

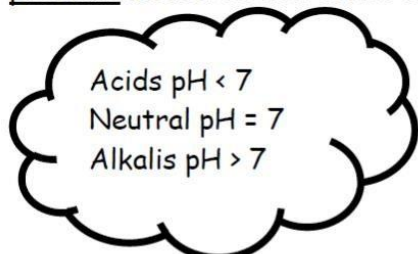
EP4_1A N5 Acids & Alkalis

Write the date in the margin of your jotter.
Write the title of this Exercise as a heading: EP1_1 N5 Acids & Bases



SUMMARY

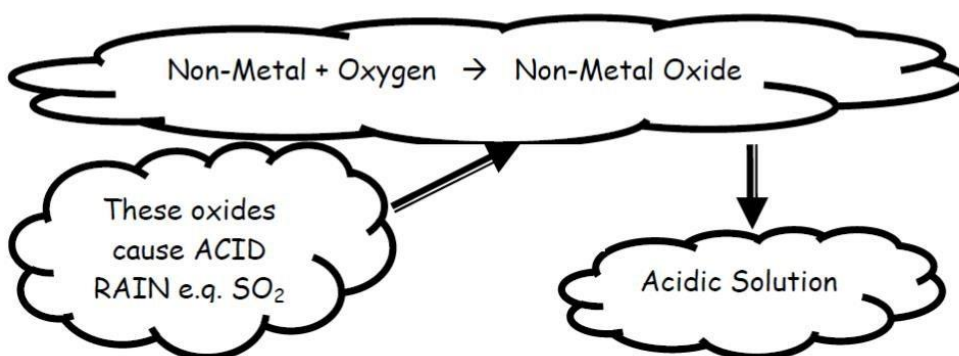
pH scale measures how acidic or alkaline a substance is.



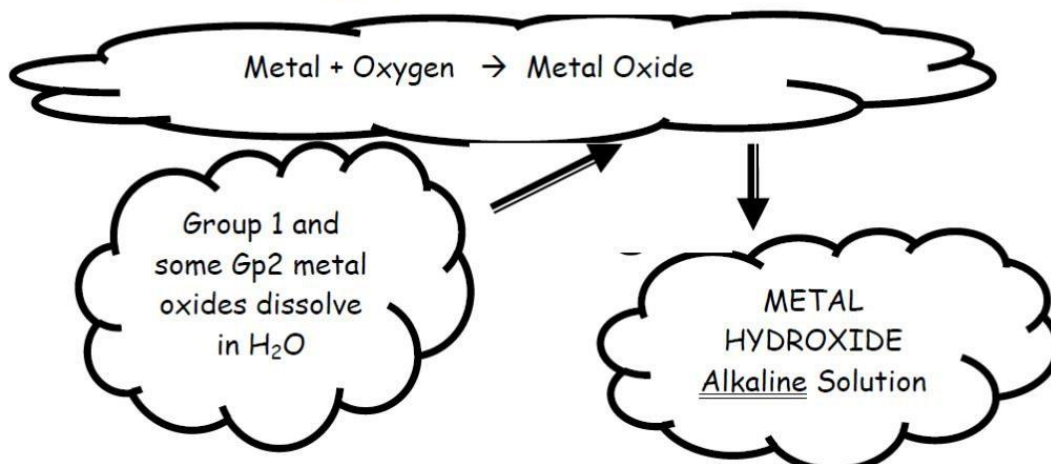
e.g. hydrochloric acid $\text{pH} = 1$
water $\text{pH} = 7$
sodium hydroxide $\text{pH} = 12$

Forming acids/ alkalis from oxides

When non-metals burn in oxygen,



When metals burn in oxygen,



ACIDS contain hydrogen ions, H^+

ALKALIS contain hydroxide ions, OH^-

Electrolyse an ACID to get hydrogen H_2 at (-) electrode

Water is NEUTRAL because there are equal concentrations of H^+ and OH^- ions

Dilute an ACID

pH increases towards 7 +

Concentration of H^+ decreases

pH decreases towards 7 +

Concentration of OH^- decreases

Dilute an ALKALI

Formula of Acids

Hydrochloric Acid HCl

Nitric Acid HNO_3

Sulphuric Acid H_2SO_4

Formula of Alkalis

Sodium Hydroxide

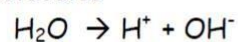
NaOH

Potassium Hydroxide

KOH

Conductivity of Water

Water conducts very slightly - this is due to the presence of FEW IONS. These come from the dissociation of a few water molecules



QUESTIONS

1. Use the table to answer the following.

The grid shows six oxides.

A	H ₂ O	B	NO ₂	C	K ₂ O
D	CaO	E	CO	F	SO ₂

(a) Identify the **two** oxides which dissolve in water to produce alkaline solutions.

- 2.

Some indicators can have different colours when in solutions of different pH values.

The tables give information about two indicators, bromothymol blue and methyl orange.

