M1.(a) filtration

or

by passing through filter beds to remove solids

1

sterilisation to kill microbes

allow chlorine / ozone allow ultraviolet light

1

(b) water needs more / different processes

1

because it contains any **two** from:

- more organic matter
- more microbes
- toxic chemicals or detergents

2

(c) *(as part of glassware attached to bung)*

salt solution in (conical) flask

allow suitable alternative equipment, eg boiling tube

1

(at end of delivery tube)

pure water in test tube which must not be sealed

allow suitable alternative equipment, eg, beaker, condenser

1

heat source (to heat container holding salt solution)

1

*if no other mark obtained allow for **1** mark suitable equipment drawn as part of glassware attached to bung **and** at end of delivery tube*

(d) determine boiling point

1

should be at a fixed temperature 100°C

allow should be 100°C

allow if impure will boil at a temperature over 100°C

1

(e) high energy requirement

1

[11]

M2.(a) start line drawn in ink

1

so it will run / dissolve in the solvent / split up

allow mixes with the spots

1

spots under solvent **or** solvent above spots / start line

1

so they will mix with solvent **or** wash off paper **or** colour the solvent **or** dissolve in the solvent

1

(b) (i) contains **A** and **E**

1

and one other (unknown substance)

*if no other marks awarded, an answer saying it is made up of three colours gains **1** mark*

1

(ii) 45 or 46

allow any value from 45 to 46

1

18

allow any value from 16 to 20

*award **1** mark if numbers correct but in cm*

1

(iii) 0.40

*allow ecf from **(b)(ii)***

ignore units

1

(c) fast red

*allow ecf from **(b)(iii)***

1

has same R_f value

*allow none of them, as none has the same R_f value for **2** marks*

1

(d) any **one** from:

- more accurate
- more sensitive
- uses small quantities of samples
- quicker / faster / more rapid
- can link to mass spectrometer (MS)

1

[12]

M3.(a) (i) (phosphoric) acid

allow phosphoric

1

(ii) H^+ / hydrogen (ion)

if ion symbol given, charge must be correct

1

(b) (i) pencil

1

so it will not run / smudge / *dissolve*

ignore pencil will not interfere with / affect the results

or

because ink would run / smudge / *dissolve*

ignore ink will interfere with / affect the results

1

(ii) any **three** from:

*reference to spots / dots = max **2***

allow colouring for colour

- *3* colours in Cola

*allow more colours in cola **or** fewer colours in fruit drink*

- *2* colours in Fruit drink
- one of the colours is the same
- two of the colours in Cola are different
- one of the colours in Fruit drink is different

allow some of the colours in the drinks are different

- *one of the colours in Cola is the most soluble*

accept one of the colours in Cola has the highest R_f value

3

(c) different substances travel at different speeds **or** have different retention times

accept different attraction to solid

ignore properties of compounds

1

(d) (i) Is there caffeine in a certain brand of drink?

1

(ii) any **two** from:

- cannot be done by experiment
- based on opinion / *lifestyle choice*
- ethical, *social* or economic issue

accept caffeine has different effects on different people

2

[11]

M4. (a) (i) prevent evaporation of solvent

allow prevent loss of solvent

allow to support the (chromatography) paper

1

(ii) ink dissolves in the solvent

*allow ink 'runs' / spreads **or** pencil does not 'run' / spread*

allow ink would affect the result / mixes with colours

or

carbon / graphite does not dissolve in the solvent

accept pencil for carbon / graphite

1

(b) (i) 4

1

(ii) *no mark for 'no / don't know'*,

ignore numbers

any **one** from:

- because not all colours match
- not all colours are safe
- some colours could be unsafe
- some colours travelled higher (than safe colours)

1

(c) (i) any **two** from:

ignore reliable / precise

- rapid / quick
- accurate

- sensitive **or** detects very small quantities
  accept small sample

2

(ii) separates

1

(iii) identifies solvents / compounds / substances
accept (relative) molecular mass
accept formula mass
accept M_r
accept relative mass
accept molecular ion peak

1

[8]

M5. (a) (improve) appearance

allow add colour

allow these food colourings have not been proven to cause hyperactive behaviour in young children

*do **not** accept taste / flavour / preservatives*

ignore reference to E-numbers

1

(b) X

1

(c) any **three** from:

- S contains six / 6 colourings
- P contains five / 5 colourings

  *if neither of first 2 bullet points given allow **1** mark for S contains more colours than P **or** converse*
- both S and P contain the same

  five / 5 colourings
- both contain W **and** Y
- both sweets (may) cause hyperactivity

  ignore unsafe
- neither contain X **and** Z

3

[5]

M6. use of solvent / solution / water / any named solvent

1

separates / carries colour(s) / dye(s)

allow any idea of movement
eg runs / moves

1

match against Rf value / known chromatogram / similar pattern
or comparison to permitted additive / colour

removal of coloured additive from salmon does not gain any marks

ignore reasons for separation

*maximum **2** if technique clearly doesn't work*

1

[3]

M7. (a) check if safe to eat / healthy

or

permitted

accept references to allergies / medical problems

1

(b) any **three** from:

accept dye for colour

- made up of <u>two</u> colours / dots
- contains an unknown colour / dot
- contains a harmful <u>colour</u>
- contains E104 / quinoline yellow
  or does not contain E133 / brilliant blue
- further analysis needed

3

(c) ignore No or Yes but No must be implied

there could be <u>other</u> additives (in the sweets)

*accept any other type of additives but **not** colourings*

1

could still contain / use / add <u>natural</u> colours

accept non-artificial for natural

or

named natural colours

1

[6]