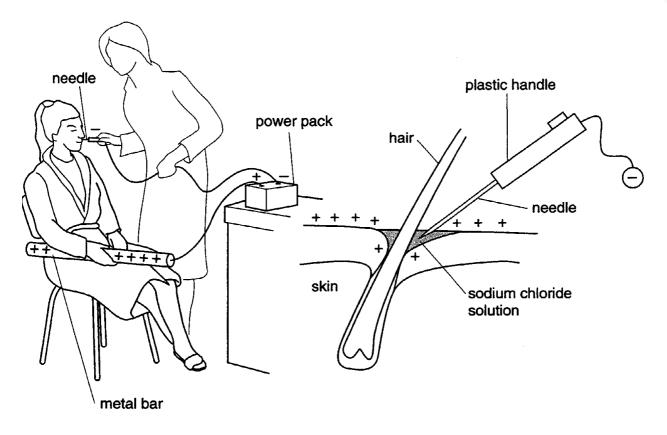
The skin is given a small positive charge when the person holds on to a metal bar. The metal bar acts as a positive electrode. A needle is the negative electrode.



- (a) What is the name given to
 - (i) a positive electrode,

.....[1]

(ii) a negative electrode?

_____[1]

- (b) What property must an electrode have if electrolysis is to work?
-[1]
- (c) The needle, which is the negative electrode, is held by the operator.

Suggest why the needle has a plastic handle, rather than a metal handle.

[1]

(d)		e liquid on the skin around the tip of the needle is mainly a solution of sodium oride.
	(i)	Give the chemical formula for sodium chloride.
		[1]
	(ii)	Explain the meaning of the word solution.
		[1]
	(iii)	Sodium chloride can be made by adding an acid to an alkali.
		Name an acid and alkali you can use to make sodium chloride.
		acid
		alkali[2]
	(iv)	Starting with this acid and alkali, describe how you can obtain sodium chloride crystals.
		[2]
(e)		en the electrolysis is carried out on the surface of the skin, a gas forms around the of the needle.
	Nar	me this gas.
		[1]

Black lead sulphide is formed when oil paints containing lead compounds react with pollutants in the atmosphere.

When hydrogen peroxide is used to clean dirty oil paintings, the following reaction occurs.

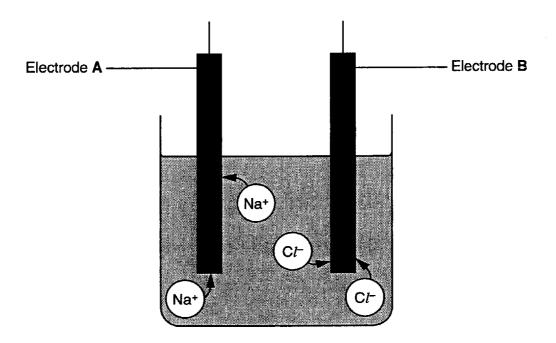
$$PbS(s) + 4H_2O_2(aq) \rightarrow PbSO_4(s) + 4H_2O(l)$$

lead hydrogen white compound
sulphide peroxide

	Caipinac	poroxido			
(i)	Name the white c	ompound of lea	ad formed in thi	s reaction.	
		••••••••••	•••••••••	•••••	[1]
ii)	Use the information been oxidised.	on in the equati	on to explain h	ow you know th	e lead sulphide has
	•••••	•••••		•••••	[1]

Alternative to Practical 1

The diagram shows the movement of the ions Na^+ and Cl^- during the electrolysis of molten sodium chloride.



(a)	Which electrode, A or B , is the positive electrode? Explain your choice.	
(b)	Which ion is attracted to the cathode?	
		[1]
(c)	Name the two elements formed by the electrolysis of molten sodium chloride.	
	1	••••
	2	[2]
(d)	Give one expected observation during this electrolysis.	
		[1]

When aqueous solutions of germanium(II) chloride and of iron(III) chloride are mixed, the following reaction occurs.

