MACHEMGUY VIDEO INDEX

MODULE 1 - DEVELOPMENT OF PRACTICAL SKILLS IN CHEMISTRY

1.1 - PRACTICAL SKILLS ASSESSED IN A WRITTEN EXAMINATION	
PAG 1	Moles determination
PAG 2	Acid-base titration
PAG 3	Enthalpy determination
PAG 4	Qualitative analysis of ions
PAG 5	Synthesis of an organic liquid
PAG 6	Synthesis of an organic solid
PAG 7	Qualitative analysis of organic functional groups
PAG 8	Electrochemical cells
PAG 9	Rates of reaction - continuous monitoring
PAG 10	Rates of reaction - initial rates
PAG 11	pH measurement

MODULE 2 - FOUNDATIONS IN CHEMISTRY

2.1 - ATOMS AND REACTIONS		
	Syllabus Code	Video Link
Atomic structure & isotopes	2.1.1	Atomic Structure
		Nuclear symbols
		Relative Atomic & Isotopic Mass
		Relative Molecular & Formula Mass
		Determination of Relative Atomic Mass by Mass Spectrometry
		Calculating the Abundance of Isotopes from Mass Spec
Compounds, formulae and equations	2.1.2	Positive Ions
		Negative Ions
		Working out the formulae of ionic compounds
		Balancing chemical equations
		Writing chemical equations from supplied information
		Ionic equations
Amount of substance	2.1.3	The mole
		Moles and Avogadro's number
		Empirical and molecular formula
		Empirical formula - when to round and when to multiply out
		Hydrated salts and water of crystallisation
		Moles and gases
		Reacting amount calculations: volumes of gases

		The ideal gas equation 1
		The ideal gas equation 2
		Reacting amount calculations: masses
		Moles and solutions
		More moles and solutions
		Reacting amount calculations: solutions
		Reacting amount calculations: using all the formula triangles
		Percentage yield & limiting reagent
		Excess & limiting reagent made easy!
		Atom economy
Acids	2.1.4	Introduction to acids and bases
		Visualising strong and weak acids
		Reactions of acids and bases
		Making a standard solution
		Stock solutions and dilution
		How to do an acid-base titration 1
		How to do and acid-base titration 2
Redox	2.1.5	Oxidation number 1
		Oxidation number 2
		Redox reactions (looking at electrons)
		Redox reactions (looking at oxidation number)

2.2 - ELECTRONS, BONDING AND STRUCTURE		
	Syllabus Code	Video Link
Electron structure	2.2.1	Electronic configuration 1
		Electronic configuration 2
		I heart electron config
		Playmobil electronic configuration
Bonding and structure	2.2.2	Ionic bonding
		Properties of ionic compounds
		Covalent bonding
		Coordinate/Dative covalent bonding
		Shapes of molecules introduction
		Shapes of molecules: 3&4 electron pairs in the valence shell
		Shapes of molecules: 5&6 electron pairs in the valence shell
		Shapes of molecules: The effect of lone pairs in the valence shell
		Electronegativity and polarity
		Identifying polar and non-polar molecules
		Polar/non-polar molecule? SUPER EASY!!!
		Intermolecular forces introduction
		Types of intermolecular forces
		Anomalous properties of water

		Explaining melting point in terms of structure and bonding

MODULE 3 - PERIODIC TABLE AND ENERGY

3.1 - THE PERIODIC TABLE		
	Syllabus Code	Video Link
Periodicity	3.1.1	Ionisation energy
		Explaining successive ionisation energies
		Periodicity
		Periodic patterns in first ionisation energies 1
		Periodic patterns in first ionisation energies 2
		Periodic patterns in melting points across period 3
Group 2	3.1.2	Group 2 - Redox reactions of group 2 elements
		Group 2 - Reactions of group 2 compounds
The halogens	3.1.3	The halogens
		Oxidising power of the halogens
		Displacement reactions of the halogens 1
		Displacement reactions of the halogens 2
		Testing for aqueous halide ions
Qualitative analysis	3.1.4	Testing for aqueous halide ions
		Testing for the ammonium ion

