AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.10.1.2

Potable water

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**14**
Available paper years	**2008–2024**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.10.1.2 Potable water

Answer 01 · Mark scheme

June 2008 | CHY3F | Original Q5 | Legacy

question	answers	extra information	mark
5(a)	contains (large amounts of) dissolved solids / difficult to remove dissolved solids	allow salty / too much salt allow sea water makes you thirsty / vomit allow polluted / untreated / contaminated	1
5(b)	filtered: removes solids / removes insoluble material / dirt	ignore large objects	1
	chlorine: kills/destroy bacteria/microbes/ germs etc	allow disinfect / sterilise **or** gets rid of bacteria ignore purify / clean	1
Total			**3**

4.10.1.2 Potable water

Answer 01 · Mark scheme

June 2008 | CHY3F | Original Q5 | Legacy

COMPONENT NUMBER: CHY3F

COMPONENT NAME: Chemistry

STATUS: Final

DATE: June 2008

4.10.1.2 Potable water

Answer 02 · Mark scheme

June 2009 | CHY2F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	covalent		1
4(b)(i)	liquid		1
4(b)(ii)	fluorine	accept F / F_2 do **not** accept fluoride	1
4(c)(i)	should fluoride ions be added to drinking water?		1
4(c)(ii)	any **one** from: • not enough reliable/valid evidence • may be other factors involved • it is an opinion / choice / belief / ethics issue • it can't be scientifically investigated	mark independently of (c)(i) allow can't do an experiment ignore test	1
Total			**5**

4.10.1.2 Potable water

Answer 02 · Mark scheme

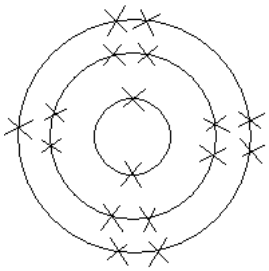
June 2009 | CHY2F | Original Q4 | Legacy

CHY2F

4.10.1.2 Potable water

Answer 03 · Mark scheme January 2010 | CHY2F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)		accept dots / crosses / e must be drawn on diagram electrons do not need to be paired ignore brackets or + or −charges ignore 2,8,7	1
7(b)	(one) electron lost / given away / transferred from sodium / transferred to chlorine owtte	recognition that electrons are involved must be linked to electrons accept loses electron(s) for **2** marks NB loses 2 or more electrons gains **1** mark reference to sharing / covalent max **1** mark ignore charges on ions formed	1 1
7(c)(i)	any **one** from: • ions / atoms / they are / it is negatively charged / anions • opposite (charges) attract	 accept they are negative accept they are attracted or it is oppositely charged ignore opposite forces attract	1
7(c)(ii)	hydrogen	accept H_2 ignore H or H^+	1

Question 7 continues on next page

4.10.1.2 Potable water

CHY2F

Question 7 continued

question	answers	extra information	mark
7(d)(i)	poisons released into environment (owtte)	accept any sensible idea of harm / harmful / poisons / poisonous / pollution / damaging do **not** accept answers such as global warming / ozone layer etc. ignore safety unless qualified	1
7(d)(ii)	any **one** sensible idea eg • loss of work / unemployment **or** company goes out of business • any adverse effect on local economy (owtte) • any adverse effect on paper production / cost of paper / cost of water (treatment) • chlorine (compounds) have been used (for many years) without causing harm owtte • only a tiny amount of chlorine is released so it would not cause harm	eg shops / house prices etc. allow less expensive to use chlorine or converse ignore uses of chlorine to treat drinking water unless qualified	1
7(d)(iii)	ideas related to bias	accept more reliable or valid or fair ignore more accurate / fair test	1
Total			**8**

