

Purity Formulations + Chromatography

Mark Scheme

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.8 Chemical Analysis
Sub-Topic	Purity Formulations + Chromatography
Difficulty Level	Silver Level
Booklet	Mark Scheme

Time Allowed: 45 minutes

Score: /45

Percentage: /100

Grade Boundaries:

M1.(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]

M2.(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]
- M3.** (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]

M4. (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]

M5. 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 R_f 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]

M6. (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]

