AQA GCSE CHEMISTRY (HIGHER) · 8462

CHEMISTRY



MARK SCHEME

4.10.1 USING THE EARTH'S RESOURCES AND OBTAINING POTABLE WATER (PACK 2)

SCORE	PERCENTAGE
/214	%

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Q1.

(a)

property	J	K
density in g/cm^3		
melting point in °C		✓
flame resistance		✓
water absorption	✓	

*three correct = **2** marks*
*one or two correct = **1** mark*

2

(b) $\frac{1.4 \times 6.0}{0.90}$

1

= 9.3 (kg)

allow 9.3(333…)(kg)

1

*an answer of 9.3(333…)(kg) scores **2** marks*

(c) polymer **L** will not melt

1

(d) polymers are more hard-wearing

1

(e) any **two** from:

- (wool / sheep) renewable
  allow wool grows back, etc.
- (wool) will not run out
  ignore (wool is) readily available
- (crude oil) non-renewable
  allow finite
- (crude oil) will run out
  ignore references to cost
  ignore properties from tables 1 and 2

2

[8]

Q2.

(a) bar to 0.3 g

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bar labelled copper

allow Cu

1

1

(b) (£) 57

allow (£) 57.00

1

(c) $\frac{22}{9} \times 1.9$

1

= 4.6 (g)

allow an answer of 4.6(4444) (g)

1

*an answer of 4.6(4444) (g) scores **2** marks*

(d) (9 carat gold is)

any **two** from:

- harder

  allow stronger or more durable or less malleable
- less expensive

  allow cheaper
- aesthetic reasons

  allow references to colour

  allow converse arguments about 24 carat or pure gold

  ignore references to finite resources

2

(e) any **three** from:

- copper ores will run out

  allow copper ores scarce
- landfill sites running out

  allow reduces waste
- less energy used

  allow produces less carbon dioxide or an implication e.g. global warming
- mining causes pollution

  allow a specific pollution resulting from mining, e.g. noise, eyesore, damage to environment
- copper from copper ore more expensive

  allow recycled copper is cheaper

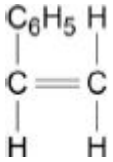
3

[10]

Q3.

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(a)



1

(b) polymerisation

1

(c) monomers

1

many

1

polymers

1

must be in this order

(d) **Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.

3–4

Level 1: Relevant features are identified and differences noted.

1–2

Level 1: Relevant features are identified and differences noted.

1–2

No relevant content

0

Indicative content

for coated paper cups − accept converse for poly(styrene)

advantages
- produced from a renewable resource
- biodegradable so breaks down

disadvantages
- higher energy costs
- greater use of fossil fuels and consequent pollution
- not recyclable so uses landfill

[9]

Q4.

(a) water

allow H_2O

1

allow hydrogen chloride ***or*** *HCl*

1

(b) single C–C bond and nothing added to the trailing bonds

1

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3 × H and CH_3 correct

must be four single bonds

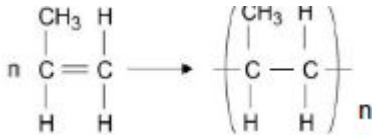
1

n at bottom right

1

*must be fully correct to score all **3** marks*

an answer of



*scores **3** marks*

(c) any **two** from:

- poly(propene) comes from a non-renewable source

  allow poly(propene) will run out

- poly(propene) requires a lot of energy to make
- poly(propene) is not biodegradable
- a wool carpet needs replacing more often

  must refer to the carpet, not just the fibre

- wool requires the use of large areas of land (which could be used to grow food crops)

  ignore references to cost
  ignore pollution
  ignore landfill
  allow converse arguments

2

(d) any **four** from:

advantages of polyester

- better flame resistance (so burns less easily)

  allow good flame resistance so protects the firefighter

- higher melting point (so melts less easily)

  allow high melting point so uniform is not damaged

- absorbs water so less likely to ignite

disadvantages of polyester:

- high density so uniform is heavy
- absorbs water so firefighter gets wet
- absorbs water so uniform becomes heavy
- justified conclusion

4

allow converse arguments throughout.

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max 3 *marks if only advantages or only disadvantages of one type of fibre*

[10]

Q5.

