Mark schemes

Q1.

(a) (test)
flame test

1

(result)
yellow (flame)

OR

(test)
flame emission spectroscopy (1)
allow FES

(result)
lines match sodium spectrum (1)

1

(b) (test)
(add acidified) silver nitrate
(solution)

1

(result)
white precipitate
MP2 is dependent upon the award of MP1

1

(c) to ensure that all the water has evaporated

1

(d) mass of evaporating dish and dry contents – mass of empty evaporating dish

1

(e)

(mean concentration of NaCl =)
$$\frac{35.2 + 34.6 + 36.4 + 33.8}{4}$$

or

$$\frac{140}{4}$$

1

= 35.0 (g/dm^3)
allow **1** mark for
$$\frac{35.2 + 34.6 + 33.8}{3} = 34.5$$

1

(mean concentration of Na^+ =)

$35.0 \times \frac{39.3}{100}$

allow correct use of an incorrectly determined mean concentration of sodium chloride

1

= 13.8 (g/dm^3)

allow 13.755 correctly rounded to at least 3 significant figures

1

alternative approach 1:

(total concentration of NaCl =
35.2 + 34.6 + 36.4 + 33.8 = 140
total concentration of Na^+ =)

$140 \times \frac{39.3}{100}$ (1)

= 55.02 (g/dm^3) (1)

allow 1 mark for

(35.2 + 34.6 + 33.8 = 103.6)

$103.6 \times \frac{39.3}{100}$ = 40.71

(mean concentration of Na^+ =)

$\frac{55.02}{4}$ (1)

allow correct use of incorrectly determined concentration(s) of Na^+

=13.8 (g/dm^3) (1)

allow 13.755 correctly rounded to at least 3 significant figures

alternative approach 2:

(concentrations of Na^+ =)

$35.2 \times \frac{39.3}{100}$

$34.6 \times \frac{39.3}{100}$

$36.4 \times \frac{39.3}{100}$

$33.8 \times \frac{39.3}{100}$ (1)

= 13.83 13.60 14.31 13.28 (1)

*allow **1** mark if a concentration of 36.4 is treated as an anomaly and not used*

(mean concentration of Na^+ =)
$$\frac{13.83 + 13.60 + 14.31 + 13.28}{4}$$ (1)

allow correct use of an incorrectly determined total concentration of Na^+

=13.8 (g/dm^3) (1)

allow 13.755 correctly rounded to at least 3 significant figures

[10]

Q2.

(a) **Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.

5-6

Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.

3-4

Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1-2

No relevant content

0

Indicative content

(potassium ions)
- **place sample on (clean metal) wire**
- **introduce into (blue / non-luminous) flame**
- using (Bunsen) burner
- **observe lilac flame colour**
- which shows presence of potassium (ions)

(bromide ions)
- **dissolve sample**
- in (distilled) water
- in test tube
- add (dilute) nitric acid
- **add silver nitrate (solution)**
- using (dropping) pipette
- **observe cream precipitate (formed after addition of silver nitrate solution)**
- which shows presence of bromide (ions)

(b) flame emission spectroscopy

1

(c) any **one** from:
- (more) accurate
- (more) sensitive
- fast(er)
- determine the concentration of ions present

allow requires a small(er) sample

1

[8]

Q3.

(a) 100

1

7

1

must be in this order

(b) pH probe / meter

or

universal indicator (paper / solution)

allow wide range indicator (paper / solution)

1

(c) balance

1

measuring cylinder

1

(d) (mean =) $\frac{1.73 + 1.70 + 1.75 + 1.78}{4}$

1

= 1.74 (g)

1

(e) (mass =) $\frac{1.5 \times 1000}{50}$

1

= 30 (g)

1

(f) yellow

1

(g) white

1

[11]

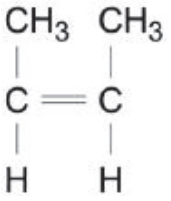
Q4.

(a) C=C bond

2 × C-H bonds **and** 2 × C-CH_3 bonds

*do **not** accept extra bonds*

an answer of



*scores **2** marks*

2

(b) any **one** from:

- (otherwise) the copper (produced) would be impure

  allow (otherwise) the copper (produced) would be contaminated
- (otherwise) the copper (produced) would be a mixture
- (otherwise) the insulation would burn / melt (during recycling)

  allow (otherwise) poly(butene) could produce toxic fumes
- copper and poly(butene) are recycled by different methods

1

(c) (wire heated until) copper melts

1

(re)cast / reformed (into pipes)

allow (re)shaped / extruded / (re)moulded

1

(d) any **two** from: (recycling scrap copper)

- uses less energy
- conserves copper (ore)
- (produces) less waste

  allow less landfill required

- specified environmental impact

  allow converse statements for extracting copper from ores

  ignore references to cost

2

(e) sodium hydroxide (solution)

allow NaOH for sodium hydroxide

1

blue precipitate

allow blue solid

1

MP2 dependent on MP1

(f) (add acidified) barium chloride (solution)

allow $BaCl_2$ for barium chloride

allow (add acidified) barium nitrate (solution)

*do **not** accept add sulfuric acid*

1

white precipitate

allow white solid

1

MP2 dependent on MP1

[11]