



Isaac Chemistry

Andrea Chlebikova

ac782@cam.ac.uk

andrea.c@isaacscience.org

This symposium
is generously
funded by



**making
physics
matter**

Today



- What do we have available on Isaac Chemistry?
 - How do we find the various resources?
- Have a go at some Isaac Chemistry problems/using practice tools.
- Go through how to tackle some of the more challenging problems


This symposium
is generously
funded by




**making
physics
matter**


Isaac A Level Chemistry overview





 **A Level Chemistry**


Try a random question! Get a different question ↻


 **Black Pepper**
Chemistry | Organic | Reactions


A Level Challenge 2 


**Question finder**
Find A Level Chemistry questions to try by topic and difficulty level.
[Find questions](#)

**Concepts**
Review the key concepts for A Level Chemistry.
[Explore concepts](#)

**Tests**
Use tests to practise a range of topics. These tests are available for you to freely attempt.
[Find a test](#)

**Question decks by topic**
Practise specific topics by using our ready-made question decks.
[View topic question decks](#)

**Glossary**
Use the glossary to understand the vocabulary you need for A Level Chemistry.
[Browse the glossary](#)

**Core skills practice**
Practise core skills required in A Level chemistry.
[Practise core skills](#)

This symposium
is generously
funded by

**making
physics
matter**

Question finder



A Level Chemistry >

Question finder

Help

Search questions

Filter questions by

Learning Stage

2 ▾

☒ A Level

☒ Further A

Topic

▾

☐ Foundations

☐ Physical

☐ Inorganic

☐ Organic

☐ Analytical

Difficulty

>

The questions shown on this page have been filtered to only show those that are relevant to A Level Chemistry. You can browse all questions [here](#).

Showing 30 of 739.

Shuffle questions ↻

2p Orbitals as Wavefunctions Chemistry Foundations Atomic Structure	Further A Challenge 3 University Practice 3
C₃H₆ Combustion Chemistry Physical Energetics	A Level Practice 2
CoCl₃-Ammonia Complexes Chemistry Inorganic Transition Metals	A Level Challenge 2
LiH and PCl₃ Chemistry Foundations Stoichiometry	A Level Challenge 2
XCl_n Chemistry Inorganic Bonding & IMFs	A Level Challenge 3
d-block Electronic Configurations Chemistry Foundations Atomic Structure	A Level Practice 2

This symposium
is generously
funded by



**making
physics
matter**

Questions: topics



☒ Foundations

- ☐ Numerical Skills
- ☐ Atomic Structure
- ☐ Stoichiometry
- ☐ Gas Laws

☒ Inorganic

- ☐ Periodic Table
- ☐ Bonding & IMFs
- ☐ Redox
- ☐ Transition Metals

☒ Analytical

- ☐ Chromatography
- ☐ Mass Spectrometry
- ☐ IR Spectroscopy
- ☐ NMR Spectroscopy
- ☐ Electronic Spectroscopy

☒ Physical

- ☐ Kinetics
- ☐ Energetics
- ☐ Entropy
- ☐ Equilibrium
- ☐ Acids & Bases
- ☐ Electrochemistry

☒ Organic

- ☐ Functional Groups
- ☐ Isomerism
- ☐ Reactions
- ☐ Aromaticity
- ☐ Reactions (aromatics)
- ☐ Polymers

This symposium
is generously
funded by



**making
physics
matter**

Questions: difficulty



Difficulty



Learn more about difficulty levels

☐ Practice 1

☐ Practice 2

☐ Practice 3

☐ Challenge 1

☐ Challenge 2

☐ Challenge 3

- Practice questions are similar to what one would expect to see in an exam paper for the relevant stage (difficulty increasing P1 → P3)
- Challenge questions require more problem solving/insights/... e.g. such as seen in C3L6 papers, Chemistry Olympiad, ...

This symposium
is generously
funded by



**making
physics
matter**

Question decks by topic



Question decks by topic

Decks by stage

A Level

Decks by subject

Physics

Chemistry

Maths

Biology



The Chemistry topics below are ordered to allow for progression of ideas from one question deck to the next. To find a question deck on a specific topic, use `Ctrl+F` in your browser.

The "**What it contains**" column lists the difficulty levels of the questions and how many there are: for example, "7×P1" means seven questions of "Practice 1" difficulty. Generally, "Practice" questions are exam style, while "Challenge" questions use the same knowledge in a less familiar style and may require problem solving or combining of ideas. Some ratings are preliminary and subject to change, so feedback from teachers is very welcome. The table also shows which question types are used in each deck:

- **Quick:** show/hide the answer (not marked)
- **MCQ:** multiple-choice
- **Numeric:** enter a number (with or without units)
- **Symbolic:** enter an algebraic expression
- **Chemistry:** enter a chemical formula or chemical equation
- **Short-answer:** type a word or combination of words
- **Organic:** use the [external structure editor](#) to draw a structure and generate a SMILES string, then copy into Isaac for checking
- **Drag-and-drop:** drag pre-loaded options into gaps in text or a table

[Stoichiometry and Inorganic Chemistry](#) >

[Physical Chemistry](#) >

[Organic Chemistry and Spectroscopy](#) >

This symposium
is generously
funded by



**making
physics
matter**

Concept pages



Concepts

Use our concept finder to explore all concepts on the Isaac platform.



