

Chemical Reactions

40 slides, 13 Flash activities

This presentation is designed to teach:

- what a chemical reaction is
- what reactants and products are
- how to recognize when a reaction is occurring
- how to write symbol equations for reactions and name compounds
- how making a mixture or solution is different from causing a chemical reaction
- what thermal decomposition is, using the example of calcium carbonate.

The elements

Click a symbol for more information about the element

51 vanadium

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Speed of Reactions

39 slides, 13 Flash activities

This presentation is designed to teach:

- what rate of a reaction is, and how it is calculated
- what activation energy is
- how to set up an experiment to determine the rate of a reaction
- how to read rate of reaction from a graph
- how rate of reaction is affected by temperature, concentration, surface area and the presence of a catalyst.

Surface area and particle collisions

How does surface area affect particle collisions?

19 10 35

small surface area large surface area

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Atoms and Atomic Structure

40 slides, 12 Flash activities

This presentation is designed to teach:

- what elements are
- the atomic particles that make up atoms and how these particles are arranged
- what atomic number and mass number represent
- what isotopes are
- how electrons are arranged by their electronic configuration.

What are the isotopes of carbon?

Most naturally-occurring carbon exists as carbon-12, about 1% is carbon-13 and a much smaller amount is carbon-14.

12 C 6	6 protons 6 neutrons 6 electrons	13 C 6	6 protons 7 neutrons 6 electrons	14 C 6	6 protons 8 neutrons 6 electrons
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The Periodic Table

40 slides, 15 Flash activities

This presentation is designed to teach:

- how elements are laid out in the periodic table
- how element arrangement relates to atomic number
- how an element's position in the periodic table allows prediction of behaviour
- the patterns of reactivity of particular groups of metals and non-metals
- how electron arrangement changes across periods.

Electrons in period 3

Elements in period 3 have complete first and second shells. What happens to electrons in the third shell in period 3?

	1	2	3	4	5	6	7	0
3	Na	Mg	Al	Si	P	S	Cl	Ar
	2,8,1	2,8,2	2,8,3	2,8,4	2,8,5	2,8,6	2,8,7	2,8,8

The third shell is completed, one electron at a time, across the period from left to right.

What is special about the outer shell of argon?

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How Atoms Combine

40 slides, 9 Flash activities

This presentation is designed to teach:

- why atoms form bonds
- what covalent bonds are
- which elements form these bonds
- that simple covalent molecules are most often formed by covalent bonds, but giant covalent structures also exist
- how structure affects the properties of substances.

How does structure affect properties?

How do the different structures of diamond and graphite influence their properties?

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Fuels

51 slides, 12 Flash activities

This presentation is designed to teach:

- what combustion and incomplete combustion are
- how to test for the products of combustion
- that combustion is an exothermic reaction used to power engines
- how fossil fuels were formed
- how crude oil is made useful
- how combustion of fossil fuels contributes to air pollution and acid rain
- how air pollution can be reduced.

Fractional distillation in the lab

Fractional distillation of crude oil can be done in the laboratory by heating crude oil and collecting the vapour produced at different temperatures.

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Structures and Reactions of Hydrocarbons

37 slides, 8 Flash activities

This presentation is designed to teach:

- what alkanes and alkenes are, their general formulae and their structures
- how alkane structures relate to their melting and boiling points
- how alkenes react with bromine and hydrogen
- what the terms saturated and unsaturated mean
- how crude oil is refined by fractional distillation and what the fractions are used for
- how catalytic cracking is used.

How does fractional distillation work?

How are different fractions separated from crude oil?

Stage 6
Each fraction contains a mix of hydrocarbons with similar properties, including similar boiling points and viscosities.

gasoline
naphtha
kerosene
diesel oil
lubricating oil
fuel oil
residue

Gas
Contains molecules with 1-4 carbon atoms.
Boils at $<0\text{ }^\circ\text{C}$.
Also known as liquid petroleum gas (LPG).

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Properties of Substances

43 slides, 14 Flash activities

This presentation is designed to teach:

- how atoms form ions, and how ionic compounds are formed
- what the typical properties of ionic compounds are
- what the properties of simple and complex covalent substances are
- what electrolysis is and how solutions of ionic compounds and molten ionic compounds conduct electricity
- what oxidation and reduction are
- what the products of the electrolysis of sodium chloride are and how these form.

Electrolysis of molten lead bromide

Electrolysis of molten lead bromide

Stage 3
The positive lead ions (Pb^{2+}) are attracted to the negative electrode. They gain electrons from the current and form lead atoms (Pb). The Pb^{2+} ions have been reduced.

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Acids and Alkalis

34 slides, 7 Flash activities

This presentation is designed to teach:

- what acids and alkalis are
- that water molecules can dissociate to form ions
- how dilution affects the pH of a solution
- how relative formula mass is calculated
- how relative formula mass relates to moles
- how mole values are used in calculations to find the concentration of a solution or the amount of a solute in a solution.

