

1a - States of matter

Edexcel IGCSE Chemistry Revision Notes

For more resources, visit www.mooramo.com

How to use these notes

These notes cover everything you need to know for this part of the specification. They have been written in question-answer format to make them easier for you to study from.

In order to study successfully, I recommend you do the following for each question and answer:

- Read it carefully and make sure you **understand** it.
- **Memorise** the answer.
- **Practice** applying your understanding to past exam questions.

A good way to memorise information is to use **retrieval practice**. This is when you practise retrieving information from your memory. You could do this by making a flashcard for each question with the question on one side and the answer on the other. Or you could use a flashcard app. Alternatively, use a sheet of paper to cover up the answer so you can only see the question. Try to answer the question and then check how you did.

You should practise retrieving each answer from your memory until you can do it perfectly. Even once you can retrieve the answer perfectly, your ability to retrieve it will probably fade as time passes without practising. Therefore you will need to keep going back to the questions that you have previously mastered and practising them again. However, each time you re-learn the answer, the memory will be stronger and will last longer than the time before.

1.1

What are the three states of matter?

The three states of matter are solid, liquid and gas.

What is the arrangement of the particles like in a solid?

In a solid, the particles are in a regular arrangement and they are close together and touching.

What is the movement of the particles like in a solid?

In a solid, the particles vibrate around fixed positions. They do not move around apart from vibrating.

What is the energy of the particles like in a solid?

In a solid, the particles have less energy than they would in a liquid or gas of the same substance.

What is the arrangement of the particles like in a liquid?

In a liquid the particles are in a random arrangement and they are close together and touching.

What is the movement of the particles like in a liquid?

In a liquid the particles move around in random directions sliding over each other.

What is the energy of the particles like in a liquid?

In a liquid, the particles have more energy than they would in a solid but less energy than they would in a gas of the same substance.

What is the arrangement of the particles like in a gas?

In a gas the particles are in a random arrangement and are spaced very far apart not touching each other.

What is the movement of the particles like in a gas?

In a gas, the particles move around in random directions.

What is the energy of the particles like in a gas?

In a gas, the particles have more energy than they would in a liquid or gas of the same substance.

1.2

What is the general term for when a substance changes from one state of matter to another?

The general term for when a substance changes from one state of matter to another is a 'change of state'.

What is a change of state from solid to liquid called?

A change of state from solid to liquid is called melting.

What is a change of state from liquid to solid called?

A change of state from liquid to solid is called freezing.

What is a change of state from liquid to gas called?

A change of state from liquid to gas is called vaporisation.

What are the two types of vaporisation?

The two types of vaporisation are evaporation and boiling.

What is a change of state from gas to liquid called?

A change of state from gas to liquid is called condensation.

What is a change of state from solid directly to gas called?

A change of state from solid directly to gas is called sublimation.

What is a change of state from gas directly to solid called?

A change of state from gas directly to solid is called deposition.

What does a substance's state of matter depend on?

A substance's state of matter depends on the temperature and pressure.

How does increasing temperature affect the state of matter of a substance?

If the temperature of a solid is raised high enough it will melt into a liquid. If the temperature of a liquid is raised high enough it will vaporise into a gas.

How does decreasing pressure affect the state of matter of a substance?

If the pressure of a solid is lowered enough, it will melt into a liquid. If the pressure of a liquid is lowered enough it will vaporise into a gas.

What is the name for the temperature at which a substance will melt at standard pressure?

The temperature at which a substance will melt at standard pressure is called its melting point.

What is the name for the temperature at which a substance will boil at standard pressure?

The temperature at which a substance will boil at standard pressure is called its boiling point.

Extra Explanation: Melting point = freezing point, and boiling point = condensing point

A substance's melting point is the temperature at which it will melt (at standard pressure). In other words, if we start with the substance as a solid and then heat it up, the melting point is the temperature at which it will turn into a liquid.

We can also talk about a substance's freezing point, which is the temperature at which it will freeze (at standard pressure). In other words, if we start with the substance as a liquid and cool it down, the freezing point is the temperature at which it will turn into a solid.

For any substance, the melting point and the freezing point are actually the same temperature. For example, water has a melting point of 0°C . This means that if we start with ice (solid water) and heat it up, it will melt into liquid water when the temperature reaches 0°C . However, if we start with liquid water and cool it down, 0°C is also the temperature at which it will freeze into ice. Therefore 0°C is both the melting point and the freezing point of water, it just depends on whether we are talking about heating up a solid

to melt it or cooling down a liquid to freeze it.

Similarly, boiling point and condensing point are the same temperature, it just depends on whether we are talking about heating up a liquid to boil it or cooling down a gas to condense it.

This point will be helpful to bear in mind when you learn about fractional distillation. In that topic, we usually talk about the fractions having different boiling points, even though we are talking about cooling down gases to condense them into liquids. Therefore, it will be helpful to remember that the boiling point is the same temperature as the condensing point.

1.3

What experiment can be done to demonstrate that coloured, water-soluble crystals of a substance are made up of very small particles?

To demonstrate that coloured, water-soluble crystals of a substance are made up of very small particles, do the following:

- Dissolve a small number of the crystals in water. The whole solution will turn the colour of the crystals.
- Then gradually add more water to the solution. As you add more water, the solution will gradually turn lighter in colour, but the colour will not disappear until a very large volume of water is added.

This shows that the particles that made up the crystals are spread out in the water. The fact that the colour is still visible even when a large volume of water is added shows that there are a large number of particles present. Since a large number of particles were present in the small crystals, this demonstrates that the particles must be very small.

What is diffusion?

Diffusion is the net movement of a substance from an area of higher concentration to an area of lower concentration.

How can diffusion be demonstrated using gases?

Diffusion can be demonstrated with gases by doing the following:

- Fill one glass flask with bromine gas, which is brown.
- Connect the opening of the flask to the opening of a glass flask full of air (which is colourless).

Over time you will see the brown bromine gas moving out of the first flask and into the other one. This demonstrates that the bromine gas is diffusing.

1.4

What is a solution?

A solution is a mixture made up of a substance with one or more other substances dissolved in it.

What is a solute?

A solute is a substance that is dissolved in another substance.

What is a solvent?

A solvent is the substance that a solute is dissolved in.

What is a saturated solution?

A saturated solution is a solution in which the maximum possible amount of solute is dissolved in the solvent. If any more solute is added, it will not dissolve in the solvent.

1.5C

What is meant by the solubility of a solute in a particular solvent?

The solubility of a solute in a particular solvent is the maximum mass (in g) of solute that can be dissolved in 100g of the solvent.

What are the units of solubility?

The units of solubility are g per 100g of solvent.

1.6C

What is a solubility curve?

A solubility curve is a graph that shows how the solubility of a particular solute in a particular solvent changes with temperature.

On a solubility curve, what is plotted on the x-axis?

On a solubility curve, the temperature is plotted on the x-axis.

On a solubility curve, what is plotted on the y-axis?

On a solubility curve, the solubility is plotted on the y-axis.

How would you use a solubility curve to work out what mass of solute is dissolved in a saturated solution if you are given the mass of the solvent and the temperature?

To work out what mass of solute is dissolved in a saturated solution if you are given the mass of the solvent and the temperature, do the following:

- First, find the temperature on the x-axis and use this to work out what the solubility is at that temperature.
- Then, divide the solubility by 100 and multiply it by the mass of the solvent in grams. This will give you the mass of the solute in grams.