Woodkirk Academy
&
The Sixth Form @ Woodkirk Academy

Woodkirk Academy

Course Handbook

A-LEVEL CHEMISTRY

How is the Subject examined

- There are three papers for each subject that last 2 hours. Each paper has questions on set topics.
- The style of questions are multiple choice questions, structured questions, open and closed answer questions as specified below.
- There is no coursework. Students complete a number of required practicals and skills to achieve the practical endorsement – this is independent of their A-level grade

The content of each paper is summarised below:

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 assessed** • Any content • Any 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

For a more detailed breakdown of the subject content use the link to the specification below

http://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-7404-7405-SP-2015.PDF

Year 12 year view

Week	Lead teacher	2nd teacher
1	1.1 Atomic Structure	1.3 Bonding
2	1.1	1.3
3	1.1	1.3
4	1.1	1.3
5	1.1	1.3
6	1.2 Amount of Substance	1.3
7	1.2	1.5 Kinetics
Half term		
8	1.2	1.5
9	1.2	1.5
10	1.2	1.5
11	1.4 Energetics	1.5
12	1.4	1.5
13	1.4	3.1 Introduction to Organic Chemistry
14	1.4	3.1
Xmas		
Xmas		
15	1.4	3.2 Alkanes
16	1.4	3.2
17	1.6 Chemical Equilibria	3.3 Halogenoalkanes
18	1.6	3.3
19	1.6	3.3
20	1.6	3.4 Alkenes
Half term		
21	1.7 Oxidation and Reduction	3.4
22	1.7	3.4
23	1.7	3.5 Alcohols
24	1.7	3.5
25	1.7	3.5
26	2.1 Periodicity	3.5
Easter		
Easter		
27	2.1	3.6 Organic analysis
28	2.2 Group 2	3.6
29	2.2	3.6
30	2.2	Revision Organic paper 2 including Practicals
31	2.3 Group 7	Revision Organic paper 2 including Practicals
32	2.3	Revision Organic paper 2 including Practicals
Half Term		
33	2.3	Mock & Feedback
34	Revision Inorganic Paper 1	Revision Physical Paper 1
35	Revision Physical Paper 1	Revision Physical Paper 1
36	Year 12 exam	Year 12 exam
37	Year 12 work experience	

38	1.8 Thermodynamics	Feedback from mock and target setting
39	1.8	Summary of Organic chemistry

Year 13 year view

Week	Lead teacher	2nd teacher
1	1.8 Thermodynamics	3.7 Optical isomerism
2	1.8	3.8 Aldehydes and Ketones
3	1.8	3.8
4	1.8	3.9 Carboxylic acids and derivatives
5	1.12 Acids and Bases	3.9
6	1.12	3.9
7	1.12	1.9 Rate equations
Half term		
8	1.12	1.9
9	1.11 Electrode potentials and electrochemical cells	1.9
10	1.11	1.9
11	1.11	3.10 Aromatic Chemistry
12	1.11	3.10
13	2.5 Transition metals	3.10
14	2.5	3.11 Amines
Xmas		
Xmas		
15	1.10 Equilibrium constant Kp	3.11
16	Revision for mock - Paper 1	Revision for mock - Paper 2
17	Revision for mock Paper 1	Revision for mock - Paper 2
18	Year 13 mock exams	Year 13 mock exams
19	Year 13 mock exams	Year 13 mock exams
20	2.5 Transition metals	3.11 Amines
Half term		
21	2.6 Reactions of ions in aqueous solution	3.12 Polymers
22	2.6	3.12 Polymers
23	2.6	3.13 Amino acids, proteins and DNA
24	2.4 Properties of Period 3 elements and their oxides	3.13
25	2.4	3.15 Nuclear Magnetic resonance
26	2.4	3.15
Easter		
Easter		
27	Physical Chemistry Paper 1 revision	3.16 Chromatography
28	Physical Chemistry Paper 1 revision	3.14 Organic synthesis
29	Inorganic Chemistry Paper 1 revision	3.14
30	Paper 1 mock exam and feedback	Organic Chemistry Paper 2 revision
31	Paper 3 revision including practicals	Organic Chemistry Paper 2 revision
32	Paper 3 mock exam and feedback	Paper 2 mock exam and feedback

