CHEMISTRY

KS3 SCIENCE EXAM PREPARATION STUDENT BOOK

USING RESOURCES

Please complete all of these questions in this book and store this work in your student revision files.

This will provide a useful resource for revision.

Name	
Class	
Teacher	

Revision Question Book

KS3 Science

This book is suitable for students carrying out the KS3 Science course

In the following book there are several questions based on KS3 Science. These questions are additional to the work which you do on in your lessons.

To gain the highest grade possible in KS3 Science it is recommended that you complete these questions at home or in revision sessions outside of lessons.

This will both familiarise yourself with both the concepts found in the syllabus and the examination technique found in examinations.

The mark scheme to the questions is integrated in the book for you to use independently.

To improve competency in answering questions on KS3 Science and achieve mastery in this module, answer all of these questions independently.

When you have completed your work in this book, please store this work in your student files.

Many thanks for all of your hard work in Science.

Mr. Turnbull

HIGHER TIER

1. Water in Britain is taken from reservoirs to use as drinking water.

1.1 What are the **two** main steps used to treat water from reservoirs?

Give **one** reason for each step.

[4 Marks]

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Some people use water filters to treat water before drinking it.

1.2 Water filters remove hardness from hard water.

What is in water filters that removes hardness from water?

[1 Mark]

.....

.....

1.3 Suggest why water filters used in the home contain particles of silver.

[1 Mark]

.....

.....

1.4 Pure water can be produced by distillation.

Why is distillation **not** usually an economic method of treating water for drinking?

[1 Mark]

.....

.....

1.5 Drinking hard water has health benefits.

State **one** health benefit of drinking hard water.

[1 Mark]

.....

.....

Q2.

Most water contains dissolved compounds.

The concentrations of these dissolved compounds are higher in sea water than in drinking water.

2.1 Draw a ring around the correct answer to complete the sentence.

[1 Mark]

Pure water can be obtained from sea water by

distillation.
filtration.
neutralisation.

2.2 What is the boiling point of pure water? _____ °C

[1 Mark]

A student wanted to find out how much solid was dissolved in sea water.

This is the method the student used:

- measure the mass of an empty evaporating basin
- measure 25 cm^3 of sea water and pour it into the evaporating basin
- heat the evaporating basin gently until all of the water has evaporated
- measure the mass of the evaporating basin containing the solid residue.

2.3 What piece of apparatus would be suitable for measuring 25 cm^3 of sea water?

[1 Mark]

.....

.....

2.4 How could the student check that all of the water had evaporated?

[2 Marks]

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2.5 The results the student obtained using 25 cm^3 of sea water are:

Mass of empty evaporating basin = 23.21 g

Mass of evaporating basin and dry solid residue = 24.04 g

Calculate the mass of solid dissolved in 1000 cm^3 of the sea water.

[2 Marks]

.....

.....

.....

.....

Mass dissolved in 1000 cm^3 = _____ g

2.6 In many countries chlorine is added to drinking water supplies.

Why is chlorine added to drinking water?

[1 Mark]

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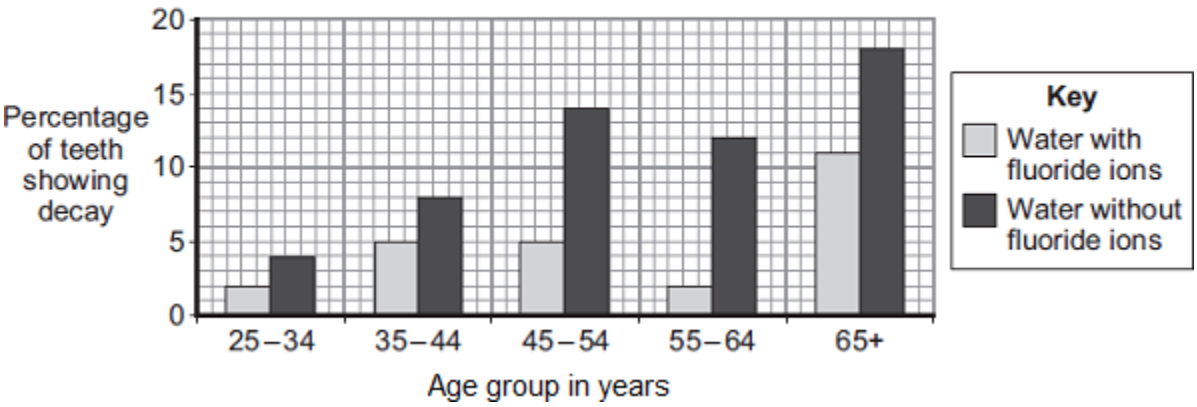
.....

