

WJEC (Eduqas) Chemistry GCSE

2 - Particles and Atomic Structure

Flashcards

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What is the particle theory of matter?



What is the particle theory of matter?

It is a model that describes how particles within a substance move and are arranged. This allows us to explain the physical properties of solids, liquids and gases in terms of their particles.



In which states are particles able to flow?



In which states are particles able to flow?

Liquids and gases. Liquids take the shape of their containers and gases can completely fill their containers.



Explain the difference between
evaporation and boiling



Explain the difference between evaporation and boiling

Evaporation is slower than boiling, occurs only from the surface of the liquid, does not produce bubbles, and leads to cooling. Evaporation can take place below a substance's boiling point.

Boiling is faster, can occur throughout the liquid, produces lots of bubbles, and does not result in cooling. Boiling only occurs at a substance's boiling point.

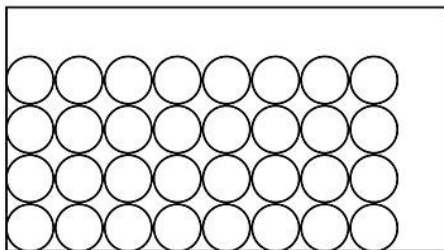


In which state of matter do particles have the most energy?

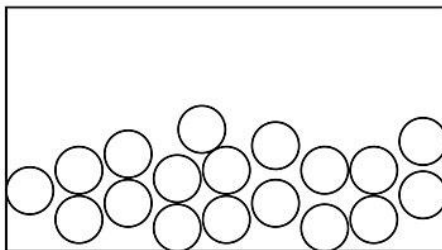


In which state of matter do particles have the most energy?

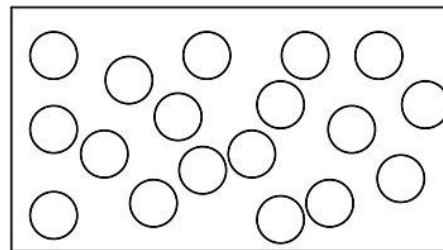
Gas - the particles are spread out and are able to move freely



Solid



Liquid



Gas

https://commons.wikimedia.org/wiki/File:Solids_liquids_and_gases_-_particle_model.jpg [CC-BY-SA-4.0](#)



What state are elements at temperatures below their melting points?



What state are elements at temperatures below their melting points?

Solid



What state are elements at temperatures between their melting and boiling points?



What state are elements at temperatures between their melting and boiling points?

Liquids



List the limitations of the particle model



List the limitations of the particle model

- In the model there are no forces and all particles are represented as inelastic, solid spheres.
- The model does not explain why atoms of some elements react with one another



Explain how physical changes and chemical changes differ



Explain how physical changes and chemical changes differ

Physical changes (such as changes of state) are easily reversed as no new substances are made.

In contrast, chemical changes (e.g. chemical reactions) particles rejoin in different formations and therefore are more difficult to reverse.



What do experimental observations suggest about atoms?



What do experimental observations suggest about atoms?

Suggests that atoms are mostly empty space with almost all the mass in a central nucleus.



Explain what an atom is made up of

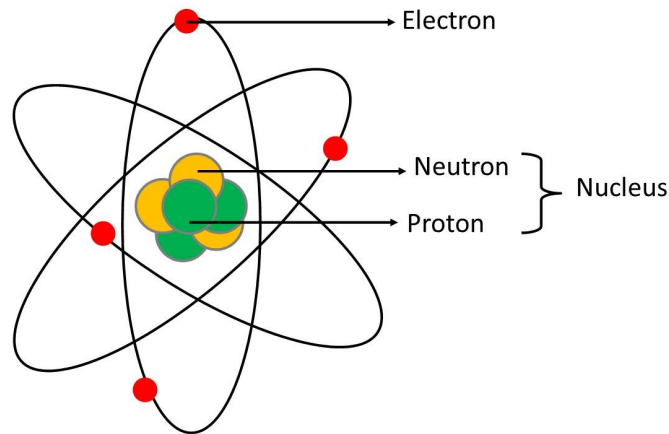


Explain what an atom is made up of

Positively charged nucleus (containing protons and neutrons)

Surrounded by negatively charged electrons

The nucleus radius is much smaller than the atomic radius



What are the relative charges of protons,
neutrons and electrons?