4.10.1.2 Potable water

Answer 03 · Mark scheme

January 2010 | CHY2F | Original Q7 | Legacy

CHY2F

4.10.1.2 Potable water

Answer 04 · Mark scheme January 2010 | CHY3F | Original Q5 | Legacy

Question 5

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

4.10.1.2 Potable water

Answer 04 · Mark scheme

January 2010 | CHY3F | Original Q5 | Legacy

CHY3F

4.10.1.2 Potable water

Answer 05 · Mark scheme

June 2010 | CHY3F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	evaporate condenses		1 1
2(b)	high amounts of / too much (dissolved) solids in the water **or** not sterilised	allow contains (dissolved) salt / sewage / micro-organisms / toxins / oil etc	1
Total			**3**

4.10.1.2 Potable water

Answer 05 · Mark scheme

June 2010 | CHY3F | Original Q2 | Legacy

CHY3F

4.10.1.2 Potable water

Answer 06 · Mark scheme

January 2011 | CHY3F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	filtered: removes insoluble / solid	Ignore named substances / minerals do **not** accept ions	1
	chlorine: kills microorganisms / microbes / bacteria / disinfects (water)	allow kills germs / pathogens **or** sterilises allow chlorine is a disinfectant ignore cleans water or removes impurities / bacteria	1
6(b)(i)	<u>advantages of portable</u>: any **two** from : • costs less • little training needed • water can be tested within 10 seconds / immediately / quicker • can be used anywhere	accept converse throughout	2
	<u>disadvantage of portable</u> less precise / sensitive	allow only detect down to 0.1 mg ignore less accurate	1
6(b)(ii)	(PIWE) is unbiased **or** company may be biased	it / they = PIWE allow honest / trusted / respected / reliable ignore professional / scientific / skilled allow company trying to sell products	1
Total			**6**

4.10.1.2 Potable water

Answer 06 · Mark scheme

January 2011 | CHY3F | Original Q6 | Legacy

CHY3F

4.10.1.2 Potable water

Answer 07 · Mark scheme

June 2012 | CH2FP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 2, and apply a 'best-fit' approach to the marking.		6

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	There is a simple description of a laboratory procedure for obtaining potassium chloride.	There is a clear description of a laboratory procedure for obtaining potassium chloride from potassium hydroxide solution and hydrochloric acid that does not necessarily allow the procedure to be completed successfully by another person. The answer must include the use of an indicator or a method of obtaining crystals.	There is a detailed description of a laboratory procedure for obtaining potassium chloride from potassium hydroxide solution and hydrochloric acid that can be followed by another person. The answer must include the use of an indicator and a method of obtaining crystals

examples of the chemistry points made in the response:

- One reagent in beaker (or similar)
- Add (any named) indicator
- Add other reagent
- Swirl or mix
- Add dropwise near end point
- Stop addition at change of indicator colour
- Note volume of reagent added
- Repeat without indicator, adding same volume of reagent **or** remove indicator using charcoal
- Pour solution into basin / dish
- Heat (using Bunsen burner)
- Leave to crystallise / leave for water to evaporate / boil off water

Accept any answers based on titration

Question 7 continues on the next page . .

4.10.1.2 Potable water

CH2FP

Question 7 cont'd..

question	answers	extra information	mark
7(b)	nitric (acid)	allow HNO_3 ignore incorrect formula	1
7(c)(i)	because it is a fertiliser / helps plants grow	allow plant food do **not** accept pesticide / herbicide / neutralising soil	1
7(c)(ii)	tick by: 'Should farmers stop using ammonium nitrate on their land?' any **two** from: • cannot be done by experiment • based on opinion / view • ethical **or** economic issue	 accept difficult to get / not enough evidence allow must be done by survey if top box ticked allow **1** mark for drinking water varies from place to place	1 2
Total			**11**

