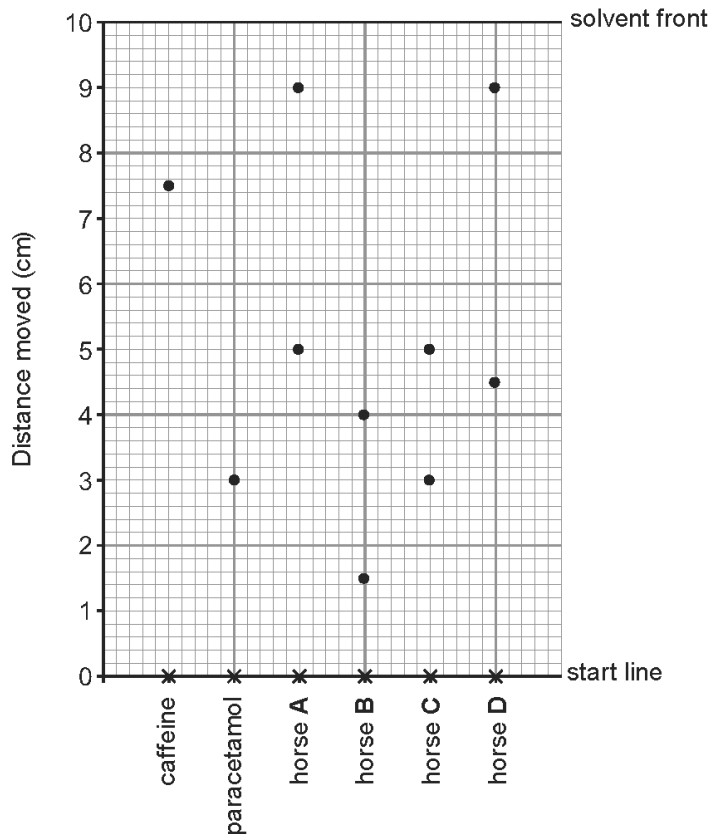


PAG C3 Chromatography

| Question | Maximum Mark | Mark Awarded |
|------------|--------------|--------------|
| 1 | 4 | |
| 2 | 4 | |
| 3 | 6 | |
| Total Mark | | |

1.

Chromatography can be used to test if racehorses have been given illegal drugs. Urine samples from four horses, A–D, were tested to find out whether they contained caffeine or paracetamol. The following diagram shows the results obtained.



(a) Give the letter of the horse, A–D, that had been given paracetamol. [1]

.....

(b) State, giving a reason, if any of the four horses had been given caffeine. [1]

.....
.....

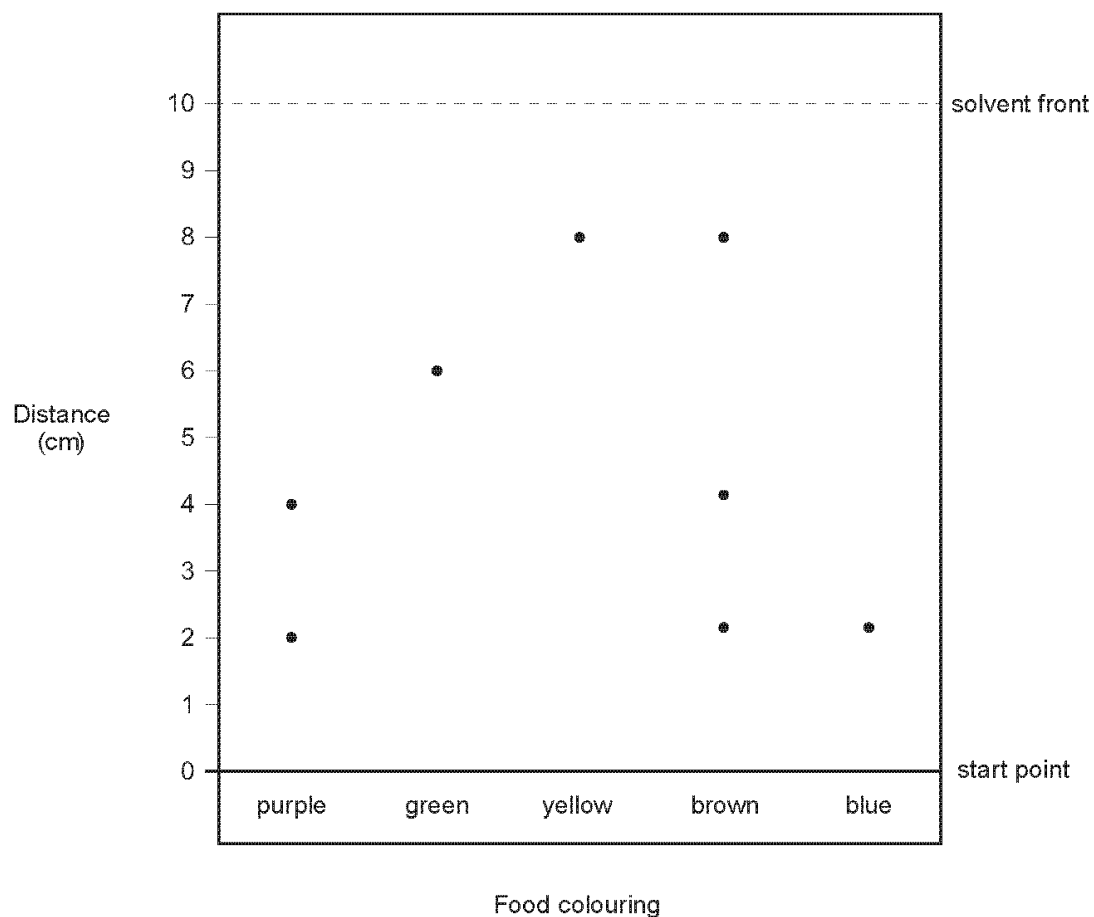
(c) The R_f value can be used to identify a substance. Use the following equation to calculate the R_f value of paracetamol. [2]