		Testing for the carbonate ion
		Testing for the sulfate ion

3.2 - PHYSICAL CHEMISTRY		
	Syllabus Code	Video Links
Enthalpy changes	3.2.1	Enthalpy introduction
		Standard enthalpy changes
		Calculating enthalpy change of reaction by calorimetry
		Calculating enthalpy change of combustion by calorimetry
		Calculating enthalpy changes from bond enthalpies
		Calculating a bond enthalpy from the enthalpy change
		Enthalpy change of neutralisation
		Hess' law introduction
		Hess' law cycles involving enthalpy changes of formation
		Hess' law cycles involving enthalpy changes of combustion
Reaction rates	3.2.2	Rates of reaction introduction
		Rates of reaction collision theory
		Rates of reaction - Boltzmann distribution curves
		Colorimetry
Chemical equilibrium	3.2.3	Chemical equilibrium introduction
		Chemical equilibrium - Le Chatelier's principle
		Effect of changing concentration on equilibrium position

		Effect of changing temperature on equilibrium position
		Chemical Equilibrium and Industry - The Haber Process
		The equilibrium constant Kc
		Two Kc calculations

MODULE 4 - CORE ORGANIC CHEMISTRY

4.1 - BASIC CONCEPTS AND HYDROCARBONS		
	Syllabus Code	Video Links
Basic concepts of organic chemistry	4.1.1	The key organic terms
		The key organic terms made simple!
		Key organic terms (with examples)
		Test yourself on organic terms
		Basic concepts of organic chemistry - key terms test
		Organic functional groups and homologous series
		Organic formulae
		Naming alkanes
		Naming alkenes
		Naming alcohols
		Naming halogenoalkanes
		Naming aldehydes

		Naming ketones
		Naming carboxylic acids
		Naming cycloalkanes
		Naming cycloalkenes
Alkanes 4.1.2		Alkanes - The essentials
		Sigma bonds in 15 seconds
		Radical substitution mechanism
		Radical substitution - looking at the electrons
Alkenes	4.1.3	Bonding in alkenes
		Pi bonds in 15 seconds
		Stereoisomerism
		E/Z Isomerism - It's not that bad really!
		So what is cis-trans isomerism???
		Explaining the lack of rotation in the C=C bond
		My E/Z Key
		Applying CIP rules to tricky molecules
		Reactions of alkenes introduction
		Reactions of alkenes with hydrogen
		Reaction of alkenes with halogens
		Reaction of alkenes with hydrogen halides
		Reaction of alkenes with steam

		Electrophilic addition mechanism 1
		Electrophilic addition mechanism 2
		Markovnikoff's rule
		Addition polymers from alkenes

4.2 - ALCOHOLS, HALOALKANES AND ANALYSIS		
	Syllabus Code	Video Links
Alcohols	4.2.1	Alcohols introduction
		Oxidation reactions of alcohols
		Oxidation of alcohols reflux vs distillation
		Dehydration of alcohols
Haloalkanes	4.2.2	Introduction to haloalkanes
		Hydrolysis of haloalkanes
		Relative rates of hydrolysis of haloalkanes
		Organohalogens and the ozone layer
Organic synthesis	4.2.3	Synthetic routes 1
		Synthetic routes 2

		Synthetic routes 3
		Revise organic reaction mechanisms
		Test yourself AS organic reactions
		Quickfit apparatus
		Preparation of a pure organic liquid
Analytical techniques	4.2.4	An introduction to infrared spectroscopy
		Introducing infrared spectroscopy
		Getting started with interpreting IR spectra
		Interpreting infrared spectra
		Mass spectrometry of organic compounds
		Interpreting mass spectra

MODULE 5: PHYSICAL CHEMISTRY AND TRANSITION ELEMENTS

5.1 - RATES, EQUILIBRIUM AND pH		
	Syllabus Code	Video Links
How fast?	5.1.1	Rate and order of reaction
		Order and half-life
		Rate equations

