OCR (B) Chemistry GCSE

C1 - Air and Water

Flashcards

How are particles arranged in solids, liquids and gases?

How are particles arranged in solids, liquids and gases?

- Solid - regular arrangement, very close together.
- Liquid - random arrangement, close together.
- Gas - random arrangement, far apart.

Describe the energy and movement of particles in solids, liquids and gases

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- Solid - vibrate in a fixed position, low energy.
- Liquid - move around each other, higher energy.
- Gas - move randomly in all directions, highest energy.

What are the names for the state changes from solid to liquid and vice versa?

What are the names for the state changes from solid to liquid and vice versa?

Solid → liquid: Melting

Liquid → solid: Freezing

Describe what happens, in terms of particles, when a solid melts

Describe what happens, in terms of particles, when a solid melts

When heated the particles absorb thermal energy which is converted into kinetic energy. The particles in the solid vibrate more. This causes the solid to expand until the structure breaks and becomes a liquid.

What is the term describing when a solid changes straight into a gas?

What is the term describing when a solid changes straight into a gas?

Sublimation

What are the names for the state changes from liquid to gas and vice versa?

What are the names for the state changes from liquid to gas and vice versa?

Liquid → gas: Evaporation

Gas → liquid: Condensation

Describe what happens, in terms of particles, when a liquid evaporates

Describe what happens, in terms of particles, when a liquid evaporates

When heated, the particles in a liquid expand and some particles on the surface gain sufficient energy to overcome the intermolecular forces and evaporate. At the boiling point, all of the liquid particles gain enough energy to evaporate.

Describe, in terms of energy what happens when a liquid freezes

Describe, in terms of energy what happens when a liquid freezes

Energy is transferred from the liquid to the surroundings. The particles have less kinetic energy so the liquid becomes a solid.

Do particles have the same properties as the bulk substance?

Do particles have the same properties as the bulk substance?

No

The arrangement and movement of all the particles affects the physical properties of a bulk substance.

Explain the physical properties of solids

Explain the physical properties of solids

- Fixed shape because the particles can't move.
- They cannot be compressed because the particles are very close together so there is no space for particle to move into.

Explain the physical properties of liquids

Explain the physical properties of liquids

- Flow because the particles can move around each other.
- Cannot be compressed because the particles are quite close together so there is no space for particles to move into.

Explain the physical properties of gases

Explain the physical properties of gases

- Fill a container because the particles move rapidly in all directions.
- Can be compressed because the particles are far apart together with space for particle to move into.
- Flow because the particles can move around each other.

How does a physical change differ from a chemical change?

How does a physical change differ from a chemical change?

A physical change involves changes in the forces between particles. The particles and chemical properties remain the same.

A chemical change affects the chemical properties of the substance.

What are the limitations of the particle model?

(Higher only)

What are the limitations of the particle model? (Higher only)

- It assumes particles are spherical.
- All particles are shown as the same size.
- Gaps between gaseous atoms should be much larger.
- It doesn't show the difference in the forces of attraction between particles.

Substance A melts at 42°C and boils at 107°C. What state is substance A at 50° C?

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Liquid

Substance B melts at -17°C and boils at 2°C. What state is substance B at 20°C?

Substance B melts at -17°C and boils at 2°C. What state is substance B at 20°C?

Gas

Substance C melts at -30°C and boils at -5°C. What state is substance C at -45° C?

Substance C melts at -30°C and boils at -5°C. What state is substance C at -45°C?

Solid

What three types of evidence are there for the composition of the early atmosphere?

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Volcanoes - modern volcanoes release CO_2 and water suggesting the early atmosphere was mostly made up of these compounds.

Ancient rocks - iron sulfide is only found in rocks formed before oxygen was in the atmosphere. Rocks with iron oxide need oxygen to form. Dating rocks suggests when oxygen was first in the atmosphere.

Fossils - life processes affect the atmosphere. Early plants suggest how oxygen was added to the atmosphere.

How did oceans initially form?

How did oceans initially form?

Condensation of water vapour from volcanoes.

How did the amount of carbon dioxide in the atmosphere decrease after oceans formed?

How did the amount of carbon dioxide in the atmosphere decrease after oceans formed?

Carbon dioxide dissolved into the oceans so the amount of carbon dioxide in the atmosphere decreased.

How did the oxygen-rich atmosphere develop?

How did the oxygen-rich atmosphere develop?

The growth of early plants used carbon dioxide for photosynthesis and released oxygen. This increased the amount of oxygen and decreased the amount of carbon dioxide in the atmosphere.

What is the main source of carbon monoxide and carbon particulates?

