


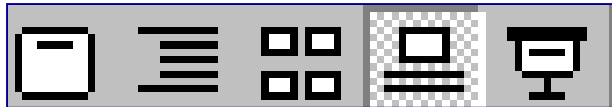
KS4: Useful materials from rocks



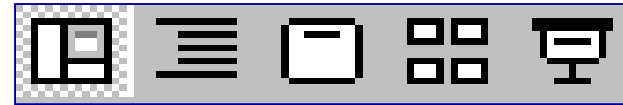
Teacher's Notes

A slide contains teacher's notes wherever this icon is displayed - 

To access these notes go to 'Notes Page View' (PowerPoint 97) or 'Normal View' (PowerPoint 2000).




Notes Page View



Normal View

Flash Files

A flash file has been embedded into the PowerPoint slide wherever this icon is displayed – 

← These files are not editable.

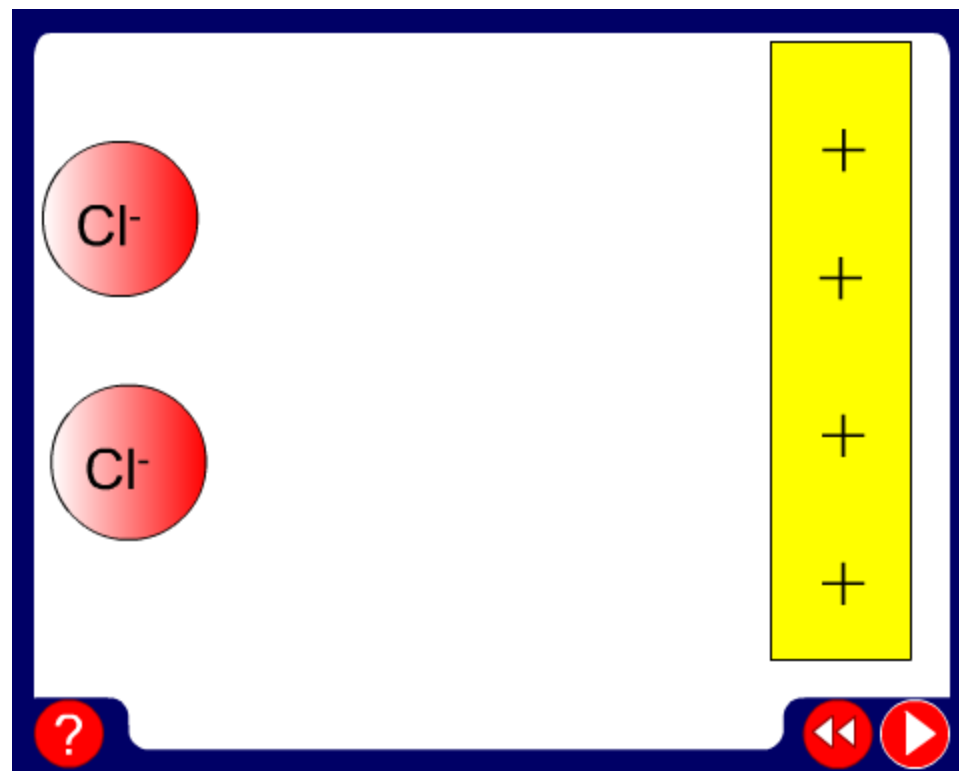


- Three quarters of the salt we use comes from rock salt.
- As the earth's surface changed stretches of sea-water became landlocked.
- Evaporation of this water along with further geological changes led to deposits of rock salt in many countries including the UK.



Negative ions

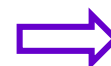
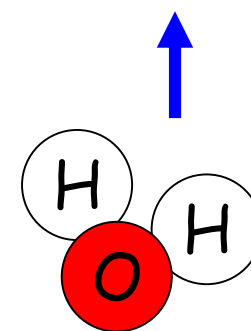
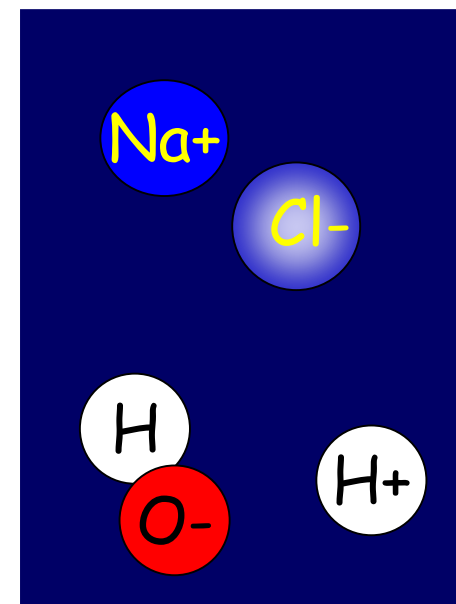
- Salt consists of sodium ions (Na^+) and chloride ions (Cl^-).
- Chloride ions go to the anode where they lose an electron
- The neutral chlorine atoms produced join up into pairs



← Chlorine gas is formed →

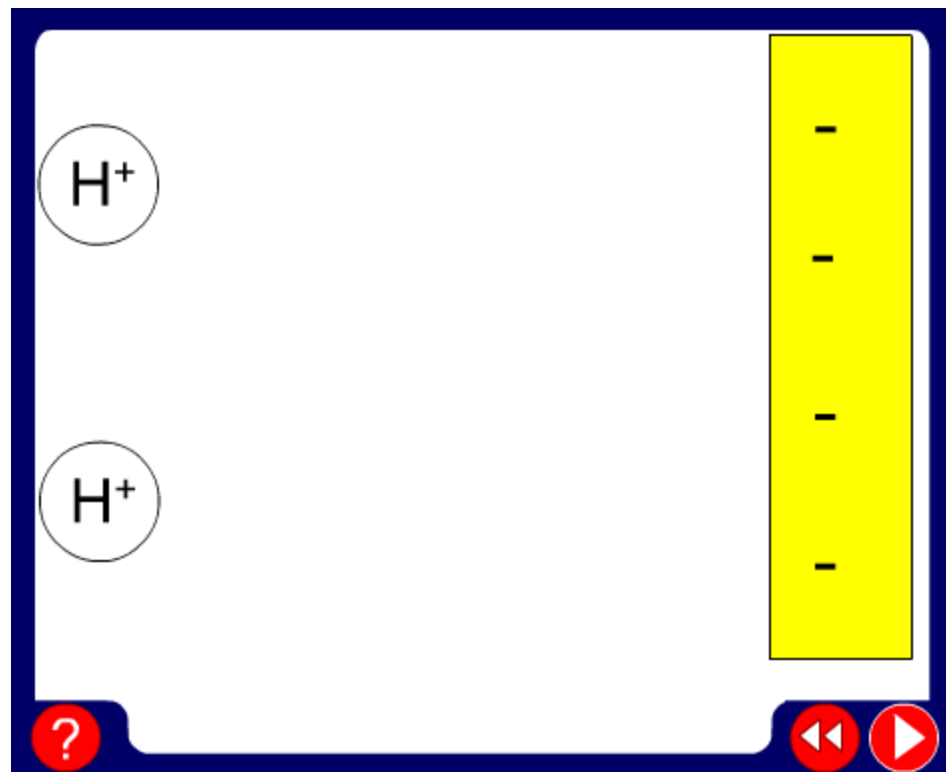
Positive ions

- Na^+ are not the only $+$ ions present.
- There are also H^+ ions because some water molecules split up into H^+ and OH^- ions.
- H^+ accepts electrons more easily than Na^+ does.
- This has important consequences at the cathode.

