2+}$

Iron – $Fe^{2+ / 3+}$

Lead – $Pb^{2+}$

Hydrogen – $H^+$

Copper – $Cu^{2+}$

Silver – $Ag^+$

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**Question 12:**

What rules are used to determine which *anion* will be preferentially *oxidised* when the aqueous solution of an ionic compound is electrolysed?

Sulfate – $SO_4^{2-}$

Nitrate – $NO_3^-$

Chloride – $Cl^-$

Bromide – $Br^-$

Iodide – $I^-$

Hydroxide – $OH^-$

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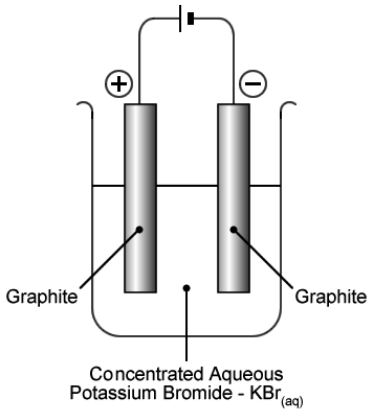
• Oxidation = loss of electrons at the anode. Reduction = gain of electrons at the cathode.

**Question 13:**

Describe what happens when aqueous solutions of the following ionic compounds are electrolysed.




Anode: ……

Cathode: ……

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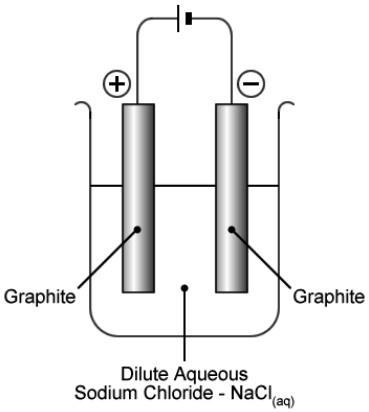


Anode: ……

Cathode: ……

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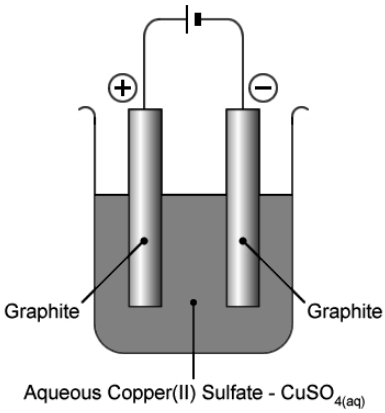


Anode: ……

Cathode: ……

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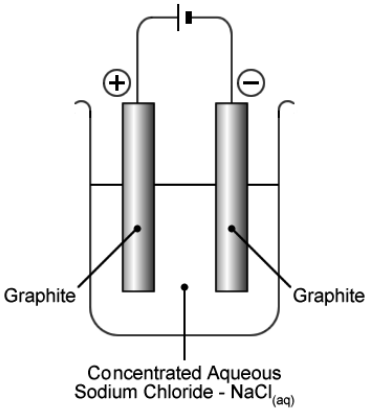


Anode: ……

Cathode: ……

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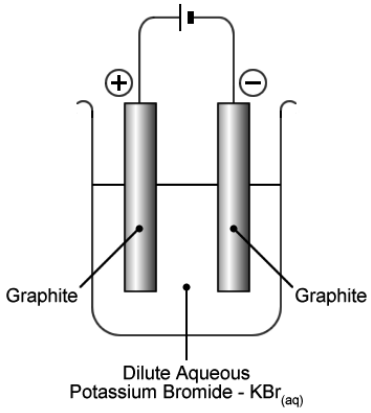


Anode: ……

Cathode: ……

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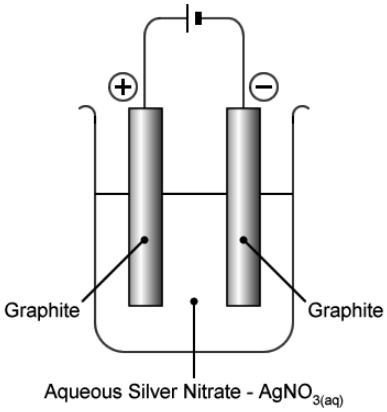


