

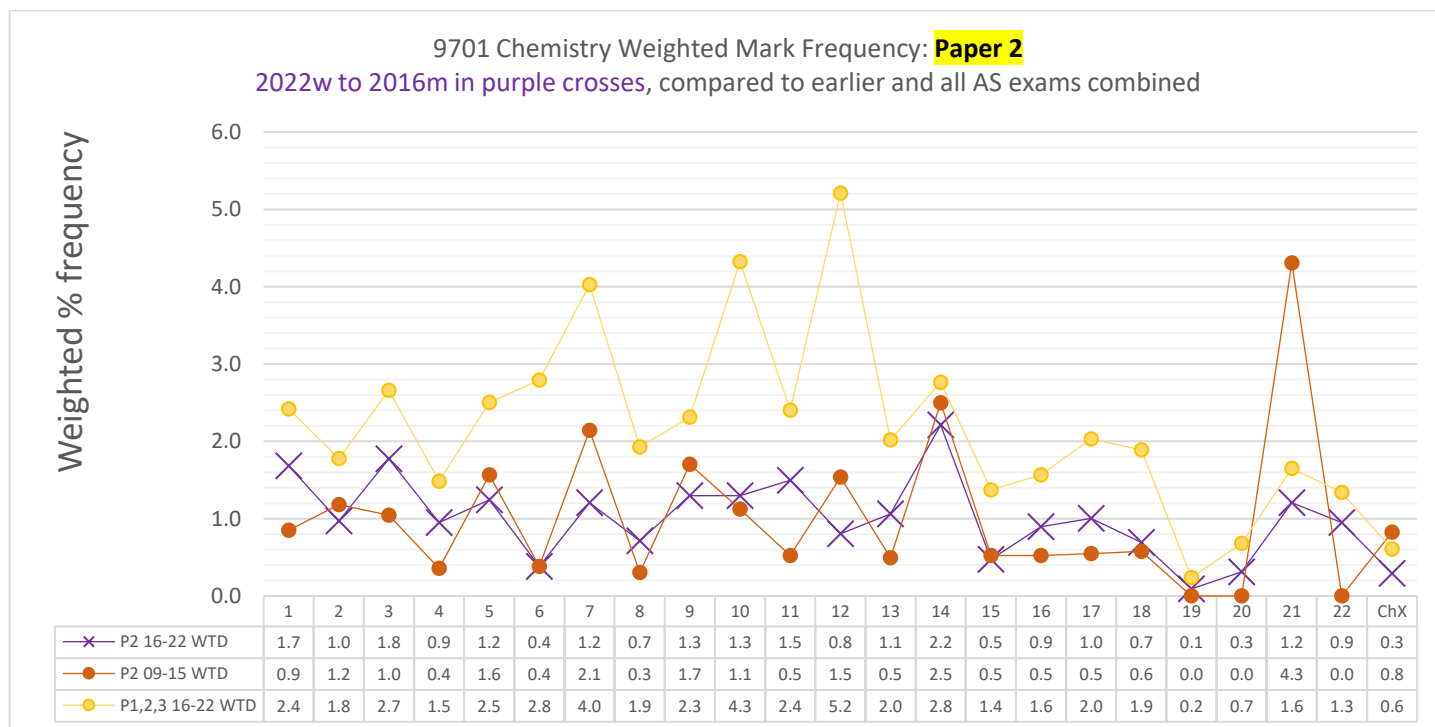
## ALvl Chem 19 EQ P2 22w to 09s Paper 2 Nitrogen compounds 5marks

As you start and work through this worksheet you can tick off your progress to show yourself how much you have done, and what you need to do next. The first task is just to read the first question and should take you less than one minutes to complete.