Half Term		
33	Study leave	Study leave

Required Practicals

The following practicals are required of all students taking the A level chemistry course. Practical skills (the Apparatus and Technique) skills are developed during these practicals and students are assessed using Common Practical and Assessment criteria, the CPAC skills. Students who demonstrate the required standard will receive a pass grade and an endorsement of their practical work. There are also questions on the required practical on all 3 exam papers particularly paper 3.

Required activity	Apparatus and technique reference
1. Make up a volumetric solution and carry out a simple acid–base titration	a, d, e, f, k
2. Measurement of an enthalpy change	a, d, k
3. Investigation of how the rate of a reaction changes with temperature	a, b, k
4. Carry out simple test-tube reactions to identify: • cations – Group 2, NH_4^+ • anions – Group 7 (halide ions), OH^-, CO_3^{2-}, SO_4^{2-}	d, k
5. Distillation of a product from a reaction	b, d, k
6. Tests for alcohol, aldehyde, alkene and carboxylic acid	b, d, k
7. Measuring the rate of reaction: • by an initial rate method • by a continuous monitoring method	a, k, l a, k, l
8. Measuring the EMF of an electrochemical cell	j, k
9. Investigate how pH changes when a weak acid reacts with a strong base and when a strong acid reacts with a weak base	a, c, d, k
10. Preparation of: • a pure organic solid and test of its purity • a pure organic liquid	a, b, d, g, h, k b, d, g, k
11. Carry out simple test-tube reactions to identify transition metal ions in aqueous solution	b, d, k
12. Separation of species by thin-layer chromatography	i, k

The CPAC skills

1. Follows written procedures	a. Correctly follows written instructions to carry out experimental techniques or procedures.
2. Applies investigative approaches and methods when using instruments and equipment	a. Correctly uses appropriate instrumentation, apparatus and materials (including ICT) to carry out investigative activities, experimental techniques and procedures with minimal assistance or prompting. b. Carries out techniques or procedures methodically, in sequence and in combination, identifying practical issues and making adjustments when necessary. c. Identifies and controls significant quantitative variables where applicable, and plans approaches to take account of variables that cannot readily be controlled. d. Selects appropriate equipment and measurement strategies in order to ensure suitably accurate results.
3. Safely uses a range of practical equipment and materials	a. Identifies hazards and assesses risks associated with these hazards, making safety adjustments as necessary, when carrying out experimental techniques and procedures in the lab or field. b. Uses appropriate safety equipment and approaches to minimise risks with minimal prompting.
4. Makes and records observations	a. Makes accurate observations relevant to the experimental or investigative procedure. b. Obtains accurate, precise and sufficient data for experimental and investigative procedures and records this methodically using appropriate units and conventions.
5. Researches, references and reports	a. Uses appropriate software and/or tools to process data, carry out research and report findings. b. Cites sources of information demonstrating that research has taken place, supporting planning and conclusions.

The Apparatus and Techniques skills

Apparatus and techniques	
AT a	Use appropriate apparatus to record a range of measurements (to include mass, time, volume of liquids and gases, temperature)
AT b	Use water bath or electric heater or sand bath for heating
AT c	Measure pH using pH charts, or pH meter, or pH probe on a data logger
AT d	Use laboratory apparatus for a variety of experimental techniques including: • titration, using burette and pipette • distillation and heating under reflux, including setting up glassware using retort stand and clamps • qualitative tests for ions and organic functional groups • filtration, including use of fluted filter paper, or filtration under reduced pressure
AT e	Use volumetric flask, including accurate technique for making up a standard solution
AT f	Use acid–base indicators in titrations of weak/strong acids with weak/strong alkalis
AT g	Purify: • a solid product by recrystallisation • a liquid product, including use of separating funnel
AT h	Use melting point apparatus
AT i	Use thin-layer or paper chromatography
AT j	Set up electrochemical cells and measuring voltages
AT k	Safely and carefully handle solids and liquids, including corrosive, irritant, flammable and toxic substances
AT l	Measure rates of reaction by at least two different methods, for example: • an initial rate method such as a clock reaction • a continuous monitoring method

