Mark schemes

Q1.

(a) (mass) balance

allow scales

1

(volume) measuring cylinder

allow burette / pipette

1

(b) (mass of salt = 30.49 – 30.44 =)
0.05 (g salt)

1

(mass of salt in 1000 cm^3 =)
$\frac{1000}{50} \times 0.05$

allow correct use of incorrectly determined mass of salt

1

= 1.0 (g)

1

alternative approach:

(volume ratio = $\frac{1000}{50}$) = 20 (1)

(mass of salt in 1000 cm^3) = (30.49 – 30.44) × 20 (1)

allow correct use of incorrectly determined volume ratio

= 1.0 (g) (1)

(c) heat the evaporating dish and salt again

1

measure the mass of the evaporating dish and salt again

1

(d) (no condenser)

(more) steam escapes
or
less steam condenses

allow converse for condenser
allow water vapour for steam

1

(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

(e) (distilled) water is pure

allow microbes are destroyed (by distillation)

1

(f) using chlorine

1

using ozone

1

(g) pH 7

1

[13]

Q2.

(a) use of oil has decreased by 0.8%
or
use of oil has decreased from 1.3% to 0.5%

1

use of solar energy has increased by 3.4%
or
use of solar energy has increased from 0% to 3.4%

allow any value below 0.05% for 2007

1

any **one** from:

- use of oil increased from 2007 to 2009
- no change in oil use between 2013 and 2015
- no change in solar energy use between 2007 and 2009

  allow use of oil was highest in 2009
- use of solar energy increased most between 2013 and 2015
- between 2007 and 2011 more oil was used **and** between 2013 and 2017 more solar energy was used

*if no other mark is awarded, allow **1** mark for oil decreased **and** solar energy increased*

1

(b) **Level 3**: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

5–6

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

- carbon dioxide produced
- (which is) a greenhouse gas
- (therefore) surface temperature increases
- (therefore) global warming
- (so) climate change
- (so) polar ice caps melt
- (so) increasing sea levels
- (so) flooding
- (so) extreme weather events
- (so) reduction in biodiversity
- (so) famine ***/*** drought

- sulfur dioxide produced
- (which causes) acid rain
- (so) damage to buildings / statues
- (so) damage to trees
- (so) damage to aquatic animals
- (so) respiratory problems in humans

- carbon ***/*** soot produced
- (which are) particulates
- (which cause) global dimming
- (so) respiratory problems in humans

- carbon monoxide produced
- (which is) toxic

(c) solar is (a) renewable (source of energy)

allow oil is (a) finite (source of energy)

1

(d) any **two** from:

- sunshine is unreliable
- increased demand for energy
- lack of space

ignore references to cost

2

[12]

Q3.

(a) (lead is) toxic / poisonous

allow (lead is) harmful

ignore (lead is) dangerous / deadly / lethal

1

(b) the proportions (of metals) are different

1

(c) any **three** from:
- recycling conserves copper ores
- recycling uses less energy
- recycling reduces waste

ignore references to cost

allow copper ores are finite

allow recycling reduces use of landfill

- mining / quarrying cause environmental impacts

allow description of environmental impact caused by mining / quarrying

3

(d) grow plants (on land containing copper ores)

allow named plant

1

plants are burnt (to produce ash)

1

ash dissolved in acid (to produce a solution of a copper compound)

1

electrolysis of solution (containing a copper compound)
or
displacement (of copper) from solution (containing a copper compound)

allow addition of scrap iron to the solution (of a copper compound)

1

(e) any **two** from:
- high grade ores still available
- land not available
- phytomining takes a long time
- new technology

allow demand not high enough

2

[11]

Q4.

(a) **Level 2**: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

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

- 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

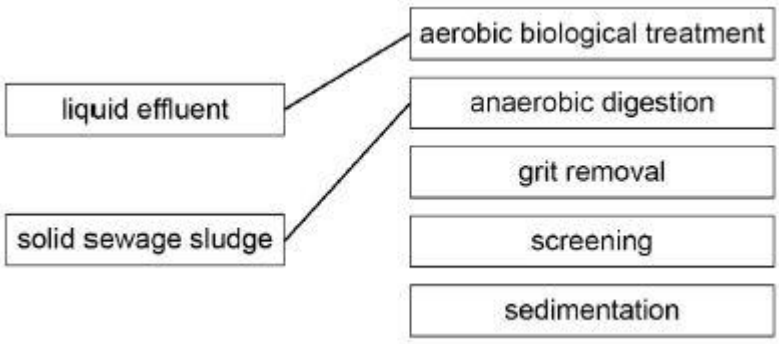
(b) any **one** from:
- distillation
- reverse osmosis

allow use of membranes

allow desalination

1

(c)



1

additional line from a box on the left negates the mark for that box

1

(d) $\frac{260}{1413} \times 100$

1

= 18.40056617 (%)

1

= 18.4 (%)

allow an answer correctly calculated to 3 significant figures from an incorrect percentage calculation which uses values in the question

1

(e) any **one** from:
- the population increased

- more waste water produced
- less untreated sewage discharged

1

(f) any **two** from:

ignore references to cost

- increased demand for food (due to increasing population)

  allow more farming

- conserves energy / resources

  allow more sustainable

- landfill space is running out

  allow more awareness of the negative environmental impacts of landfill

  ignore less sent to landfill

- increased demand for organic fertiliser

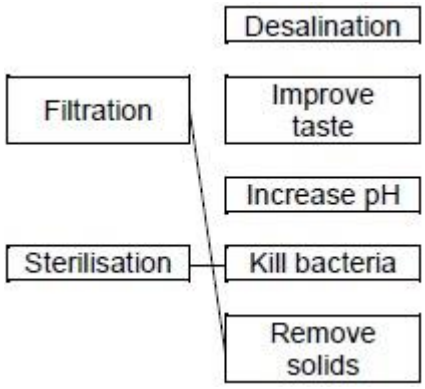
  allow lifestyle choice for organic food

2

[13]

Q5.

(a)



an extra line from a step to a reason for that step negates that mark

2

(b) chlorine

1

ozone

1

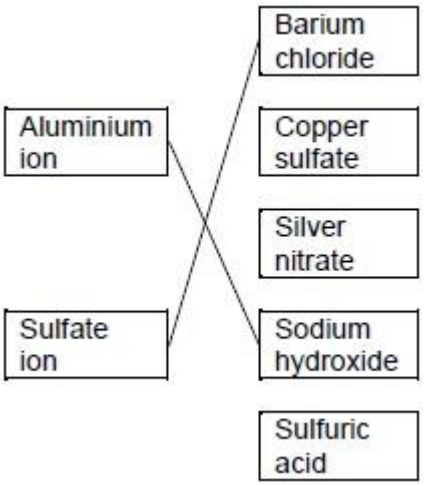
(c) evaporate all water from the sample

1

measure the sample's boiling point

1

(d)



an extra line from an ion to a compound needed negates that mark

2

(e) distillation

1

[9]

Q6.

(a) colourless

1

odourless

1

toxic

1

any order

if more than three answers are given, apply the list principle as follows:

Number of answers	Number correct	Number incorrect	Mark awarded
4	3	1	2
	2	2	1
	1	3	0
5	3	2	1
	2	3	0
	1	4	0

(b) oxygen

allow air / O_2

1

(c)

*an answer of 24 (g) scores **2** marks*

$\frac{36}{12} \times 8$

1

= 24 (g)

1

(d) animal waste

1

food in landfill

1

[8]

Q7.

(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

(g) 0.05 g

1

(h) did not immerse the thermometer (bulb)

1

[10]

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]