What is the main source of carbon monoxide and carbon particulates?

Incomplete combustion

What are the problems with carbon monoxide?

What are the problems with carbon monoxide?

Carbon monoxide is a toxic gas.

It is colourless and odourless and if breathed in can cause death by preventing the red blood cells from carrying oxygen around the body.

What is the problem with carbon particulates?

What is the problem with carbon particulates?

- Causes breathing problems
- Blackens buildings
- Can block appliances and cause fires

What is the main source of sulfur dioxide?

What is the main source of sulfur dioxide?

Combustion of sulfur impurities in fuel.

What is the problem with sulfur dioxide?

What is the problem with sulfur dioxide?

Sulfur dioxide reacts with water in clouds to form acid rain.

Acid rain:

- Corrodes metal structures.
- Damages stone buildings and statues.
- Damages the waxy layer on leaves.
- Increases the acidity of aquatic environments such as lakes.

What is the main source of oxides of nitrogen?

What is the main source of oxides of nitrogen?

Oxidation of nitrogen at high temperatures (i.e. when fuels are combusted in engines) followed by further oxidation in the air.

What is the problem with oxides of nitrogen?

What is the problem with oxides of nitrogen?

- React with sunlight to form smog
- Toxic
- Causes bronchitis / lung diseases
- React with water to form acid rain

List three ways the emission of atmospheric pollutants can be reduced

List three ways the emission of atmospheric pollutants can be reduced

- Use catalytic converters
- Use lower sulfur fuel
- Use gas scrubbers

Describe how a catalytic converter reduces emissions of atmospheric pollutants

Describe how a catalytic converter reduces emissions of atmospheric pollutants

Nitrogen monoxide and carbon monoxide are converted to nitrogen and carbon dioxide which are less harmful.

Describe how gas scrubbers reduce emissions of atmospheric pollutants

Describe how gas scrubbers reduce emissions of atmospheric pollutants

Reduces emissions of sulfur dioxide in flue gases from power stations.

An alkaline slurry (calcium oxide and water) or sea water are used in wet scrubbing.

Use chemical symbols to write the formula of carbon dioxide, nitrogen and methane

Use chemical symbols to write the formula of carbon dioxide, nitrogen and methane

Carbon dioxide - CO_2

Nitrogen - N_2

Methane - CH_4

Write the word and balanced symbol equations for the combustion of methane

Write the word and balanced symbol equations for the combustion of methane

Methane + oxygen → carbon dioxide + water

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

Describe the test for oxygen

Describe the test for oxygen

A test tube of oxygen will relight a glowing splint.

Describe the test for hydrogen

Describe the test for hydrogen

A lighted splint placed in a test tube of hydrogen will make a squeaky pop.

Describe the test for carbon dioxide

Describe the test for carbon dioxide

Turns limewater (calcium hydroxide) from colourless to cloudy as calcium carbonate precipitate is produced.

In terms of oxygen, what is meant by oxidation?

In terms of oxygen, what is meant by oxidation?

Gain of oxygen

What is an example of a common oxidation reaction?

What is an example of a common oxidation reaction?

Combustion

What do the terms exothermic and endothermic mean?

What do the terms exothermic and endothermic mean?

Endothermic - a reaction that takes in energy from the surroundings.

Exothermic - a reaction that gives out energy to the surroundings.

During a chemical reaction, the temperature of the surroundings increases. Is this reaction exothermic or endothermic?

During a chemical reaction, the temperature of the surroundings increases. Is this reaction exothermic or endothermic?

Exothermic - energy is released during the reaction.