		Initial rates 1
		Initial rates 2
		Ten initial rates questions
		Rate determining steps and reaction mechanism 1
		Rate determining steps and reaction mechanism 2
		The Arrhenius equation
		Arrhenius Calculations
		Arrhenius Plots
How far?	5.1.2	The equilibrium constant Kc
		Kc calculations 1
		Kc calculations 2
		Kc for heterogeneous equilibria
		Explain in terms of Kc
		The equilibrium constant Kp
		Kp calculations involving total pressure
		Kp calculations involving mole fractions
		Exam paper Kp calculation
Acids, bases and buffers	5.1.3	Acids and bases introduction
		The acid dissociation constant Ka
		Calculating the pH of strong acids
		Calculating the pH of weak acids

		Weak acid approximations
		The ionic product of water Kw
		Calculating the pH of strong bases
		Introduction to buffer solutions
		Buffer calculations 1
		Buffer calculations 2
		pH curves strong acid-strong base
		pH curves strong acid-weak base
		pH curves weak acid-strong base
		pH curves weak acid-weak base
		Choosing the right indicator
		All the K's

5.2 - ENERGY		
	Syllabus Code	Video Links
Lattice enthalpy	5.2.1	Lattice enthalpy 1
		Lattice enthalpy 2
		Lattice enthalpy 3
		Lattice enthalpy for Al_2O_3

		Enthalpy of Solution 1
		Enthalpy of Solution 2
		Enthalpy of Solution 3
Enthalpy and entropy	5.2.2	Entropy 1
		Entropy 2
		Calculating the minimum temperature a reaction takes place spontaneously
		Awkward Gibbs equation question
Redox and electrode potentials	5.2.3	Writing half equations
		Writing half-equations made easy!
		Combining half equations
		Redox titrations 1
		Redox titrations 2
		Thiosulphate titrations 1
		Thiosulphate titrations 2
		Electrode potentials 1
		Electrode potentials 2
		Fuel cells introduction
		Advantages and disadvantages of fuel cell vehicles

5.3 - TRANSITION ELEMENTS

	Syllabus Code	Video Links
Transition elements 5.3.1		Transition Elements 1 (Introduction)
		Transition Elements 2 (4 general properties)
		Transition Elements 3 (Precipitation reactions)
		Transition Elements 4 (Complexes)
		Transition Elements 5 (Isomerism in complex ions)
		Transition Elements 6 (Ligand substitution reactions)
		Transition Element Colours by Metal
		Transition Element Colours by Colour
		Test yourself TM reactions
Qualitative analysis	5.3.2	Inorganic Qualitative Analysis

MODULE 6: ORGANIC CHEMISTRY AND ANALYSIS

6.1 - AROMATIC COMPOUNDS, CARBONYLS AND ACIDS		
	Syllabus Code	Video Links

Aromatic Compounds	6.1.1	Structure and bonding in benzene
		Evidence for benzene's structure and bonding
		Reactions of benzene
		Friedel-Crafts Reactions
		Comparing the reactivities of benzene and alkenes
		Phenols 1
		Phenols 2
		Aromatic directing groups
Carbonyl Compounds	6.1.2	An introduction to carbonyl compounds
		Oxidation and reduction reactions of carbonyl compounds
		Nucleophilic addition mechanism for the reduction of carbonyls
		Testing for carbonyl compounds
Carboxylic acids and esters	6.1.3	An introduction to carboxylic acids
		Reactions of carboxylic acids
		Esters
		Esterification
		Hydrolysis of esters
		Acyl(acid) chlorides introduction
		Reactions of acyl chlorides

