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A G U S S C I L E A N N A | A N D S K I L L S

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## CIRCULAR LETTER 0047/2013

To the Principals and Boards of Management of Second Level Schools

### Adjustments to the Leaving Certificate Chemistry Syllabus

#### Introduction

[Circular 0014/2011 \(Discontinued Use of Chemicals – Substances of Very High Concern\)](#) informed schools of a number of substances which have been designated as Substances of Very High Concern by the European Chemicals Agency. As a result of the ban on the continued use of these substances, three of the mandatory practical activities on the [Leaving Certificate chemistry syllabus](#) could no longer be carried out by students. Since 2011, the theoretical knowledge of the experimental procedure and outcomes of the mandatory experiments listed in the circular remained as part of the syllabus, but students were not required to carry out the procedure.

The [Leaving Certificate chemistry syllabus](#) is now being adjusted so that all of the mandatory practical activities can be carried out safely by students. The theoretical content of the syllabus is not being changed. Four of the mandatory experiments are being adjusted. Three are being adjusted to accommodate removal of banned substances and one that did not require the use of a banned substances is being extended to ensure that the overall amount of practical work in the syllabus does not change.

Teaching guidelines for each of the adjusted practical activities will be published online at [www.curriculumonline.ie/](http://www.curriculumonline.ie/)

#### Leaving Certificate Chemistry Syllabus adjustments

Full details of the changes are provided in the appendix but in summary:

In section 7.3 of the syllabus (Organic Chemical Reaction Types), students will continue to test the properties of an aldehyde and a carboxylic acid as previously specified, but will not prepare them as both experiments involve oxidation using a chromium(VI) solution. The two organic oxidations involving a chromium(VI) solution are being replaced by the preparation of benzoic acid from phenylmethanol by oxidation using potassium manganate(VII) in alkaline conditions. This is being introduced as a new experiment.

In section 7.4 of the syllabus (Organic Natural Products), the steam distillation of an organic substance is being adjusted to specify the extraction of clove oil and to include the liquid-liquid extraction of eugenol from the emulsion produced using cyclohexane. This does not introduce any new theory. The extension of this experiment will make up for the reductions in the mandatory experiments in sections 7.3 and 8.2.

In section 8.2 of the syllabus (Le Chatelier's Principle), investigations of three aqueous equilibrium mixtures are being replaced by an investigation of one aqueous equilibrium mixture. The two aqueous equilibria that are being discontinued involved chromium(VI) and cobalt(II) salts.

These adjustments are effective from September 2013 for all students who will sit the Leaving Certificate Chemistry examination in 2015 and thereafter.

## General

Please bring this Circular and [Circular 0014/2011 \(Discontinued Use of Chemicals - Substances of Very High Concern\)](#) to the attention of teachers of science in the school and also provide a copy to members of the school board of management. Note that any activity which involves substances whose use should be discontinued such as the demonstration of the oxidation of potassium sodium tartrate by hydrogen peroxide, catalysed by cobalt(II) salts (page 18 Ordinary level Chemistry syllabus / page 53 Higher level Chemistry syllabus) or using cobalt chloride paper to test for water (OC14, page 19 Junior Certificate Science syllabus) should no longer be conducted.

This Circular and Circular 0014/2011 may also be accessed at <http://www.education.ie>

Breda Naughton  
Principal Officer  
16<sup>th</sup> September 2013

## Appendix: Details of adjustments to the [Leaving Certificate Chemistry Syllabus](#)

### Ordinary Level Syllabus - Page 18 - Current Content

#### Activity

Demonstration of the oxidation of potassium sodium tartrate by hydrogen peroxide, catalysed by cobalt(II) salts.

### Ordinary Level Syllabus – Page 18 - Adjusted Content – effective from September 2013 for all students who will sit the Leaving Certificate Chemistry examination in 2015 and thereafter

#### Activity

Observation of the oxidation of potassium sodium tartrate by hydrogen peroxide, catalysed by cobalt(II) salts (This should be shown using an appropriate video clip).

### Ordinary Level Syllabus - Page 23 - Current Content

#### Mandatory Experiment 7.4

Preparation and properties of ethanal [properties limited to reactions with (i) acidified potassium manganate(VII) solution, (ii) Fehling's reagent and (iii) ammoniacal silver nitrate].

#### Mandatory Experiment 7.5

Preparation and properties of ethanoic acid [properties limited to reactions with sodium carbonate and magnesium].

#### Mandatory Experiment 7.6

Extraction of clove oil from cloves (or similar alternative) by steam distillation.

### Ordinary Level Syllabus – Page 23 - Adjusted Content – effective from September 2013 for all students who will sit the Leaving Certificate Chemistry examination in 2015 and thereafter

#### Mandatory Experiment 7.4

Properties of;

(a) ethanal [properties limited to reactions with (i) acidified potassium manganate(VII) solution, (ii) Fehling's reagent, and (iii) ammoniacal silver nitrate]

(b) ethanoic acid [properties limited to reactions with sodium carbonate and magnesium].