Draw and label a reaction profile diagram for an exothermic reaction

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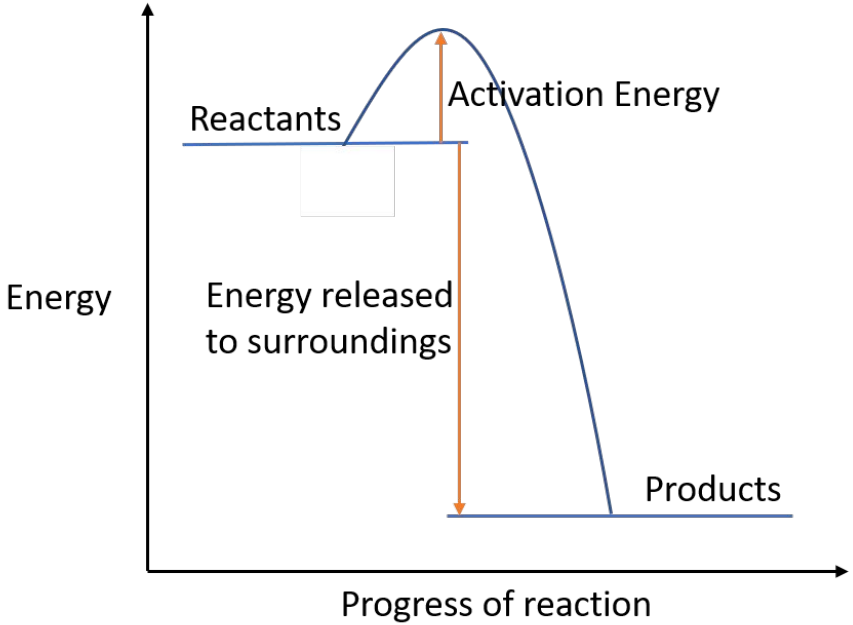
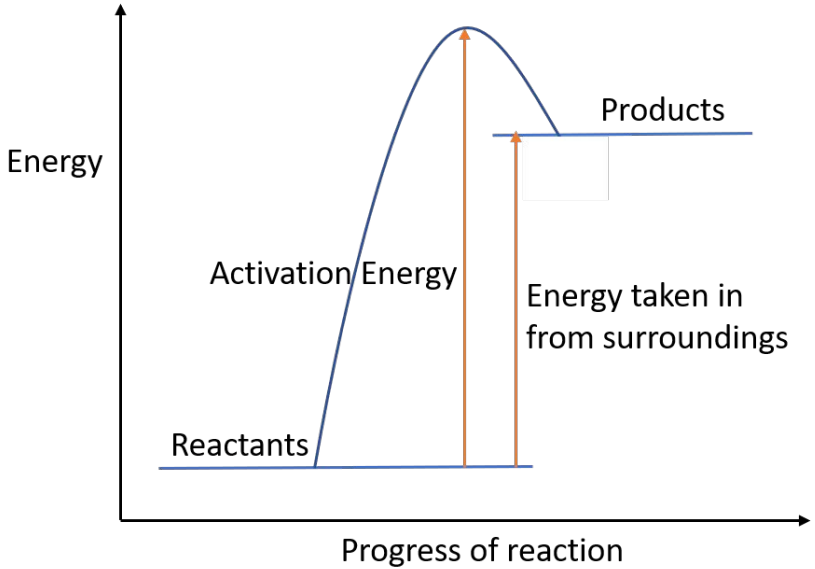


Draw and label a reaction profile diagram for an endothermic reaction

Draw and label a reaction profile diagram for an endothermic reaction



What does the term activation energy mean?

What does the term activation energy mean?

The minimum energy required for a reaction to occur.

In terms of bond energies, what happens during a chemical reaction? Describe exothermic and endothermic reactions in terms of bonds breaking / forming.

(Higher only)

In terms of bond energies, what happens during a chemical reaction? Describe exothermic and endothermic reactions in terms of bonds breaking/forming. (Higher only)

Energy is needed to break bonds and is released when bonds are made.

Exothermic: Energy released from breaking bonds is greater than the energy used to make bonds.

Endothermic: Energy released in forming new bond is greater than the energy used to break old bonds.

How can the energy change of a reaction be calculated from bond energies? (Higher only)

How can the energy change of a reaction be calculated from bond energies? (Higher only)

Energy change (kJ mol^{-1}) =

Total energy of bonds broken - total energy of bonds made

Using the table below, calculate the energy change that takes place when methane is combusted (Higher only)

Bond	Bond energy (kJ/mol)
C-H	413
O=O	498
C=O	805
O-H	464

Using the table below, calculate the energy change that takes place when methane is combusted (Higher only)

Bond	Bond energy (kJ/mol)
C-H	413
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C=O	805
O-H	464

1. Balanced equation: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
2. Bonds to break: C-H (x 4), O=O (x 2)
3. Energy in: (4 x 413) + (2 x 498) = 2648
4. Bonds to form: C=O (x 2), O-H (x 4)
5. Energy out: (2 x 805) + (4 x 464) = 3466
6. Energy change: energy in - energy out = 2648 - 3466 = -818 kJ/mol

Describe an experiment to investigate whether a reaction is exothermic or endothermic

(Chemistry only)

Describe an experiment to investigate whether a reaction is exothermic or endothermic (Chemistry only)

Place a thermometer into the first reactant, and record the initial temperature. Add a second reactant and mix, observing the temperature change. A temperature rise means the reaction is exothermic. A fall in temperature means it's endothermic.

How can a chemical cell be set up to produce a potential difference? (Chemistry only)

How can a chemical cell be set up to produce a potential difference? (Chemistry only)

Two different metals are placed in salt solutions of their own ions. The metals are connected by a wire.

