AQA Chemistry GCSE

Required Practical 4 - Temperature Changes

Mark Scheme

Q1. (a) (i) 40

correct answer with or without working or incorrect working if the answer is incorrect then evidence of 24 + 16 gains 1 mark

ignore units

(2)

(ii) 60

correct answer with or without working or incorrect working if the answer is incorrect then evidence of 24/40 or 24/(i) gains 1 mark

ecf allowed from part(i)

ie 24/(i) ×100

ignore units

(2)

(iii) 15

ecf allowed from parts(i) and (ii)

24/(i) × 25 or (ii)/100 × 25

ignore units

(1)

(b) (i) any two from:

ignore gas is lost

- error in weighing magnesium / magnesium oxide
  allow some magnesium oxide left in crucible
- loss of magnesium oxide / magnesium
  allow they lifted the lid too much
  allow loss of reactants / products
- not all of the magnesium has reacted
  allow not heated enough
  allow not enough oxygen / air

(2)

(ii) any two from:

ignore fair test

•check that the result is not anomalous

•to calculate a mean / average

allow improve the accuracy of the mean / average

•improve the reliability

allow make it reliable

•reduce the effect of errors

(2)

Q2 (a) left hand: (conical) flask

Do not accept round bottomed flask or container which is not a flask

(1)

right hand: beaker / trough
accept plastic box

(1)

(b) (i) 157

(1)

(ii) all calcium carbonate used up
or
reaction stopped
Do not accept all acid used up

(1)

Q3. (a) 31

1

(b) (i) any **two** from:
- incorrect reading of thermometer / temperature
- incorrect measurement of volume of acid
- incorrect measurement of volume of alkali (burette).

2

(ii) glass is a (heat) conductor **or** polystyrene is a (heat) insulator
*answer needs to convey idea that heat lost using glass **or** not lost using polystyrene*
accept answers based on greater thermal capacity of glass (such as "glass absorbs more heat than polystyrene")

1

(c) (i) temperature increases

1

(ii) no reaction takes place **or** all acid used up **or** potassium hydroxide in excess

1

cool / colder potassium hydroxide absorbs energy **or** lowers temperature
ignore idea of heat energy being lost to surroundings

1

(iii) take more readings
ignore just "repeat"

1

around the turning point **or** between 20 cm^3 and 32 cm^3

accept smaller ranges as long as no lower than 20 cm^3 and no higher than 32 cm^3

1

Q4

(a) any **one** from:

- solution becomes colourless or colour fades
- zinc becomes bronze / copper coloured

  allow copper (forms) or a solid (forms)
- zinc gets smaller

  allow zinc dissolves
- bubbles or fizzing.

  ignore precipitate

1

(b) improvement:
use a plastic / polystyrene cup or add a lid

accept use lagging / insulation

1

reason - must be linked
reduce / stop heat loss
OR
improvement:
use a digital thermometer

allow use a data logger

reason - must be linked
more accurate or easy to read or stores data

allow more precise or more sensitive

ignore more reliable

ignore improvements to method, eg take more readings

1

(c) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best–fit' approach to the marking.

0 marks
No relevant content

Level 1 (1–2 marks)
There is a statement about the results.

Level 2 (3–4 marks)
There are statements about the results. These statements may be linked or may include data.

Level 3 (5–6 marks)
There are statements about the results with at least one link and an attempt at an explanation.

Examples of chemistry points made in the response:
Description:
Statements
Concentration of copper sulfate increases
Temperature change increases
There is an anomalous result
The temperature change levels off
Reaction is exothermic

Linked Statements
Temperature change increases as concentration of copper sulfate increases
The temperature change increases, and then remains constant
After experiment 7 the temperature change remains constant

Statements including data
The trend changes at experiment 7
Experiment 3 is anomalous

Attempted Explanation
Temperature change increases because rate increases
Temperature change levels off because the reaction is complete

Explanation
As more copper sulfate reacts, more heat energy is given off
Once copper sulfate is in excess, no further heat energy produced

6

Q5.

.(a) eg plastic (beaker) / insulation / lid / cover **or** any mention of enclosed

any sensible modification to reduce heat loss

ignore prevent draughts

ignore references to gas loss

ignore bomb calorimeter

1

(b) all the substances react **or** all (the substances) react fully / completely **or** heat evolved quickly **or** distribute heat

'so they react' is insufficient for the mark

accept increase chances of (successful) collisions / collision rate increase

*do **not** accept rate of reaction increase / make reaction faster*

1

(c) experiment 2 **and**
different / higher / initial / starting temperature

accept experiment 2 ***and*** *the room is hotter / at higher temperature*

do ***not*** *accept temperature change / results higher*

1

(d) temperature change does not fit pattern

accept anomalous / odd ***or*** *it is the lowest* ***or*** *it is lower than the others* ***or*** *it is different to the others*

'results are different' is insufficient

1

(e) 7 / 7.0

1

(f) (100 × 4.2 × 7) = 2940

ecf from (e)

(g) diagram A **and**
reaction exothermic / heat evolved / Δ H is negative / temperature rises

accept energy is lost (to the surroundings)

accept energy of products lower than reactants

allow arrow goes downwards

1

[7]