2.7 Compounds containing fluoride ions are added to some drinking water supplies.

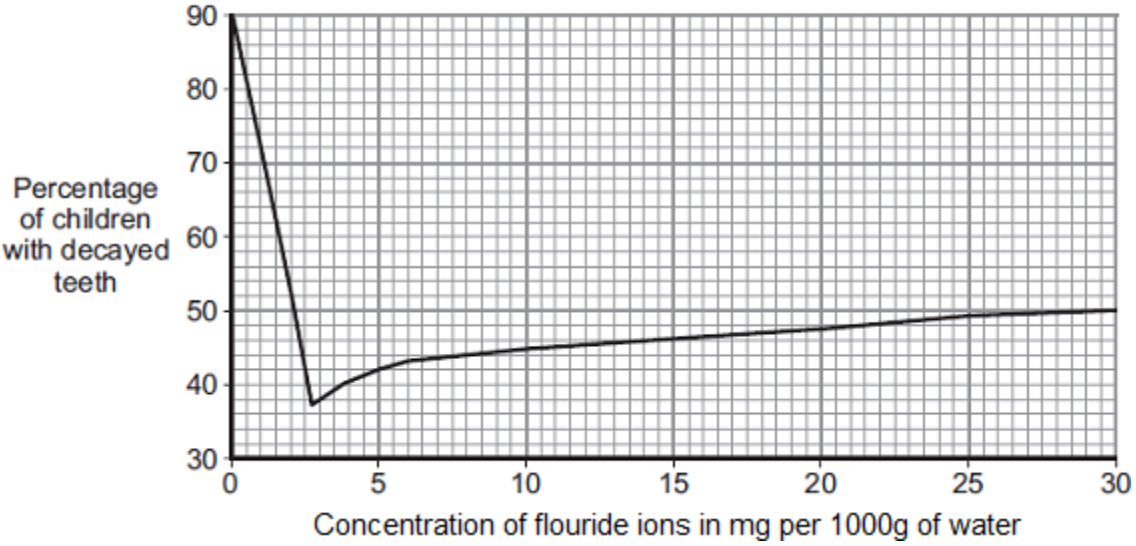
Many scientists have done research into the effects of fluoride ions in drinking water.

Graphs 1, **2** and **3** show some of the results obtained.

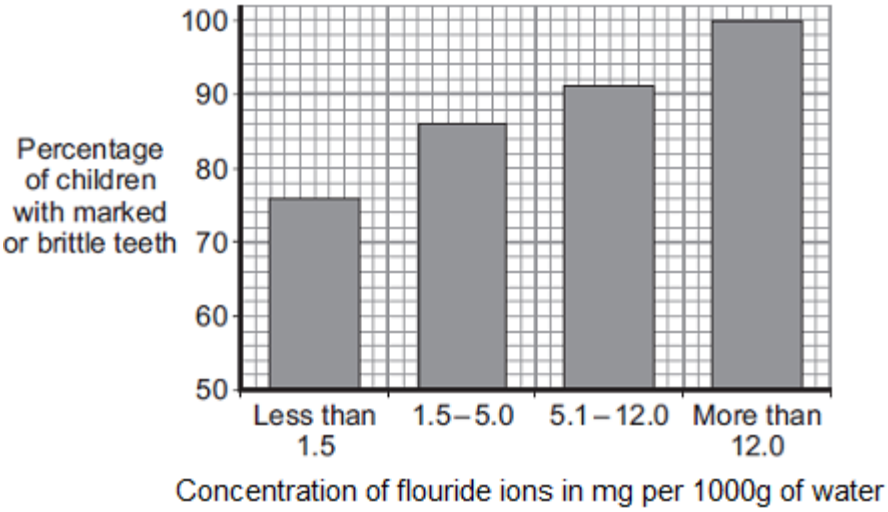
Graph 1



Graph 2



Graph 3



Evaluate the advantages and disadvantages of adding fluoride ions to drinking water.

You should support your answer with evidence from **all three** graphs.

[6 Marks]

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Q3.
Read the following information and then answer the questions.

Chlorine – for better, for worse?

Chlorine is used to make bleaches, plastics and medicines. Swimming pool water is often treated with chlorine.

Chlorine is used to make water safe to drink. It is relatively cheap and easy to use. People who drink untreated water risk dying from typhoid and cholera.

