



General Certificate of Secondary Education

Additional Science 4463 / Chemistry 4421

CHY2H Unit Chemistry 2

Mark Scheme

2012 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 students' 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 students' 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 students' 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 students 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)

Student	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)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student 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

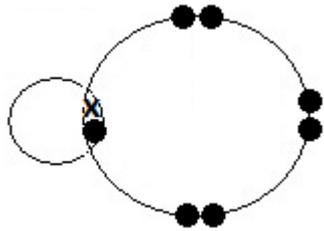
The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

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.

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Question 1

question	answers	extra information	mark
1(a)	any one from: <ul style="list-style-type: none"> • they are negative / anions • they are attracted • they are oppositely charged 	allow Cl^- ignore atoms / chlorine do not accept chloride ions are negative electrodes	1
1(b)	hydrogen is less reactive than sodium		1
1(c)	hydroxide (ions) / OH^-	ignore OH do not accept NaOH / sodium hydroxide	1
1(d)(i)		allow any combination of dots or crosses ignore chemical symbols	1
1(d)(ii)	covalent	allow close spelling errors apply list principle	1
1(d)(iii)	hydrogen (ion) / H^+	ignore (aq) / H do not accept hydrochloric acid / HCl apply list principle	1
Total			6

CHY2H**Question 2**

question	answers	extra information	mark
2(a)	1.86	ignore units / 1.9	1
2(b)	use a balance which weighs to more decimal places or use more sensitive balance	accept (use a measuring cylinder with) smaller (scale) divisions / intervals allow reference to more decimal places allow smaller units / scale	1
2(c)(i)	45.8(3333333)	correct answer gains 2 marks with or without working ignore units / 46 if the answer is not correct then evidence of: (45.4 + 46.3 + 45.8) ÷ 3 or 137.5 ÷ 3 or 47.25 / 47.3 / 47.2 gains 1 mark	2

Question 2 continues on the next page . . .

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Question 2 cont'd...

question	answers	extra information	mark
2(c)(ii)	any two from: <ul style="list-style-type: none"> • loss of gas or leak • error in measurement of volume of gas / gas in cylinder / 1 dm^3 • error in weighing the canister / gas at start • error in weighing the canister / gas at end • change in temperature • change in pressure 	ignore zero error / faulty equipment error in weighing the canister / gas = 1 mark allow incorrect measurement of temperature allow incorrect measurement of pressure if no other mark awarded allow error in weighing for 1 mark	2
2(c)(iii)	any one from: <ul style="list-style-type: none"> • check for anomalous results • to find the mean / average • (improve) reliability / make reliable 	ignore fair test / precise / valid or to check for errors / mistakes allow improve (accuracy of) <u>mean</u> / <u>average</u>	1
2(d)	44	correct answer gains 2 marks with or without working ignore units if the answer is incorrect evidence of $(3 \times 12) / 36$ and $(8 \times 1) / 8$ gains 1 mark	2
Total			9

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Question 3

question	answers	extra information	mark
3(a)(i)	hydrochloric (acid) / HCl	allow phonetic spelling ignore incorrect formula ignore state symbols	1
3(a)(ii)	idea of a solid / insoluble substance being formed (from solutions)	accept solid / insoluble product ignore cloudy do not accept evaporation	1
3(a)(iii)	filtration / filter	accept decanting / centrifugation ignore evaporate if after filtering	1
3(a)(iv)	idea of making safe (to eat) or idea of purification or idea of neutralisation	allow remove harmful substances / organisms or sterilisation	1
3(a)(v)	crystallisation	accept evaporation / heating / boiling allow cooling do not allow freezing / solidifying	1
3(b)(i)	$2e^-$	accept $e^- + e^-$ ignore working out	1
3(b)(ii)	electron(s) are lost (from calcium atoms)	ignore numbers if given do not accept any reference to oxygen	1
Total			7

CHY2H**Question 4**

question	answers	extra information	mark
4	any three from: <ul style="list-style-type: none">• giant structure / lattice / macromolecule• covalent (bonds)• bonds are (very) strong• each atom / carbon joined to <u>four</u> others	any reference to incorrect bonding = max 2 allow bonds difficult to break or takes a lot of energy to break bonds accept each atom / carbon forms <u>four</u> bonds	3
Total			3

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Question 5

question	answers	extra information	mark
5(a)	mixture is cooled / cooling		1
	so ammonia / it condenses or so ammonia <u>turns into</u> a liquid (but nitrogen and hydrogen remain as gases)		1
5(b)(i)	exothermic reaction or equilibrium / reaction moves in the direction which raises the temperature	accept reverse reaction is endothermic ignore answers based on rate or collisions	1
5(b)(ii)	they / particles / molecules move faster or have more (kinetic) energy	allow atoms instead of particles ignore particles move more / vibrate do not accept electrons (max1)	1
	any one from: <ul style="list-style-type: none"> particles / molecules collide more often / more frequently / more likely to collide more of the collisions are successful or particles collide with more energy / harder or more of the particles have the activation energy 	ignore collide faster ignore more collisions accept more successful collisions	1
5(b)(iii)	more molecules / particles / moles / volumes on LHS (of equation than RHS) or greater volume on LHS (than RHS) or equilibrium / reaction moves in the direction which reduces the pressure / volume	accept 4 molecules / particles / moles / volumes on LHS and 2 molecules / particles / moles / volumes on RHS accept converse	1

Question 5 continues on the next page . . .

Question 5 cont'd...

question	answers	extra information	mark
5(b)(iv)	cost or difficulty in containing such a high pressure	allow risk of explosion ignore dangerous	1
5(c)(i)	60		1
5(c)(ii)	2.4(2857....)	correct answer gains 3 marks with or without working accept any answer that rounds to 2.4 ignore units if answer is incorrect look for evidence of correct working to a maximum of 2 marks. moles of N ₂ = 2/28 = (0.0714) moles of ammonia = 2 x 0.0714 = (0.1428) mass of ammonia = 0.1428 x 17 = (2.4276) or 28 → 34 1g → 34/28 2g → 2.4.....	3
5(d)(i)	15		1
5(d)(ii)	unreacted gases are recycled rate (of production) is fast	allow unreacted gases are reused accept production is continuous ignore compromise between rate and yield	1 1
Total			14

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Question 6

question	answers	extra information	mark
6(a)(i)	giant structure / lattice or particles arranged in a regular pattern	mention of molecules or any reference to incorrect bonding = max 2 allow close packed / layers	1
	sea of electrons / delocalised electrons	allow free electrons	1
	positive ions and electrons attract each other	ignore metallic bonds appropriately labelled diagrams can gain first two marks	1
6(a)(ii)	(sea of) electrons can move <u>through the structure</u> or delocalised electrons	allow free / roaming / mobile electrons	1
6(b)	(metal) oxide / ionic compound formed		1
	ions not free to move or electrons cannot move <u>through the structure</u>	allow no / fewer delocalised / free / roaming / mobile electrons	1
Total			6

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