

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_r value

allow none of them, as none has the same R_r 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 two colours / dots
- contains an unknown colour / dot
- contains a harmful colour
- 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 other additives (in the sweets)

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

1

could still contain / use / add natural colours

accept non-artificial for natural

or

named natural colours

1

[6]