However, chlorine is a poisonous chemical. It causes breathing difficulties and can kill people. Some people are also allergic to chlorine.

3.1 How does chlorine make water safe to drink?

[1 Mark]

.....

.....

3.2 The amount of chlorine in swimming pool water should be carefully monitored and controlled.

Explain why.

[2 Marks]

.....

.....

.....

.....

.....

.....

3.3 Developing countries are likely to choose chlorination as their method of making water safe to drink.

Suggest why.

[1 Mark]

.....

.....

A government is setting up an enquiry into the safety of using chlorine.

3.4 Suggest why people from all political parties should be represented.

[1 Mark]

.....

.....

3.5 Suggest why the opinion of a well-respected scientist might change the outcome of any discussion.

[1 Mark]

.....

.....

3.6 The decision taken about the safety of using chlorine should be based on evidence and data rather than on hearsay and opinion.

Suggest why.

[1 Mark]

.....

.....

Q4.

Good quality water is essential for life.

4.1 In the United Kingdom, water is filtered and treated with chlorine to make it safe to drink.

[2 Marks]

Explain why the water is:

filtered

.....

.....

treated with chlorine.

.....

.....

Millions of people in Bangladesh drink water from wells that contain high levels of arsenic. Arsenic is poisonous.

The World Health Organisation recommends that there should be no more than 0.01 mg of arsenic per litre in drinking water.

The table gives some information about two instrumental methods of testing for arsenic.

Factor to consider	**Laboratory Instrumental Method**	**Portable Instrumental Method**
Cost of equipment	£10 000	£50
Skill level of technician	Highly skilled	where test is done
Little training needed	Laboratory only	Anywhere
Time to prepare the instrument for the test	5 minutes	10 seconds
Sensitivity of the instrument	0.000001 mg of arsenic per litre of water	0.1 mg of arsenic per litre of water

4.2 Use the information in the table to give **two** advantages and **one** disadvantage of using the Portable Instrumental Method compared with the Laboratory Instrumental Method.

[3 Marks]

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4.3 The information about these two instrumental methods was provided by the Professional Institute of Water Engineers (PIWE). The Institute has no connection with the companies that make these instruments.

Suggest why many people would accept the views of PIWE rather than the views of the companies that make the instruments.

[1 Mark]

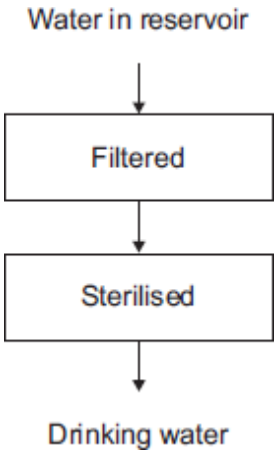
.....

.....

FOUNDATION TIER

1. This question is about drinking water.

The flow diagram below shows how water is made suitable for drinking.



1.1 What is removed when the water is filtered?

[1 Mark]

Tick (✓) **one** box.

Gases ☐

Liquids ☐

Solids ☐

1.2 What is used to sterilise the water?

[1 Mark]

Tick (✓) **one** box.

Carbon ☐

Chlorine ☐

Sodium chloride ☐

1.3 Why is the water sterilised?

[1 Mark]

.....

.....

1.4 Water can be purified by distillation.

Drinking water is **not** usually purified by distillation because distillation is expensive.

Complete the sentence.

Distillation is expensive because it requires a lot of

[1 Mark]

.....

.....

1.5 Why do some water companies add fluoride to drinking water?

[1 Mark]

.....

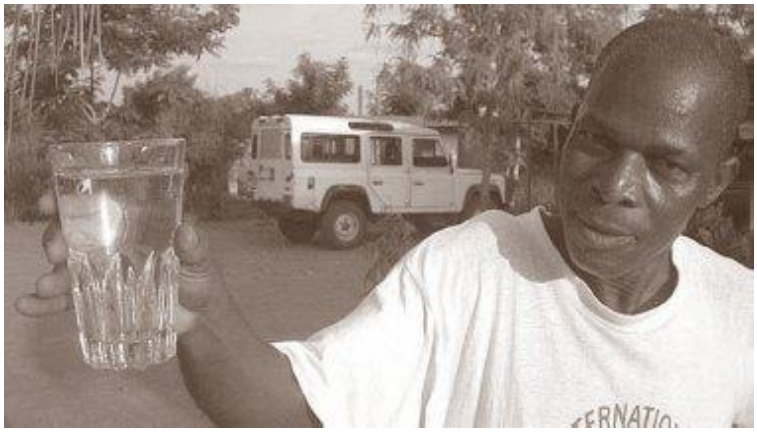
.....

