GCSE
CHEMISTRY

Topic Paper: 8.2 & 8.3 Identification of gases and ions
Part 1 & 2 Mark Scheme

MARK SCHEME

61 Marks

M1. (a) (acidified) barium chloride / nitrate

*incorrect reagent **or** no reagent = **0** marks*
*do **not** accept acidified with sulfuric acid (still allow result mark if correct)*
*allow solution of barium ions / salt **not** barium solution*
*do **not** accept barium hydroxide*

1

(white) precipitate / solid

*do **not** accept incorrect colour for precipitate*
allow barium sulfate (formed)
ignore 'it goes white / cloudy'

1

(b) (white) precipitate / solid

allow aluminium hydroxide (formed)
*do **not** allow incorrect colour for precipitate*

1

(precipitate) dissolves (in excess)

allow sodium aluminate (formed)
allow goes clear / colourless
if incorrect colour precipitate then allow dissolves (in excess)

1

(c) any **two** from:

apply list principle

yellow = sodium (alum)
*allow orange **or** yellow orange*

lilac = potassium (alum)
allow purple

colourless = ammonium (alum)
*if no colours given, allow 'different coloured flames' for **1** mark*

2

[6]

M2. (a) Drain Buster is a concentrated sodium hydroxide solution that would damage the skin

1

therefore it is diluted so that it is safe to use for the experiment

1

(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.

No relevant content.

0 marks

There is a brief description of the titration that may include a risk assessment.

Level 1 (1–2 marks)

There is some description of the titration that may include a risk assessment.

Level 2 (3–4 marks)

There is a clear, balanced and detailed description of the titration and an appropriate risk assessment.

Level 3 (5–6 marks)

examples of the chemistry points made in the response

burette / acid / HCl used correctly

pipette used for Drain Buster solution / alkali / NaOH correctly

read meniscus at eye level

acid / HCl added dropwise

indicator used

white background/tile

end-point of titration recorded

swirling/mixing

repeat

example of risk assessment points made in the response eg

Wear safety goggles – to protect eyes because
hydrochloric acid is corrosive / irritant and / or
sodium hydroxide is caustic

[8]

M3. (a) (i) hydrochloric acid / HCl

accept any (named) acid

1

carbon dioxide / CO_2

*accept bubbles / fizz / gas **or** limewater gets milky*
ignore 'add limewater'
*do **not** accept other named gases*
2nd mark dependant on first mark
*accept for this answer only heat gives CO_2 / limewater milky = **1** mark*

1

(ii) (white) precipitate / solid

ignore names of substances even if incorrect
accept white deposit / substance
*do **not** accept any coloured precipitate*

1

(iii) eg flame colour of (Na) and flame colour of (K)
interfere / mask / mix with each other

*accept 'can't see the colours' **or** 'difficult to determine the colour' **or** 'both produce different colours' **or** a correct statement of colours **or** hard to distinguish*

1

(b) (i) eg essential (mineral) **or** everyone
needs it / some (salt) **or** problems
with health if have no salt

accept preservative / flavouring / taste
it = salt
(all) foods contain / use it / sodium chloride / salt

1

(ii)

mark positively ie no list principle

advantages

any **two** from:

*ignore economic arguments throughout **or** people eat less salt*

more people will be healthier

(should have) less heart disease

(should have) less cancer

(more people with) lower blood pressure

2

disadvantages

any **one** from:

ignore references to too much / too little (salt)

not everyone affected

not enough evidence

does not provide choice

undemocratic

less taste / flavour
ignore no flavour / taste

shorter shelf life / not preserved (as long)
ignore references to sell by dates

too much potassium chloride might be bad

1

[8]

M4. (a) (i) red / brick-red / orange-red / red-orange
allow red-brown or brown-red
*do **not** accept orange alone eg 'red or orange' = 0*

1

(ii) sodium
allow sodium compounds
ignore incorrect symbol

or Na / Na^+

*if symbol alone given do **not** accept Na^{2+} **or** Na^-*

1

(iii) any **one** from

accurate / sensitive

use small amounts

fast / quick / rapid

ease of automation

reliable / efficient

operatives do not need chemical skills
*ignore cost / safety / human error **or** ease of use **or** shows all the elements*

1

(iv) (atomic absorption) spectroscopy **or** (mass) spectrometry

*accept AAS / aas **or** mass spec*
accept atomic absorption
ignore ms / MS
*do **not** allow UV / IR / NMR / chromatography / GLC*

1

(b) any **three** from:

(safe because) similar to mothers. milk

allow calcium carbonate is in breast milk
allow some mothers unable to breast feed
ignore 'recommended' alone

babies (in developing world) would die

accept causes malnutrition

if banned there would be a cost involved

allow it is free

it is not a pollutant / harmful / dangerous

accept not all chemicals are pollutants / harmful / dangerous

not mass medication

not just used for gravestones

allow it has many uses
*ignore only small amounts of it **or** it occurs naturally*

