M1. (a) (i) carbon dioxide / CO_2

1

carbonate / CO_3^{2-}

answers must be in the order shown

marks are independent

1

(ii) ammonia / NH_3

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 / $BaCl_2$

allow barium nitrate / barium ions / Ba^{2+}

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 / 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 <u>white</u> 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 <u>different</u> 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 <u>no</u> 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 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 <u>chemical</u> 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) <u>attracted</u> less easily'

electron(s) gained <u>less</u> 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 <u>pale</u> yellow / off-white precipitate / solid
ignore names of chemicals

1

[10]

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

Na_2CO_3 / $NaHCO_3$

ie
*sodium / sodium ions (**1** mark)*
carbonate / carbonate ions
*(**1** mark)*
incorrect formula including Na and
*CO_3 = **1** mark*

2

(b) calcium chloride

$CaCl_2$

*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

Fe^{2+} ferrous ions
ignore anions
ignore nickel / chromium
do not accept iron(III) or ferric ions5

1

[5]