



General Certificate of Education  
Advanced Level Examination  
June 2011

**Chemistry**

**CHM6T/P11/TN**

Unit 6T A2 Investigative Skills Assignment

**Teachers' Notes**

**Confidential**

A copy should be given immediately to the teacher(s) responsible for  
GCE Chemistry

**Teachers' Notes****Confidential**

These notes must be read in conjunction with *Instructions for the Administration of the Investigative Skills Assignment: GCE Chemistry* published on the AQA Website.

**Determination of an equilibrium constant**

In this Task known amounts of propanoic acid and of ethanol are mixed with a sulfuric acid catalyst in a boiling tube and left for at least one week to reach equilibrium.

The mixture is then poured into water into a volumetric flask (to 'freeze' the equilibrium) and the mixture made up to 250 cm<sup>3</sup>. Samples of the equilibrium mixture are then titrated with sodium hydroxide solution to allow the amount of acid at equilibrium to be determined.

Since the components of the equilibrium mixture have pungent odours, the Centre may wish to give specific advice to candidates on the disposal of their conical flask contents after titration.

**Materials**

Each candidate should be provided with the following reagents. Sufficient communal burettes should be available for **Part 1** dependent on the size of the group.

Reagents	Quality / Concentration	Volume	Note
<b>Part 1 - Preparing the equilibrium mixture</b>			
Propanoic acid	Standard Lab. Reagent		in burette labelled ' <b>Propanoic acid</b> '
Ethanol	Standard Lab. Reagent		in burette labelled ' <b>Ethanol</b> '
Sulfuric acid	0.95 to 1.05 mol dm <sup>-3</sup>		in burette labelled ' <b>Sulfuric acid</b> '
<b>Part 2 - Titrating the equilibrium mixture</b>			
Sodium hydroxide solution	0.090 to 0.100 mol dm <sup>-3</sup>	125 cm <sup>3</sup>	labelled ' <b>Sodium hydroxide solution</b> '
Phenolphthalein	Standard indicator		Individual supplies not required

The Centre should make up several equilibrium mixtures in addition to those made up by the candidates. These should be issued to candidates whose own mixtures cannot be used.

If a replacement mixture is required as the result of candidate error then there will be a penalty. See Marking Guidelines.

## General

This investigation has been trialled successfully.

It is the responsibility of the centre to ensure that the investigation works with the materials provided to the candidates before candidates carry out the Task.

Reagents of good quality should be used and spare supplies of all solutions specified in these notes must be available.

Teachers should check that the boiling tubes are properly sealed with cling film before storage.

## Apparatus

Each candidate will require the following:

Number	Apparatus
<b>Part 1 - Preparing the equilibrium mixture</b>	
1	boiling tube
	cling film
<b>Part 2 - Titrating the equilibrium mixture</b>	
1	250 cm <sup>3</sup> volumetric flask
	distilled or deionised water
2	filter funnel suitable for filling burette and volumetric flask
1	50 cm <sup>3</sup> burette and stand
1	25 cm <sup>3</sup> pipette
1	pipette filler
1	250 cm <sup>3</sup> conical flask
1	250 cm <sup>3</sup> beaker

## Checking the burette reading

In the Task, candidates are instructed to have one of their final burette readings checked by their teacher in order to assess their ability to read the burette. If the candidate has not read the burette correctly, the teacher must tell the candidate the correct reading. This is to ensure that a candidate does not lose several accuracy marks because of an incorrect reading.

## Teacher Result

Teachers must carry out the Task on their own sample. Teacher results are required for **each** group of candidates.

**The teacher's results, along with the Teacher Group, must be recorded in the space provided on the Teacher Results Sheet.**

These results are needed by the teacher to assess the accuracy of the candidates' results. The teacher must **not** carry out the Task in the presence of the candidates.

In order to ensure that the appropriate Teacher Result can be matched with each candidate, teachers must ensure that candidates complete all the boxes on the Candidate Results Sheet, including 'Teacher Group'.

**The Teacher Results Sheet(s) must be included with the sample sent to the moderator.**

## Centres with more than one teaching set

Centres may wish to divide their candidates into manageable groups and to conduct the Task at different times.

Candidates **must not** be given information about an ISA assessment until one week before Stage 1.

One week before Stage 1 candidates should be given the following information.

The aim of this task is to determine the equilibrium constant for an esterification reaction. This will involve setting up a mixture of a carboxylic acid, alcohol and sulfuric acid catalyst and allowing this to reach equilibrium. The equilibrium mixture will then be titrated with sodium hydroxide solution. The main areas of the specification in the Written Test are Sections 3.2.3 (Equilibria), 3.4.2 (Equilibria) and 3.4.5 (Compounds containing the carbonyl group).

There **must** be no further discussion and candidates **must not** be given any further resources to prepare for the assessment.

**ISA CHM6T/P11 Teacher Results Sheet**Centre Number 

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Teacher Name ..... Teacher Group .....

**Results**

Please record your titration results in the table below. Indicate the average titre you obtained and the concentration of the sodium hydroxide solution used by the Group (to three significant figures).

Final burette reading / cm <sup>3</sup>				
Initial burette reading / cm <sup>3</sup>				
Volume of sodium hydroxide used / cm <sup>3</sup>				
Tick the titres to be used in calculating the average titre				

Average titre / cm<sup>3</sup> ..... Concentration of NaOH(aq) .....