### Paper 2 Topic 19

**Checklist** Tick each task off as you go along

RANK:	P1 Noob	P1 Novice	P1 Bronze	P1 Silver	P1 Gold	P1 <sup>1</sup> Winner	P1 Hero	P1 Legend
	1 Q started	1 Q done	10% of marks	25% of marks	40% of marks	50% of marks	75% of marks	100% of marks
<b>Topic (marks)</b>	5	2	1	1	2	3	4	5
<b>Time @75s/mark (minutes)</b>								



What the most thoughtful students will get out of their extensive studying will be a capacity to do meaningful brain-based work even under stressful conditions, which is a part of the self-mastery skillset that will continue to deliver value for the whole of their lives. Outstanding grades will also happen, but the most important goal from skillful action in study is being better at any important task, even if circumstances do not feel ideal.

As you are moving through your studies you can learn more about yourself by trying out new ways to manage yourself, and analysing how effective those new techniques were. In this reflective process not only will you get better at working positively and productively to deliver ambitious and successful outcomes, but you will be working towards one aspect of life's highest pursuit, summarised and inscribed on the Temple of Apollo at Delphi: "know thyself".

- To complete these questions, as important as your answer, is checking your answer against the mark scheme.
- For each page or group of 10-20 marks, convert your mark score into a percentage. This will allow you to see (and feel) your progress as you get more experience and understanding with each topic.
- Multiple choice questions, done carefully where you explain and show yourself your thinking using written notes as you move through each question, can be more useful than just Paper 2 for students aiming for a C or B grade. Paper 2 should be the larger focus for students aiming for A and A\* grades, however.
- If you find you get a higher percentage answering short answer questions than multiple choice questions that often means you are NOT using the marking scheme correctly; your correct answer might not be fully complete for all the marks you are awarding. The marks easiest to miss rely on providing the largest amount of detail.

<sup>1</sup> **DO NOT** work on these higher levels of completion in your AS year unless you have also achieved at least a "Silver" (25%) in the same topic in **Paper 1**, which tend also to be easier questions, as well as "Silver" (25%) in the same topic, if it exists, in Paper 3.

## 19 Nitrogen compounds

### 19.1 Primary amines

#### Learning outcomes

Candidates should be able to:

- recall the reactions by which amines can be produced:
  - reaction of a halogenoalkane with  $\text{NH}_3$  in ethanol heated under pressureClassification of amines will not be tested at AS Level.

### 19.2 Nitriles and hydroxynitriles

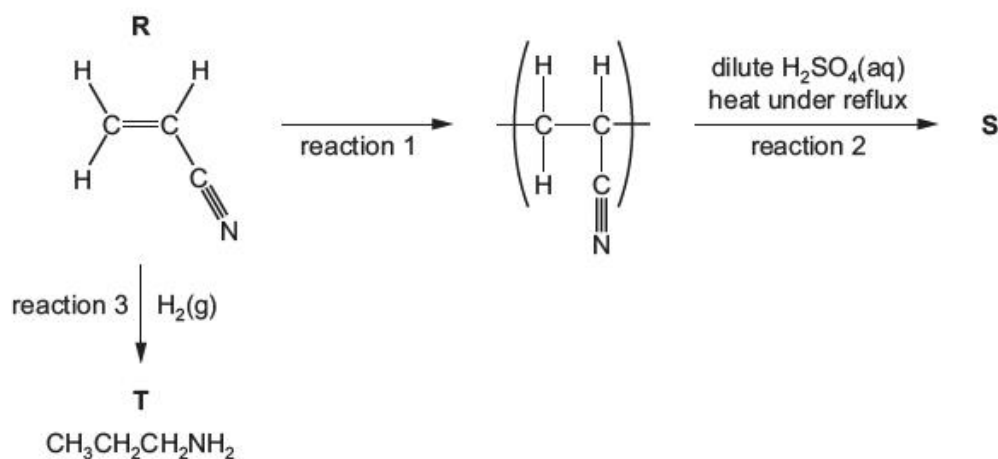
#### Learning outcomes

Candidates should be able to:

- recall the reactions by which nitriles can be produced:
  - reaction of a halogenoalkane with KCN in ethanol and heat
- recall the reactions by which hydroxynitriles can be produced:
  - the reaction of aldehydes and ketones with HCN, KCN as catalyst, and heat
- describe the hydrolysis of nitriles with dilute acid or dilute alkali followed by acidification to produce a carboxylic acid

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(d) The flow chart shows some reactions of **R**.