UMS Conversion Calculator www.aqa.org.uk/umsconversion

4.10.1.2 Potable water

Answer 08 · Mark scheme

June 2014 | CH3FP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
7(a)	filter to remove *solids* **or** *insoluble particles* **OR** *add coagulant (1)* flocculation / settling / remove solids (1) (add) chlorine to reduce the number of microbes	 *accept ozone / UV* accept to kill microbes / bacteria / germs accept sterilise *allow disinfect* *ignore remove microbes*	1 1 1 1	1 / 3.2.2a/c	E
7(b)(i)	ion exchange resin	allow ion exchange column *allow sodium ions / Na^+* *allow hydrogen ions / H^+*	1	1 / 3.2.2b	E
7(b)(ii)	prevent growth of microbes	*accept sterilise* *accept to kill microbes / bacteria / germs* *accept to reduce the number of microbes* *ignore remove microbes*	1	1 / 3.2.2b	E
7(c)	high cost of energy / *heating*	*allow uses a lot of energy*	1	2 / 3.2.2d	E
7(d)	any **one** from: • helps to develop / maintain bones • helps to develop / maintain teeth • reduces heart disease	 allow any suitable positive effect on bones allow any suitable positive effect on teeth	1	1 / 3.2.1f	E
Total			**8**		

4.10.1.2 Potable water

Answer 08 · Mark scheme

June 2014 | CH3FP | Original Q7 | Legacy



4.10.1.2 Potable water

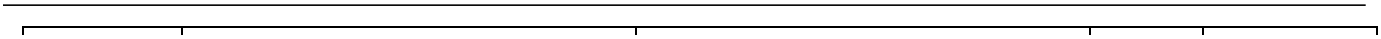
Answer 09 · Mark scheme June 2015 | CH3FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	Solids		1	**AO1** 3.2.2.a
1(a)(ii)	Chlorine		1	**AO1** 3.2.2.c
1(a)(iii)	kill microbes/bacteria	allow to make the water safe to drink ignore disinfect ignore remove / get rid of microbes	1	**AO1** 3.2.2.a,c
1(b)	energy	allow heat	1	**AO1** 3.2.2.d
1(c)	improve dental health	allow reduce tooth decay allow (local) government requirement allow help teeth	1	**AO1** 3.2.2.c
Total			**5**	

4.10.1.2 Potable water

Answer 09 · Mark scheme

June 2015 | CH3FP | Original Q1 | Legacy



4.10.1.2 Potable water

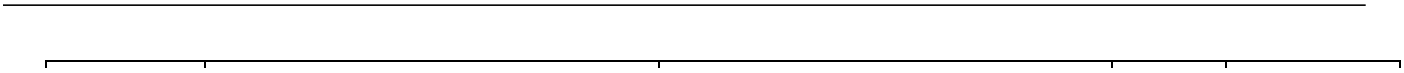
Answer 10 · Mark scheme June 2017 | CH3FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	filter → to remove solids sterilise → to kill microbes	more than one line from any treatment negates the mark	1 1	**AO1** 3.2.2a,c
2(a)(ii)	tick (✓) by: chlorine		1	**AO1** 3.2.2c
2(b)	large amount of energy / fuel needed	allow electricity / heat for energy ignore time / temperature / lots of stages	1	**AO1** 3.2.2d
2(c)(i)	improve dental health	do **not** allow bones	1	**AO1** 3.2.2c
2(c)(ii)	personal choice **or**may not benefit everyone		1	**AO3** 3.2.2c
Total			**6**	

4.10.1.2 Potable water

Answer 10 · Mark scheme

June 2017 | CH3FP | Original Q2 | Legacy

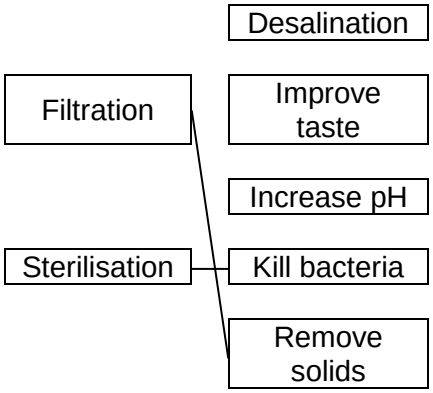
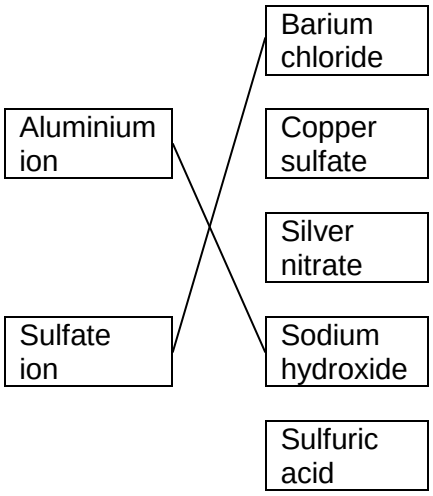