Personal learning checklists (PLC's)

Topic strengths and weaknesses analysis

0 - Achieve 0-2 marks can't answer precisely

1 - Achieve 3-4 marks

2 - Achieve 5-6 marks using key terms precisely

3 - Can apply to most questions

Paper 1 and 2 – Physical chemistry

These are the key ideas **not everything you need to know** make sure you use your text book and chemrevise to learn everything

Year 12

Topic	Key idea	0	1	2	3
1.1 Atomic structure					
	Fundamental particles				
	Mass number, atomic number and isotopes				
	Electronic configuration				
	The Time of Flight Mass Spectrometer				
	Ionisation energies				
1.2 Amount of substance					
	Relative atomic and relative molecular masses, Avogadro's constant, moles				
	Concentration				
	The Ideal Gas equation				
	Empirical and Molecular formulae				
	Atom economy and % yield				
	Balanced equations and related calculations				

Topic	Key idea	0	1	2	3
1.3 Bonding					
	Ionic bonding				
	Covalent and Dative Covalent bonding				
	Metallic bonding				
	Electronegativity and polarised bonds				
	Intermolecular forces				
	Shapes of molecules and ions				
	Bonding and physical properties				
1.4 Energetics					
	Exothermic and Endothermic reactions				
	Enthalpy				
	Measuring enthalpy changes				
	Hess's Law				
	Enthalpy change of combustion and formation				
	Enthalpy cycles				
	Bond enthalpy				
1.5 Kinetics					
	Collision theory				
	The Maxwell Boltzmann Distribution				
	Catalysts				
1.6 Equilibria					
	Definitions of equilibrium and closed system				
	Changing the conditions of an equilibrium reaction and Le Chatelier's Principle				
	Equilibrium reactions in Industry				
	The Equilibrium constant K_C				
	Calculations using K_c				
1.7 Oxidation and reduction					
	Qxidation and reduction definitions.				
	Oxidation states				
	Redox equations				

Paper 1 – Inorganic chemistry

Year 12

Topic	Key idea	0	1	2	3
2.1 Periodicity					
	Trends in the physical properties of Period 3 elements				
	Ionisation energies across a period				

2.2 Group 2					
	The Physical and Chemical properties of Group 2				
2.3 Group 7					
	Physical properties of the Halogens				
	Chemical reactions of the Halogens				
	Reactions of the Halide ions				
	Uses of chlorine				

Paper 2 – Organic chemistry

Year 12

Topic	Key idea	0	1	2	3
3.1 Introduction to organic chemistry					
	Naming organic compounds				
	Isomerism				
3.2 Alkanes					
	Structures and names of alkanes				
	Fractional distillation of crude oil				
	Industrial cracking				
	Combustion of alkanes				
	Formation of halogenoalkanes				
3.3 Halogenoalkanes					
	Physical properties of halogenoalkanes				
	Nucleophilic substitution in halogenoalkanes				
	Elimination in halogenoalkanes				
3.4 Alkenes					
	Names, geometrical isomerism				
	Reactions of alkenes				
	Addition polymers				
3.5 Alcohols					
	Names and types of alcohol				
	Ethanol production				
	The reactions of alcohols				
3.6 Organic analysis					
	Test tube reactions				
	Mass spectrometry				
	Infrared spectroscopy				

Year 13

Papers 1, 2 and 3 Physical chemistry

These are the key ideas **not everything you need to know** make sure you use your text book and chemrevise to learn everything.

