AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Secondary Education

Chemistry 4421

CHY3H   Unit 3 Chemistry

Mark Scheme

2008 examination – June 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.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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.

COMPONENT NUMBER: CHY3H

COMPONENT NAME: Chemistry

STATUS: Final

DATE: June 2008

question	answers	extra information	mark
1(a)(i)	hydrogen / H^+ / H^+ (aq)	allow H_3O^+ (aq) ignore H alone	1
1(a)(ii)	any valid test		1
	linked comparison	**NB** titration = 0	1
	eg magnesium **or** any (named) carbonate	allow zinc / iron do **not** allow calcium **or** alkali metals	
	any **one** from:	independent mark	
	• weak(er) acid: slower rate / fewer bubbles **or** less gas	allow converse for strong(er)	
	• weak(er) acid longer for Mg to disappear		
	or		
	UI **or** pH paper / solution / meter / full range indicator (1)	**not** litmus **or** any other paper	
	any **one** from: (1)	independent mark	
	• weak(er) acid has higher pH	allow converse for strong(er) acid pH values must be below 7	
	• correct comparison of colours	ie strong = red / pink weak = orange / yellow	
	or		
	conductivity test (1)		
	weak acid conducts less **or** bulb (1) less bright	allow converse for stronger	

Question 1 continued on next page...

COMPONENT NUMBER: CHY3H

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Question 1 continued...

question	answers	extra information	mark
1(b)(i)	any **two** from eg: • nicotine kills people • nicotine causes cancer / diseases • nicotine is harmful / dangerous • nicotine is addictive • cost to NHS	any plausible answer allow it would save lives allow it kills people ignore references to pollution / passive smoking	2
1(b)(ii)	any **two** from eg: • nicotinic acid / vitamin B3 / niacin has different properties to nicotine • it is in many / listed foods **or** nicotine in food is not dangerous • more health risks to people / pellagra / diarrhoea / dermatitis / dementia / it will cause deaths or save lives • it is a vitamin **or** important part of diet • tobacco raises money / taxes • human rights issues • can't give up straight away / are addicted to it **or** perceived benefit of smoking	any sensible answer ignore if you ban nicotine, nicotinic acid cannot be made ignore malnutrition ignore just 'illness'	2
Total			**7**

COMPONENT NUMBER: CHY3H

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STATUS: Final

DATE: June 2008

question	answers	extra information	mark
2(a)	reasonable smooth curve	do **not** allow straight lines joining dot to dot curve must extend from 0 and 30 ^{o}C	1
2(b)	solubility curve changes direction	allow solubility decreases (after 35 ^{o}C) **or** solubility goes up and down	1
2(c)	(experiments were) repeated	allow they were an average	1
2(d)	35	accept any value from 34 to 35	1
2(e)	14	accept any value from 13 to 15	1
2(f)	27	correct answer = **2** marks accept 46 **or** 19 for **1** mark	2
2(g)	no more solid / gas can be dissolved	owtte allow unable to dissolve any more **or** no more can go into solution ignore absorbs	1
Total			**8**

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question	answers	extra information	mark
3(a)	test: add NaOH	allow any group 1 / 2 hydroxide **or** hydroxide (ions) **or** OH^- incorrect **or** no reagent = **0**, except add NaOH and aluminium **or** heat / warm could get <u>result</u> mark	1
	result: gas turns (red) litmus blue / ammonia is given off	accept alkaline gas / ammonia produced do **not** accept blue litmus turns blue allow any acid-base indicator with correct result	1
3(b)	test: add (dilute) acid	named acid incorrect **or** no reagent = 0	1
	result: gas gives (white) solid / precipitate with limewater **or** goes white with limewater	accept CO_2 produced gas turns limewater milky / cloudy / white (ignore misty) allow calcium hydroxide for limewater	1
Total			**4**

