MASTER CLASS

CHEMISTRY

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THE PAPER

3 HOURS

ANY 8 QUESTIONS OUT OF 11.

50 MARKS EACH

22.5 MINUTES EACH

SECTION A - 3 QUESTIONS

QUESTION 1
VOLUMETRIC ANALYSIS – 8 mandatory experiments
This topic is always examined in this section. The good news is that there is quite a large amount of common material in each of the experiments.

Every year they examine **general practical procedures** which are roughly the same for each experiment that you do. For example how to prepare a solution in a volumetric flask and how to use a pipette, burette and conical flask. I strongly advise that you put effort into this.

Every year there are **calculations** to do. Also be familiar of the types of calculations that are asked in each experiment. For example, if it is a bleach or vinegar experiment they will ask for the concentration as %(w/v), in a water of crystallisation titration you'll be asked to solve for 'x'/percentage of water in the crystals. A thorough understanding of concentrations of solutions is essential here.

Finally, you should take time to ensure you know the different **unique or specific questions** that go with each experiment. For example, what indicators are used (if any), colour changes, when should indicators be added, if any precipitates appear.

QUESTION 2
0RGANIC CHEMISTRY EXPERIMENT(S) – 7 mandatory experiments

These are divided into 4 **preparations** (ethene, ethyne, soap and benzoic acid) and 3 **techniques** (steam distillation with solvent extraction, chromatography and recrystallisation with finding the melting point).

Each experiment is different but I would go through this check list.

1. Any **diagram** showing the apparatus needed.

2. Any balanced **equations** needed.

3. **Safety procedures** unique to the experiment including hazard symbols.

4. If a technique, what **principle** is involved.

5. Any **calculations** needed e.g. determining limiting reactant and percentage yield.

6. Any **tests** being carried out on the preparations, e.g. combustion, tests for unsaturation, tests to show the presence of an aldehyde or carboxylic acid.

7. **Observations** - Physical appearances of the materials used, effervescence, flame colours, colour changes.

QUESTION 3 - USUALLY ON ONE (OR MORE) OF THE REMAINING 12 MANDATORY EXPERIMENTS (BUT HAS BEEN A SECOND ORGANIC EXPERIMENT ON TWO OCCASIONS).

The common experiments to appear here are:
Rates of reaction experiments (usually involving drawing graphs and interpreting graphs).

Water- Colorimetry and Suspended and dissolved solids.

Heat of reaction of an acid with a base.

Gas laws – determining the Mr of a volatile liquid.

Tests for anions and flame tests appeared in this question.

Rates of reaction experiments.

SECTION B

There are 8 questions in section B. Three of which have an internal choice, 4, 10 and 11.

QUESTION 4

Three words. PRACTISE, PRACTISE, PRACTISE.

Topics here usually include
Atomic theory
Organic chemistry
Stoichiometry
Definitions
Acids/bases
Water

QUESTION 5

ATOMIC THEORY generally one of three topics
*Electronegativity and bonding including shapes of molecules
*Atomic radius and Ionization energies
*Scientists involved in the history of the periodic table and history of the atom/Radioactivity.

QUESTION 6

FUELS AND HEATS OF REACTION
Crude oil, natural gas, petrol and in recent years hydrogen.
Hess's law using heats of combustion and heats of formation.

This is a good one to prepare in advance of the exam as it is quite repetitive ….

QUESTION 7

Often this is on acids and bases with pHs. Otherwise it can be chemical equilibrium or rates of reaction.

QUESTION 8 (OR 9)

GENERAL ORGANIC CHEMISTRY
Drawing and naming organic molecules from 8 homologous series. THIS IS SO IMPORTANT!

Reactions types and reagents and conditions involved in the conversion of one homologous series to another.

Mechanisms of free radical substitution and ionic addition reactions, with evidence.

QUESTION 10
THREE PARTS, PICK TWO

QUESTION 11
FOUR PARTS, PICK TWO

In questions 10 and 11 there is usually **more organic chemistry and more atomic theory**. This is also where there may be a stoichiometry problem to solve. Any other topic can appear in these questions. Part (d) of question 11 will be examining the option.

OTHER IMPORTANT TOPICS – there is usually a full question and a half question (minimum) on these areas of the syllabus.

CHEMICAL EQUILIBRIUM
RATES OF REACTION
WATER

ALLOCATION OF MARKS IN THE MAIN AREAS

Organic chemistry - 150 to 200 marks
Atomic theory - 81 marks
Volumetric analysis – 50 marks

Then chemical equilibrium, rates of reaction and water will give one full question and at least one half question (but more likely more) – 75 marks

QUESTION 1 CALCULATION EXAMPLE

LEAVING CERT 2014

A batch of washing soda crystals (hydrated sodium carbonate, $\mathbf{Na_2CO_3 \cdot \mathit{x}H_2O}$) had lost some of its water of crystallisation by a process called efflorescence. A chemist was required to determine the percentage water of crystallisation in the crystals and the value of ***x***, the average number of water molecules in the formula.

A sample of the crystals was accurately weighed and found to have a mass of 2.50 g. The sample was dissolved in deionised water and made up to 250 cm^3 of solution. A number of 25.0 cm^3 portions of this solution were titrated with a previously standardised 0.10 M hydrochloric acid (**HCl**) solution. The mean volume of the hydrochloric acid solution required to reach the end point was 21.6 cm^3. The balanced equation for the titration reaction is:

$$\mathbf{2HCl + Na_2CO_3 \rightarrow 2NaCl + H_2O + CO_2}$$

(e) Calculate the moles of HCl added to the conical flask.

Hence calculate the moles of Na_2CO_3 that reacted with this amount of HCl.

Express this concentration in (i) moles per litre and (ii) grams per litre. (9)

(*f*) Calculate the percentage water of crystallisation in the crystals and the value of ***x***, the average number of water molecules in the formula $\mathbf{Na_2CO_3 \cdot \mathit{x}H_2O}$. (9)

LEAVING CERT 2017

A student determined the relative molecular mass of a volatile liquid by vapourising a known mass of the liquid at a known temperature and pressure.

Draw a clearly labelled diagram of an apparatus that could have been used in this experiment. (10)

The student recorded that 0.28 g of the volatile liquid occupied a volume of 268 cm^3 when vapourised at a temperature of 98 C and at a pressure of 101kPa.

(I) Calculate the number of moles of the vapour present.

(II) Find, correct to the nearest whole number, the relative molecular mass of the volatile liquid. (15)

SOME REACTION TYPES IN ORGANIC CHEMISTRY

COMBUSTION

FREE RADICAL SUBSTITUTION REACTION (alkanes, one to learn)

IONIC ADDITION REACTIONS (alkenes, five to learn)

ELIMINATION REACTIONS (two to learn)

CONDENSATION REACTION – Esterification reaction (one to learn)

BASE HYDROLYSIS REACTION (SAPONIFICATION – one to learn)