Electrons flow through the wire from the more reactive metal to the less reactive metal. This flow of electrons produces a potential difference.

When does a chemical cell stop producing a potential difference?

(Chemistry only)

When does a chemical cell stop producing a potential difference? (Chemistry only)

When the reactants have been used up.

What are the advantages of using hydrogen fuel cells in vehicles?
(Chemistry only)

What are the advantages of using hydrogen fuel cells in vehicles? (Chemistry only)

- No pollutants produced (only water) so less air pollution
- Reduces carbon dioxide emissions
- Reduces use of fossil fuels

What are the disadvantages of using hydrogen fuel cells in vehicles?

(Chemistry only)

What are the disadvantages of using hydrogen fuel cells in vehicles? (Chemistry only)

- Hydrogen is produced by electrolysis which uses electricity (pollutants produced when burning fossil fuel).
- Difficult to store hydrogen.
- Fuel cells and electric motors aren't as durable as petrol/diesel engines.
- Very expensive.

Describe the greenhouse effect

Describe the greenhouse effect

- Electromagnetic radiation passes through the atmosphere and is absorbed by the Earth, causing the Earth to warm up.
- The Earth releases energy as infrared radiation (IR).
- Some IR goes into space but some is absorbed by greenhouse gases in the atmosphere. This warms the lower atmosphere.

How does human activity cause climate change?

How does human activity cause climate change?

- Burning of fuels releases carbon dioxide.
- Raising livestock releases methane which is a greenhouse gas.
- Deforestation limits the amount of vegetation absorbing carbon dioxide for photosynthesis.

What is the trend between carbon dioxide concentration and use of fossil fuels?

What is the trend between carbon dioxide concentration and use of fossil fuels?

As fuel consumption increases so does the concentration of carbon dioxide in the atmosphere.

Why are there uncertainties in the evidence used to look at the causes of climate change?

Why are there uncertainties in the evidence used to look at the causes of climate change?

- It is hard to model the complex idea of global climate change.
- Evidence is largely based on simplified models.

What are the effects of increasing levels of carbon dioxide and methane in the atmosphere?

What are the effects of increasing levels of carbon dioxide and methane in the atmosphere?

- Extinction of species.
- Melting of polar ice caps leading to rising sea levels.
- Flash flooding - impacting crop yield.
- Extreme weather.
- Fewer places suitable for growing crops.

How can the effects of increasing levels of carbon dioxide be reduced?

How can the effects of increasing levels of carbon dioxide be reduced?

- More carbon dioxide sinks to absorb CO_2 (reforestation of rainforests).
- Lower vehicle emissions: Discourage car use with taxes, have more efficient and affordable public transport or improve engine efficiency.
- Decrease power station emissions by reducing electricity consumption. Use carbon capture or different methods to generate electricity.

How can the effects of increasing levels of methane be reduced?

How can the effects of increasing levels of methane be reduced?

- Reduce emissions from landfill by encouraging composting and incineration or by capturing methane for use as fuel.
- Reduce farming emissions by decreasing livestock numbers and by spreading manure on fields (where it doesn't release methane).
- Use anaerobic digester to store and capture methane produced by waste.

What is meant by potable water?

What is meant by potable water?

Water that is safe to drink.

Describe the main steps involved in treating groundwater

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Groundwater has passed through layers of rock and sand so has already been filtered. The water must be chlorinated to kill microorganisms and make it potable.

Describe the main steps involved in treating wastewater

Describe the main steps involved in treating wastewater

1. Sedimentation: Large insoluble particles sink to the bottom after the water is left still for a while.
2. Filtration: Removes small insoluble particles by passing the water through layers of sand and filters.
3. Chlorination: Kills bacteria and microorganisms which are too small to be removed by filtration.

What is the name of the process used to remove salt from water?

What is the name of the process used to remove salt from water?

Desalination

Describe two methods that could be used to treat salt water

Describe two methods that could be used to treat salt water

Distillation - filter the sea water, boil it, water evaporates and collects in condenser.

Membrane filtration - extremely fine membranes allow water molecule to pass through but not dissolved salts.

Why is chlorine added to water? What is the problem with chlorine?

Why is chlorine added to water? What is the problem with chlorine?

Adding chlorine to water to kill microorganisms.

Chlorine is toxic but reduces the risk of waterborne diseases. Only a small amount is added to water so most countries believe the benefits outweigh the risks.

Describe the test for chlorine

Describe the test for chlorine gas

Insert damp blue litmus paper into a test tube of gas. If chlorine is present, the litmus paper turns red then fades to white.