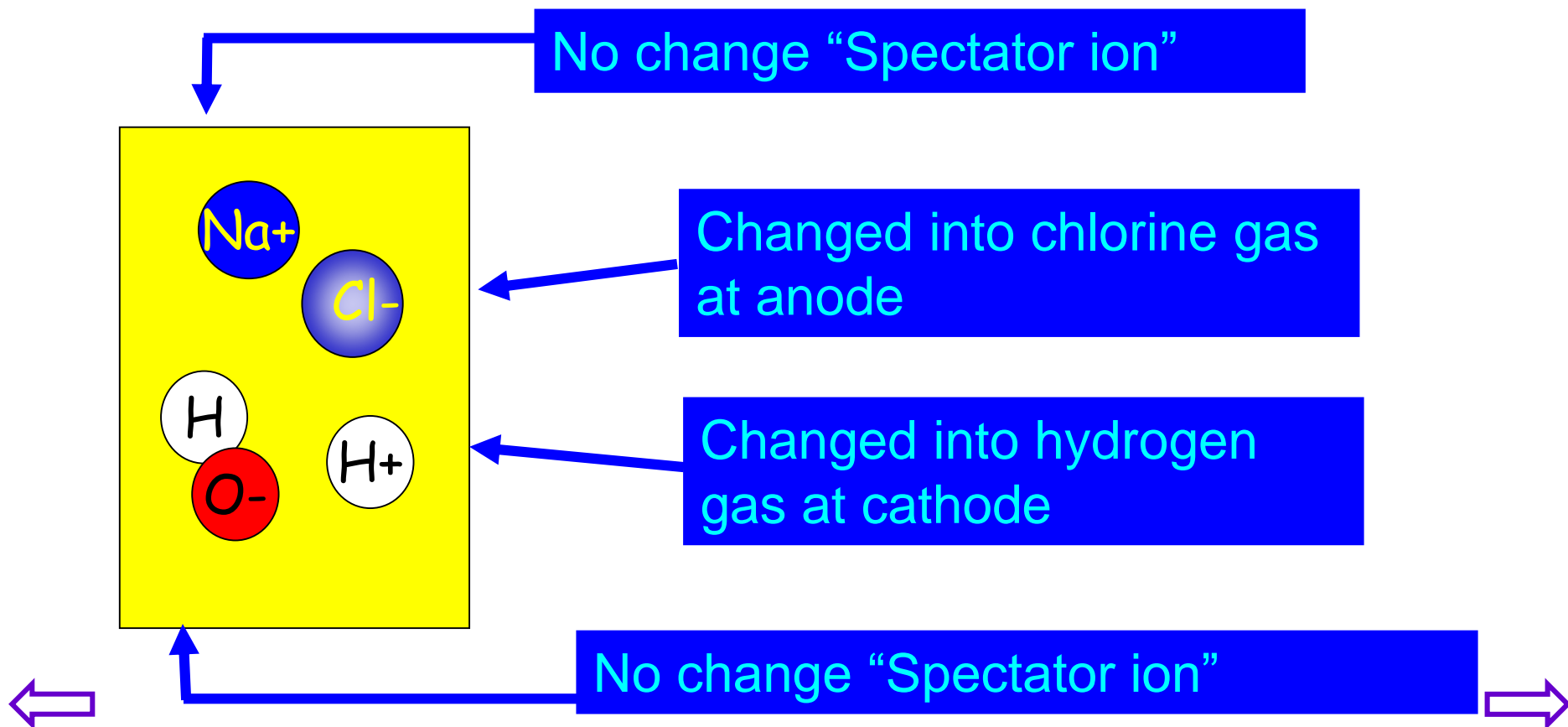


Electrolysis of salt 3

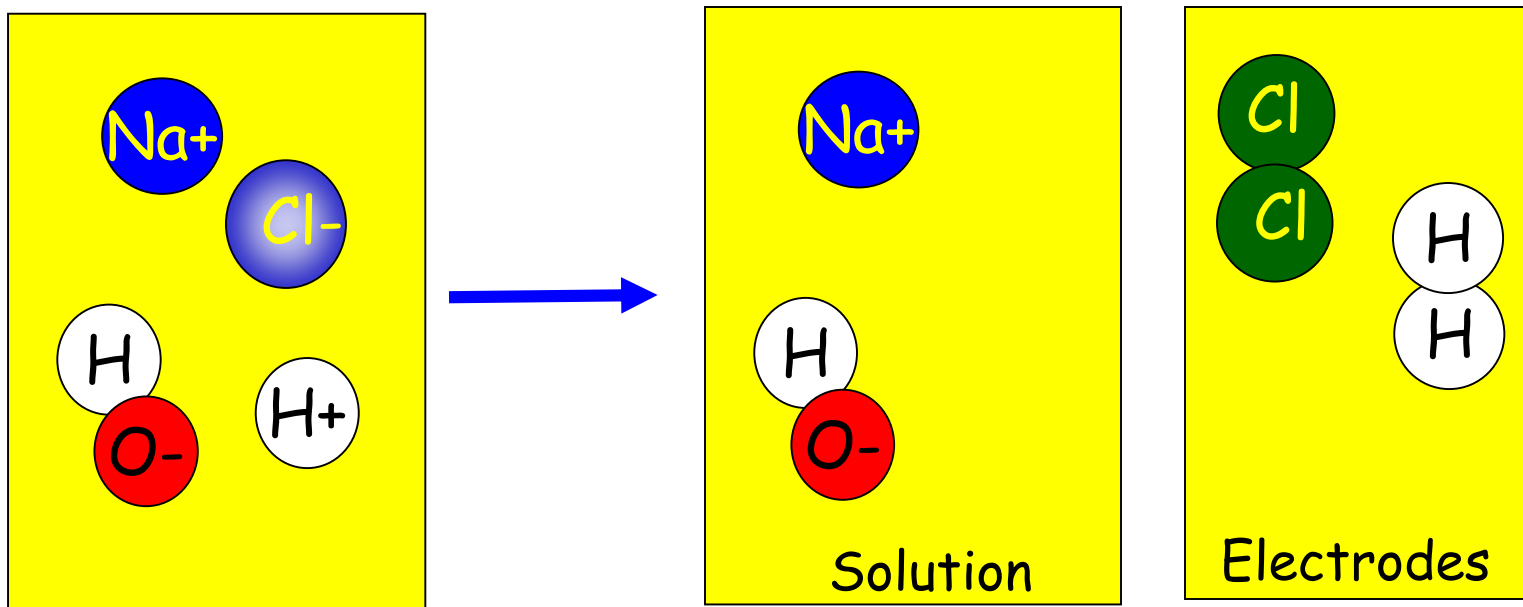
- Na^+ ions move to the cathode but *do not* accept electrons.
- It is the hydrogen ions that gain electrons
- As a result hydrogen gas is formed at the cathode.



- What happens to the various ions?



- Sodium hydroxide is what is left in the solution at the end of electrolysis



Using your knowledge of salt electrolysis decide whether the following statements are likely to be TRUE or FALSE.