4.10.1.2 Potable water

Answer 11 · Mark scheme

June 2019 | 8462/2F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1		an extra line from a step to a reason for that step negates that mark	1 1	AO1 4.10.1.2
01.2	chlorine ozone		1 1	AO1 4.10.1.2
01.3	evaporate all water from the sample measure the sample's boiling point		1 1	AO2 4.8.1.1 4.10.1.2
01.4		an extra line from an ion to a compound needed negates that mark	1 1	AO1 4.8.3.2 4.8.3.5
01.5	distillation		1	AO1 4.10.1.2
Total			9	

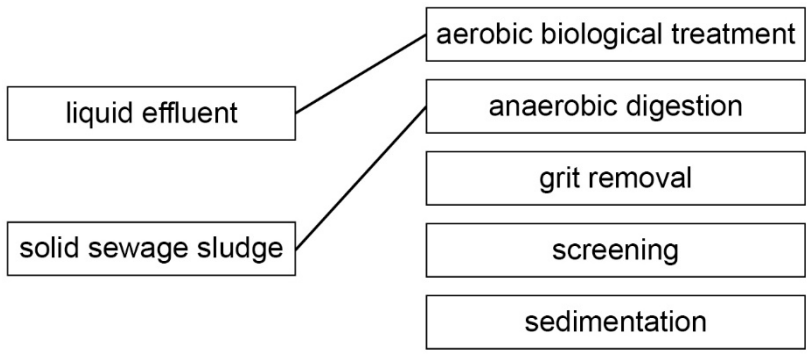
4.10.1.2 Potable water

Answer 12 · Mark scheme

November 2020 | 8462/2F | Original Q9

Question 9

Question	Answers	Mark	AO/ Spec. Ref
09.1	**Level 2**: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	3–4	AO1 4.10.1.2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content • choose an appropriate source of fresh water • such as rivers, streams, lakes, boreholes • pass through filter beds • (which) removes undissolved solids • sterilise • using chlorine / ozone / UV light • (which) destroys harmful microbes		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	any **one** from: • distillation • reverse osmosis	allow use of membranes allow desalination	1	AO3 4.10.1.2
09.3	 additional line from a box on the left negates the mark for that box		1 1	AO1 4.10.1.3

Question 9 (continued)

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	$\frac{260}{1413}$ x 100 = 18.40056617 (%) = 18.4 (%)	 allow an answer correctly calculated to 3 significant figures from an incorrect percentage calculation which uses values in the question	1 1 1	AO2 4.10.1.3
09.5	any **one** from: • the population increased • more waste water produced • less untreated sewage discharged		1	AO3 4.10.1.3
09.6	any **two** from: • increased demand for food (due to increasing population) • conserves energy / resources • landfill space is running out • increased demand for organic fertiliser	ignore references to cost allow more farming allow more sustainable allow more awareness of the negative environmental impacts of landfill ignore less sent to landfill allow lifestyle choice for organic food	2	AO3 4.10.1.3
Total			**13**	

4.10.1.2 Potable water

Answer 13 · Mark scheme

November 2021 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(mass) balance (volume) measuring cylinder	allow scales allow burette / pipette	1 1	AO1 4.10.1.2 RPA 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(mass of salt = 30.49 – 30.44 =) 0.05 (g salt) (mass of salt in 1000 cm^3 =) $\frac{1000}{50} \times 0.05$ = 1.0 (g) **alternative approach**: (volume ratio = $\frac{1000}{50}$) = 20 (1) (mass of salt in 1000 cm^3) = (30.49 – 30.44) × 20 (1) = 1.0 (g) (1)	allow correct use of incorrectly determined mass of salt allow correct use of incorrectly determined volume ratio	1 1 1	AO2 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	heat the evaporating dish and salt again measure the mass of the evaporating dish and salt again		1 1	AO3 4.10.1.2 RPA 8