6.2 - NITROGEN COMPOUNDS, POLYMERS AND SYNTHESIS		
	Syllabus Code	Video Links
Amines	6.2.1	Amines
Amino acids, amides and chirality	6.2.2	Amides
		Amino acids introduction
		Reactions of amino acids
		Introduction to optical isomerism
		Drawing the optical isomers for molecules with 2 chiral centres
		How we distinguish between optical isomers
Polyesters and polyamides	6.2.3	Introduction to condensation polymerisation
		Polyesters
		Polyamides
		Hydrolysis of polyesters
		Hydrolysis of polyamides
Carbon-carbon bond formation	6.2.4	C-C bond synthesis

6.3 - ANALYSIS		
	Syllabus Code	Video Links
Chromatography and qualitative analysis	6.3.1	Chromatography introduction

		Thin layer chromatography
		Gas chromatography
		Qualitative analysis video to follow
Spectroscopy	6.3.2	An introduction to NMR
		Carbon-13 NMR introduction
		Carbon-13 NMR two worked examples
		Proton NMR 1 - Basic spectra
		Proton NMR 2 - Integration values
		Proton NMR 3 - Peak splitting
		Proton NMR 4 - More peak splitting
		Proton NMR 5 - Dealing with -OH and -NH protons
		Interpreting IR spectra
		Mass spectrometry of organic compounds
		Combined techniques 1
		Combined techniques 2
		Combined techniques 3
		Combined techniques 4

Quick revision videos

Module 1: Practical skills (See also PAG section)

Inorganic qualitative analysis (WITH PHOTOS)
Organic synthesis (practical skills)

Module 2: Foundations in chemistry
Atomic structure
Ions and ionic formulae
Ionic equations
Relative molecular mass and relative formula mass
Relative mass
The mole
Amount of substance (Reacting mass)
Titration calculations
Further titration calculations
Excess and limiting reagents
Ideal gas equation
Acids & bases
Hydrated salts
Redox
Electron configuration
Ionic bonding

Covalent bonding
Shapes of molecules
Shapes of molecules (2)
Shapes of molecules (3)
Shapes of molecules (4)
Polar and non-polar molecules
Intermolecular forces

Module 3: Periodic table and energy
Periodicity - Ionisation energy trends
Periodic trends in bonding and structure
Explaining melting point in terms of bonding and structure (1)
Explaining melting point in terms of bonding and structure (2)
Group 2
The halogens
Inorganic qualitative analysis
Enthalpy change calculations
Enthalpy changes from bond enthalpies
Hess' Law cycles (formation)
Hess' Law cycles (combustion)
Vector approach to Hess' Law using enthalpy changes of combustion

Vector approach to Hess' Law using enthalpy changes of formation
Enthalpy change of neutralisation
AS Reaction rates
AS Equilibria

Module 4: Core organic chemistry
Key Organic Chemistry Terms
Alkanes
Radical substitution mechanism (past exam question)
Alkenes (bonding & shape)
Alkenes (reactions)
Electrophilic addition mechanism
Alkenes (Markownikoff's rule)
E/Z Isomerism
Cis-trans isomerism
Addition polymerisation
Alcohols (Classification & physical properties)
Alcohols (Reactions)
Haloalkanes
Purification of an organic liquid

Mass spectrometry
Infrared spectroscopy
AS organic conversions
AS organic pathways map
AS organic mechanisms

Module 5: Physical chemistry and transition elements
Initial rates
Rates graphs
Rate determining steps and reaction mechanisms
Clock reactions
Arrhenius equation
The equilibrium constant Kc
The equilibrium constant Kp
Explaining equilibrium shift in terms of equilibrium constants
Bronsted-Lowry acids and bases
Strong acids
Weak acids
Acids, bases and buffers formulae
Weak acids calculations

Ionic product of water, Kw
Buffer solutions
Buffer solution calculations
pH titration curves
pH titration curve calculations
Calculating pH of mixture of a strong acid and strong alkali
Calculating pH of mixture of a weak acid and strong alkali
Born-Haber cycles
Enthalpy change of solution
Entropy & free energy
Awkward Gibbs equation question
Redox titrations
Sodium thiosulfate titrations
Redox titration question walkthrough (inc practical skills)
Redox titration question walkthrough (OCR A 2018 Paper 1)
Using redox titrations to establish the mole ratio
Oxidation number
Balancing awkward redox equations
Half-equations
Electrode potentials & electrochemical cells
Fuel-cells