1. Chlorine ions gain electrons

☐ T F

2. Chlorine gas is formed at the cathode

☐ T F

3. Hydrogen ions gain electrons at the cathode

☐ T F

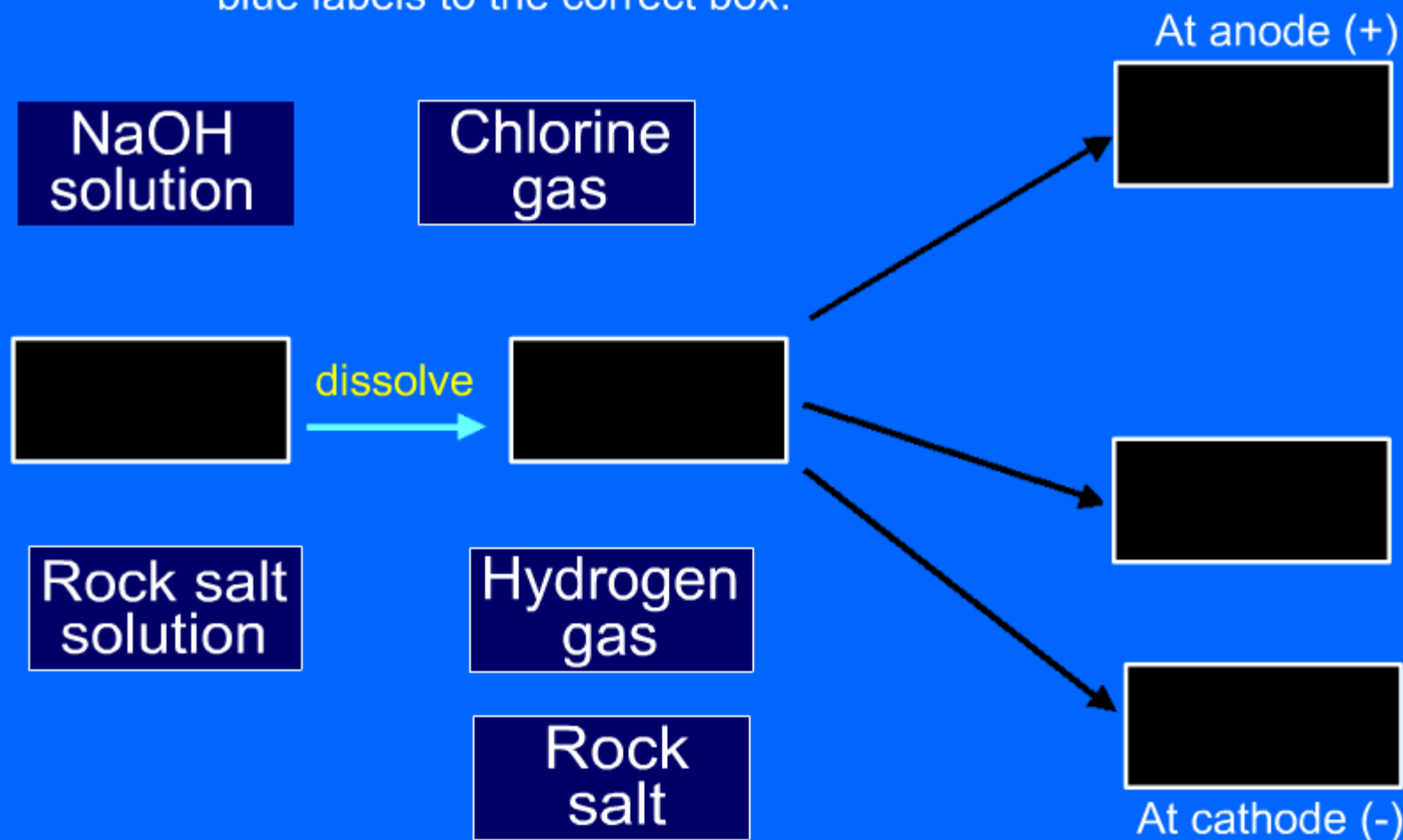
4. Hydrogen gas is formed at the anode

☐ T F



Electrolysis of salt - summary

Complete the summary diagram by dragging the blue labels to the correct box.

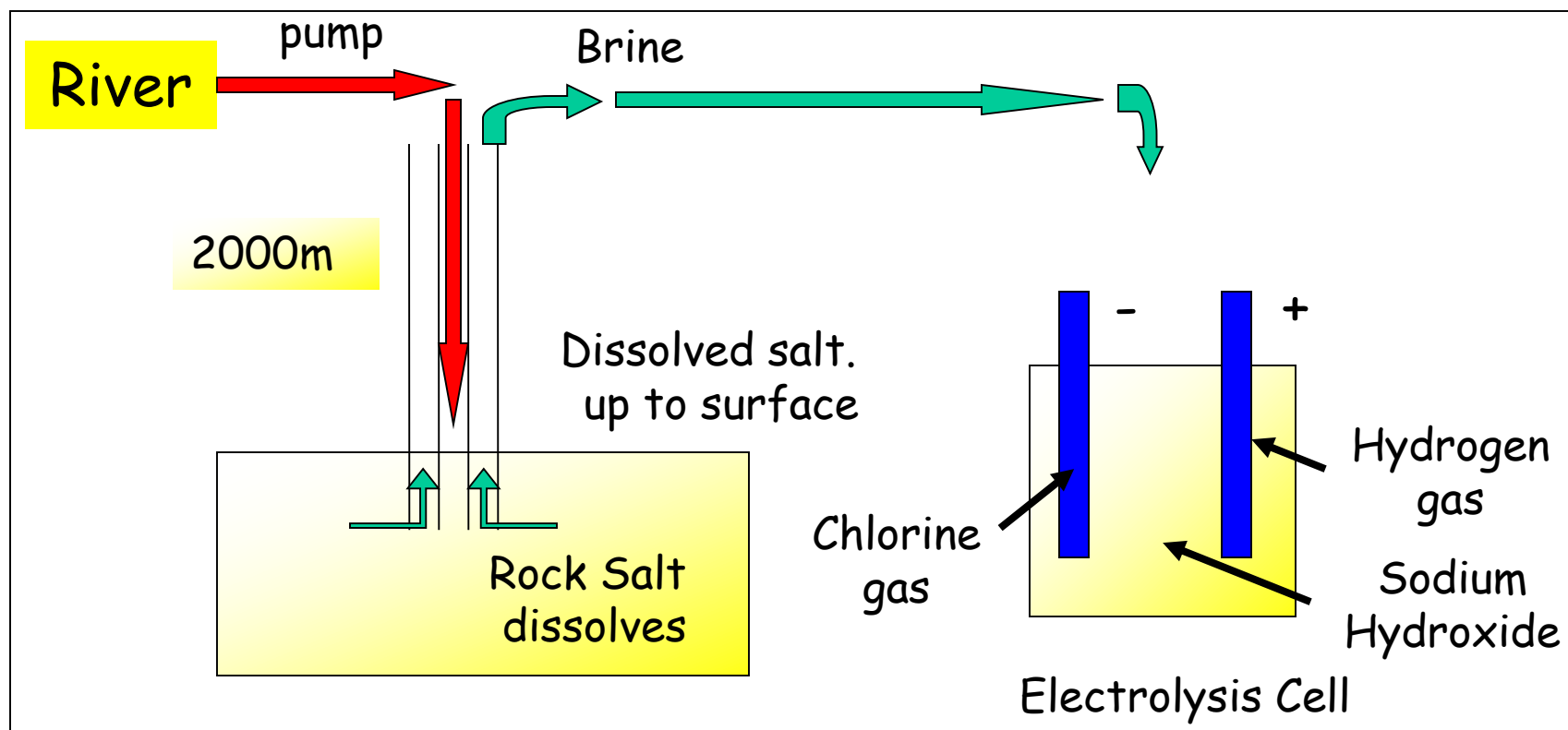


Some salt is dug out of underground deposits of rock salt but most salt is obtained by pumping river water into the salt deposits which may be about 2000m below ground. The salt dissolves to form a solution called brine which travels up a second pipe to the surface. It is then stored in a brine reservoir prior to being used for various purposes.