Q2.

Good quality water is needed for a healthy life.

In the United Kingdom, obtaining safe water for drinking is as simple as turning on a tap. The water is made safe to drink by water companies.

However, in many parts of Africa and Asia, water used for drinking is contaminated and untreated. It is estimated that 2.2 million people die each year as a result of drinking contaminated water.



2.1 Sea water is **not** used as drinking water.

Suggest why.

[1 Mark]

.....

.....

2.2 Explain why water for drinking is filtered and then treated with chlorine.

[2 Marks]

.....

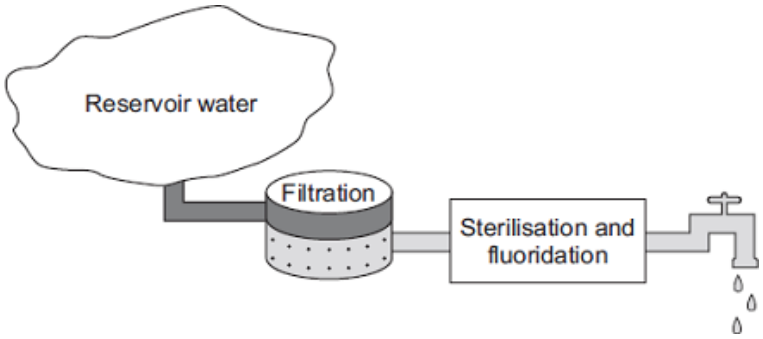
.....

.....

.....

Q3.

The diagram shows three stages in the treatment of reservoir water.



3.1 What is separated from the reservoir water during filtration?

Tick (✔) **one** box.

[1 Mark]

- Bacteria ☐
- Dissolved nitrates ☐
- Solids ☐

3.2 What is added to sterilise the water?

Tick (✔) **one** box.

[1 Mark]

- Calcium ☐
- Chlorine ☐
- Magnesium ☐

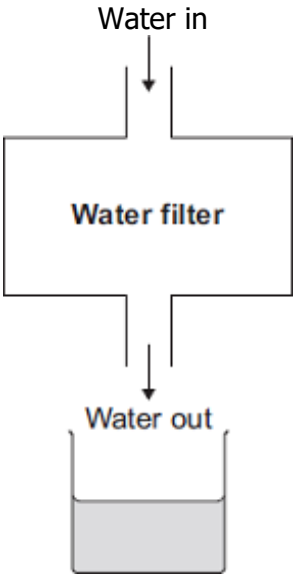
3.3 State **one** advantage of adding fluoride to drinking water.

[1 Mark]

.....

.....

3.4 The diagram shows a water filter used in the home.



A student collected a sample of water from the filter.

The student could show that the filtered water contains dissolved salts without using a chemical test.

Describe how.

[2 Marks]

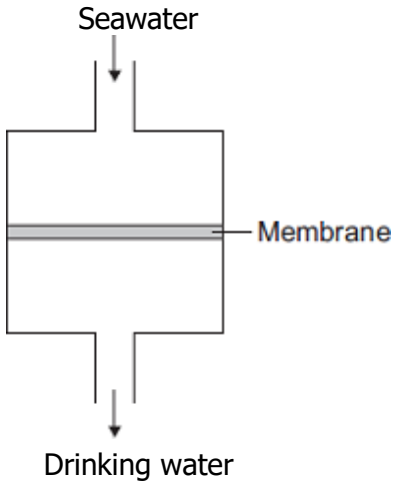
.....

.....

.....

.....

3.5 Seawater is forced through a membrane to make drinking water.



Suggest why water molecules can pass through the membrane, but sodium ions and chloride ions cannot.

[1 Mark]

.....

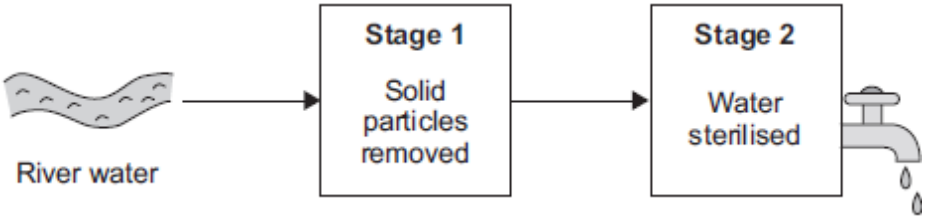
.....

