

(7 marks)

(b) Write ionic equations **omitting spectator ions**, for the reactions in a(ii) and a(v) above.

(i) _____

(ii) _____

(4 marks)

(c) (i) Write the ionic half equations for the reactions in (a) (iv) above.

(ii) Explain why this is also a redox reaction.

(4 marks)

3. State whether the substances underlined in each of the following equations has been oxidised or reduced. Give a reason for your answer as indicated in the brackets. You should also identify the oxidizing agent and the reducing agent.

(i) $\text{PbO} + \underline{\text{C}} \rightarrow \text{Pb} + \text{CO}$ (in terms of oxygen)

_____ (2)

Oxidizing agent _____ reducing agent _____ (2)

(ii) $\underline{\text{MnO}}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$ (in terms of oxidation number)

_____ (2)

Oxidizing agent _____ reducing agent _____ (2)

(iii) $2\text{Na} + \underline{\text{Cl}}_2 \longrightarrow 2\text{NaCl}$ (in terms of electrons)

_____ (2)

Oxidizing agent _____ reducing agent _____ (2)

4a) This question is about the reactivity series of metals.

Put these metals in order of reactivity, starting with the most reactive first.

potassium, gold, aluminium, silver, lead, sodium, iron, copper, zinc,

_____ (3 marks)

b) State whether the following are **true** or **false**:

- i. Copper will replace lead from a solution of lead nitrate.
- ii. Iron will replace copper from a solution of copper (II) sulphate.
- iii. Aluminium will replace magnesium from a solution of magnesium chloride.
- iv. Copper will liberate hydrogen from dilute sulphuric acid.
- v. Magnesium will liberate hydrogen from dilute hydrochloric acid.
- vi. Potassium reacts violently in cold water.

(6 marks)

5a. Fill in the following table.

Electrolyte	Ions present	Ions discharged		Name of product	
		At cathode	At anode	At cathode	At anode
concentrated lithium chloride solution					
concentrated sulphuric acid					
concentrated copper (II) sulphate solution					
molten lead bromide					

(10 marks)

b. An electric current of 1.5A passes through a solution of silver nitrate for 45 minutes.

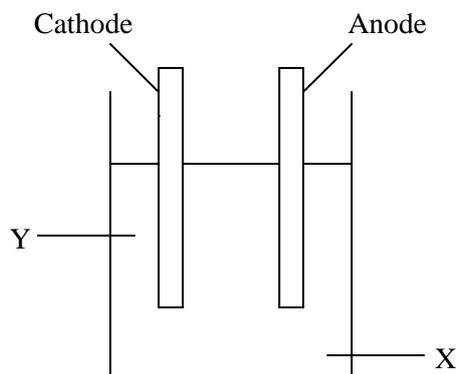
(i) Calculate the quantity of electricity used?

(ii) What mass of silver is deposited at the cathode?

(4 marks)

**SECTION B – Answer TWO questions only on the foolscap provided.
This section carries 40 marks.**

6. Copper is purified by electrolysis, as in the example shown below.



- (i) Name the materials used for the electrodes. (2)
- (ii) Suggest a suitable electrolyte Y. (2)
- (iii) What is substance X and why is it of economic importance in respect of this process. (1)
- (iv) Write half equations for the reactions that occur at the cathode and anode. (4)
- (v) At which electrode does an oxidation reaction occur? Explain your answer. (2)
- (vi) At which electrode does a reduction occur? Explain your answer. (2)
- (vii) Draw a labelled diagram to show the cell after electrolysis has taken place. (4)
- (viii) Is there a change in the colour of the electrolyte? Explain your answer. (2)
- (ix) It is found that the solid impurities from this process contain silver. Why does silver not react with the electrolyte? (1)

(Total: 20 marks)

7. This question is about the uses of electrolysis.

A student was asked to coat a small spoon with silver. She was given the following laboratory apparatus: a battery, wires, a large trough and a suitable solution.

- (a) What is the name of this process? (1)
- (b) Mention one important use of this process. (1)
- (c) Suggest a suitable material for the spoon. (1)
- (d) Draw a well-labelled diagram to show how the apparatus should be set up. (5)
- (e) Suggest a suitable material for the other electrode. (1)
- (f) Mention a suitable electrolyte. (1)
- (g) Write the ionic half equations at the anode and cathode. In each case state whether oxidation or reduction is taking place. (6)
- (h) Galvanizing involves a similar process.
 - a. What is galvanizing?
 - b. Mention one important use of galvanizing? (4)

(20 marks)

8. For each of the statements below, give:
- one observation (other than those described)
 - the name of the reaction where possible
 - the name of the product
 - a balanced equation for the reaction described.
- i. When a Hoffmann Voltmeter is filled with acidified water and the power supply is switched on, a colourless gas is soon collected at the anode.
- ii. When a small piece of sodium is placed in a trough of water, it darts around the surface of the water. A gas is also given off.
- iii. When a piece of magnesium ribbon is placed in a test tube containing copper (II) sulphate solution, the colour of the solution fades.
- iv. When a piece of calcium is placed in a test tube containing dilute hydrochloric acid, there is effervescence.

(20 marks)