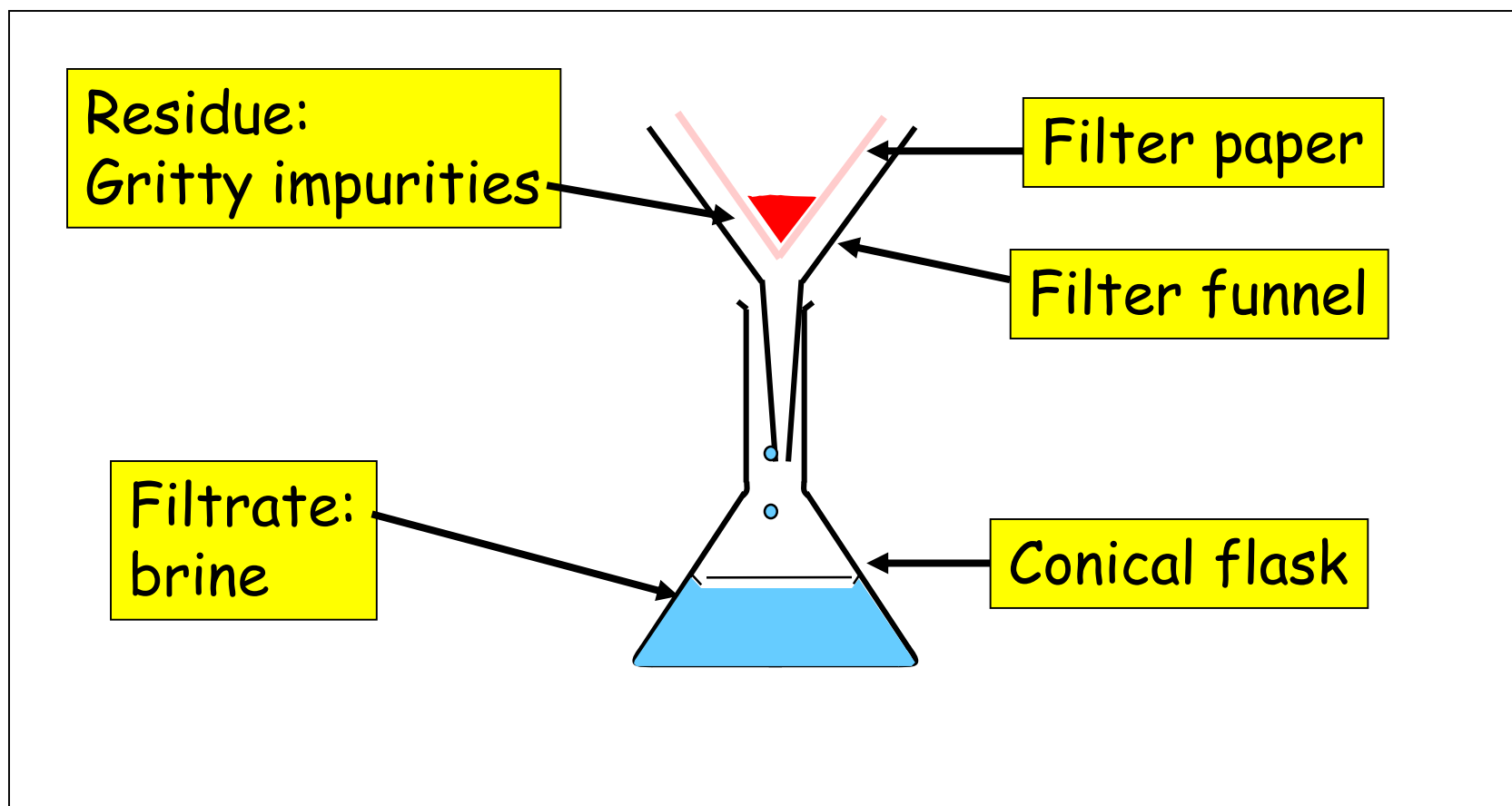
1. Name one important winter use of solid rock-salt.
2. Draw a diagram illustrating the production of brine and its subsequent electrolysis.
3. Draw a diagram showing how you could remove the gritty impurities in rock-salt in the laboratory.



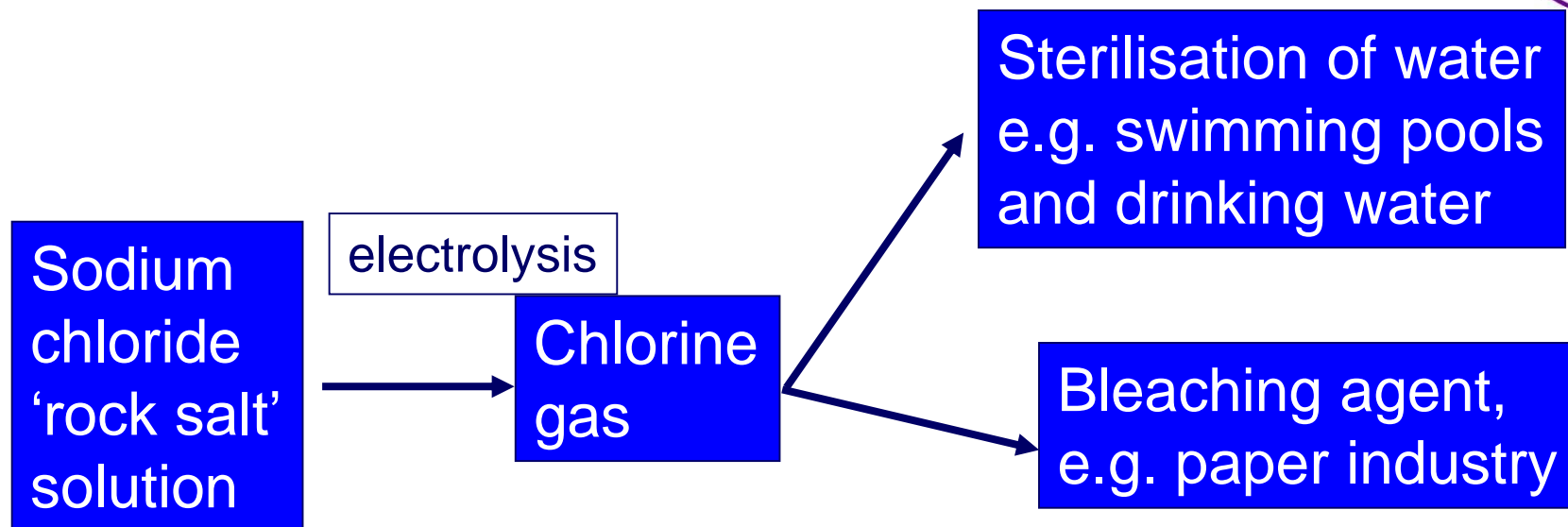
1. An important winter use of solid rock-salt is to treat icy roads.
2. Diagram of brine production to electrolysis.