Non-hydrogen fuel-cells
Storage cells (batteries)
Transition element (properties)
Transition elements (complex ions)
Transition elements (reactions)
Writing equations from supplied information
Inorganic qualitative analysis

Module 6: Organic chemistry and analysis
Structure & bonding in benzene
Electrophilic substitution
Alkylation & acylation of benzene
Comparing the reactivities of benzene and alkenes
Phenols
Comparing the reactivities of benzene and phenol
Aromatic directing groups
Carbonyl compounds
Carboxylic acids
Esters
Acid anhydrides

Acyl chlorides
Amines
Amides
Amino acids
Condensation polymers
Awkward polymerisation questions
Hydrolysis of condensation polymers
Nitriles & hydroxynitriles
Organic reaction pathways (aliphatic)
Organic reaction pathways (benzene)
Organic reaction pathways (phenol)
Purification of an organic solid
Organic qualitative analysis
Chromatography
Calibration curves
Proton NMR
Carbon-13 NMR
All six mechanisms
Combustion analysis

Quick Test Videos

Module 2: Foundations in chemistry
Atomic Structure & Isotopes 1
Formulae & Equations 1
Formula & Equations 2
Formulae & Equations 3
Relative mass 1
Calculations 1
Calculations 2
Calculations 3
Calculations 4 (Solution calculations)
Calculations 5 (Excess & limiting reagents)
Acids & Bases 1
Acids & Bases 2 (Water of crystallisation)
Electron configuration
Bonding & Structure 1

Module 5: Physical chemistry and transition elements
Rates 1

Buffers & Neutralisation 1

Module 6: Organic Chemistry & Analysis
Aromatic Chemistry 1
Aromatic Chemistry 2

Exam Question Walkthroughs

Structure determination from titration results
Structure and bonding
Enthalpy Changes
Halogens and Enthalpy Changes
Equilibrium (Y12)
Alkene reactions and mechanism
Organic reactions
Haloalkanes
Structure Determination
Organic Synthesis and Reaction Rates
Rates (Y13)
Rates (Y13)
Equilibrium (Y13)

Equilibrium (Y13)
Structure determination (Y13)

AS/Y12 EXAM PAPER WALKTHROUGHS		
Paper	Topic(s)	Video Link
F321 May14	Atomic structure, relative atomic mass, shapes of molecules	F321 May14 Q1
F321 May14	Empirical formula, acids, bases and salts	F321 May14 Q2
F321 May14	Amount of substance calculations	F321 May14 Q3
F321 May14	Intermolecular forces, structure and bonding properties	F321 May14 Q4
F321 May14	Periodicity and group 7 chemistry	F321 May14 Q5
F321 May14	Group 2, water of crystallisation, dot and cross diagram	F321 May14 Q6
F321 May13	Atomic structure, number of molecules present calculation, ionic bonding	F321 May13 Q1
F321 May13	Water of crystallisation calculation, bleach chemistry	F321 May13 Q2
F321 May13	Oxidation numbers, amount of substance calculations, intermolecular forces, structure and bonding, shapes of molecules	F321 May13 Q3
F321 May13	Group 2 & 7	F321 May13 Q4
F321 May13	Periodicity	F321 May13 Q5
F322 Jun13	Hydrocarbons	F322 Jun13 Q1
F322 Jun13	Alcohols	F322 Jun13 Q2
F322 Jun13	Alkenes and calorimetry	F322 Jun13 Q3