#### Mandatory Experiment 7.5

The oxidation of phenylmethanol (benzyl alcohol) to benzoic acid with potassium manganate (VII) solution in alkaline conditions.

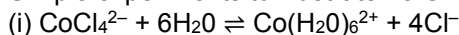
#### Mandatory Experiment 7.6

Extraction of clove oil from cloves by steam distillation and liquid-liquid extraction of eugenol from the emulsion produced using cyclohexane (structure of eugenol not required).

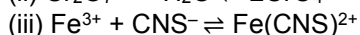
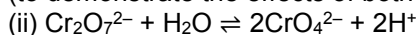
### Ordinary Level Syllabus - Page 24 – Current Content

#### Mandatory Experiment 8.1

Simple experiments to illustrate Le Chatelier's principle:



(to demonstrate the effects of both temperature changes and concentration changes on an equilibrium mixture).

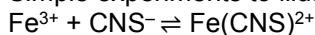


(to demonstrate the effects of concentration changes on an equilibrium mixture).

**Ordinary Level Syllabus – Page 24 - Adjusted Content – effective from September 2013 for all students who will sit the Leaving Certificate Chemistry examination in 2015 and thereafter**

**Mandatory Experiment 8.1**

Simple experiments to illustrate Le Chatelier's principle:



(to demonstrate the effects of both temperature changes and concentration changes on an equilibrium mixture)

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**Higher Level Syllabus - Page 53 - Current Content**

**Activity**

Demonstration of the oxidation of potassium sodium tartrate by hydrogen peroxide, catalysed by cobalt(II) salts.

**Higher Level Syllabus – Page 53 - Adjusted Content – effective from September 2013 for all students who will sit the Leaving Certificate Chemistry examination in 2015 and thereafter**

**Activity**

Observation of the oxidation of potassium sodium tartrate by hydrogen peroxide, catalysed by cobalt(II) salts (This should be shown using an appropriate video clip).

**Higher Level Syllabus - Page 60 - Current Content**

**Mandatory Experiment 7.4**

Preparation and properties of ethanal [properties limited to reactions with (i) acidified potassium manganate(VII) solution, (ii) Fehling's reagent and (iii) ammoniacal silver nitrate].

**Mandatory Experiment 7.5**

Preparation and properties of ethanoic acid [properties limited to reactions with sodium carbonate, magnesium and ethanol].

**Mandatory Experiment 7.6**

Extraction of clove oil from cloves (or similar alternative) by steam distillation.

**Higher Level Syllabus – Page 60 - Adjusted Content – effective from September 2013 for all students who will sit the Leaving Certificate Chemistry examination in 2015 and thereafter**

**Mandatory Experiment 7.4**

Properties of;

(a) ethanal [properties limited to reactions with (i) acidified potassium manganate(VII) solution, (ii) Fehling's reagent, and (iii) ammoniacal silver nitrate]

(b) ethanoic acid [properties limited to reactions with sodium carbonate, magnesium and ethanol].

**Mandatory Experiment 7.5**

The oxidation of phenylmethanol (benzyl alcohol) to benzoic acid with potassium manganate (VII) solution in alkaline conditions. Calculation of percentage yield (the balanced equation will be given).

**Mandatory Experiment 7.6**

Extraction of clove oil from cloves by steam distillation and liquid-liquid extraction of eugenol from the emulsion produced using cyclohexane (structure of eugenol required).

## Higher Level Syllabus - Page 61 – Current Content

### Mandatory Experiment 8.1

Simple experiments to illustrate Le Chatelier's principle:

(i)  $\text{CoCl}_4^{2-} + 6\text{H}_2\text{O} \rightleftharpoons \text{Co}(\text{H}_2\text{O})_6^{2+} + 4\text{Cl}^-$  (to demonstrate the effects of both temperature changes and concentration changes on an equilibrium mixture).

(ii)  $\text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{O} \rightleftharpoons 2\text{CrO}_4^{2-} + 2\text{H}^+$  }

(iii)  $\text{Fe}^{3+} + \text{CNS}^- \rightleftharpoons \text{Fe}(\text{CNS})^{2+}$  }

(to demonstrate the effects of concentration changes on an equilibrium mixture).

## Higher Level Syllabus – Page 61 - Adjusted Content – effective from September 2013 for all students who will sit the Leaving Certificate Chemistry examination in 2015 and thereafter

### Mandatory Experiment 8.1

Simple experiments to illustrate Le Chatelier's principle:

$\text{Fe}^{3+} + \text{CNS}^- \rightleftharpoons \text{Fe}(\text{CNS})^{2+}$  (to demonstrate the effects of both temperature changes and concentration changes on an equilibrium mixture).