$$R_f \text{ value} = \frac{\text{distance moved by paracetamol}}{\text{distance moved by solvent}}$$

$R_f \text{ value} = \dots\dots\dots$

| |
|---|
| |
| 4 |

2. The diagram below shows the chromatogram of several food colourings.



(a) Use the chromatogram to give the two food colourings that are mixed to make brown food colouring. [1]

..... and

- (b) The R_f value of a substance can be used to identify that substance.
The R_f value for a red food colouring is 0.4.

Use the equation below to calculate the distance this red food colouring would move on this chromatogram. [2]

$$\text{distance moved} = R_f \times \text{distance moved by the solvent}$$

Distance moved = cm

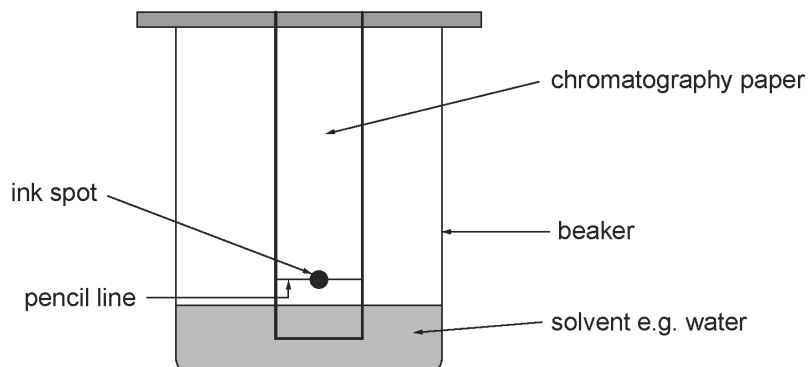
- (c) Give the reason why water is used as the solvent when obtaining this chromatogram of food colourings. [1]

.....

| |
|---|
| |
| 4 |

3.

Chromatography can be used to separate the pigments in ink.



Describe how chromatography can be used to determine whether two inks contain the same pigments. [6 QWC]

Your answer should include

- a description of how chromatography is carried out
- a description of what happens during the process
- how the results would show whether the two inks contain identical or different pigments.

You may include a diagram in your answer.

Marking Scheme

1.

| Question Number | | Sub-section | Mark | Answer | Accept | Neutral answer | Do not accept |
|-----------------|----|-------------|------|---|---------------------------|----------------|---------------|
| FT | HT | | | | | | |
| 3 | | (a) | 1 | horse C | | | |
| | | (b) | 1 | no, none have a spot corresponding to caffeine | no samples match caffeine | | |
| | | (c) | 2 | 3 (1) R _f value = 0.3 (1) correct answer only (cao) – 2 marks ft incorrect 'distance moved' only if value given divided by 10 i.e. correct distance moved by solvent – 1 mark | | | |

2.

| Question Number | | Sub-section | Mark | Answer | Accept | Neutral answer | Do not accept |
|-----------------|----|-------------|------|--|--------|----------------|---------------|
| FT | HT | | | | | | |
| 4 | | (a) | 1 | purple and yellow both needed | | | |
| | | (b) | 2 | 0.4 × 10 (1) 4 (1) award (2) for correct answer only (cao) no error carried forward (ecf) | | | |
| | | (c) | 1 | (food colourings are) soluble (in water) / (food colouring) dissolve (in water) | | | |

3.

| Question Number | | Mark | Answer |
|-----------------|----|------|--|
| FT | HT | | |
| 10 | 4 | 6 | <p>Indicative content: how it is carried out – spot of each ink on pencil line and dip end of paper in water, leave for water to rise up paper what happens – water dissolves ink and carries the components different distances according to their solubilities, appear as spots/streaks on paper / as chromatogram results – if inks contain the same pigments, the pattern of spots would be identical; different pattern if inks contain different pigments</p> <p>5-6 marks: The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p>3-4 marks: The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p>1-2 marks: The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p>0 marks: The candidate does not make any attempt or give a relevant answer worthy of credit.</p> |