1. Removal of gritty impurities from Rock Salt



Uses of chlorine 1



Uses of chlorine 2

Sodium
chloride
'rock salt'
solution

electrolysis

Chlorine
gas

Sterilisation of water
e.g. swimming pools
and drinking water

Bleaching agent,
e.g. paper industry

Manufacture of HCl

Manufacture of
Cl-containing
organic chemicals

continued



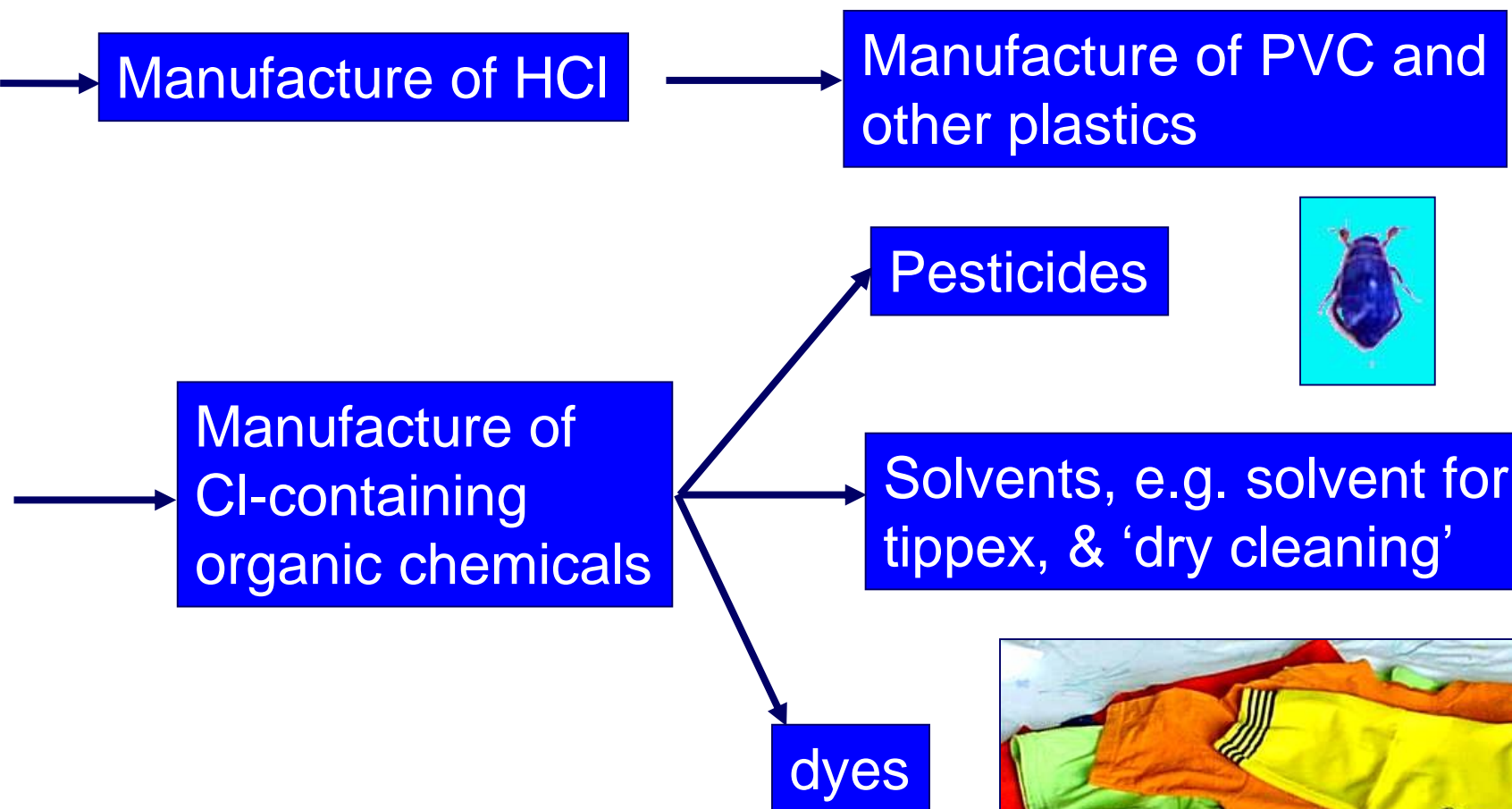
Uses of chlorine 3

→ Manufacture of HCl

→ Manufacture of PVC and other plastics



Uses of chlorine 4



Uses of sodium hydroxide 1

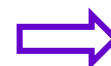
Sodium
chloride
'rock salt'
solution

electrolysis

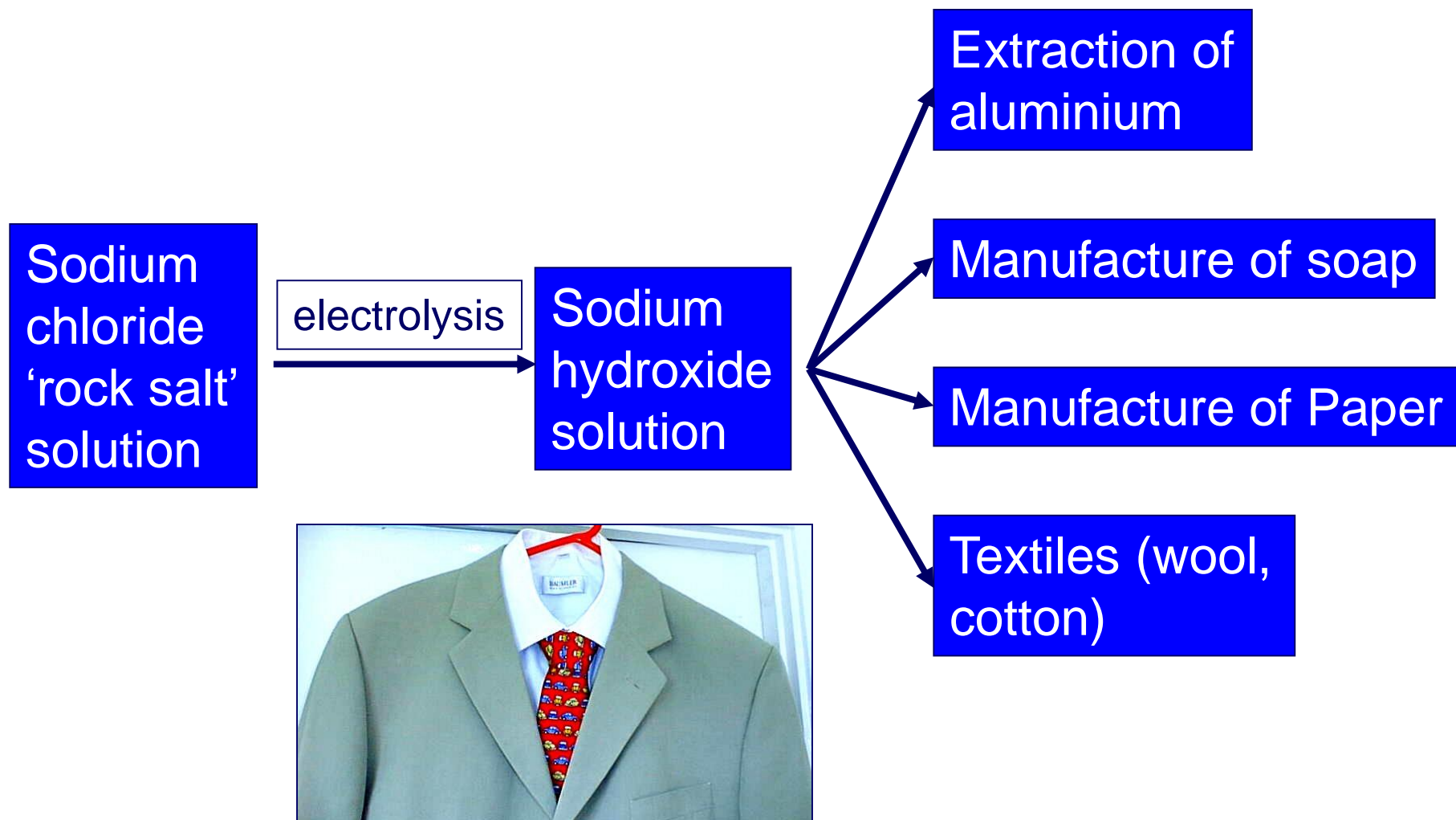
Sodium
hydroxide

Extraction of aluminium

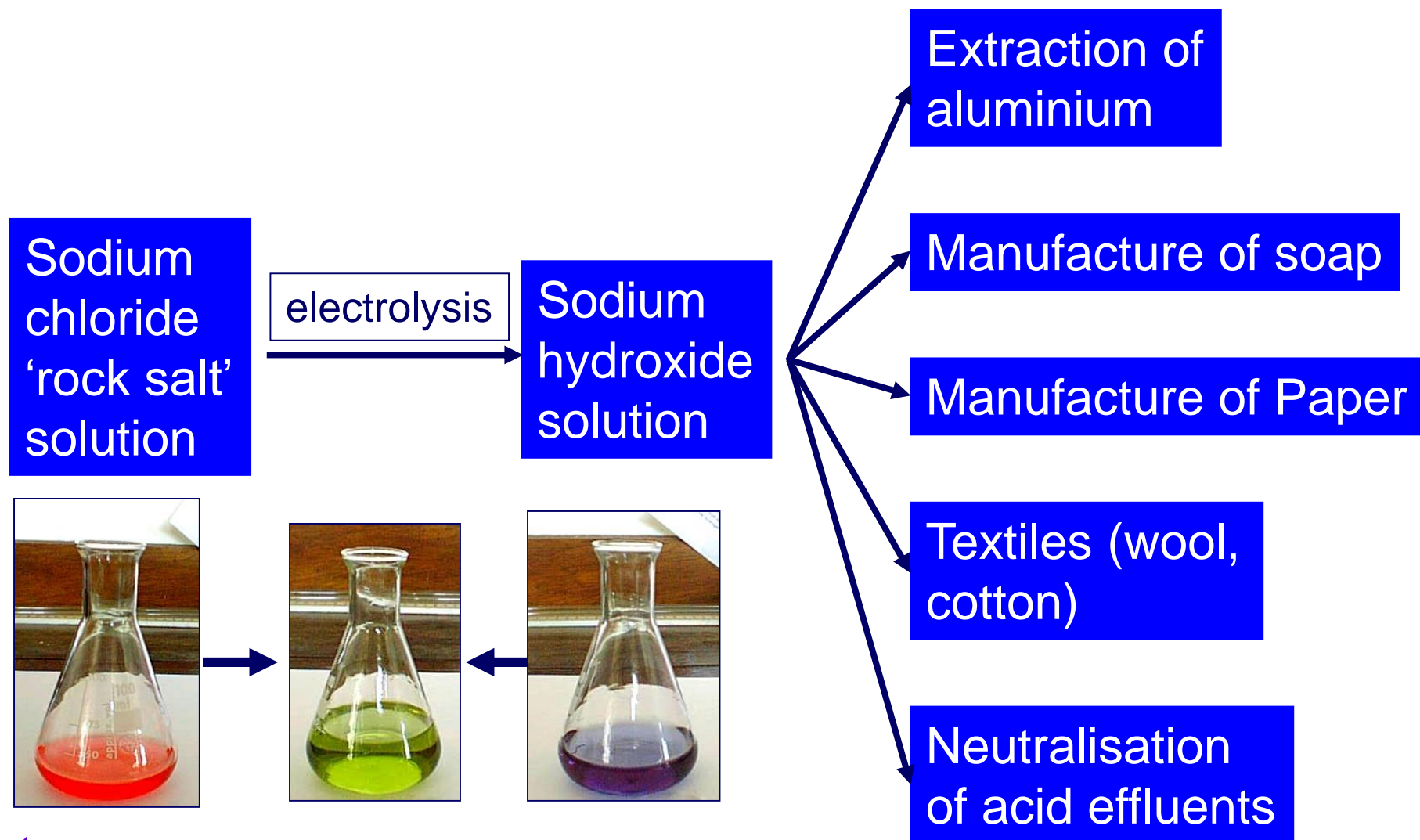
Manufacture of soap



Uses of sodium hydroxide 2



Uses of sodium hydroxide 3



Uses of Cl and NaOH

Soap

Bleach

HCl

Paper

Tippex

PVC

Pesticides

Dye

Cotton

Plastics

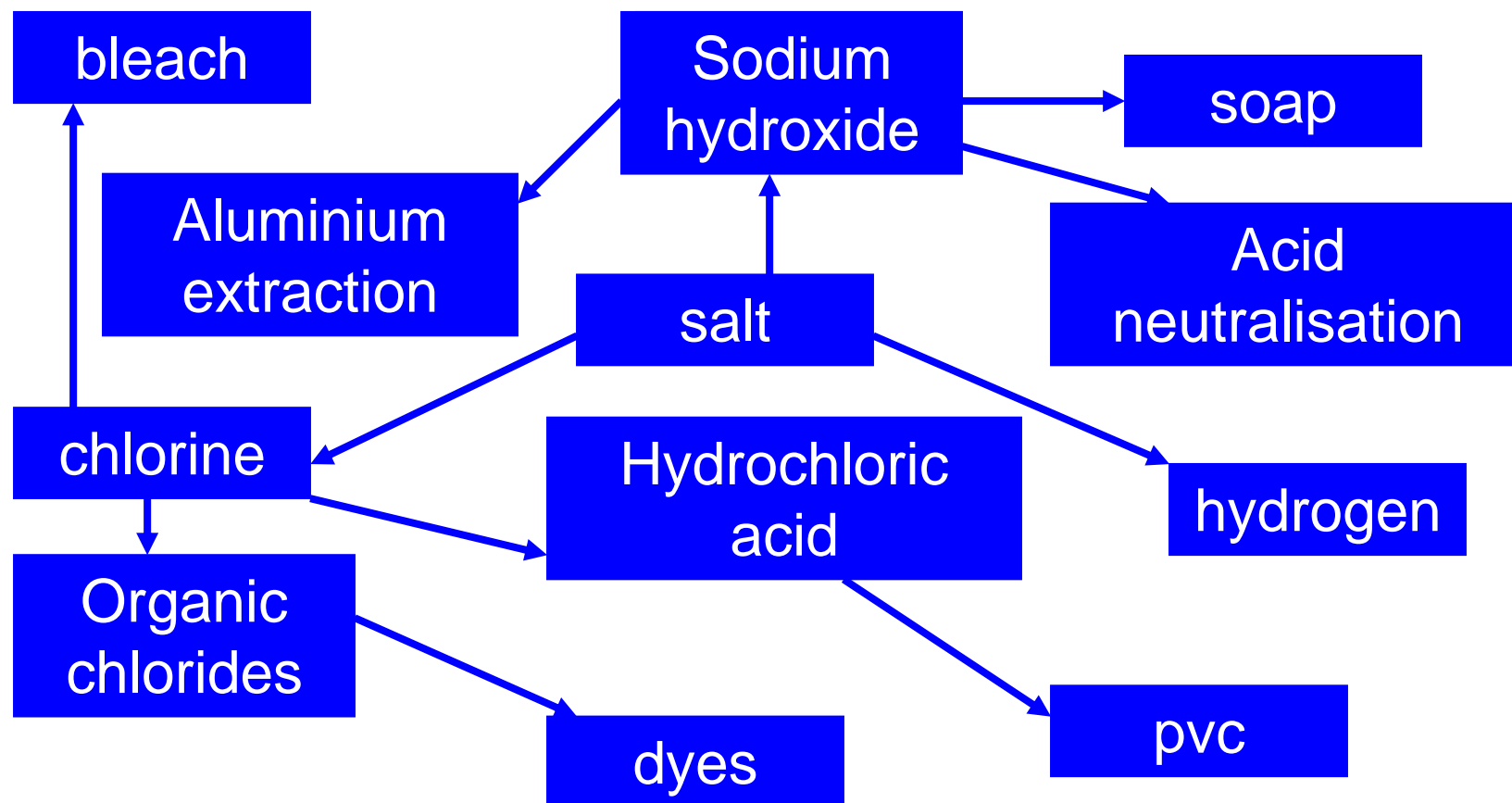
Chlorine

Sodium hydroxide



Uses of products from salt

Join the appropriate substances with arrows.

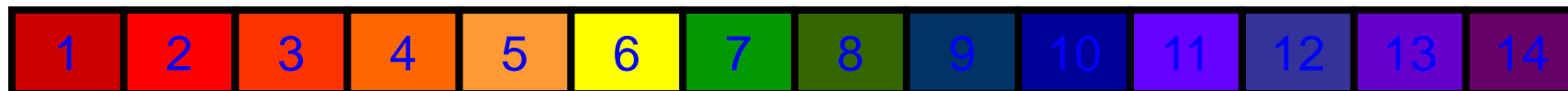
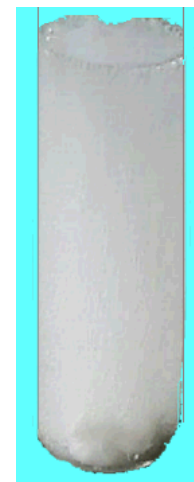


- Limestone is a sedimentary rock.
