

Unit 8: gas chemistry

Gas	% in air
Nitrogen	78
Oxygen	21
Carbon dioxide	0.03-0.04
Noble gases	Small proportions
Water vapour	Varies
Hydrogen	0

Properties of gases: Hydrogen

Hydrogen is the lightest of all elements. On the Earth it occurs in many compounds. Outside the Earth it is the most common element in the Universe.



Observations:

- Bubbles of colourless gas
- zinc granules get smaller and eventually disappear
- bottom of flask hot to touch

Physical properties: It is made up of diatomic molecules, $\text{H} - \text{H}$ or H_2 .

Density: least dense gas known

Colour: colourless

Odour: odourless

Solubility in water: almost insoluble in water.

Oxidation and reduction reactions:

Oxidation	Reduction
Gain of oxygen	Loss of oxygen
Loss of hydrogen	Gain of hydrogen

An oxidising agent provides the oxygen. A reducing agent removes the oxygen. When both oxidation and reduction occur in a reaction, it is called a REDOX reaction. RED = reduction, OX = oxidation

Redox reaction: oxidation and reduction occur at the same time

1. Reaction with air

Hydrogen gas burns in excess air, specifically with oxygen gas, with a blue flame, to form water vapor.

This is an example of an oxidation reaction, i.e. oxygen has been added to the hydrogen gas to form water



Oxidising agent: Oxygen gas

Reducing agent: hydrogen gas

2. As a reducing agent

Hydrogen gas can act as a reducing agent by removing oxygen from a compound. If passed over hot copper (II) oxide it will remove the oxygen as shown below.



Colour change: Black to **pink/orange**

This is another example of a redox reaction

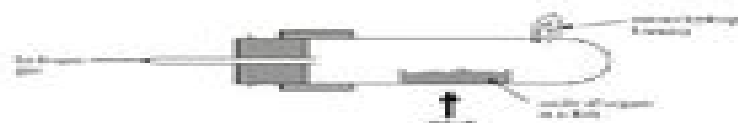
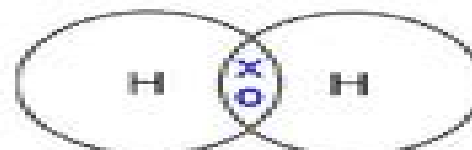
3. With nitrogen gas (see next section)

Uses of hydrogen gas:

- It is used in meteorological (weather) balloons.
- It is used in hardening oils i.e. margarine production
- It is used as a rocket fuel.
- It has the potential to be a clean fuel for transport.

Clean fuel: Water is the only waste product and this is non-polluting

- Safe in fuel cells but expensive to run
- Stored under pressure as a liquid-energy expensive as it needs insulation
- Metal containers coated with non-porous materials to reduce diffusion of gases
- Leaks may damage ozone layer
- Costly distribution systems to be set up, highly flammable



The Essentials Of Gcse Double Award Chemistry Materials And Their Properties

Yan Bai



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Table of Contents The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties

1. Understanding the eBook The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - The Rise of Digital Reading The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - Advantages of eBooks Over Traditional Books
2. Identifying The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - User-Friendly Interface
4. Exploring eBook Recommendations from The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - Personalized Recommendations
 - The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties User Reviews and Ratings
 - The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties and Bestseller Lists
5. Accessing The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties Free and Paid eBooks
 - The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties Public Domain eBooks
 - The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties eBook Subscription Services

- The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties Budget-Friendly Options
- 6. Navigating The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties eBook Formats
 - ePub, PDF, MOBI, and More
 - The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties Compatibility with Devices
 - The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - Highlighting and Note-Taking The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - Interactive Elements The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
- 8. Staying Engaged with The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
- 9. Balancing eBooks and Physical Books The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - Setting Reading Goals The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - Fact-Checking eBook Content of The Ebentials Of Gcse Double Award Chemistry Materials And Their Properties
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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