



Name



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1. Foreword

"Chemistry begins in the stars. The stars are the source of the chemical elements, which are the building blocks of matter and the core of our subject" - Peter Atkins

Dear student of chemistry,

Welcome to the Science Faculty of UTC Swindon. The staff aim to offer outstanding teaching and training support that will help you develop the knowledge and skills necessary to obtain your A-level qualification and subsequent employment.

This handbook provides helpful information about the school and your course. I hope that it will be useful to you and that it will answer any of your questions.

Chemistry is an excellent preparation for students looking to extend their understanding of a key physical science. It is a central science which opens up the possibility of a huge range of science related university courses and jobs. These includes medicine and health related professions such as dentistry, pharmacy and veterinary sciences etc., as well as chemical engineering, optometry and courses that overlap with maths and physics.

A Level chemistry blends particularly well with other science subjects such as physics and biology.

We wish you well in your studies and hope that you have an enjoyable and productive time as a student here.



2. Key Staff & Contact Details

| Name | Role | Email |
|------------------|--|----------------------------|
| Cherise Osolin | Head of KS5 | cosolin@utcswindon.co.uk |
| Helen Curtis | Attendance Officer & Reception | hcurtis@utcswindon.co.uk |
| Dr Alex Shevchuk | Head of Science & A-level Physics teacher | ashevchuk@utcswindon.co.uk |
| Ash Olson | A-level Biology teacher | aolson@utcswindon.co.uk |
| Annabel Ford | A-level Chemistry teacher | aford@utcswindon.co.uk |

Head of Key Stage 5 (KS5) Cherise Osolin will be able to advise on many issues about general school procedures, as well as those specific for KS5. In the event of absence, general enquiries can be made to your designated year tutor.

The Attendance Officer will be able to help with attendance related issues on the day-to-day basis.

If you are having a problem, Head of KS5 will be your first point of contact. If you would prefer, you could also always talk to someone in the pastoral team on the first floor.



3. <u>Recommendations</u>

Before I came here, I was confused about this subject. Having listened to your lecture I am still confused. But on a higher level. Enrico Fermi



Key things on the route to success in chemistry:

- 1. Use past papers and marking scheme.
- 2. Read the examines report.
- 3. Use variety of paper & digital resources → part of your independent learning to support the content delivered as part of lessons.
- 4. Maths skills are essential.
- 5. Pay attention during the chemistry practicals, spend time interpreting and analysing the results, as well as linking it to the wider topic being studied.

Nuclear Analytical Synthesis Qualitychemical ISO Chemistry Medicinal Magnetic HighPerformance Chromatography Liquid Development Science NMR Organic Research Engineering HPLC Product Standards Spectroscopy



4. Expectations

My interest in the sciences started with mathematics in the very beginning, and later with chemistry in early high school and the proverbial home chemistry set. **Rudolph A. Marcus**

- 1. Punctuality.
- 2. Acceptable Classroom Conduct.
- 3. Good Organisation.
- 4. Homework.
- 5. Independent Work.

OUR VISION

Transforming lives through learning

OUR MISSION

To 'transform lives through learning' by igniting confidence, expanding opportunities, energising the community and generating prosperity.

Through **<u>our Learning Philosophy</u>** and core values of empowerment, enterprise, connectedness and transformation, we will provide our students and staff with a safe and supportive environment in which to thrive and become independent learners.

OUR VALUES

Empowerment, enterprise, connectedness, and transformation.











5. Curriculum Outline

AQA

UTC Swindon follows the AQA Chemistry A-level Specification (7404/7405).