Bromothymol blue	
Colour	pH
yellow	below 6.0
blue	above 7.6

Methyl orange	
Colour	pH
red	below 3.1
yellow	above 4.4

The pH of three solutions was investigated using both indicators.

The results are shown below.

Substance	Colour with bromothymol blue	Colour with methyl orange
A	yellow	red
B	yellow	yellow
C	blue	yellow

- (a) Which solution is alkaline?
 (b) Suggest a pH value for solution B.

3.

Acids have many uses.

(a) Phosphoric acid is found in a fizzy drink.

Suggest the pH of the fizzy drink.

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(b) A student measured the pH of malt vinegar and other substances.

The results are shown.

Substance	pH value
malt vinegar	
oven cleaner	11
water	7
lemon juice	5
liquid soap	8

(i) Describe how the student would have used universal indicator or pH paper to measure the pH values.

(ii) Malt vinegar contains ethanoic acid.

Suggest a pH value for malt vinegar.

1

(c) Lemon juice contains citric acid.

Complete the sentence below by **circling** the correct answer.

When lemon juice is diluted with water the pH $\left\{ \begin{array}{l} \text{decreases} \\ \text{stays the same} \\ \text{increases} \end{array} \right\}$.

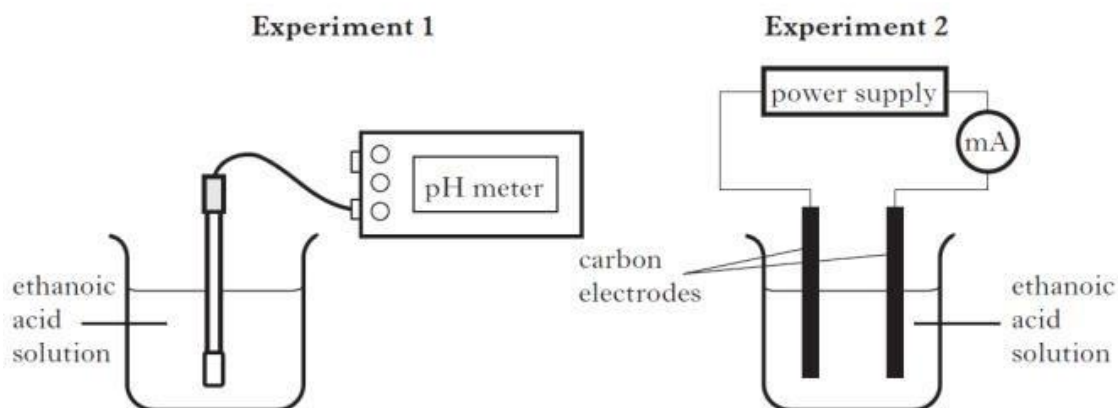
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(5)

4.

Vinegar is a solution of ethanoic acid in water.

(a) A student set up the following experiments.

He tested ethanoic acid solutions of different concentrations.



His results are shown below.

Ethanoic acid solution	pH	Current/mA
A	3	18
B	4	9
C	5	5

(i) Which ethanoic acid solution is the most acidic, **A**, **B** or **C**?

1

(ii) Predict the current, in mA, for an ethanoic acid solution of pH 6.

_____ mA

1

(b) Name the ion present in all acidic solutions.

1

5.

Indigestion tablets and dental products contain many chemical compounds.



(a) Stomach acid has a pH value of 2.

Indigestion tablets neutralise stomach acid.

What effect do the tablets have on the pH value of stomach acid?

_____ 1

(b) Some indigestion tablets contain calcium carbonate.

Calcium chloride, carbon dioxide and water are produced when calcium carbonate reacts with hydrochloric acid in the stomach.

(i) Write a **word** equation for the reaction.

1

(ii) Describe the chemical test, including the result, for carbon dioxide.

_____ 1

6.

Which of the following solutions is most acidic?

Solution	pH Value
A	8
B	7
C	4
D	2

7.

Which line in the table describes what happens to a dilute solution of hydrochloric acid when water is added to it?

	pH	$\text{H}^+(\text{aq})$ concentration
A	increases	increases
B	increases	decreases
C	decreases	increases
D	decreases	decreases

8.

Which of the following statements describes the concentrations of $\text{H}^+(\text{aq})$ and $\text{OH}^-(\text{aq})$ ions in pure water?

- A The concentrations of $\text{H}^+(\text{aq})$ and $\text{OH}^-(\text{aq})$ ions are equal.
- B The concentrations of $\text{H}^+(\text{aq})$ and $\text{OH}^-(\text{aq})$ ions are zero.
- C The concentration of $\text{H}^+(\text{aq})$ ions is greater than the concentration of $\text{OH}^-(\text{aq})$ ions.
- D The concentration of $\text{OH}^-(\text{aq})$ ions is greater than the concentration of $\text{H}^+(\text{aq})$ ions.

9.

Which oxide, when shaken with water, would leave the pH unchanged?

- A Calcium oxide
- B Carbon dioxide
- C Sulphur dioxide
- D Zinc oxide

NOW CHECK YOUR ANSWERS