- It comes from the shells of sea creatures or from solids formed in the oceans long ago.
- It is mostly made of calcium carbonate - CaCO_3 .
- It is an important raw material for both the chemical and the construction industries.

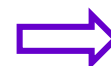


Limestone is a base with the formula CaCO_3 .

- It is capable of neutralising acids but because it is insoluble in water it does so without ever making the solution strongly alkaline.
- Carbonates fizz (effervesce) when they react with acids.



Neutralises acid - without the need for strong alkali



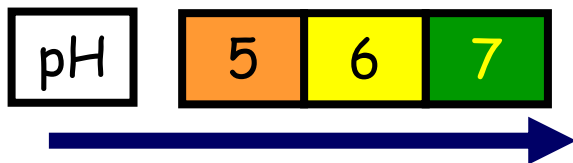
Limestone is a base with the formula CaCO_3 .

- During indigestion the stomach may produce too much (excess) acid.
- Indigestion tablets neutralise some of this acid.
- These tablets often contain purified calcium carbonate.



Limestone is used in agriculture.

- Acidity can build up in soils.
- This can inhibit the growth of many crops. Consequently farmers need to adjust the pH back towards neutral.
- Limestone provides a cheap way of neutralising soil acidity.



In the blast furnace limestone removes acidic earthy impurities that would ruin the quality of iron.