Subject content:

3.1 Physical chemistry

- 3.1.1 Atomic structure
- 3.1.2 Amount of substance
- 3.1.3 Bonding
- 3.1.4 Energetics
- 3.1.5 Kinetics
- 3.1.6 Chemical equilibria, Le Chatelier's principle and Kc
- 3.1.7 Oxidation, reduction and redox equations
- 3.1.8 Thermodynamics (A-level only)
- 3.1.9 Rate equations (A-level only)
- 3.1.10 Equilibrium constant K_p for homogeneous systems (A-level only)
- 3.1.11 Electrode potentials and electrochemical cells (A-level only)
- 3.1.12 Acids and bases (A-level only)

3.2 Inorganic chemistry

- 3.2.1 Periodicity
- 3.2.2 Group 2, the alkaline earth metals
- 3.2.3 Group 7(17), the halogens
- 3.2.4 Properties of Period 3 elements and their oxides (A-level only)
- 3.2.5 Transition metals (A-level only)
- 3.2.6 Reactions of ions in aqueous solution (A-level only)

3.3 Organic chemistry

- 3.3.1 Introduction to organic chemistry
- 3.3.2 Alkanes
- 3.3.3 Halogenoalkanes
- 3.3.4 Alkenes
- 3.3.5 Alcohols
- 3.3.6 Organic analysis
- 3.3.7 Optical isomerism (A-level only)
- 3.3.8 Aldehydes and ketones (A-level only)
- 3.3.9 Carboxylic acids and derivatives (A-level only)
- 3.3.10 Aromatic chemistry (A-level only)
- 3.3.11 Amines (A-level only)
- 3.3.12 Polymers (A-level only)
- 3.3.13 Amino acids, proteins and DNA (A-level only)
- 3.3.14 Organic synthesis (A-level only)
- 3.3.15 Nuclear magnetic resonance spectroscopy (A-level only)
- 3.3.16 Chromatography (A-level only)

The A level chemistry exam will cover the whole of the two-year course via three papers.



You can also view the detailed steps of your learning journey in the diagram below.





6. Evidence of Work

Chemists do not usually stutter. It would be very awkward if they did, seeing that they have at times to get out such words as methylethylamylophenylium **Sir William Crookes**

Class Work and Independent Work

Theory

You will organise your notes in a folder that you will keep in either an electronic folder or a paper folder. It's your responsibility to keep the notes and have them organised. Good organisation involves such information as **dates**, **titles** and **subtitles**, **deadlines** and sources of information.

Problem Solving

This is a crucial part of your work. Solving problems is an application of theory into practice. You are expected to solve problems in class and at home. You are expected to follow certain guidelines and structure and communicate your solution clearly with good English. Again, you can keep your solutions, worksheets & notes in a folder or have them in your exercise book.

Practical Work

This is the core of scientific method. As a student, you must organise your practical (laboratory) work and store it in a Practical folder. There you must keep your final analysis and write ups and all worksheets together. The front page of the folder will contain a check sheet so when the experiment is done it's ticked on the check sheet and feedback given by the teacher.

Study Time

It is recommended that for every hour in the classroom you spend an hour outside the classroom. You are expected to complete the end of chapter summary questions from your textbook independently. Asking for help when issues arise that can't be resolved through review of class notes or referring to the textbook is a must. In addition, you will be set independent tasks which need to be completed to deadline and will be marked and returned to you.



7. Assessment

Wonder is the heaviest element on the periodic table. Even a tiny fleck of it stops time. Diane Ackerman

Interim

Theory has many sources – teacher's lecture in the class, textbook or Internet – so you must be able to learn it with a required degree of understanding. It is the main principles, laws and relationships that we as teachers want to see you understand. Here the ultimate test would be your ability to apply the knowledge. Solving problems and answering examstyle questions is the application. Therefore, our day-to-day assessment could be in the form of a mini-test made up of three questions: one theory, one problem requiring a structured solution, and one exam-style question. A problem should already be known to you or be similar to a known one. The exam-style question is there to develop a habit of the method and look of the exam question as well as to give a teacher an idea if the student is on target or not.

Official External

Exams are taken once a year in May/June. You must ensure that you have sufficient time for revision at home.

| Paper 1 | | Paper 2 | + | Paper 3 |
|--|--|--|---|---|
| What's assessed Relevant Physical chemistry topics (sections 3.1.1 to 3.1.4, 3.1.6 to 3.1.8 and 3.1.10 to 3.1.12) Inorganic chemistry (section 3.2) Relevant practical skills | | What's assessed Relevant Physical chemistry topics (sections 3.1.2 to 3.1.6 and 3.1.9) Organic chemistry (section 3.3) Relevant practical skills | | What's assessedAny contentAny practical skills |
| How it's assessed Written exam: 2 hours 105 marks 35% of A-level | | How it's assessed Written exam: 2 hours 105 marks 35% of A-level | | How it's assessed Written exam: 2 hours 90 marks 30% of A-level |
| Questions 105 marks of short and long answer questions | | Questions 105 marks of short and long answer questions | | Questions 40 marks of questions on practical techniques and data analysis 20 marks of questions testing across the specification 30 marks of multiple choice questions |



Official Internal Internal Assessment is in the form of past paper questions and will occur periodically.