COMPONENT NUMBER: CHY3H

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question	answers	extra information	mark
4(a)	acts as barrier between sodium and air / oxygen / water (vapour)	accept because they are reactive ignore oil will not react	1
4(b)	**2**Na + **2**H$_2$O → **2**NaOH + H$_2$	allow multiples / fractions	1
4(c)	these metals react with water producing an alkaline solution **or** produce solution with pH greater than 7 / high pH	owtte allow produce OH$^-$ ions **not** these metals are / form alkalis ignore 'strong' pH	1
4(d)		it = potassium outer electron must be mentioned once for all **3** marks	
	bigger atom **or** outer shell electron further from nucleus **or** more shells	**or** converse argument for sodium less reactive provided sodium is specified	1
	less attraction to nucleus **or** more shielding	**not** less magnetic attraction	1
	outer electron more easily lost	**ignore** potassium reacts more easily	1
Total			**6**

COMPONENT NUMBER: CHY3H

COMPONENT NAME: Chemistry

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DATE: June 2008

question	answers	extra information	mark
5(a)(i)	0.2255 / 0.226 / 0.23 (mole)	correct answer gains **2** marks 0.2 / 0.22 = **1** mark 27.06×0.9 for **1** mark **or** 24.354 **or** $\dfrac{27.06}{108}$ **or** 0.25055 for **1** mark	2
5(a)(ii)	loss in mass due to wear / eroding / corroding / weathering / clipping	owtte ignore damage	1
5(b)(i)	atomic absorption spectroscopy / spectrometry **or** mass spectrometry / spectroscopy	allow atomic / absorption spec(troscopy) allow aas allow mass spec	1
5(b)(ii)	only a (very) small amount needed for test	ignore faster etc	1
Total			**5**

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DATE: June 2008

question	answers	extra information	mark
6(a)	B		1
6(b)	eg link between Li, Na, K, (Rb, Cs) **or** Mg, Ca, (Sr, Ba) **or** F, Cl, Br, I	allow any **two** elements in the same group (in both Newland's **and** the modern periodic table)	1
	linked appropriate comment about that link eg similar physical / chemical properties **or** similar specific reactions **or** same number of outer electrons	if no elements identified, allow **1** mark for a general comment about elements **in the same column** having similar properties "every eighth element has similar properties" = **1** mark	1
6(c)	any **two** from: • no gaps for undiscovered elements **or** elements still being discovered • some boxes have 2 elements • metals and non-metals in same column / mixed up / some elements in the same column had different properties • pattern for first 16 or so elements only • any sensible suggestion about misplaced elements eg copper in group 1 metals		2
6(d)	alkanes are not elements **or** alkanes are compounds	ignore molecule / molecular	1
Total			**6**

COMPONENT NUMBER: CHY3H

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question	answers	extra information	mark
7(a)(i)	energy / heat of products less than energy of reactants	owtte allow products are lower than reactants allow more energy / heat given out than taken in allow methanol is lower allow converse allow energy / heat is given out / lost allow ΔH is negative	1
7(a)(ii)	lowers / less activation energy	owtte allow lowers energy needed for reaction **or** it lowers the peak/ maximum do **not** allow just 'lowers the energy'	1
7(b)(i)	bonds broken: $(2 \times 435) + 498 = 1368$ bonds made: $(2 \times 805) + (2 \times 464) = 2538$ energy change: $1368 - 2538 = (-)1170$	allow: $(8 \times 435) + 498 = 3978$ allow: $(6 \times 435) + (2 \times 805) + (2 \times 464) = 5148$ allow: $3978 - 5148 = (-)1170$ ignore sign allow ecf correct answer (1170) = **3** marks	1 1 1
7(b)(ii)	energy released forming new bonds is greater than energy needed to break existing bonds owtte	allow converse do **not** accept energy needed to form new bonds greater than energy needed to break existing bonds	1
Total			**6**

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question	answers	extra information	mark
8	**two** methods and **1 linked** explanation **or 1** method and **two** explanations, **1** linked = **3** marks no linking of method and explanation then max **2** marks **method 1:** filter **explanation 1:** remove insoluble substances / remove solids / small bits / dirt / mud/ soil / sand / silt **method 2:** precipitate / flocculate / add eg. alum **explanation 2:** removes (some) soluble material as solids / removes (some) metal ions **method 3:** add chlorine / chlorine dioxide / ozone **explanation 3:** sterilise / kill bacteria / microorganisms / microbes	 ignore references to removal of hardness ignore screening / sedimentation allow other named substances ignore 'remove bacteria' ignore disinfect	3
Total			**3**