

# GRAYS TUITION CENTRE – Online Tutoring

**WEEK: 12**

**Week Beginning: (08/03/2021)**

**Subject: SCIENCE**

**Year: 7**

## **Lesson Objective:**

- Reactions of oxides with acids
- Displacement reactions

## **Keywords/ Concepts**

- Oxides
- Alkaline
- Acidic
- Displacement

## **Class Questions**

## **Homework**

- Make notes for displacement reactions.

## **Additional Notes**

- **Answers to last week's homework (week 11)**

## Classwork

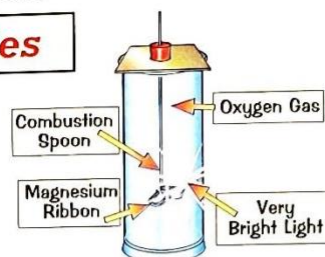
# Reactions of Oxides with Acids

Oxides are pretty self-explanatory — they've got oxygen in them somewhere...

## Metals React With Oxygen to Make Oxides

Metals react with oxygen to make metal oxides.

E.g. magnesium + oxygen → magnesium oxide.



## Metal Oxides are Alkaline

- 1) Metal oxides in solution have a pH which is higher than 7 — i.e. they're alkaline.
- 2) So metal oxides react with acids to make a salt and water.

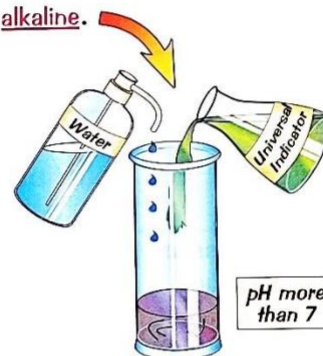


### EXAMPLES:

hydrochloric acid + copper oxide → copper chloride + water

sulfuric acid + zinc oxide → zinc sulfate + water

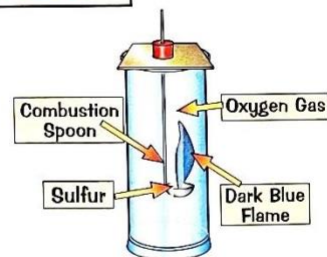
nitric acid + magnesium oxide → magnesium nitrate + water



## Non-metals React With Oxygen to Make Oxides

Non-metals also react with oxygen to make oxides.

E.g. sulfur + oxygen → sulfur dioxide.



## Non-metal Oxides are Acidic

- 1) The oxides of non-metals have a pH below 7. This means they're acidic.
- 2) So non-metal oxides will react with alkalis to make a salt and water.

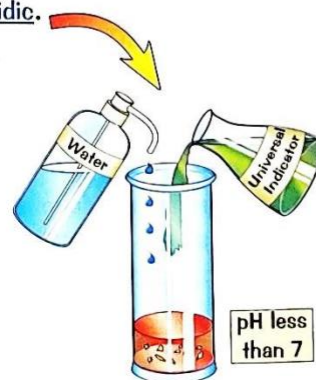


### EXAMPLE:

sodium hydroxide + silicon dioxide → sodium silicate + water

↑  
an alkali

↑  
a non-metal oxide



## Reactions of Oxides with Acids

Q1 Fill in the gaps in these chemical equations.

- a) iron + oxygen  $\rightarrow$  ..... oxide
- b) ..... + oxygen  $\rightarrow$  potassium oxide
- c) ..... + .....  $\rightarrow$  lead oxide
- d) carbon + oxygen  $\rightarrow$  .....
- e) silicon + .....  $\rightarrow$  ..... dioxide



Q2 Complete the sentences below by circling the correct words in brackets.

- a) Metal oxides in solution have a pH ( **higher** / **lower** ) than 7.  
This means that they are ( **acidic** / **alkaline** ).
- b) Non-metal oxides are ( **acidic** / **alkaline** ) and have a pH ( **higher** / **lower** ) than 7.
- c) When a metal oxide reacts with an acid it produces ( **a salt** / **an alkali** ) and ( **oxygen** / **water** ).

Q3 Magnesium ribbon burns in oxygen leaving behind a white powder.

- a) Why should you wear **eye protection** and not look directly at the magnesium when watching it burn?

.....

- b) What chemical is the **white powder**?

.....

Q4 Lithium oxide is mixed with water to make a solution.

- a) Is the solution an acid, an alkali or neutral?

.....

- b) Which **salt** will be made if **hydrochloric acid** is added to the beaker?

.....

- c) Name **one** other product of the reaction between lithium oxide and hydrochloric acid.

.....

# Reactions of Oxides with Acids

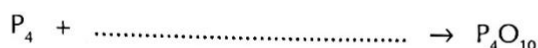
Q5 Tyler's teacher demonstrated how **phosphorus**, a non-metal, reacts with **oxygen**. A diagram of the experiment is shown below.



a) After the demonstration, Tyler noticed that the inside of the gas jar was coated with a **white powder**. What was the white powder?

