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## General Certificate of Secondary Education

# Chemistry 4421

# CHY3F Unit Chemistry 3

# Mark Scheme

*2010 examination – January series*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.



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# MARK SCHEME

## Information to Examiners

### 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

### 2. Emboldening

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

### 3. Marking points

#### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

| Candidate | Response | Marks awarded |
|---|---|---|
| 1 | 4,8 | 0 |
| 2 | green, 5 | 0 |
| 3 | red*, 5 | 1 |
| 4 | red*, 8 | 0 |

Example 2: Name two planets in the solar system. (2 marks)

| Candidate | Response | Marks awarded |
|---|---|---|
| 1 | Pluto, Mars, Moon | 1 |
| 2 | Pluto, Sun, Mars, Moon | 0 |

### 3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

### 3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

### 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

## CHY3F

## Question 1

| question | answers | extra information | mark |
|---|---|---|---|
| **1**(a)(i) | E | | 1 |
| **1**(a)(ii) | B | | 1 |
| **1**(a)(iii) | C | | 1 |
| **1**(a)(iv) | A | | 1 |
| **1**(b)(i) | quickly melted | allow melts in contact with water,<br><br>allow bp 100 °C (of water) shows mp is low<br><br>ignore one other piece of information | 1 |
| **1**(b)(ii) | easily cut | ignore one other piece of information | 1 |
| **1**(b)(iii) | effervescence / fizzing / bubbling | ignore named gas<br><br>ignore one other piece of information | 1 |
| **Total** | | | **7** |

## CHY3F

## Question 2

| question | answers | extra information | mark |
|---|---|---|---|
| **2**(a) | burette | | 1 |
| **2**(b) | indicator changed colour | allow any indication of colour change | 1 |
| **2**(c)(i) | 0.2 **or** 18.3 to 18.5 | | 1 |
| **2**(c)(ii) | 18.4 | | 1 |
| **2**(c)(iii) | improve reliability | allow improve accuracy<br><br>allow to calculate a mean / average **or** get rid of anomalous result<br><br>ignore fair test / correct results / random results | 1 |
| **Total** | | | **5** |

## CHY3F

## Question 3

| question | answers | extra information | mark |
|---|---|---|---|
| **3**(a) | electricity / (high) temperatures | allow lightning / heat<br><br>ignore energy | 1 |
| **3**(b) | nitrogen + oxygen → nitrogen oxide / monoxide | allow any oxide of nitrogen | 1 |
| **3**(c) | more than | | 1 |
| **3**(d)(i) | A | | 1 |
| **3**(d)(ii) | C | | 1 |
| **Total** | | | **5** |

## CHY3F

## Question 4

| question | answers | extra information | mark |
|---|---|---|---|
| **4**(a)(i) | yellow | | 1 |
| **4**(a)(ii) | lilac | | 1 |
| **4**(a)(iii) | melting point | | 1 |
| **4**(b)(i) | barium chloride<br>solid | | 1<br>1 |
| **4**(b)(ii) | white<br>dissolved | | 1<br>1 |
| **Total** | | | **7** |

## CHY3F

## Question 5

| question | answers | extra information | mark |
|---|---|---|---|
| **5**(a)(i) | carbon | | 1 |
| **5**(a)(ii) | calcium | | 1 |
| **5**(b) | (shake with) soap (solution)<br>scum | ignore detergent<br>accept less lather with hard water<br>allow solid / precipitate<br>ignore bubbles<br>incorrect test = **0** marks for question<br>correct results with no test score **1** | 1<br>1 |
| **5**(c) | any **two** from:<br>• good for health / healthier<br>• stronger bones / teeth<br>• less heart disease | ignore vitamins | 2 |
| **Total** | | | **6** |

## CHY3F

## Question 6

| question | answers | extra information | mark |
|---|---|---|---|
| **6**(a) | reasonable <u>smooth</u> curve through all the points over the range 10 - 80 | ignore outside range<br><br>do **not** accept multiple lines | 1 |
| **6**(b) | 5.7 | range 5.5–5.9<br><br>if outside range check graph | 1 |
| **6**(c) | 7.6 | correct answer with or without working = **2** marks<br><br>if answer incorrect 10 **or** 2.4 gains **1** mark | 2 |
| **Total** | | | **4** |

## CHY3F

## Question 7

| question | answers | extra information | mark |
|---|---|---|---|
| **7**(a) | sterilise / disinfect (water)<br>**or**<br>kill bacteria / micro-organisms / microbes / germs / pathogens | ignore removes bacteria / impurities / disease<br>ignore cleans the water / makes (water) safe<br>allow destroy bacteria **or** gets rid of bacteria | 1 |
| **7**(b) | any **two** from:<br>• chlorine is toxic / poisonous<br>• so (too much) will be dangerous / harmful / kill people / cause illness / health problems<br>• cause breathing difficulties **or** cause (more) allergic reactions / skin **or** eye irritation<br>• <u>too little</u> will not kill bacteria | ignore reference to safe / unsafe<br>allow causes damage<br>allow bacteria still there | 2 |
| **7**(c) | cheap / easy / quick to use (process) | accept prevents typhoid / cholera<br>ignore reference to specialists or equipment | 1 |
| **7**(d)(i) | fair / more ideas / views / opinions **or** less chance of bias **or** more democratic | allow idea of different points of view / balanced view<br>allow avoids undue influence owtte | 1 |

**Question 7 continues on next page**

**CHY3F**

**Question 7 continued**

| question | answers | extra information | mark |
|---|---|---|---|
| **7**(d)(ii) | (more likely) to have support / influence / convince people | ignore well respected<br><br>allow ideas about trust eg people will have more confidence in their views / more likely to be believed<br><br>allow ideas about expertise eg more likely to know what they are talking about / have done experiments / tests<br><br>allow have knowledge / understanding<br><br>allow (more) reliable | 1 |
| **7**(d)(iii) | (more likely) to be correct / less likely to be incorrect<br><br>**or**<br><br>reliable / factual / accurate / based on proof / based on experiments or tests / based on validation | owtte<br><br>ignore based on evidence unqualified<br>allow hearsay / opinion can be biased | 1 |
| **Total** | | | **7** |

## CHY3F

## Question 8

| question | answers | extra information | mark |
|---|---|---|---|
| **8**(a) | hydroxide (ion) / $OH^-$ / $OH^-(aq)$ | ignore OH | 1 |
| **8**(b) | fully / all / completely ionised / dissociated | ignore strongly ionised **or** more ions **or** concentration<br><br>ignore all 'noise'<br><br>do **not** accept <u>ions</u> are fully ionised / dissociated | 1 |
| **8**(c) | | assume it = sodium hydroxide | |
| | any valid test | incorrect test / titration = **0** marks for question | 1 |
| | linked comparison | correct result / reference to pH with no test = **1** mark | 1 |
| | eg UI **or** full range indicator **or** pH paper / solution / (pH) meter (1) | | |
| | NaOH has higher pH **or** | allow converse for weak(er)<br>pH values must be above 7 | |
| | correct <u>comparison</u> of colours (1) | NaOH – purple, Ammonia – blue<br><br>allow correct comparison of blue or purple | |
| | **or** | | |
| | conductivity test (1) | | |
| | NaOH conducts better / more **or** bulb brighter (1) | | |
| **Total** | | | **4** |