Topic	Key idea	0	1	2	3
1.8 Thermodynamics					
	Enthalpy change definitions				
	Born-Haber cycles				
	Enthalpy of solution				
	Entropy calculations				
	Gibbs Free energy calculations				
1.9 Rate equations					
	Measuring the rates of chemical reactions				
	The rate equation and orders of reaction				
	Determining the rate equation from results				
	The rate determining step				
	The Arrhenius equation and rearrangements				
	Calculating the activation energy from a graph or data provided.				
1.10 The equilibrium constant K_P					
	Write an expression for K_P and calculate partial pressures and K_P				
1.11 Electrochemical cells					
	Half cells, standard hydrogen cell, representing cells and the electrochemical series				
	Calculating E_{cell} and predicting the direction of redox reactions				
	Batteries and commercial electrochemical cells				
1.12 Acids, bases and buffers					
	Definitions of Bronsted Lowry acids and bases. Calculating the pH of a strong acid				
	The ionic product of water K_W, calculating the pH of water at different temperatures, calculating the pH of a strong base.				
	The acid dissociation constant K_a and calculating the pH of a weak acid				
	Acid –base titrations				
	Choice of indicators for titrations				
	Buffer solutions and calculations				

Paper 1 and 3– Inorganic chemistry

Year 13

Topic	Key idea	0	1	2	3
2.4 Periodicity					
	Reactions of the period 3 elements with water and oxygen				
	The structure and bonding of the oxides of elements in period 3 and pH of the solutions formed if they dissolve in water				
	Writing equations for the reaction of period 3 oxides with acids and bases				
2.5 Transition metals					
	Definition of a transition metal and properties of them				
	Complex formation and the shape of complex ions. Isomerism in complex ions.				
	Coloured ions				
	Variable oxidation states of transition elements and redox titrations and calculations.				
	How transition elements act as homogeneous and heterogeneous catalysts				
2.6 Reactions of ions in aqueous solutions Cu^{2+}, Al^{3+}, Fe^{2+}, Fe^{3+}					
	The hydrolysis reaction. Comparing the acidity of M^{2+} and M^{3+} ions. Lewis acids and bases.				
	The reactions of these ions with NaOH, Na_2CO_3, NH_3. Know all colour changes and write all equations.				
	Write equations to show why aluminium hydroxide is amphoteric				
	Ligand substitution reactions				

Paper 2 and 3– Organic chemistry

Year 13

Topic	Key idea	0	1	2	3
3.7 Optical isomerism					
	Stereoisomers, optical activity, racemic mixtures, identification of chiral centres, drawing enantiomers.				
3.8 Aldehydes and Ketones					
	Names of aldehydes and ketones and physical properties. Use of Tollens reagent and Fehling's solution to distinguish between them				
	Nucleophilic addition with HCN and $NaBH_4$				
	Oxidation of aldehydes				
3.9 Carboxylic acids and their derivatives					
	Names of carboxylic acids and esters and physical properties. Strength of a carboxylic acid.				
	Formation and hydrolysis of esters under acid and alkaline conditions.				
	Uses of esters, biodiesel and hydrolysis of triglycerides to make soap.				
	Acylation reactions with acyl chlorides and acid anhydrides using alcohols, water, ammonia and amines by nucleophilic addition-elimination				
	Making aspirin. Advantages of using acid anhydrides				
3.10 Aromatic chemistry					
	Evidence for the structure of benzene.				
	Names of aromatic compounds and reactivity.				
	Electrophilic substitution reactions of arenes by nitration and Friedel Crafts acylation				
	Reduction of nitrobenzene				
3.11 Amines					