(ii) Draw the structure of **S**, the organic product of reaction 2.

[1]

(iii) Name **T**.

[1]

(iv) **T** can also be formed by the reaction of  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$  with ammonia.

State the necessary conditions of this reaction.

[1]

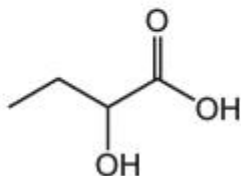


3 The reducing agent  $\text{LiAlH}_4$  can be synthesised by reacting aluminium chloride with lithium hydride,  $\text{LiH}$ .

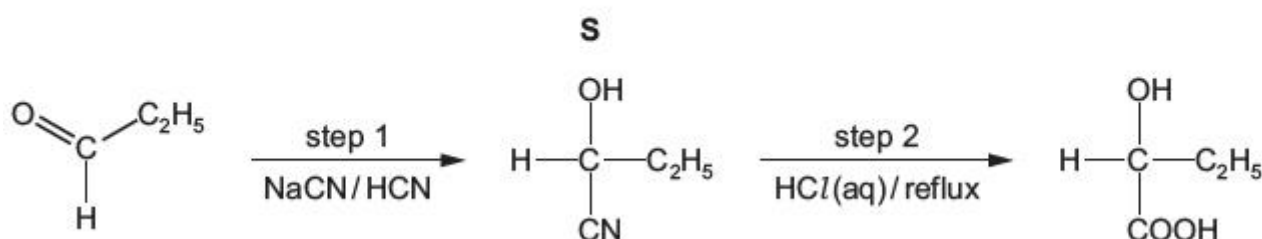
(a) (i) At  $200^\circ\text{C}$ , aluminium chloride exists as  $\text{Al}_2\text{Cl}_6(\text{g})$ .

(c) Two students try to prepare 2-hydroxybutanoic acid in the laboratory.

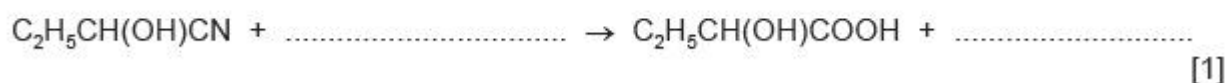
2-hydroxybutanoic acid



A third student prepares 2-hydroxybutanoic acid using propanal as the starting material. In step 1 the student reacts propanal with a mixture of  $\text{NaCN}$  and  $\text{HCN}$ .



(iv) Complete the equation for the reaction in step 2, when **S** is heated under reflux with  $\text{HCl}(\text{aq})$ .



5 Ethanal reacts with a mixture of  $\text{HCN}$  and  $\text{NaCN}$  to make 2-hydroxypropanenitrile,  $\text{CH}_3\text{CH}(\text{OH})\text{CN}$ .

The reaction mechanism is nucleophilic addition.

(c) Give the structure of the organic product of the reaction of  $\text{CH}_3\text{CH}(\text{OH})\text{CN}$  with dilute sulfuric acid.

..... [1]

## Mark Scheme ALvl Chem 19 EQ P2 22w to 09s Paper 2 Nitrogen compounds 5marks

3(d)(i)	addition polymerisation	1
3(d)(ii)		1
3(d)(iii)	propan-1-amine / 1-aminopropane	1
3(d)(iv)	alcoholic / ethanolic solution AND high pressure / heat in a sealed container	1

3(c)(iv)	$\text{C}_2\text{H}_5\text{CH}(\text{OH})\text{CN} + \text{HCl} + 2\text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_5\text{CH}(\text{OH})\text{COOH} + \text{NH}_4\text{Cl}$	1
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5(c)	$\text{CH}_3\text{CH}(\text{OH})\text{CO}_2\text{H}$ OR $\text{HO}_2\text{CCH}(\text{OH})\text{CH}_3$	1
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