(calcium carbonate) is needed for bones / teeth / health

allow 'essential mineral'

Mrs Right has a personal interest **or** not impartial **or** distorts information / bias **or** she is paid by a charity

accept 'it is (only) her opinion'

3

[7]

M5. (a) kills bacteria / sterilises (water)

allow kills microorganisms / microbes / germs
*allow 'makes (water) safe (to drink)' **or** disinfectant*
*ignore cleans water **or** removes impurities / bacteria*

1

(b) goes colourless / decolourised (from red / red-brown / brown / yellow / orange)

allow colour disappears
*ignore 'goes clear' **or** discoloured*
*do **not** accept incorrect initial colour*
*do **not** accept precipitate*

1

(c) (i) Br_2 **and** $2Cl^-$

allow multiples / fractions if whole equation balanced

1

(ii) changes to red / red-brown / brown / yellow / orange

*do **not** accept effervescence / fizzing / precipitate / gas given off*
ignore vapour / temperature changes / ignore initial colour

1

(d) (i) 7 outer electrons **or**

same number of outer electrons

allow last / final shell for outer
allow energy level / orbit / ring for shell
allow 'need to gain 1 e^- to have a full outer shell'
ignore 'similar number of outer electrons'

1

(ii) bromine / it (atom) is bigger **or**

must be a comparison

outer electrons (level / shell) further from nucleus **or** more shells

*do **not** accept more outer shells*
ignore more electrons

forces / attractions are weaker **or** more shielding **or** attracts less

*do **not** accept magnetic / gravitational / intermolecular forces*
allow 'electron(s) attracted less easily'

electron(s) gained less easily

*"outer / last / final" must be mentioned once, otherwise max **2** marks.*
accept converse for chlorine throughout where clearly stated

3

(e) (i) white precipitate **or** white solid

ignore names of chemicals

1

(ii) cream precipitate **or** cream solid

allow pale yellow / off-white precipitate / solid
ignore names of chemicals

1

[10]

M6. (a) (i) Na_2CO_3: HCl → gas / effervescence / bubbles (1)

CO_2 / carbon dioxide / turns lime water milky (1)

1

NaCl: $AgNO_3$ → white ppt (1)

silver chloride (1)

1

$NaNO_3$: Al + NaOH → pungent / sharp smell / choking gas (1)
NH_3 / ammonia / turns (red) litmus blue(1)

1

Na_2SO_4: $BaCl_2$ → white ppt (1)
barium sulfate (1)

1

*each correct test and one result = **1** mark*
***one** other result for any test = **1** mark this mark can only be awarded once*

(ii) all would give a yellow / yellow-orange (flame) / same coloured (flame) / same results
allow orange (flame) 1

or

they all contain sodium

1

(b) any **two** from:
ignore cost/errors

fast / quick or comment about speed
allow precise

small amounts/sensitive
allow can be left to run/continuous analysis

accurate

ease of automation
accept operators do not need chemical skills

sample not used up

reliable / efficient

2

[7]

M7. (a) (i) (bubble gas produced through) limewater
incorrect tests = zero

1

(limewater) goes cloudy / milky

1

(ii) *ignore yes or no*

red flame indicates that calcium / lithium ions present
allow aluminium has no flame colour

or

Ca/Mg also produce a (white) precipitate with NaOH

1

the (white) precipitate formed in test 3 **or** by adding sodium hydroxide solution would dissolve (in excess) if aluminium ions were present

1

(iii) *ignore yes or no*

because a white precipitate is formed in test 4 **or** by adding silver nitrate

1

but chloride ions are in hydrochloric acid

1

(b) (i) mass spectrometry

allow MS

or

atomic absorption spectroscopy

allow AAS

spectrometry / spectroscopy alone is insufficient

1

(ii) can detect a small(er) amount of the substance

allow can detect small(er) changes

allow small(er) sample sizes

ignore references to precision / accuracy

1

[8]

M8. (a) lithium

allow Li^+ / Li

1

yellow

allow orange

1

(b) silver nitrate (solution)

*incorrect test = **0** marks*
ignore (nitric) acid
*do **not** allow other named acids*

1

white precipitate

1

(c) blue precipitate (with sodium hydroxide) indicates copper ions

allow Cu^{2+}

1

and white precipitate (with barium chloride) indicates sulfate ions

allow SO_4^{2-}

*accept compound X is copper sulfate / $CuSO_4$ for **1** mark*

1

but iron(II) ions produce a green precipitate (with sodium hydroxide)

1

[7]