	Types of amines and naming amines, physical properties of amines				
	Comparing the base strength of amines				
	Preparation of amines by reaction of halogenoalkanes with ammonia, reduction of nitrile and reduction of nitrobenzene				
	Economic importance of amines				
3.12 Polymers					
	Formation of the condensation polymers: polyesters, polyamides, polypeptides. Physical properties.				
	Disposal of polymers				
3.13 Amino acids, proteins and DNA					
	Structure of α amino acids, zwitterions and physical properties.				
	Formation of peptides, polypeptides and proteins. Hydrolysis of peptides and chromatography.				
	Enzymes, stereospecificity, inhibition				
	Structure of nucleotides, drawing hydrogen bonds between base pairs, structure of DNA				
	How cisplatin reacts with DNA as an anti-cancer drug				
3.14 Organic synthesis					
	Synthetic routes				
	Organic analysis by chemical tests.				
3.15 Nuclear magnetic resonance					
	Give the solvent and internal standard for ^{1}H nmr and describe the number of peaks and chemical shift a compound would have.				
	Use coupling to interpret a spectrum and determine the structure				
	Interpret ^{13}C nmr				
3.16 Chromatography					
	Describe and interpret, thin layer, column and gas-liquid chromataography				

Revision Top Tips

1) Avoid Distractions

Revise away from the TV and especially your phone as this is a major distraction. Distractions such as checking phones has been proven to reduce the information absorbed. So put that phone away, turn off the T.V and find a quiet place to revise.

2) Flash Cards

Ensure you practice and learn key definitions and formulae. Repetition is key to remembering key facts. Flash cards are available from quizlet or even better make your own. Test yourself on them then check the answer – repeat. You could even get someone else at home to test you on these.

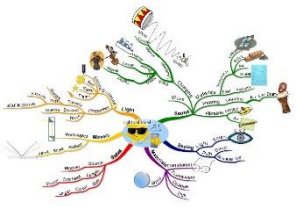
3) Look, Cover, Write, Check

Another way to revise key points is cover it over so you can't see it. Write it out and check whether you have done it correctly. Doing this with mind maps help to revise large chunks of information.

4) Be organised

You have a large amount to revise. This can be daunting but with a bit of organisation plan out your revision. Be realistic about how long you will spend on each topic. Use the specification or personal learning checklists to see if you have covered everything. Don't try and cram everything in a short time period remember repetition is key.

5) Don't just read or write out notes



The ability of the brain to remember visual information is much better than just text. Summarise notes using diagrams or use mind-maps. These are great when combined with the Look, Cover, Write, Check technique

6) Attend Revision Sessions

Revision is every Tuesday (yr13) and Thursday (y12) after school. Teachers are there to help and guide you with areas that you are finding difficult.

7) Practice Exam Questions

Booklets of exam questions are available on pupil share and past papers are available from the AQA website. You don't have to print these off. Just use a scrap piece of paper and complete these then mark your answers using the mark scheme.

Useful online Resources

There is a wealth of information available online to help you revise – here are just a few of our favourites

https://chemrevise.org/

http://chemguide.co.uk/

https://quizlet.com/en-gb

http://www.a-levelchemistry.co.uk/

https://www.youtube.com/user/virtualschooluk

https://www.aqa.org.uk>as-and-a-level

http://www.tomred.org/chemistry.html

AS Holiday Homework – Half term 1

Hour	Task
1	Learn 1.1 Atomic structure, 1.2 Amount of substance and 1.3 Bonding flashcards (you will be tested on these after the holidays)
2	Find AQA past paper questions on the above topics by going on the AQA A level chemistry assessment resources website and mark them with the mark scheme.
3	Make sure your notes are up to date
4	Create mindmaps of the above topics in blue/black without a book then add to it in red using your notes
5	Complete (under exam conditions) at least 1 test from pupil share and mark in red

AS Holiday Homework – Christmas

Hour	Task
1	Learn 1.4 Energetics, 1.5 Kinetics,1.1 Atomic structure, 1.2 Amount of substance and 1.3 Bonding flashcards (you will be tested on these after the holidays)
2	Find AQA past paper questions on the above topics by going on the AQA A level chemistry assessment resources website and mark them with the mark scheme.
3	Make sure your notes are up to date
4	Create mindmaps of the above topics in blue/black without a book then add to it in red using your notes
5	Complete (under exam conditions) at least 1 test from pupil share and mark in red.