Evidence of Assessment

Independent work will be set and marked on point mark basis (e.g., 36/47).

Laboratory work has a focused assessment and those will be marked against CPAC criteria.

Exams are the external indication of success of a student.

8. Guidance on Practicals

Practical work is at the heart of chemistry and practical assessments have been divided into those that can be assessed in written exams and those that can only be directly assessed whilst students are carrying out experiments.

A-level grades will be based only on marks from written exams.

A separate endorsement of practical skills will be taken alongside the A-level. This is assessed by teachers and will be based on direct observation of students' competency in a range of skills that are not assessable in written exams.

The assessment of practical skills is a compulsory requirement of the course of study for Alevel qualifications in chemistry. It will appear on all students' certificates as a separately reported result, alongside the overall grade for the qualification. These arrangements will include:

- A minimum of 12 practical activities to be carried out by each student.
- Teachers will assess students against Common Practical Assessment Criteria (CPAC).
- Each student will keep an appropriate record of their practical work, including their assessed practical activities.
- Students who demonstrate the required standard across all the requirements of the CPAC will receive a 'pass' grade.
- Students will answer questions in the A-level exam papers. These questions may draw on, or range beyond, the practical activities included in the specification.



Here is the list of chemistry experiments that you will be completing as part of your course:

| | A-level Chemistry Experiments |
|-----|--|
| 1. | Make up a volumetric solution and carry out a simple acid-base titration |
| 2. | Measurement of an enthalpy change |
| 3. | Investigate how the rate of reaction changes with temperature |
| 4. | Carryout simple test-tube reactions to identify: [cations; group II and NH ₄ ⁺] & [anions; group VII, OH ⁻ , CO ₃ ²⁻ and SO ₄ ²⁻] |
| 5. | Distillation of a product from a reaction |
| 6. | Tests for alcohol, aldehyde, alkene and carboxylic acid |
| 7. | Measure the rate of reaction by; a. initial rate method; b. continuous rate method |
| 8. | Measure the EMF of an electrochemical cell |
| 9. | Investigate how the pH changes when a weak acid reacts with a strong base and when a strong acid reacts with a weak base |
| 10. | Preparation of: a. a pure organic solid and test its purity; b. a pure organic liquid |
| 11. | Carry out simple test-tube reactions to identify transition metal ions in aqueous solution |
| 12. | Separation of a species by thin-layer chromatography |



9. <u>Independent Learning</u>

Life is a chemical reaction; it only requires balancing. Priyavrat Gupta

Being an independent learner means having better chances for a successful career. It is all about one's ability to make the right decisions and have enough self-discipline to execute them.

UTC Swindon wants to help you become an independent learner and at the same time retain freedom of choice. To promote independent learning, we have put together some options:

We have put together the reading list and useful online resources. You can read a scientific journal article here <u>https://www.scienceopen.com</u> and explore it even further as more information and discoveries are made in the field of chemistry almost week. You can turn this article into your own PowerPoint presentation and have up to 5 minutes at the end of a lesson to present it to the class if you wish.

During Y12 and Y13 to help you with this aspect of independent learning you will be requested to read around the subject. You will be presented with a reading list and required to choose two books per year from it. You will then have sufficient time to read and then write a review of the book. Should you find a chemistry related book that is not on the list please consult with your teacher before submitting that.

Another aspect of Independent Learning is linked to the curriculum, and may I say that without this component it is going to

be hard to achieve an 'A*' in chemistry. If you want to become a professional, you shouldn't restrict yourself to classwork and set tasks.

You should find additional sources of information, plan more, do more and offer more in class.

You shouldn't give up on a hard question or wait for the teacher to explain everything to you.