What are the relative charges of protons, neutrons and electrons?

Protons = +1

Neutrons = 0

Electrons = -1



What are the approximate relative masses of protons, neutrons and electrons?



What are the approximate relative masses of protons, neutrons and electrons?

Protons = 1

Neutrons = 1

Electrons = 0.0005



Explain why atoms have no overall electrical charge, i.e. neutral



Explain why atoms have no overall electrical charge, i.e. neutral

Every atom contains equal number of positive protons and negative electrons, therefore making the overall atom neutral.



What is relative atomic mass?



What is relative atomic mass?

The average mass value which takes the mass and abundance of isotopes of an element into account, on a scale where the mass of ^{12}C is 12.



What is an isotope?



What is an isotope?

These are different forms of an element that contain the same number of protons (and therefore atomic number) but different numbers of neutrons (and therefore mass number)



Calculate the number of neutrons in $^{13}_6\text{C}$



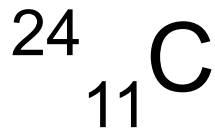
Calculate the number of neutrons in $^{13}_6\text{C}$

Neutrons = mass number - atomic number

$13 - 6 = 7$ neutrons



Calculate the number of neutrons in



Calculate the number of neutrons in ${}^{24}_{11}\text{C}$

Neutrons = mass number - atomic number

$24 - 11 = 13$ neutrons



What is relative atomic mass?



What is relative atomic mass?

The average mass of an element's atoms, compared to 1/12th of the mass of a carbon-12 atom.

The carbon-12 atom is the standard atom against which we compare other masses of atoms.

$$A_r = \frac{\text{total mass of atoms}}{\text{total number of atoms}}$$



Calculate the relative atomic mass of chlorine (atomic number 17) if 75% exist as chlorine-35 and 25% exist as chlorine-37



Calculate the relative atomic mass of chlorine (atomic number 17) if 75% exist as chlorine-35 and 25% exist as chlorine-37

$A_r = \frac{\text{total mass of atoms}}{\text{total number of atoms}}$

$$= \frac{(75 \times 35) + (25 \times 37)}{(75 + 25)} = \frac{3350}{100} = 33.5$$



What is relative formula mass (M_r)?



What is relative formula mass (M_r)?

The addition of all the relative atomic mass values for all the atoms in the formula

The relative formula mass of a substance is called one mole of that substance



Calculate the M_r of CO_2
(C A_r = 12, O A_r = 16)



Calculate the M_r of CO_2 (C A_r = 12, O A_r = 16)

$$M_r \text{ CO}_2 = (1 \times 12) + (2 \times 16) = 12 + 32 = 44$$



Explain how the position of an element in the Periodic Table is related to its electronic arrangement and atomic number



Explain how the position of an element in the Periodic Table is related to its electronic arrangement and atomic number

The number of electrons found in the outermost shell of an element is represented by its group number in the Periodic Table. For example, group 7 elements will all have 7 electrons in their outermost shells.

The atomic number is equal to the number of electrons in all of the shells.



What is the electronic structure of an element in Group 2 and Period 4?



What is the electronic structure of an element in Group 2 and Period 4?

2, 8, 8, 2



What is the electronic structure of $^{13}_6\text{C}$?



What is the electronic structure of $^{12}_6\text{C}$?

2, 4



Explain Mendeleev's arrangement of the Periodic Table



Explain Mendeleev's arrangement of the Periodic Table

He arranged the elements based on 'atomic weights'

In some cases the order was not quite right as different isotopes have different masses.

He arranged them so that they were arranged in groups with similar chemical properties and so left gaps where elements had not yet been discovered.

