

M1. (a) (i) carbon dioxide / CO₂ 1

carbonate / CO₃²⁻
answers must be in the order shown
marks are independent 1

(ii) ammonia / NH₃ 1

litmus
answers must be in the order shown
marks are independent 1

(b) (i) solution is blue
accept blue precipitate only if sodium hydroxide added
allow blue liquid
allow copper sulfate / copper ions are blue 1

(ii) barium chloride / BaCl₂
allow barium nitrate / barium ions / Ba²⁺ 1

white
answers must be in the order shown
marks are independent 1

[7]

M2. (a) limewater / calcium hydroxide 1

(limewater) goes milky / cloudy

do not allow this mark if lime water added to solution or powder

or

gives white precipitate / solid

1

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

accept difficult to determine the colour

or

hard to distinguish

accept some indication that two distinct colours are not seen

1

(c) (i) barium chloride (solution) / BaCl_2

ignore mention of acidification but

do not allow sulfuric acid.

wrong reagent = no mark

1

white precipitate / white solid

allow white barium sulfate

or

barium sulfate precipitate

1

(ii) white precipitate / white solid

ignore goes milky

do not accept any mention of precipitate dissolving

1

[6]

- M3.** (a) (i) *it = copper*
- (copper) stops barnacles / seaweed (sticking)
accept lead doesn't stop barnacles / seaweed (sticking)
ignore all other properties 1
- (ii) *it = Muntz Metal*
- (Muntz Metal) is less expensive / cheaper / cheapest
must be a comparison
accept copper is more expensive
ignore other properties 1
- (b) (i) atomic absorption spec(troscopy) / spectrometry **or** mass spec(trometry) / spectroscopy
- accept spectroscopy / spectrometry alone*
allow AAS / MS
*do **not** allow NMR spectroscopy*
***or** IR spectrometry **or** chromatography* 1
- (ii) *it = instrumental method*
- sensitive **or** detect (very) small amounts
or only small sample needed
allow (more) precise
ignore accurate
allow converse for chemical method
ignore metal contains small amount / low concentration of iron 1
- (c) any **two** from:
- transition elements (= they)*
- unreactive / not very reactive
allow does not corrode

ignore reference to rust

- strong / hard
ignore tough / durable / hard wearing
- malleable / easy to shape
ignore ductile / density / melting point

2

[6]

M4. (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]

- M5. (a) (i) hydrochloric acid / HCl
accept any (named) acid 1
- carbon dioxide / CO₂
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 CO₂ / 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]

M6. (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 Na²⁺ **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]

- M7.** (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]

M8. (a) sodium carbonate / sodium hydrogencarbonate / sodium bicarbonate



ie

sodium / sodium ions (1 mark)

carbonate / carbonate ions

(1 mark)

incorrect formula including Na and

CO₃ = 1 mark

2

(b) calcium chloride



ie calcium / calcium ions (1 mark) chloride / chloride ions (1 mark)

incorrect formula including Ca and Cl = 1 mark

2

(c) iron or iron(II) ions

Fe²⁺ ferrous ions

ignore anions

ignore nickel / chromium

do not accept iron(III) or ferric ions

1

[5]