(a) **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

5–6

Level 2: Some logically linked reasons are given. There may also be a simple judgement.

3–4

Level 1: Relevant points are made. They are not logically linked.

1–2

No relevant content

0

Indicative content

raw materials

- crude oil finite **or** will run out (so will be unavailable for other uses)
- wood is a renewable resource
- wood involves land use for forestry (so less available for agriculture / food)
- wood may involve deforestation (so reduces biodiversity)

manufacturing

- both require energy which may be derived from finite fuels (so they run out more quickly)
- paper more energy intensive (so more pollution is possible)
- the need for more energy for paper potentially releases more carbon dioxide to the atmosphere (so increases global warming)
- paper involves higher water usage (so increases the potential for water pollution)
- paper cups are heavier to transport (so have higher energy requirement)
- packaging requirements similar (so neither has an advantage)

usage

- both single-use (so neither has an advantage)

disposal

- paper releases more energy if incinerated (so more energy can be used for other purposes)
- paper will decompose (so will not remain in landfill)
- poly(styrene) could release toxins on incineration
- poly(styrene) will not decompose (so will remain in landfill)
- poly(styrene) can be used to manufacture other products (so conserves energy **or** finite resources)
- both can cause litter **or** visual pollution

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(b) $\frac{1000}{8.3} \times 550$ (kJ)

1

= 6.63×10^4 (kJ)

allow 6.6265060240963 × 10^4 (kJ) correctly rounded

*allow 66265.060240963 (kJ) correctly rounded for **1** mark*

1

*an answer of 6.63 × 10^4 (kJ) scores **2** marks*

(c) (melamine is a) thermosetting (polymer)

1

(which) contains crosslinks / bonds (between polymer chains)

*do **not** accept reference to intermolecular forces*

allow (so) it decomposes

1

[10]

Q6.

(a) sodium chloride

or

salt

allow dissolved salts

1

(b) expensive

1

(c) to remove solids

1

(d) to sterilise the water

allow to kill microorganisms

1

(e) test: (damp) litmus paper

1

result: bleached

or

turns white

1

(f) pH: 7.0

1

mass of dissolved solid: 0.0 (g)

1

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(g) 0.05 g

1

(h) did not immerse the thermometer (bulb)

1

[10]

Q7.

(a) **Level 2 (3-4 marks):**
A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

Level 1 (1-2 marks):
Relevant points are made. These are not logically linked.

Level 0
No relevant content.

Indicative content

raw material
- wood will not run out
- aluminium (ore) will run out
- more expensive to process aluminium from its raw material

mass of frame
- wooden frame more expensive to transport
- wooden frame uses more fuel to transport
- wooden frame more difficult to handle / erect

useful lifetime
- wooden greenhouse would need replacing more often
- fewer aluminium greenhouses needed over time

end of useful life
- both materials can be put to further use
- aluminium can be recycled repeatedly

4

(b) $\frac{12000}{80}$

1

= 150

1

*an answer of 150 scores **2** marks*

(c) any **two** from:

- conserves finite ores
  allow ores will last longer
- uses less energy
- lower energy costs
- reduces landfill

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allow less waste

2

(d) (polymer windows are) lighter

1

[9]

Q8.

(a) filtration
or
by passing through filter beds to remove solids

1

sterilisation to kill microbes

allow chlorine / ozone allow ultraviolet light

1

(b) water needs more / different processes

1

because it contains any **two** from:

- more organic matter
- more microbes
- toxic chemicals or detergents

2

(c) *(as part of glassware attached to bung)*
salt solution in (conical) flask

allow suitable alternative equipment, eg boiling tube

1

(at end of delivery tube)
pure water in test tube which must not be sealed

allow suitable alternative equipment, eg, beaker, condenser

1

heat source (to heat container holding salt solution)

1

*if no other mark obtained allow for **1** mark suitable equipment drawn as part of glassware attached to bung **and** at end of delivery tube*

(d) determine boiling point

1

should be at a fixed temperature 100°C

allow should be 100°C

allow if impure will boil at a temperature over 100°C

1

(e) high energy requirement

1

[11]

Q9.