.....

b) Complete the chemical equation for this reaction. Make sure your equation is **fully balanced**.



c) The teacher dissolved the white powder in water. If Tyler added some universal indicator to the solution, what would happen and why?

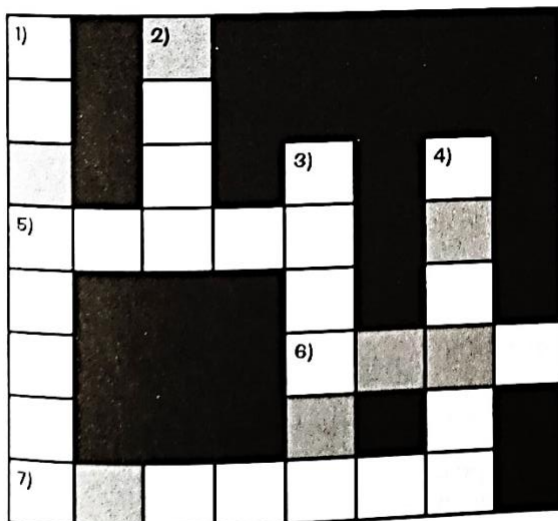
.....

d) Next, the teacher carefully added **sodium hydroxide** to the solution. The universal indicator turned **green**. Explain why.

.....

.....

Q6 Solve the clues and complete this crossword. Use the letters in the shaded boxes to make the name of a **mystery element** that forms an **acidic oxide**.



### Down

- 1) This reacts with oxygen to make an acidic oxide (3-5)
- 2) One of the products of a reaction between an acid and a metal oxide (4)
- 3) A solution that has a pH higher than 7 (6)
- 4) A substance that makes sodium oxide when burned in oxygen (6)

### Across

- 5) ..... oxides are alkaline (5)
- 6) Metal oxides react with this to make a salt and water (4)
- 7) This Group 1 element forms an alkaline oxide (7)

Mystery Element: .....

## Homework

# Displacement Reactions

This page is pretty crammed, but the stuff on it is actually dead easy, I promise...

**'Displacement' Means 'Taking the Place of'**



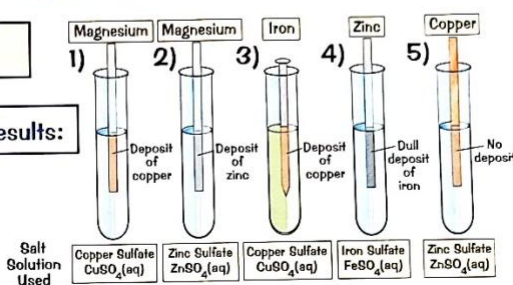
A **more reactive** metal will displace a **less reactive** metal from its compound.

- 1) The **reactivity series** (see page 54) tells you which are the most **reactive metals** — i.e. the ones which react **most strongly** with other things.
- 2) If you put a **more reactive** metal like **magnesium** into a solution of a **less reactive** metal compound, like **copper sulfate**, then **magnesium** will take the place of the **copper** — and make **magnesium sulfate**.
- 3) The "kicked out" metal then **coats** itself on the reactive metal, so we'd see **copper**.
- 4) This **only happens** if the metal added is **more reactive** — **higher displaces lower**. Got it?

## A Reactivity Series Investigation

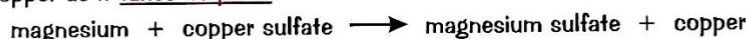
Method: Slap a bit of metal into some salt solutions and see what happens.

Results:



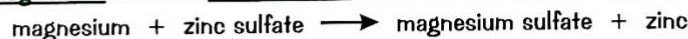
**Tube 1:** The blue **copper sulfate** solution goes **colourless** and the **copper** coats the magnesium strip.

**Magnesium** must be **more reactive** than copper as it **takes its place**.



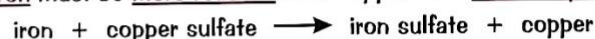
**Tube 2:** **Zinc** is seen coating the magnesium strip.

**Magnesium** must be **more reactive** than zinc as it **takes its place**.

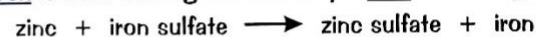


**Tube 3:** The blue **copper sulfate** solution goes **green** and the **copper** coats the nail.

**Iron** must be **more reactive** than copper as it **takes its place**.



**Tube 4:** **Iron** is seen coating the zinc strip. **Zinc** must be **more reactive** than iron as it **takes its place**.



**Tube 5:** There's **no reaction**. Copper **can't displace** zinc — it's **not reactive** enough.



Most Reactive

Magnesium

Zinc

Iron

Copper

Least Reactive



## Neutralisation is a Displacement Reaction

- 1) The **hydrogen** in hydrochloric acid is **displaced** (or replaced) by **sodium** from the **sodium hydroxide** (the alkali).
- 2) This makes **NaCl** and **H<sub>2</sub>O**.
- 3) NaCl is **sodium chloride** — common salt. And of course **H<sub>2</sub>O** is **water**. Of course you knew.