Relative formula mass 'calculator'

What is the relative formula mass?

H₂SO₄ total 98g

Correct selection! Try a new formula.

The Reactions of Acids

31 slides, 7 Flash activities

This presentation is designed to teach:

- that neutralization is the reaction between an acid and a base
- how knowledge of neutralization is useful in everyday life
- that reactions between an acid and a base produce a salt and water
- that reactions between acids and metals produce salts and hydrogen
- that reactions between acids and metal carbonates produce salts, carbon dioxide and water
- how to test for hydrogen and carbon dioxide.

What is the pH?

Is the pH value higher or lower?

water car battery

1 2 3 4 5 6 7 8 9 10 11 12 13 14

strong acid weak acid neutral weak alkali strong alkali

solve

Making Electricity

52 slides, 10 Flash activities

This presentation is designed to teach:

- what a displacement reaction is
- common examples of displacement reactions
- the reactivity of different metals
- what reduction and oxidation are
- what cells and batteries are
- the different types of cells and batteries
- what an electrochemical cell is
- how voltage changes during electrolysis
- how an ion bridge works.

The ion bridge

The ion bridge is present to complete the circuit. What is happening inside the ion bridge?

The K^+ and NO_3^- ions move through the salt bridge to complete the circuit:

- the positive K^+ ions move towards the copper electrode
- the negative NO_3^- ions move towards the zinc electrode.

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Metals – Properties and Corrosion

40 slides, 8 Flash activities

This presentation is designed to teach:

- the typical properties of metals
- what the properties of specific metals are and how this relates to their use
- what an alloy is and how alloys are used
- what corrosion is and the ways it can be prevented
- what reactions are involved in rusting.

Do all metals behave in the same way?

What are the properties of different metals?

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Metals – Extraction and Recycling

36 slides, 11 Flash activities

This presentation is designed to teach:

- that most metals are deposited as ores in the Earth's crust
- the difficulties involved in recycling metals
- how carbon and electrolysis are used to separate metals from their ores
- that the reactivity of a metal determines how it is extracted
- how mining for metals affects the environment.

Guess the metal


Which metal is it?

Mystery metal 1

Clue A It is found in the Earth as bauxite.

Clue B It does not corrode easily.

Clue C It is used to make drinks cans.



gold ✗ aluminium ✓ iron titanium copper

next

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Plastics and Synthetic Fibres

46 slides, 14 Flash activities

This presentation is designed to teach:

- what polymers are and how they are formed
- what the monomers of particular synthetic fibres are
- how addition reactions form polymers and how to write the shorthand formulae of polymers
- how to name polymers
- what the properties of plastics are, how these relate to their use and how additives affect them
- the problems of disposing of plastics.

What's the polymer?

What is the shorthand formula for polypropene?

The monomer is propene (C_3H_6):

$$\begin{array}{c} \text{H} & \text{H} & & \text{H} \\ | & | & & | \\ \text{H}-\text{C} & -\text{C} & = & \text{C}-\text{H} \\ | & & & | \\ \text{H} & & & \text{H} \end{array}$$

which can be drawn as:

$$\begin{array}{c} \text{CH}_3 & \text{H} \\ & | \\ & \text{C} = \text{C} \\ & | \\ \text{H} & \end{array}$$

1. Draw two C atoms that were in the double bond with a single covalent bond.
2. Draw the brackets and the 'n'.
3. Add the links outside the brackets.
4. Add the atoms that were attached to each C atom of the double bond.

$$\left(\begin{array}{c} \text{CH}_3 & \text{H} \\ | & | \\ -\text{C} & - & \text{C}- \\ | & | \\ \text{H} & \text{H} \end{array} \right)_n$$

polypropene

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Fertilizers

46 slides, 13 Flash activities

This presentation is designed to teach:

- which nutrients are essential for plant growth
- how fertilizers can be used to supplement phosphates, potassium and nitrates in soil
- how nitrates are produced naturally within the nitrogen cycle
- how ammonia is produced
- what the Haber compromise is
- how to calculate the percentage mass of an element in a compound.

Eutrophication

What is eutrophication?

Stage 4
The bacteria that decompose the dead plants reduce the amount of oxygen in the water.

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Carbohydrates

40 slides, 11 Flash activities

This presentation is designed to teach:

- what monosaccharides are
- how disaccharides and polysaccharides form
- what reducing sugars are
- the properties of starch and how it is used by organisms
- how digested carbohydrates are used
- the equation for photosynthesis
- how photosynthesis uses carbon dioxide from the air
- how different drinks can be produced by fermenting different carbohydrate-containing plants and how alcohol is distilled.

Word equation to symbol equation

What are the chemical formulas for the reactants and products of photosynthesis?

carbon dioxide + water → glucose + oxygen

light energy

chlorophyll

6 H₂O

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