Anode: ……

Cathode: ……

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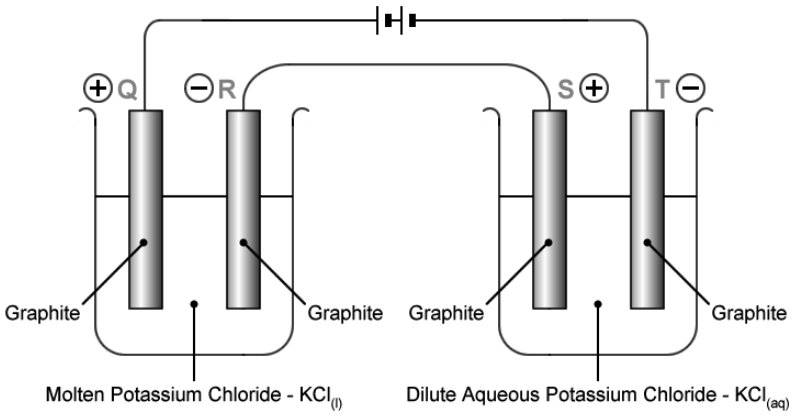
• Oxidation = loss of electrons at the anode. Reduction = gain of electrons at the cathode.

**Question 14:**

Describe what happens when electricity is passed through the following system.

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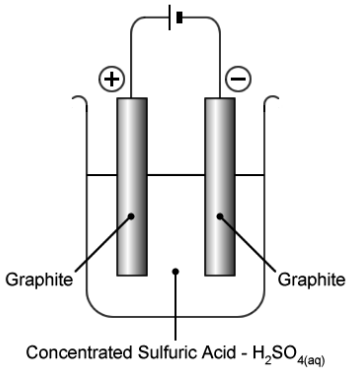
**Question 15:**

Describe what happens when the following acids and alkalis electrolysed.




Anode: ……

Cathode: ……

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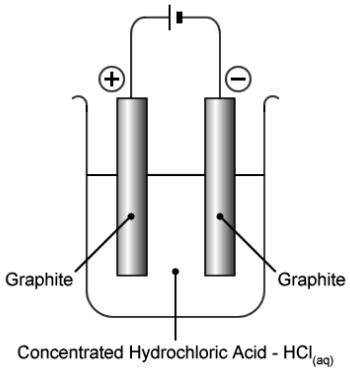


Anode: ……

Cathode: ……

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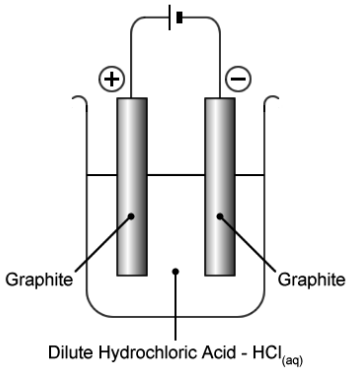


Anode: ……

Cathode: ……

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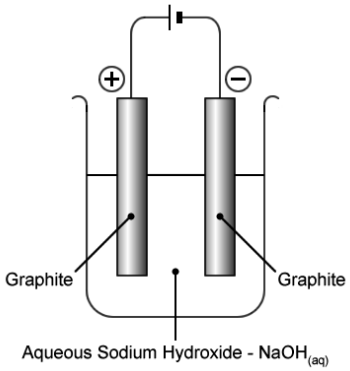


Anode: ……

Cathode: ……

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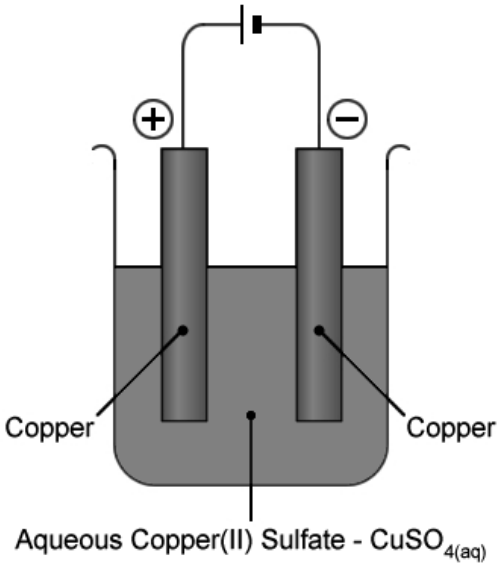
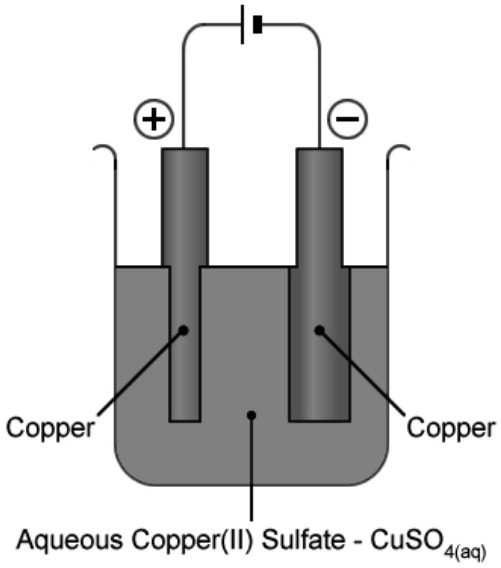
• Oxidation = loss of electrons at the anode. Reduction = gain of electrons at the cathode.

