OCR
Oxford Cambridge and RSA

Friday 12 June 2015 – Afternoon

LEVEL 1 CAMBRIDGE NATIONAL IN SCIENCE IN THE WORKPLACE

R075/01 How scientific data is used

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
Pencil
Ruler (cm/mm)

Duration: 1 hour

R075/01

4539293688

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **50**.
- The quality of written communication is assessed in questions marked with a pencil (✎).
- This document consists of **20** pages. Any blank pages are indicated.

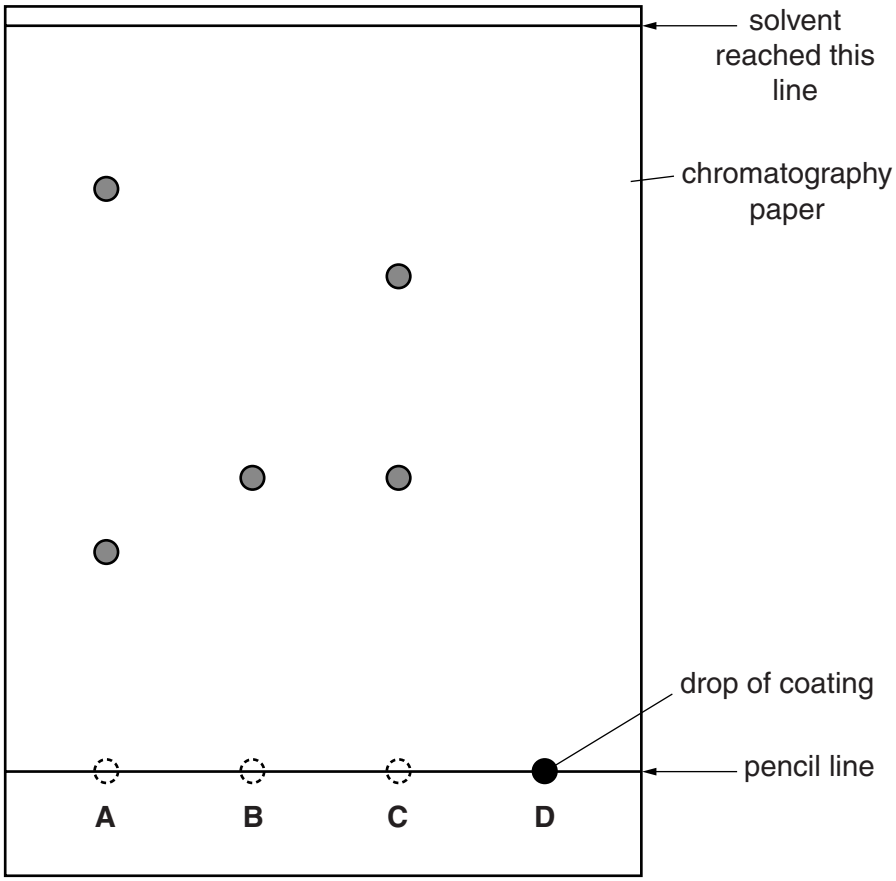
Answer **all** the questions.

1 Peter works for a sweet manufacturer.

The sweet manufacturer makes sweets with coloured coatings. The coatings contain a mixture of different food dyes.

Peter uses chromatography to test four sweet coatings **A**, **B**, **C** and **D**.

This is the chromatogram he produces.



(a) Use the results above to answer these questions.

For each question put a (ring) around each correct letter or letters.

(i) Which coating contains only one food dye?

A **B** **C** **D** **[1]**

(ii) Which coatings contain the same food dye?

A **B** **C** **D** **[1]**

(iii) Which coating contains a food dye that is not soluble in the solvent?

A **B** **C** **D** **[1]**

(b) What are the mobile and stationary phases for Peter's chromatogram?

Draw **one** straight line from each phase to its component.

Phase	Component
	chromatography paper
mobile	drop of coating
stationary	pencil line
	solvent

[2]

(c) Peter does another chromatogram to show all the food dyes in coating **D**.

Which of these changes could separate all the food dye in coating **D**?