AS Holiday Homework – Half term 2

Hour	Task
1	Learn 1.6 Equilibria, 3.2 Alkanes, 3.3 Halogenoalkanes and 3.4 Alkenes flashcards (you will be tested on these after the holidays)
2	Find AQA past paper questions on the above topics by going on the AQA A level chemistry assessment resources website and mark them with the mark scheme.
3	Make sure your notes are up to date
4	Create mind maps of the above topics in blue/black without a book then add to it in red using your notes
5	Complete (under exam conditions) at least 1 mini test from pupil share and mark in red

AS Holiday Homework – Easter

Hour	Task
1	Learn 1.7 Oxidation and Reduction, 2.1 Periodicity, 3.5 Alcohols flash cards along with all previous flash cards (you will be tested on these after the holidays)
2	Find AQA past paper questions on the above topics by going on the AQA A level chemistry assessment resources website and mark them with the mark scheme
3	Make sure your notes are up to date
4	Create mind maps of the above topics in blue/black without a book then add to it in red using your notes
5	Complete (under exam conditions) at least 1 test from pupil share and mark in red

AS Holiday Homework – Half term 3

Hour	Task
1	Learn 2.2 Group 2, 2.3 Group 7, 3.6 Organic analysis flashcards along with all previous flash cards (you will be tested on these after the holidays)
2	Find complete past papers from the AQA website and mark it using the mark scheme. Stick to the mark scheme and do not accept any other answer.
3	Make sure your notes are up to date
4	Create mind maps of the above topics in blue/black without a book then add to it in red using your notes
5	Complete (under exam conditions) at least 1 test from pupil share and mark in red

AS Holiday Homework – Summer

Hour	Task
1	Learn all the above flashcards (you will be tested on these after the holidays)
2	Find AQA past paper questions on the above topics by going on the AQA A level chemistry assessment resources website and mark them with the mark scheme
3	Make sure your notes are up to date
4	Fill in mind maps in blue/black without a book then add to it in red using your notes
5	Complete (under exam conditions) at least test from pupil share and mark in red

A2 Holiday Homework – Half term 1

Hour	Task
1	Learn 1.8 Thermodynamics, 1.12 Acids and Bases, 3.7 Optical isomerism, 3.8 Aldehydes and Ketones, 3.9 Carboxylic acids flashcards (you will be tested on these after the holidays)
2	Find AQA past paper questions on the above topics by going on the AQA A level chemistry assessment resources website and mark them with the mark scheme
3	Make sure your notes are up to date
4	Create mind maps of the topics above in blue/black without a book then add to it in red using your notes
5	Complete (under exam conditions) at least 1 test from pupil share and mark in red

A2 Holiday Homework – Christmas

Hour	Task
1	Learn 1.11 Electrochemistry, 1.9 Rate equations, 3.10 Aromatic chemistry and all previous flashcards including year 12 (you will be tested on these after the holidays)
2	Find AQA past paper questions on the above topics by going on the AQA A level chemistry assessment resources website and mark them with the mark scheme
3	Make sure your notes are up to date
4	Create mind maps of the topics above in blue/black without a book then add to it in red using your notes
5	Complete (under exam conditions) at least 1 test from pupil share and mark in red

A2 Holiday Homework – Half term 2

Hour	Task
1	Learn 1.10 Equilibrium constant K_p, 2.5 Transition metals, 3.11 Amines and all previous flashcards including year 12 (you will be tested on these after the holidays)
2	Find AQA past paper questions on the above topics by going on the AQA A level chemistry assessment resources website and mark them with the mark scheme
3	Make sure your notes are up to date
4	Create mind maps of the topics above in blue/black without a book then add to it in red using your notes
5	Complete (under exam conditions) at least 1 test from pupil share and mark in red