(a) (i) Filtration

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1

(ii) Chlorine

1

(b) (i) 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

(ii) 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

(c) (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]

Q10.

(a) because sulfur dioxide causes <u>acid rain</u>

1

which kills fish / aquatic life **or** dissolves / damages statues / stonework **or** kills / stunts growth of trees

if no other mark awarded then award 1 mark for sulfur dioxide is toxic or causes breathing difficulties.

1

(b) (i) <u>electrons</u> are lost

1

(ii) $Cu^{2+} + 2e^- \rightarrow Cu$

allow $Cu^{2+} \rightarrow Cu - 2e^-$

ignore state symbols

1

(iii) copper sulfate

allow any ionic copper compound

1

(c) (lattice of) positive ions

1

delocalised electrons

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accept sea of electrons

1

(electrostatic) attraction between the positive ions and the electrons

1

electrons can move through the metal / structure **or** can flow

allow electrons can carry charge through the metal / structure

if wrong bonding named or described or attraction between oppositely charged ions then do not award M1 or M3 − MAX 2

1

(d) (copper compounds are absorbed / taken up by) plants

allow crops

1

which are burned

1

the ash contains the copper compounds

do not award M3 if the ash contains copper (metal)

1

(e)

/ A_r	55.6 / 63.5	16.4 / 56	28.0 / 32
moles	0.876	0.293	0.875
ratio	3	1	3
formula	Cu_3FeS_3		

*award **4** marks for Cu_3FeS_3 with some correct working*

*award **3** marks for Cu_3FeS_3 with **no** working*

*if the answer is not Cu_3FeS_3 award up to **3** marks for correct steps from the table apply ecf*

*if the student has inverted the fractions award **3** marks for an answer of $CuFe_3S$*

4

[16]

Q11.

(a) (i) Solids

1

(ii) Chlorine

1

(iii) kill microbes / bacteria

allow to make the water safe to drink

ignore disinfect

ignore remove / get rid of microbes

1

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(b) energy

allow heat

1

(c) improve dental health

allow reduce tooth decay

allow (local) government requirement

allow help teeth

1

[5]

Q12.

(a) (i) Solids

1

(ii) Chlorine

1

(iii) improves dental health **or** reduces tooth decay

1

(b) 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

(c) 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]

Q13.

(a) pure copper is twice as good a conductor as 99% pure copper

accept reverse argument

*accept answers quoting 2 correct values from the graph scores **2***

*qualitative answer (e.g. pure copper is a better conductor than impure copper) scores **1***

or

*answers quoting a conductivity value from the graph scores **1***

2

(b) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response.

0 marks

No relevant content

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Level 1 (1–2 marks)
Simple list of a limited number of points given, with no linking between ideas

Level 2 (3–4 marks)
A broader set of points made. There will probably not be links between ideas

Level 3 (5–6 marks)
Answer includes linking between ideas, showing the consequence of either not recycling or the advantage of recycling. Answers such as less fossil fuel needed so less carbon dioxide produced **or** less carbon dioxide produced so less global warming

examples of the points made in the response

resources

(recycling) conserves supplies of ores
copper available for longer
as (at present rate of use) copper ores will run out in about 35 years
(recycling) conserves supplies of fossil fuels **or** energy
less fuel used at a lower cost

land pollution
mining scars landscape **or** produces noise pollution
mining destroys wildlife habitats
(recycling) less need to mine ores / fossil fuels
so less habitat destroyed or less scarring of landscape
(recycling) less need to use landfill for waste

atmospheric pollution
burning fossil fuels produces carbon dioxide / greenhouse gas
which (may) cause global warming **or** climate change
extraction produces sulfur dioxide
which causes acid rain
which can kill trees / fish

6

(c) grow plants

accept plants absorb copper (through roots)

1

then plants are burned

1

ash (from burning) contains copper compounds

1

[11]

Q14.