- Limestone is one of three major raw materials used to extract iron from its ores.
- It reacts with acidic impurities changing them into a slag that separates from the iron.

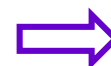


The endings to these sentences about limestone are not correct.

1. The chemical name for limestone is **slag**
2. Limestone fizzes in acid because it gives off **calcium carbonate**
3. Farmers use limestone to neutralise **carbon dioxide**
4. In the blast furnace limestone turns earthy impurities into **acid soil**



- Limestone is heated in huge ovens known as lime kilns.
- The calcium carbonate decomposes into calcium oxide (quicklime) and carbon dioxide.
- Quicklime is a vital ingredient of cement, concrete and of most types of glass.



- If water is added to quicklime the calcium oxide changes into calcium hydroxide (slaked lime).
- Slaked lime is a vital ingredient of various building materials.



- A solution of calcium hydroxide (limewater) is also used to test for carbon dioxide gas (it goes cloudy).



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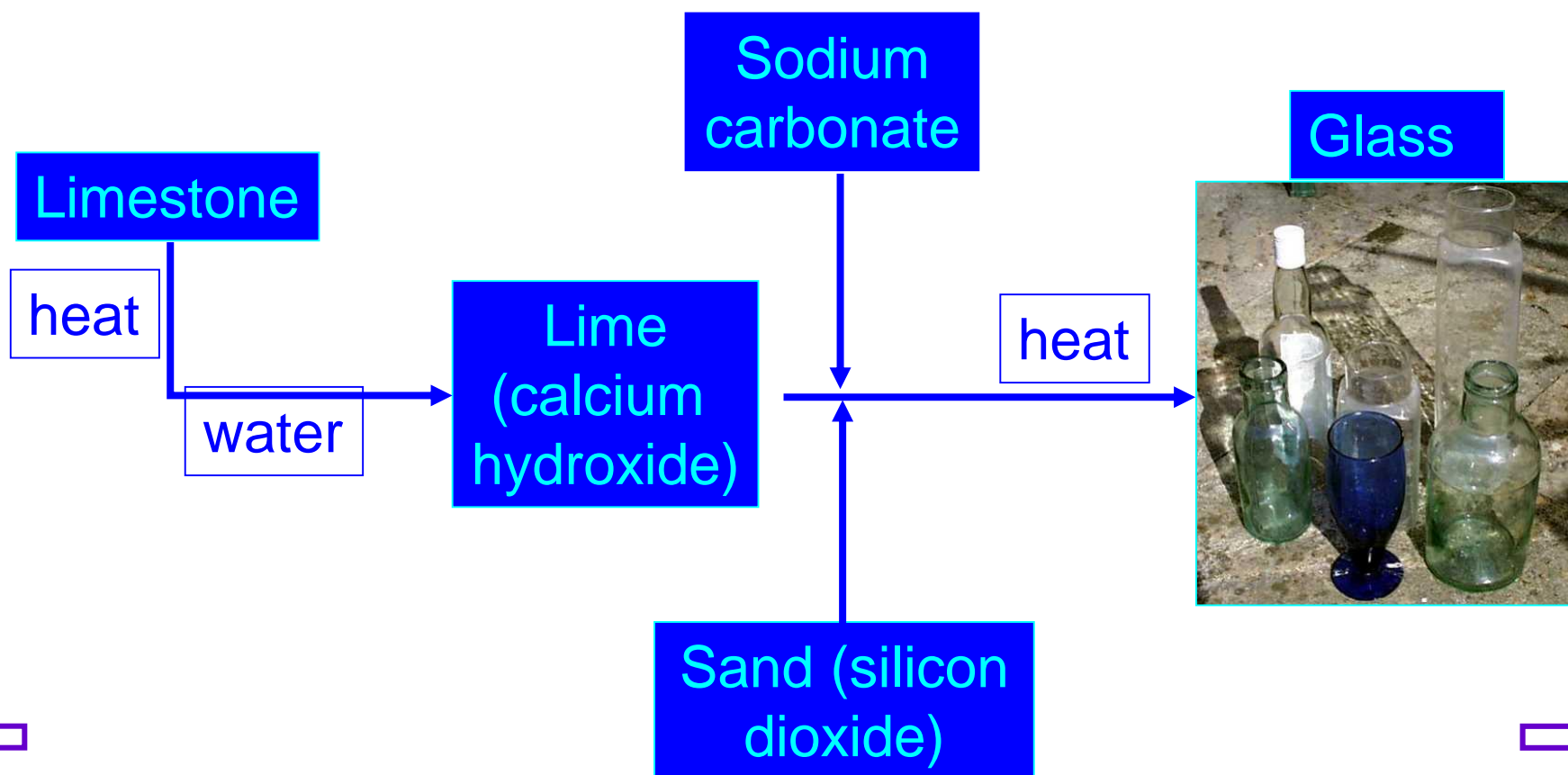