Search concepts

e.g. Forces



Filter by subject and topic

☐ Physics (78)

☐ Maths (72)

☒ Chemistry (27)

Showing 27 results



Acids and Bases

Discusses the differences between the Arrhenius, Brønsted-Lowry and Lewis definitions of acids and bases. Other key terminology for acids and bases is also introduced with examples.



Activation Energy

The minimum energy required to start a chemical reaction, and its link to reaction rates.

This symposium
is generously
funded by



**making
physics
matter**

Glossary



A Level Chemistry >



A Level Chemistry Glossary

Use our glossary to find definitions of important words and phrases.



Search glossary

e.g. Bond



Switch learning stage

GCSE

A Level

University

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

[Addition](#)

A reaction where two or more starting materials combine to form one larger product.

[Alicyclic](#)

An organic compound containing at least one non-aromatic ring.

[Aliphatic](#)

An organic compound containing no aromatic rings.

[Allotrope](#)

A specific form of a chemical element, with atoms bonded together in a particular way. For example, graphite and diamond are two different allotropes of carbon.

[Aromatic](#)

An organic compound containing at least one aromatic ring (often a benzene ring).

This symposium
is generously
funded by



**making
physics
matter**

Tests



A Level Chemistry >



Practice tests

This page lists tests you can take whenever you'd like to practise your skills and check your understanding.



Search practice tests

e.g. Practice



You can see all of the tests that you have in progress or have completed in your My Isaac:

[My tests →](#)



Chemistry Admissions Practice 1

[View test](#)



Chemistry Admissions Practice 2

[View test](#)



Chemistry Admissions Practice 3

[View test](#)



Chemistry Admissions Practice 4

[View test](#)



Chemistry Admissions Practice 5

[View test](#)



Chemistry Admissions Practice 6

[View test](#)

This symposium
is generously
funded by



**making
physics
matter**

Core skills practice tools



A Level Chemistry >



Core skills practice

Select stage

GCSE

A Level



These are new tools and are still under development. We encourage you to try them out, and give us your feedback! However, please note that there may be bugs, and the difficulty levels of the questions may change before the final versions are released.

Below you can see the list of tools available for practising different chemistry skills. Click on the buttons to access particular tools.

Atomic structure

Using the periodic table

Number of protons, neutrons and electrons

Calculations

Mole calculations

Titration calculations

Buffer calculations

Organic chemistry and spectroscopy

Functional group recognition

Counting environments in NMR

This symposium
is generously
funded by



**making
physics
matter**

Questions to tackle now...



- Showcasing Isaac Chemistry:
https://isaacscience.org/question_decks#ipts25_fri_6b
- Practising Problem Solving in Chemistry:
https://isaacscience.org/question_decks#ipts25_fri_6b_ext
- Try the chemistry core skills practice tools

This symposium
is generously
funded by



**making
physics
matter**

Isaac Chemistry content is expanding



- More core skills practice tools, concept pages and glossary entries

A. Atomic Structure

Progress in our knowledge of atomic structure over the last two centuries has allowed us to explain chemical observations and understand the chemical behaviour of many substances from first principles.

When students are first introduced to the model of the atom, they will be thinking about the components as particles: **protons** and **neutrons** (together commonly known as **nucleons**) at the centre of the atom in the **nucleus**, with **electrons** around it. In a neutral atom, the number of protons matches the number of electrons, and ions are formed by the gain or loss of electrons, giving negatively-charged anions and positively-charged cations respectively.

In early models, the electrons are often presented as spheres orbiting the nucleus, and for some purposes this model is useful, but for a better understanding, **quantum mechanics** is required. Instead of orbiting the nucleus, electrons exist in electron clouds in the atom, and their behaviour cannot be fully understood by thinking of them as classical particles. They can be described by **wavefunctions**, which in this context are more commonly known as atomic **orbitals**. While at A Level, orbitals are often presented as regions of space, in fact these wavefunctions describe the probability distribution of electrons: where the magnitude of the wavefunction is higher, the probability density is higher. This wavefunction understanding is also useful for making sense of bonding: when atomic orbitals overlap, they give rise to molecular orbitals (see Bonding chapter).

Atomic orbitals for a hydrogen atom can be found mathematically in essentially exact form. For other atoms, we often think of the atomic orbitals as scaled versions of the hydrogen orbitals. In hydrogen itself, the energy of the orbitals only depends on the shell number or, as we should properly call it, the **principal quantum number**, n .

However, in other atoms, electrons repel one another, resulting in shielding. We introduce the idea of an **effective nuclear charge**, Z_{eff} which is experienced by an electron in an atom. It is calculated by subtracting a shielding term, s from the actual nuclear charge Z . Electrons close to the nucleus experience almost the full nuclear charge Z , while the outer electrons are quite effectively shielded by those in lower shells.

- GCSE content (also suitable for KS3)
- Book collating A Level questions
- What would you most like to see?

This symposium
is generously
funded by



**making
physics
matter**