(a) (i) economical

1

(ii) phytomining

1

(iii) carbon dioxide

1

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(b) (i) copper / Cu

1

iron sulfate / $FeSO_4$

1

(ii) copper / ions have a positive charge

it = copper ions

allow copper ions have a different charge

accept copper / ions are free to move

accept to gain electrons

accept copper / ions are attracted to the negative electrode ***or*** *opposite charges attract*

1

(c) any **two** from:

ignore not biodegradable or does not decay

- copper ores are limited / running out

  allow copper is running out
- copper can be recycled
- copper can be reused
- copper is expensive
- landfill sites are filling up
- copper compounds are toxic

  allow copper is toxic

2

[8]

Q15.

(a) (i) phytomining

1

(ii) *(the land contains)* very little <u>copper</u>

allow low grade ore ***or*** *large amounts of waste*

ignore quarrying / benefits of using plants

1

uneconomical

accept (smelting) uses a lot of energy / fossil fuels

allow expensive

1

(iii) Cu

1

2 CuO + C ➔ **2** Cu + CO_2

allow 2 CuO + C ➔ Cu_2 + CO_2 for ***1*** *mark*

1

(b) (i) iron is more reactive (than copper)

1

iron is cheap(er than copper)

allow cheaper ***or*** *uses less energy than electrolysis*

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1

(ii) any **two** from:
- copper / ions move **or** are attracted to the negative electrode / *cathode*
- where they are reduced **or** gain (two) electrons
- *where they form copper (metal / atoms)*

2

[9]

Q16.

(a) 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

(b) (i) ion exchange resin

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

1

(ii) prevent growth of microbes

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

1

(c) high cost of energy / *heating*

allow uses a lot of energy

1

(d) any **one** from:
- helps to develop / maintain bones

  allow any suitable positive effect on bones
- helps to develop / maintain teeth

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allow any suitable positive effect on teeth

- reduces heart disease

1

[8]

Q17.

(a) (i) distillation

1

(ii) 100 / one hundred

1

(b) (i) measuring cylinder **or** pipette **or** burette

allow phonetic spelling

*do **not** accept teat pipette*

ignore any additional words or volumes

1

(ii) (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

(iii) 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

(c) to kill microbes / bacteria **or** to sterilise / disinfect water

allow to prevent disease

ignore 'to make it safe to drink'

1

(d) 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.

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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]

Q18.

(a) any **two** from:

- copper / ores are running out / harder to find
- there are no / very small amounts of high-grade copper ores left
- copper metal is in demand
- <u>copper</u> is expensive
- now economical to extract copper from low-grade ores

  it = copper

  allow new methods of extraction e.g. bioleaching and phytomining

  *allow high-grade ores are running out for **2** marks*

2

(b) (i) <u>large</u> amounts / 98% of rock to dispose of as waste

accept contains toxic (metal) compounds / bioleacher

or

waste rock takes up a lot of space

1

(ii) (copper sulfide reacts with oxygen to) produce sulfur dioxide / SO_2

allow (sulfur reacts with oxygen to) produce sulfur dioxide / SO_2

1

that causes acid rain

*allow description of effects of acid rain **or** sulfur dioxide*

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*if no other mark awarded allow CO_2 produced which causes global warming **or** CO_2 produced by burning fuel or heating the furnace for **1** mark*

1

(iii) any **one** from:

- large amounts of fuels / energy used (for the furnace and electrolysis)

  allow large amounts of electricity needed

  ignore high temperature / electrolysis unqualified

- (the extraction has) many steps / stages / processes

  allow (extraction) is a long process / takes a lot of time

- large amounts of ore / material have to be mined

  allow ores contain a low percentage of copper

1

(iv) (copper ions move towards) the negative electrode */ cathode*

1

because copper ions / Cu^{2+} are positively charged **or** are oppositely charged **or** copper ions need to gain electrons

*allow because metal ions are positive **or** opposites attract*

1

(v) (growing) plants

1

[9]

Q19.

(a) (i) gas

1

(ii) Increases

1

(b) (i) –1

allow Cl^-

allow –

allow negative

1

(ii) sodium + chlorine → sodium chloride

allow correct symbol equation

1

(c) reduce microbes

accept sterilise

accept prevent diseases

allow disinfect

allow kill bacteria / germs / microbes / micro-organisms

allow to make it safe to drink

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ignore get rid of bacteria

1

(d) any **one** from:

- no freedom of choice
  allow unethical
- fluoride in toothpaste
- too much can cause fluorosis
  allow too much can cause damage to teeth

1

[6]

Q20.