4.10.1.2 Potable water

Question 2 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	(no condenser) (more) steam escapes **or** less steam condenses	allow converse for condenser allow water vapour for steam	1	AO1
	(because) cooling / condensing is less efficient **or** (because) a (liebig) condenser is not used	allow (because) cooling / condensing is slower allow (because) cold water is not used for cooling / condensing	1	AO3 4.1.1.2 4.10.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	(distilled) water is pure	allow microbes are destroyed (by distillation)	1	AO3 4.8.1.1 4.10.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	using chlorine using ozone		1 1	AO1 4.10.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	pH 7		1	AO2 4.4.2.4 4.10.1.2 RPA8

Total			13

4.10.1.2 Potable water

Answer 14 · Mark scheme

June 2024 | 8462/2F | Original Q10

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	combustion reversible		1 1	AO2 4.6.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2	water molecules break down and reform at the same rate		1	AO2 4.6.2.3

4.10.1.2 Potable water

Answer 14 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
10.3	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.10.1.2 4.10.1.3
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content **Potable water production** • pass water through filter beds • to remove solids • use chlorine / ozone / UV light • to sterilise water • to destroy microbes **Waste water treatment** • screening • using a metal grid • to remove solids • to remove grit • sedimentation • to produce sewage sludge and effluent • anaerobic digestion of sewage sludge • aerobic biological treatment of effluent access to **Level 3** requires reference to **both** potable water production **and** waste water treatment.		

Total Question 10	9

4.10.1.2 Potable water

Answer 14 · Examiner comments June 2024 | 8462/2F | Original Q10

Question 10 (standard demand)

10.1 More than 15% of students correctly identified the words that are used to describe the reaction between hydrogen and oxygen with a further 70% being able to correctly identify one of the words. It is important that students read the question carefully as there was a significant number of students who ticked one box instead of two.

10.2 Over 65% of students were able to correctly identify the sentence that described the reversible reaction in the question.

10.3 Few students demonstrated a good overall understanding of the sequence of steps involved in potable water production and wastewater treatment. Weaker responses tended to focus on wastewater treatment, for which the diagram in the stem provided more scaffolding.

Most students recognised that ground water needed to be filtered initially. A few responses referred to screening before the use of filter beds, although only referring to screening in potable water production was considered insufficient. Sometimes the descriptions of things removed by filter beds did not make it clear that they were solid. The process of sterilisation was generally well described, although removal of microbes rather than their destruction was not creditworthy.

In waste water treatment removal of solids using a metal grid was included by most students, making use of the diagram where a metal grid was featured. Fewer students referred to this step

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4.10.1.2 Potable water

Answer 14 · Examiner comments

as screening and again things removed by screening were not always clearly identified as solid. Organic matter in sewage is not removed by screening as this is treated subsequently. The final steps were poorly addressed overall. Most students referred to sludge and effluent (again these featured in the diagram) but many failed to recognise that these were separated by sedimentation. Some responses confused the separation of sludge and effluent with their biological treatment afterwards. Some students recognised that sludge is treated anaerobically and effluent aerobically but did not refer to digestion or biological treatment or an equivalent description of microbial action.

References to flocculation, desalination, fluoridation or pH adjustment were considered irrelevant and ignored in the marking of this item.

Over 30% of students simply described what they could see in the picture and gained no marks. A further 40% achieved Level 1 by describing the diagram but also making a link between the use of the metal grid and the removal of solids like toilet paper or stones rather than organic waste. Most students appeared not to understand the use of the word process and failed to add any detail about how ground water is treated to produce potable water. Many students describing potable water treatment failed to identify ground water as fresh water and described desalination.

Only 10% of students achieved Level 2, usually by successfully linking the removal of solids using the metal grid and including some detail of either filtering ground water to remove solids or adding chlorine to sterilise the water or to kill microbes.

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4.10.1.2 Potable water

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

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