A2 Holiday Homework – Easter

Hour	Task
1-2	Learn 2.6 Reactions of ions in aqueous solutions, 2.4 Properties of period 3 elements and their oxides, 3.12 Polymers, 3.13 Amino acids, proteins and DNA, 3.15 Nmr and all previous flashcards including year 12 (you will be tested on these after the holidays)
3-4	Find complete past papers from the AQA website and mark it using the mark scheme. Stick to the mark scheme and do not accept any other answer.
5	Make sure your notes are up to date
6-7	Create mind maps of the topics above in blue/black without a book then add to it in red using your notes
8-10	Complete (under exam conditions) tests from pupil share and mark in red

Mathematical skills

20 % of the marks in the chemistry exam paper will assess the mathematical skills at a higher tier maths GCSE. Make sure that you can do the following:

1) Unit conversions

Length Units		How to convert
10 mm	cm	Divide by 10
100 cm	m	Divide by 100
1 000 m	km	Divide by 1000
km	0.62 mile	Multiply by 0.62
Area Units		
100 mm^2	cm^2	Divide by 100
10 000 cm^2	m^2	Divide by 10 000
1 000 000 m^2	km^2	Divide by 1 000 000
Volume Units		
1 000 cm^3	dm^3	Divide by 1000
1 000 dm^3	m^3	Divide by 1000
dm^3	Litre	Equal
dm^3	1 000 cm^3	Multiply by 1000
m^3	1 000 dm^3	Multiply by 1000
Mass Units		
1 000 mg	g	Divide by 1000
1 000 g	kg	Divide by 1000
1 000 kg	tonne	Divide by 1000
Temperature Units		
°C	Kelvin (K)	Add 273
Kelvin (K)	°C	Minus 273
°C	°F	9/5°C + 32
°F	°C	5/9(°F – 32)
Pressure Units		
1000 Pa	kPa	Divide by 1000

2) Significant figures and standard form

Standard Form

- Standard form is very useful for writing very large or small numbers.
- They are written in the form A x 10^n where A is a number between 1 and 10.
- n represents the number of places the decimal point is moved (for +n values the decimal point has been moved to the left, for -n values the decimal point has been moved to the right).

Number	3435	1029000	0.025	23.2	0.0000278
Standard form	3.435 x 10^3	1.029 x 10^6	2.5 x 10^{-2}	2.32 x 10^1	2.78 x 10^{-5}

- To find the value of n:
  - for numbers greater than 1, n = number of places between first number and decimal place
  - for numbers less than 1, n = number of places from the decimal place to the first number (including that number)

Significant figures

Full number	1 sig fig	2 sig fig	3 sig fig	4 sig fig	5 sig fig
9.378652	9	9.4	9.38	9.379	9.3787
4204274	4000000	4200000	4200000	4204000	4204300
0.903521	0.9	0.90	0.904	0.9035	0.90352
0.00239482	0.002	0.0024	0.00239	0.00239	0.002395

Always quote your answers to the smallest number of significant figures in the question unless told otherwise.

3) Rearranging equations

You will need to rearrange basic equations such as PV = nRT so that any of the symbols used is the subject.

So $P = \frac{nRT}{V}$ $V = \frac{nRT}{P}$ $T = \frac{PV}{nR}$ $n = \frac{PV}{RT}$

You will also need to rearrange more complex equations such as the Arrhenius equation.

$$k = Ae^{-\frac{E_a}{RT}} \qquad \ln k = \ln A - \frac{E_a}{RT}$$

So rearranging the second equation:

$$\ln k = \ln A - \frac{E_a}{RT}$$
$$\frac{E_a}{RT} = \ln A - \ln k$$
$$E_a = RT(\ln A - \ln k)$$

For mass spectroscopy the kinetic energy of an ion is

$$KE = \frac{1}{2}mv^2$$

$$v = \sqrt{\frac{2KE}{m}}$$

4) Using logs

The acids and bases topic and rate equations topics involve calculations using logs.

Definition of pH **$pH = -\log[H^+]$**

Useful rearrangement **$[H^+] = 10^{-pH}$**

Make sure you know how to use your calculator to do these questions.