- To make concrete cement is mixed with small stones or gravel.
- Mortar consists of cement mixed with calcium hydroxide. This makes a smooth slow setting mixture suitable for bricklaying

Cement, concrete and mortar all set when interlocking crystals grow between cement particles joining them together.



Limestone, sand and sodium carbonate are the raw materials used to make most glass.



See if you can drag out the ingredients on the right to match the products of limestone on the left

Cement

=

Cement &
 Ca(OH)_2

Concrete

=

Clay

Glass

=

Sand &
 Na_2CO_3

Mortar

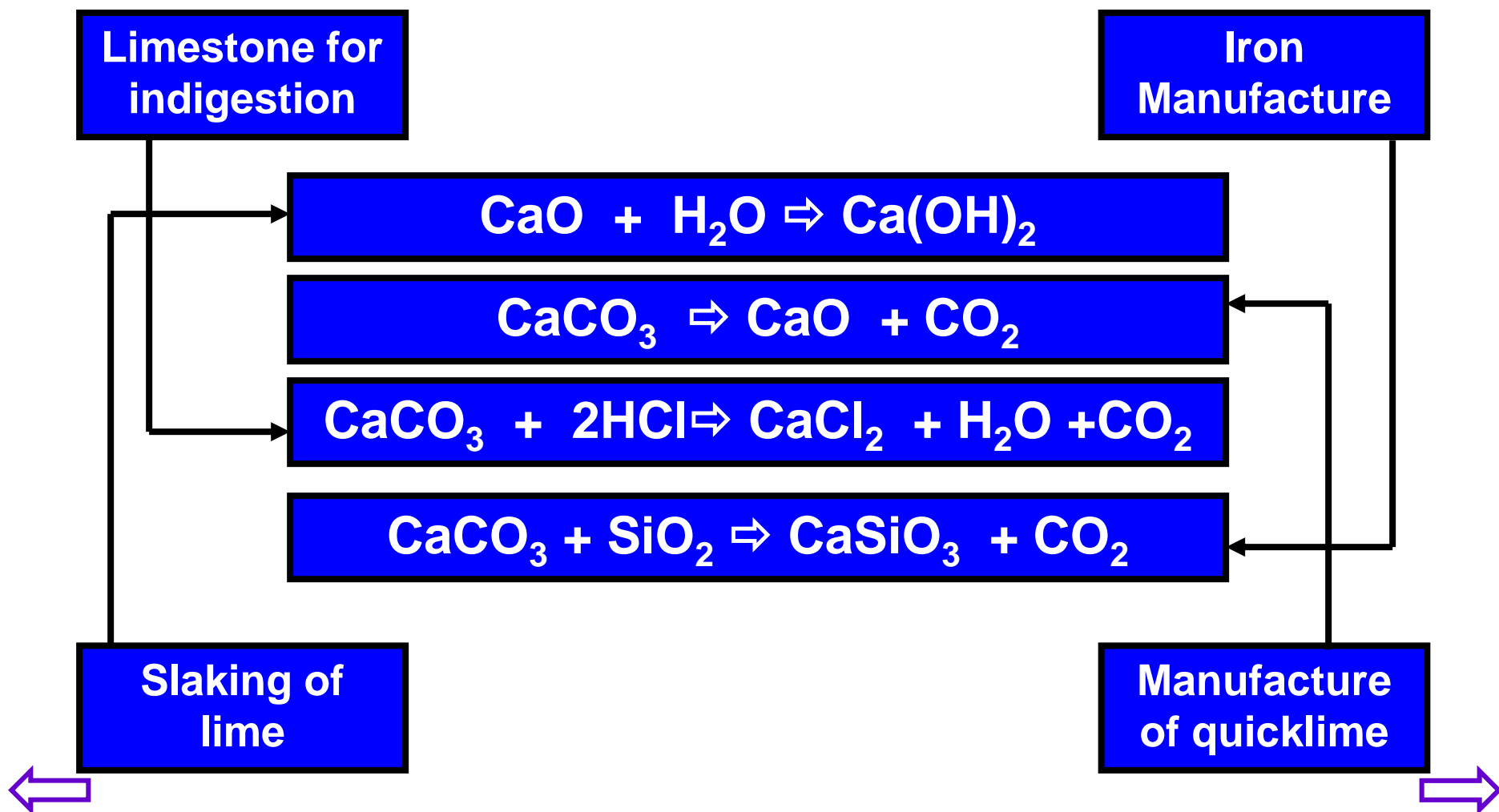
=

Cement &
gravel



Limestone

Join matching pairs with arrows.



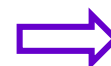
1. What is formed at the cathode in the electrolysis of aqueous rocksalt?

A. Sodium

B. Chlorine

C. Hydrogen

D. Sodium chloride



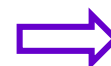
2. What is formed at the anode in the electrolysis of aqueous rocksalt.

A. Sodium

B. Chlorine

C. Hydrogen

D. Sodium hydroxide



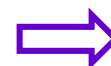
3. What is left in the solution as a result of the electrolysis of aqueous rocksalt?

A. Sodium

B. Chlorine

C. Hydrogen

D. Sodium hydroxide



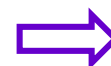
4. What is chlorine gas **NOT** used in the manufacture of?

A. Alkali

B. Hydrochloric acid

C. P.V.C.

D. Bleach



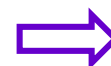
5. What is sodium hydroxide **NOT** used in the manufacture of:

A. Textiles

B. Aluminium

C. Soap

D. Cable insulation



6. Which is a true statement about limestone?

A. It is mostly calcium hydroxide

B. It reacts with acids to form carbon dioxide

C. It reacts with iron oxide in the blast furnace

D. It is used as a fertiliser