(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

(b) (i) 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

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

or

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company may be biased

allow company trying to sell products

1

[6]

Q21.

(a) 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

(b) 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

(c) cheap / easy / quick to use (process)

accept prevents typhoid / cholera

ignore reference to specialists or equipment

1

(d) (i) 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

(ii) (more likely) to have support / influence / convince people

ignore well respected

allow ideas about trust eg people will have more confidence in their views / more likely to be believed

allow ideas about expertise eg more likely to know what they are talking about / have done experiments / tests

allow have knowledge / understanding

allow (more) reliable

1

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

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owtte

or

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

ignore based on evidence unqualified

allow hearsay / opinion can be biased

1

[7]

Q22.

(a) kills bacteria / sterilises (water)

allow kills microorganisms / microbes / germs

*allow 'makes (water) safe (to drink)' **or** disinfectant*

*ignore cleans water **or** removes impurities / bacteria*

1

(b) goes colourless / decolourised (from red / red-brown / brown / yellow / orange)

allow colour disappears

*ignore 'goes clear' **or** discoloured*

*do **not** accept incorrect initial colour*

*do **not** accept precipitate*

1

(c) (i) Br_2 **and** $2Cl^-$

allow multiples / fractions if whole equation balanced

1

(ii) changes to red / red-brown / brown / yellow / orange

*do **not** accept effervescence / fizzing / precipitate / gas given off*

ignore vapour / temperature changes / ignore initial colour

1

(d) (i) 7 outer electrons **or**

same number of outer electrons

allow last / final shell for outer
allow energy level / orbit / ring for shell
allow 'need to gain 1 e^- to have a full outer shell'
ignore 'similar number of outer electrons'

1

(ii) bromine / it (atom) is bigger **or**

must be a comparison

outer electrons (level / shell) further from nucleus **or** more shells

*do **not** accept more outer shells*
ignore more electrons

forces / attractions are weaker **or** more shielding **or** attracts less

*do **not** accept magnetic / gravitational / intermolecular forces*
allow 'electron(s) attracted less easily'

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electron(s) gained less easily

*"outer / last / final" must be mentioned once, otherwise max **2** marks.*
accept converse for chlorine throughout where clearly stated

3

(e) (i) white precipitate **or** white solid

ignore names of chemicals

1

(ii) cream precipitate **or** cream solid

allow pale yellow / off-white precipitate / solid
ignore names of chemicals

1

[10]

Q23.

(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

(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

[3]

Q24.

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

ignore references to removal of hardness

method 1:

filter

ignore screening / sedimentation

explanation 1:

remove insoluble substances / remove solids / small bits / dirt / mud/ soil / sand / silt

method 2:

precipitate / flocculate / add eg. alum

allow other named substances

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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 'remove bacteria'

ignore disinfect

[3]

Q25.

(a) hydrogen

accept H_2

*do **not** accept H*

1

(b) litmus paper / Universal Indicator paper / pH paper

allow any suitable named indicator

1

bleached / turns white **or** loses its colour

*do **not** accept bleached cloth / leaves etc.*

allow second mark unless incorrect indicator given

allow starch iodide paper (1)
goes black / blue black (1)

allow potassium iodide solution (1) goes brown / orange / black precipitate (1)

1

(c) because they have a negative charge **or** opposite charges attract

accept (because) it is Cl^-

*accept chlorine, Cl **or** chlorine ions has a negative charge*

*do **not** accept Cl^- on its own*

*do **not** accept Cl_2 o.e. has negative charge*

1

(d) kill bacteria / germs, etc. **or** sterilise / disinfect

accept destroys bacteria etc.

ignore clean / purify water (owtte)

*do **not** accept just gets rid of bacteria*

1

(e) hydroxide (ion)

accept OH^-

1

[6]

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Q26.

(a) hydrogen

for 1 mark

1

(b) chloride ions are negative;
negative ions move to positive electrode

each for 1 mark

2

(c) any **one** use of chlorine e.g.
sterilisation;
bleaching;
making plastics

any one for 1 mark

1

[4]

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