**Question 16:**

Explain how a block of impure copper can be purified by electrolysis.

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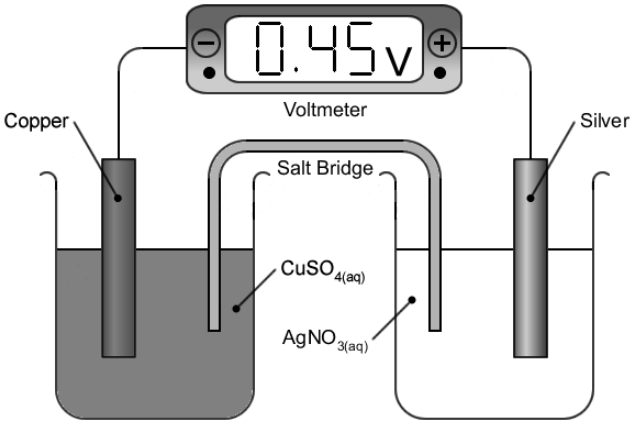
**Question 17:**

Sketch a labelled diagram that clearly illustrates how a metallic object (*e.g.* a knife, fork or spoon) can be coated with a thin layer of silver.

**Question 18:**

Describe what is happening in each one of the following electrochemical cells.

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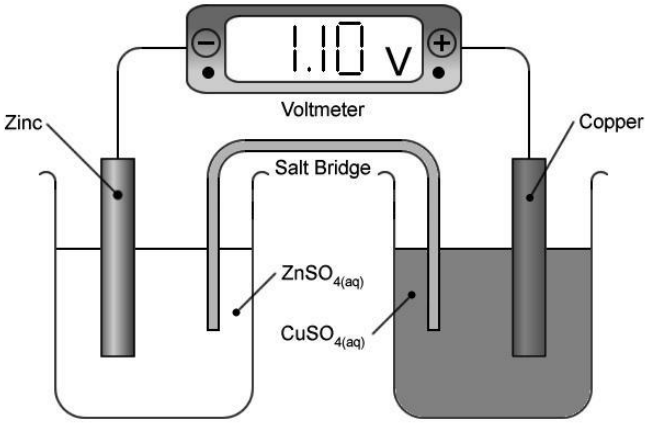


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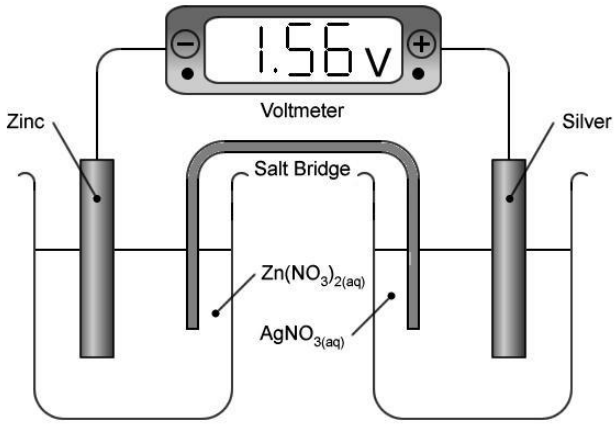


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• Oxidation = loss of electrons at the anode. Reduction = gain of electrons at the cathode.

- Scan the QR code given below to view the answers to this assignment.

http://www.chemist.sg/electro_chem/electrochem_worksheet_ans.pdf

- Oxidation = loss of electrons at the anode. Reduction = gain of electrons at the cathode.