Q4.

This question is about water.

River water needs to be treated before it is safe to drink.

The diagram shows two stages of the treatment of river water.



4.1 What is the name of the process used to remove solid particles in **Stage 1**?

Tick (✓) **one** box.

Crystallisation ☐

Fermentation ☐

Filtration ☐

(1)

4.2 What is added in **Stage 2** to sterilise the water?

Tick (✓) **one** box.

[1 Mark]

Chlorine ☐

Fluoride ☐

Potassium ☐

Toxic substances in river water are removed by adding very small amounts of iron oxide nanoparticles.

4.3 How is the size of nanoparticles different from normal-sized particles?

[1 Mark]

.....

.....

4.4 Nanoparticles are needed in only very small amounts.

Suggest why.

[1 Mark]

.....

.....

4.5 In certain areas of the UK, tap water contains aluminium ions.

What would you **see** when sodium hydroxide solution is added drop by drop to tap water containing aluminium ions?

[2 Marks]

.....

.....

.....

.....

AQA

The Periodic Table of Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[97] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[267] **Rf** rutherfordium 104	[270] **Db** dubnium 105	[269] **Sg** seaborgium 106	[270] **Bh** bohrium 107	[270] **Hs** hassium 108	[278] **Mt** meitnerium 109	[281] **Ds** darmstadtium 110	[281] **Rg** roentgenium 111	[285] **Cn** copernicium 112	[286] **Nh** nihonium 113	[289] **Fl** flerovium 114	[289] **Mc** moscovium 115	[293] **Lv** livermorium 116	[293] **Ts** tennessine 117	[294] **Og** oganesson 118

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.

MARK SCHEME
HIGHER

1.1 filter

1

to remove *solids* ***or*** *insoluble particles*

OR

add coagulant (1)

flocculation / settling / remove solids (1)

1

(add) chlorine
accept ozone / UV

1

to reduce the number of microbes
accept to kill microbes / bacteria / germs
accept sterilise
allow disinfect
ignore remove microbes

1

1.2 ion exchange resin
allow ion exchange column
allow sodium ions / Na^+
allow hydrogen ions / H^+

1

1.3 prevent growth of microbes
accept sterilise
accept to kill microbes / bacteria / germs
accept to reduce the number of microbes
ignore remove microbes

1

1.4 high cost of energy / *heating*
allow uses a lot of energy

1

1.5 any **one** from:
• helps to develop / maintain bones
allow any suitable positive effect on bones
• helps to develop / maintain teeth
allow any suitable positive effect on teeth
• reduces heart disease

1

[8]

2.1 distillation

1

2.2 100 / one hundred

1

2.3 measuring cylinder **or** pipette **or** burette
allow phonetic spelling
*do **not** accept teat pipette*
ignore any additional words or volumes

1

2.4 (re)heat the evaporating basin
*accept heat to constant mass for **2** marks*

1

weigh (again) **or** mass will not change
*if no other mark awarded allow **1** mark for a chemical test for water*

1

2.5 33.2 (g)
*correct answer with or without working scores **2** marks*
*allow mass of residue = (24.04 g − 23.21 g) = 0.83 for **1** mark*
*allow ecf (mass of residue × 40) for **1** mark*

2

2.6 to kill microbes / bacteria **or** to sterilise / disinfect water
allow to prevent disease
ignore 'to make it safe to drink'

1

2.7 Marks awarded for this answer will be determined by the Quality of Communication (QoC) as well as the standard of the scientific response. Examiners should also refer to the information on page 4, and apply a 'best−fit' approach to the marking.

0 marks
No relevant content

Level 1 (1 – 2 marks)
A simple relevant comment has been made on the data from at least one of the graphs.

Level 2 (3 – 4 marks)
At least two of the graphs have been considered with a relevant comment made.

Level 3 (5 – 6 marks)
All the graphs have been considered and relevant comments made about each.
A justified conclusion may be given.

examples of chemistry points made in the response:
extra information

• (graph 1 shows) fluoride ions reduce the amount of tooth decay
• (graph 1 shows) the effect in reducing tooth decay is greatest for 55−64 year olds

accept any in range 55 – 64

• (graph 2 shows) the fluoride ions reduce percentage with decayed teeth

• (graph 2 shows) effect is greatest at 2.5 to 3 mg per 1000 g of water then decay increases if more than 2.5 to 3 mg of fluoride ions per 1000 g water

accept any in range 2.5 – 3

• (graph 2 shows percentage) decay decreases from 0 to 2.5 / 3 mg per 1000 g

• (graph 3 shows) more marked / brittle teeth as fluoride level increases

• above points linked together to draw a justified conclusion

6

[14]