	$GeCl_2 + 2FeCl_3 \longrightarrow 2FeCl_2 + GeCl_3$
or	$Ge^{2+} + 2Fe^{3+} \longrightarrow 2Fe^{2+} + Ge^{4+}$

0.	40 1 210 7 210 4 40
(i)	Is the germanium(II) chloride acting as an oxidising agent or reducing agent? Explain your choice using the idea of electron transfer.
	[2]
(ii)	Describe a test to show that an iron(III) salt had been changed into an iron(II) salt.
	test
	result for iron(III)salt
	result for iron(II) salt
	[3]

(a) Copper is refined by electrolysis.

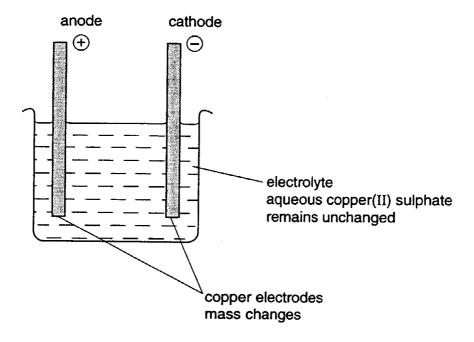


Fig. 4.1

	aqu	plain with equations why the electrodes change in mass and why the concentration of security in the security in th			
	••••	······································			

	••••	[4]			
(b)	acio	An alloy contains contains zinc and copper. A small sample of this alloy was dissolved in acid to give a solution containing zinc and copper ions. Explain what would happen when an excess of each of the following reagents is separately added to this solution.			
	(i)	iron filings			
		[2]			
	(ii)	sodium hydroxide			
		[2]			

Electrochemistry

(c) The following diagram shows a simple cell.

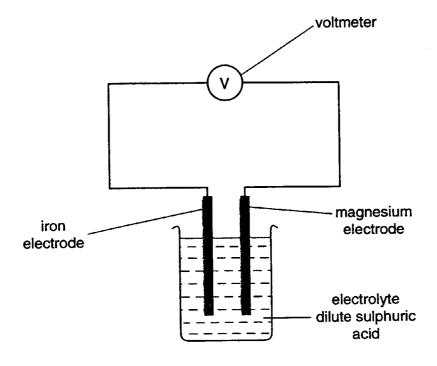


Fig. 2

(i)	What is a <i>cell</i> ?	
		[2]
(ii)	Mark on the diagram the direction of the electron flow.	[1]

21	п) anad	Δ
a) anod	ᆫ

- (ii) cathode
- b conducts electricity
- c does not conduct electricity (to operator) / plastic is an insulator / so operator does not get an electric shock
- d(i) NaCl
- (ii) substance dissolved in liquid / contains dissolved substance
- (iii) hydrochloric acid
 - sodium hydroxide / sodium carbonate / sodium bicarbonate
- (iv) add acid to the alkali until neutral / use titration evaporate off water / boil off water / leave to crystallise
- e hydrogen / H₂

- (i) lead sulphate
- (ii) oxygen has been added to it

Alternative to Practical 1

- a B Cl⁻ attracted
- b Na⁺ / cation / positive ion
- c sodium chlorine
- d bubbles / silvery metal / green yellow gas

i reducing

germanium or Ge²⁺ loses / donates electrons

or
$$Ge^{2+}$$
 - 2e \longrightarrow Ge^{4+}

iron or Fe³⁺ gains electrons

or
$$Fe^{3+} + e \longrightarrow Fe^{2+}$$

ii sodium hydroxide or aqueous ammonia

iron (III) salt brown precipitate

iron (II) salt green precipitate

(other possible reagents include iodide, thiocyanate, hexacyanoferrates, bromine, zinc, potassium manganate (VII)

a three of these points

$$Cu^{2-} + 2e \longrightarrow Cu$$
 $Cu - 2e \longrightarrow Cu^2$

ions removed at cathode

ions formed at anode

- b(i) copper formed or iron dissolves zinc not displaced or iron does not react with zinc ions
- (i) blue precipitate of copper hydroxide white precipitate of zinc hydroxide
- c(i) produces electrical energy or voltage or current from chemical energy or chemical reactions or

two different electrodes

in electrolyte

(ii) from magnesium to iron through external circuit