It is hard work but success tastes sweeter in the end!

May we wish you every success in your studies of A' level chemistry.





10. <u>Chemistry Reading list</u>



<u> Task 1</u>

Read pages 4-9 in the AQA textbook on atomic structure. This is one of the first topics we will study, and these pages should reinforce what you already learned at GCSE.

Take it a bit further....now read pages 14-16 about electron arrangement. This will give you a good idea of how ideas you learned at GCSE are developed in further detail at A level.

<u> Task 2</u>

Read through the document. This will give you some background to how the course is taught and assessed, including the practical aspect, and what the expectations of you will be.

<u>Task 3</u>

Have a look at the transition guide on the AQA website:

https://uai.org.uk/wp-content/uploads/2020/06/A-Level-Chemistry-.pdf

Read through the information pages 1-10 and have a go at one of the tasks.

These books cover a range of chemistry topics so you should be able to find one that really interests you!

| The Pleasure of Finding Things Out | Richa | rd Feynman |
|--|-----------------|--------------|
| Periodic Tales | Hugh Alders | ey-Williams |
| The Disappearing Spoon | | Sam Kean |
| Uncle Tungsten | | Oliver Sachs |
| The Shocking History of Phosphorus: A Biography of the | Devil's Element | John Emsley |



11. Action Verbs

These action verbs indicate the depth of treatment required for a given assessment statement. These verbs will be used in examination questions and so it is important that students are familiar with the following definitions.

| Define | give the precise meaning of a word or phrase as concisely as possible. |
|-------------|--|
| Draw | represent by means of pencil lines (add labels unless told not to do so). |
| List | give a sequence of names or other brief answers with no elaboration, each one clearly separated from the others. |
| Measure | find a value for a quantity. |
| State | give a specific name, value or other brief answer (no supporting argument or calculation is necessary). |
| Annotate | add brief notes to a diagram, drawing or graph. |
| Apply | use an idea, equation, principle, theory or law in a new situation. |
| Calculate | find an answer using mathematical methods (show the working unless instructed not to do so). |
| Compare | give an account of similarities and differences between two (or more) items, referring to both (all) of them throughout (comparisons can be given using a table). |
| Describe | give a detailed account, including all the relevant information. |
| Distinguish | give the differences between two or more different items. |
| Estimate | find an approximate value for an unknown quantity, based on the information provided and scientific knowledge. |
| Identify | find an answer from a number of possibilities. |
| Outline | give a brief account or summary (include essential information only). |
| Analyse | interpret data to reach conclusions. |
| Construct | represent or develop in graphical form. |
| Deduce | reach a conclusion from the information given. |
| Derive | manipulate a mathematical equation to give a new equation or result. |
| Design | produce a plan, object, simulation or model. |
| Determine | find the only possible answer. |
| Discuss | give an account including, where possible, a range of arguments, assessments of the relative importance of various factors or comparisons of alternative hypotheses. |
| Evaluate | assess the implications and limitations. |
| Explain | give a clear account including causes, reasons or mechanisms. |
| Predict | give an expected result. |
| Solve | obtain an answer using algebraic and/or numerical methods. |
| Suggest | propose a hypothesis or other possible answer. |
| Hypothesise | write a testable statement |
| | |



12. Chemistry learning & revision resources

- Revision Content: <u>https://mmerevise.co.uk/a-level-chemistry-revision/</u>
- Chemistry Simulations: <u>https://phet.colorado.edu/en/simulations/filter?subjects=chemistry&type=html,prototype</u>
- Chemistry notes, topic questions & past papers: <u>https://www.savemyexams.co.uk/a-level/chemistry/</u>
- Details of the history of the best scientific discoveries. <u>https://www.nobelprize.org/educational/</u>
- The site of the scientific journal. <u>http://nature.com</u>
- Practical resources <u>https://edu.rsc.org/resources/practical</u>
- Royal Society of Chemistry <u>www.rsc.org.uk</u>
- Institution of Chemical Engineers <u>www.icheme.org</u>
- www.chemguide.co.uk
- A-level Chemistry Notes: <u>http://www.a-levelnotes.co.uk/aqa-chemistry-notes.html</u>