F322 Jun13	2 x Mechanisms (alkenes and alkanes)	F322 Jun13 Q4
F322 Jun13	Enthalpy	F322 Jun13 Q5
F322 Jun13	Structural determination using mass spec and IR	F322 Jun13 Q6
F322 Jun13	Haloalkanes	F322 Jun13 Q7
F322 Jun13	Polymerization, equilibria and rates	F322 Jun13 Q8
F322 Jun14	Alkanes, radical substitution mechanism, stereoisomerism	F322 Jun14 Q1
F322 Jun14	Haloalkanes, atom economy, percentage yield	F322 Jun14 Q2
F322 Jun14	Equilibria, enthalpy change from bond enthalpy	F322 Jun14 Q3
F322 Jun14	Calorimetry and Hess' law calculations	F322 Jun14 Q4
F322 Jun14	Addition polymerisation, carbon capture and storage	F322 Jun14 Q5
F322 Jun14	Rates of reaction, Boltzmann curves	F322 Jun14 Q6
F322 Jun14	Reactions of alkenes, oxidation of alcohols	F322 Jun14 Q7
F322 Jun14	Identification of an organic compound from mass and spectroscopic data	F322 Jun14 Q8

A2/Y13 EXAM PAPER WALKTHROUGHS		
Paper	Topic	Video Link
H432/01 -Periodic table, elements and physical chemistry (Specimen	Various	Section A (Multiple Choice)
	Gaseous equilibria/Kp	Section B Q16
	Rates of reaction	Section B Q17
	Gibbs free energy calculation	Section B Q18

Paper)	Lattice enthalpy/Born-Haber	Section B Q19
	Acid-base calculations	Section B Q20
	Electrode potentials	Section B Q21
	Transition elements	Section B Q22
H432/03 - Unified Chemistry (Sample Paper)	Various	Unified Chem Sample Paper Q1
	Planning a qualitative analysis experiment to determine ions present in a solution, Kw calculation, empirical formula calculation	Unified Chem Sample Paper Q2
	Transition elements, weak acid calculation and balancing half equations	Unified Chem Sample Paper Q3
	Reaction rates	Unified Chem Sample Paper Q4
	Reactions of acids, gas volume calculation, reactions of organic functional groups, transition element complexes, acid-base equilibria and structure determination!!	Unified Chem Sample Paper Q5
	Titration calculations to establish a mole ratio followed by making comments on the procedure	Unified Chem Sample Paper Q6

BORN-HABER CYCLES/LATTICE ENTHALPY	
Paper	Video Link
F325 Jun13	Born-Haber 1
F325 Jun 15	Born-Haber 2
F325 Jun 10	Born-Haber 3
Machemguy's own question	Born-Haber cycle and lattice enthalpy calc for Al_2O_3

REDOX TITRATIONS	
Paper	Video Link
F325 Jun13 part 1	Redox titration 1
F325 Jun 13 part 2	Redox titration 2
F325 Jun 15	Redox titration 3

ELECTRODE POTENTIALS	
Paper	Video Link
F325 Jun 13	Electrode potentials 1
F325 Jun 15	Electrode potentials 2

ACIDS BASES AND BUFFERS	
Paper	Video Link
F325 Jun 13	Acids bases and buffers 1
F325 Jun 15	Acids bases and buffers 2
F325 Jun 11	Acids bases and buffers 3 - MAGIC TANG!!

RATES

Paper	Video Link
F325 Jun 13	Rates 1
F325 Jun 15	Rates 2
F325 Jan 11	Rates 3

ENTROPY	
Paper	Video Link
F325 Jun 13	Entropy 1
F325 Jun 15	Entropy 2

EQUILIBRIA	
Paper	Video Link
F325 Jun 13	Equilibria 1

TRANSITION ELEMENTS	
Paper	Video Link
F325 Jun 13	Transition elements 1
F325 Jun 15	Transition elements 2

ANALYSIS	
Paper	Video Link
F324 Jan 12	Combined techniques 1
F324 Jun 14	Combined techniques 2
F324 Jun 13	Combined techniques 3
F324 Jun 15	Combined techniques 4
MaChemGuy's own question	Identification of organic unknowns