3.1 sterilise / disinfect (water)
ignore removes bacteria / impurities / disease

or

kill bacteria / micro-organisms / microbes / germs / pathogens
ignore cleans the water / makes (water) safe
*allow destroy bacteria **or** gets rid of bacteria*

1

3.2 any **two** from:
ignore reference to safe / unsafe

• chlorine is toxic / poisonous

• so (too much) will be dangerous / harmful / kill people / cause illness / health problems
allow causes damage

• cause breathing difficulties **or** cause (more) allergic reactions / skin **or** eye irritation

• too little will not kill bacteria
allow bacteria still there

2

3.3 cheap / easy / quick to use (process)
accept prevents typhoid / cholera
ignore reference to specialists or equipment

1

3.4 fair / more ideas / views / opinions **or** less chance of bias **or** more democratic
allow idea of different points of view / balanced view
allow avoids undue influence owtte

1

3.5 (more likely) to have support / influence / convince people
ignore well respected
allow ideas about trust e.g. people will have more confidence in their views / more likely to be believed
allow ideas about expertise e.g. more likely to know what they are talking about / have done experiments / tests
allow have knowledge / understanding
allow (more) reliable

1

3.6 (more likely) to be correct / less likely to be incorrect

or

reliable / factual / accurate / based on proof / based on experiments or tests / based on validation

1

[7]

4.1 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

4.2 advantages of portable:
accept converse throughout

any **two** from :

• costs less

• little training needed

• water can be tested within 10 seconds / immediately / quicker

• can be used anywhere

2

disadvantage of portable

less precise / sensitive
allow only detect down to 0.1 mg
ignore less accurate

1

4.3 (PIWE) is unbiased
it / they = PIWE
allow honest / trusted / respected / reliable
ignore professional / scientific / skilled

or

company may be biased
allow company trying to sell products

1

FOUNDATION

1.1 Solids

1

1.2 Chlorine

1

1.3 kill microbes / bacteria
allow to make the water safe to drink
ignore disinfect
ignore remove / get rid of microbes

1

1.4 energy
allow heat

1

1.5 improve dental health
allow reduce tooth decay
allow (local) government requirement
allow help teeth

1

[5]

2.1 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

2.2 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
[3]

3.1 Solids

1

3.2 Chlorine

1

3.3 improves dental health **or** reduces tooth decay

1

3.4 put a sample of the filtered water in an evaporating basin **or** leave to evaporate

accept any description of evaporation (using a Bunsen or leaving on the windowsill)

1

there will be crystals of salt left

1

3.5 sodium and / or chloride ions are bigger than water (molecules) **or** ions are charged **or** molecules are not charged

*do **not** accept sodium chloride molecules as ions is given in the question*

1

[6]

Q4.

4.1 Filtration

1

4.2 Chlorine

1

4.3 nanoparticles are small / smaller / much smaller / tiny

*allow any in range 1–100 nm or 1 × 10^{-9} m – 1 × 10^{-7} m **or** a few hundred atoms in size*

ignore numbers if stated smaller

1

4.4 they have a high surface area to volume ratio

reference to surface area without volume ratio is insufficient

*allow nanoparticles are very reactive **or** nanoparticles are more reactive than normal particles.*

1

4.5 (sodium hydroxide) produces a white precipitate

accept solid / suspension or ppt or ppte for precipitate.

ignore cloudy / milky

1

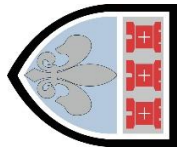
which (then) dissolves / disappears (in excess sodium hydroxide)

M2 cannot be awarded unless a solid of some sort has been made

ignore names or formulae of compounds

1

[6]



AQA

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23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[97] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[267] Rf rutherfordium 104	[270] Db dubnium 105	[269] Sg seaborgium 106	[270] Bh bohrium 107	[270] Hs hassium 108	[278] Mt meitnerium 109	[281] Ds darmstadtium 110	[281] Rg roentgenium 111	[285] Cn copernicium 112	[286] Nh nihonium 113	[289] Fl flerovium 114	[289] Mc moscovium 115	[293] Lv livermorium 116	[293] Ts tennessine 117	[294] Og oganesson 118

Key: relative atomic mass / atomic symbol / name / atomic (proton) number

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Acknowledgements

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This document has been produced for the KS3 Science Specification.