Reactions of Acids

Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.4 Chemical Changes
Sub-Topic	Reactions of Acids
Difficulty Level	Bronze Level
Booklet	Mark Scheme 1

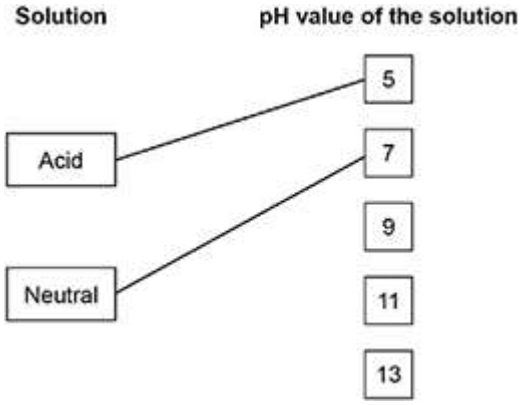
Time Allowed: **58 minutes**

Score: **/56**

Percentage: **/100**

Grade Boundaries:

M1.(a)



extra lines from solution negate the mark

2

(b) H^+

1

(c) 3

1

(d) Neutralisation

1

(e) sodium sulfate

1

(f) Add indicator to sodium hydroxide solution

allow add indicator to sulfuric acid

1

Add sulfuric acid (gradually)

allow add sodium hydroxide solution (gradually)

1

allow pH probe

until indicator just changes (colour)

or until universal indicator turns green or shows pH7

1

[9]

M2.Level 3 (5–6 marks):

A coherent method is described with relevant detail, which demonstrates a broad understanding of the relevant scientific techniques, procedures and safety precautions. The
steps in the method are logically ordered with the dependent and control variables correctly identified. The method would lead to the production of valid results.

Level 2 (3–4 marks):
The bulk of a method is described with mostly relevant detail, which demonstrates a reasonable understanding of the relevant scientific techniques, procedures and safety precautions. The method may not be in a completely logical sequence and may be missing
some detail.

Level 1 (1–2 marks):
Simple statements are made which demonstrate some understanding of some of the relevant scientific techniques, procedures and safety precautions. The response may lack a logical structure and would not lead to the production of valid results.

0 marks:
No relevant content

Indicative content

Named chemicals
- copper oxide
- sulfuric acid
- copper sulfate

Correct use of apparatus
- stirring rod
- spatula
- beaker
- filter funnel and filter paper
- evaporating basin
- Bunsen burner
- tripod and gauze
- bench mat
- conical flask

Method
- add (excess) copper oxide to sulfuric acid
- heat the mixture
- filter the mixture
- method to evaporate some of the water from the filtrate eg using a water bath or evaporating to half volume
- leave solution (to cool and) to form crystals
- remove and dry crystals

Safety
- wearing of safety glasses / goggles
- care with use of sulfuric acid as corrosive
- warming not boiling mixture of copper oxide and sulfuric acid
- hold beaker containing warm mixture with tongs whilst filtering

[6]

M3.(a) it goes up / increases

1

because the reaction is exothermic **or** transfers energy to the surroundings

allow gives out thermal / heat energy

1

(b) $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

1

(c) copper sulfate

1

(d) **X** bubbles of gas

1

Y no bubbles of gas

1

(e) calcium>magnesium>zinc>copper

*if not all correct allow **1** mark for at least two metals in the correct position*

2

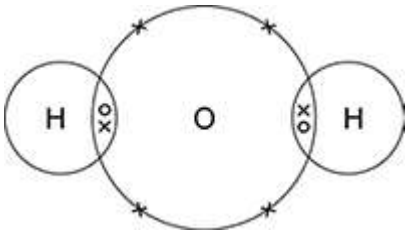
(f)

Chemical test	**Gas**
Put in a lighted splint. The gas burns with a pop sound.	Hydrogen
Put in a glowing splint. The gas relights the splint.	Oxygen
Put into limewater. The gas turns limewater cloudy.	Carbon dioxide
	Chlorine
	Nitrogen

extra lines from a test negate the mark

3

(g)



two pairs of shared electrons

1

oxygen has four other electrons not bonded

1

[13]

M4.(a) (i) (19.5 + 18.5 + 19.0) / 3

*allow (23.0 + 19.5 + 18.5 + 19.0) / 4 for **1** mark*

2

(ii) R P Q

*allow Q P R for **1** mark*

2

(b) any **two** from:

- repeat more times
- calculate a mean
- measure to one decimal place.

2

(c) both students get similar results / similar pattern

1

[7]

M5.(a) four

1

covalent

1

(b) because it has a high melting point

accept it won't melt
accept it won't decompose or react
allow withstand high temperatures
ignore boiling point

1

(c) thin

1

[4]

M6.(a) (i) sulfuric

1

(ii) 1

1

(iii) to speed up the reaction

1

(b) because copper oxide in excess

allow copper oxide unreacted

or

because acid all used up / neutralised

1

(c) evaporation

allow heating
allow cooling
allow leave (to evaporate)
*do **not** accept freezing*

or

crystallisation

1

(d) Some copper sulfate may have been lost during the experiment

1

[6]

M7. (a) sodium has a lower density

1

sodium is more reactive

1

(b) hydrogen

1

(c) $OH^-(aq)$

1

[4]

M8.(a) (i) react

allow neutralise
allow bubbles / fizzes
accept produces gas / CO_2F
ignore rises

1

(ii) stop <u>reacting</u> / <u>producing</u>

stops on its own is insufficient allow stop working / bubbling / fizzing

1

the (hydrochloric) acid / (calcium) carbonate is used up

accept because the (calcium) carbonate has neutralised the (hydrochloric) acid

OR

have been used up (1)

the graph line becomes horizontal / levels out (1)

OR

stays the same / no change (1)

ignore reference to graph line

no further reaction (1)

1

(iii) bubble the gas through limewater / calcium hydroxide solution

allow (add) limewater

test must be correct to gain result mark

1

(the solution) goes cloudy

allow milky

1

(b) advantage > Quarrying limestone provides building materials, employment and new road links

1

disadvantage > Quarrying limestone releases dust, and lorries release carbon dioxide from burning diesel fuel

1

[7]