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 cm3 =)

$$\frac{1000}{50} \times 0.05$$

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 cm3) = (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

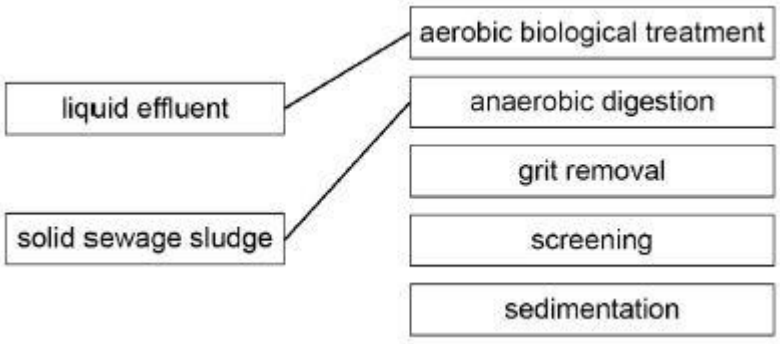
(b) any one from:

- 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

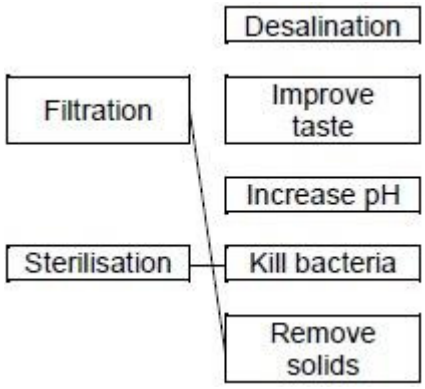
  allow lifestyle choice for organic food

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

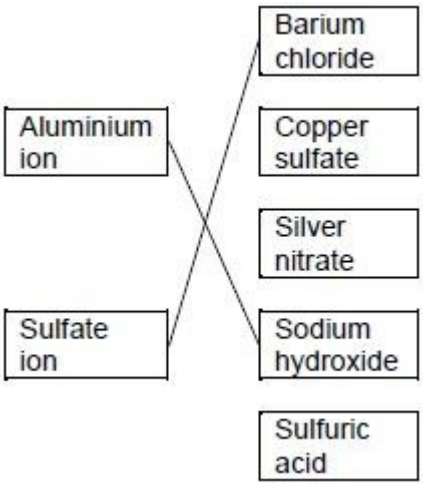
(c) evaporate all water from the sample

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 / O2

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]