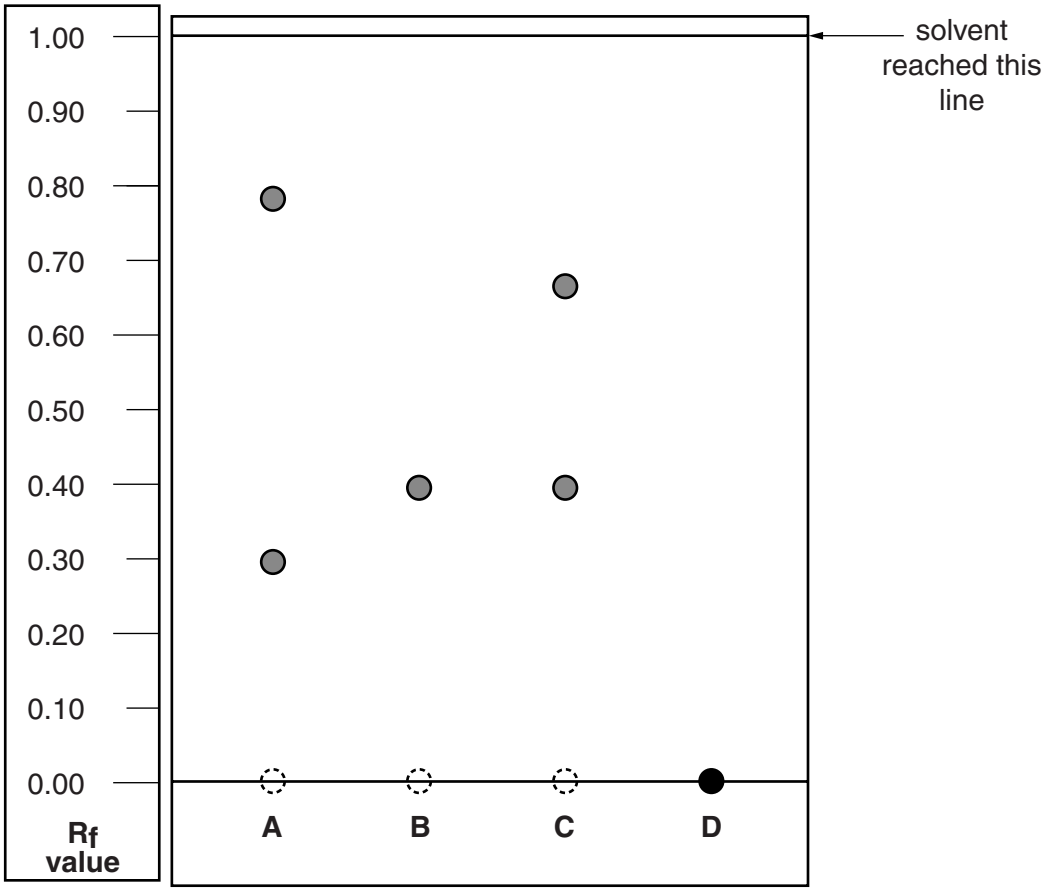
Put a tick (✓) in the box next to the correct answer.

Use a different solvent.	☐
Put a larger drop of coating on the pencil line.	☐
Use a longer piece of chromatography paper.	☐
Use more of the same solvent.	☐

[1]

(d) The chromatogram of each food dye shows coloured spots.

Peter adds a scale marked with R_f values.



He uses the scale to find the R_f value of each spot and uses this table to identify the name of the food dye present.

Name of food dye	**R_f value**
Allura red	0.30
Brilliant blue	0.76
Sky blue	0.80
Fast green	0.82

Explain why Peter comes to this conclusion.

Use data from the chromatogram and the R_f data in the table in your answer.

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..... **[3]**

(e) Describe how Peter sets up his apparatus and the method he uses to produce the chromatograms.

You may use a labelled diagram to support your answer.

The quality of written communication will be assessed in your answer.

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..... **[6]**

[Total: 15]

2 Leyla works in the quality control department of a cleaning materials company.

She tests samples of liquid cleaners.

Leyla takes samples of liquid cleaners from a number of large containers and puts each sample in a different beaker.

For each sample Leyla uses a clean pipette and labels the beaker.

(a) (i) Explain why she uses a **clean** pipette.

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..... **[1]**

(ii) Explain why she labels the beaker.

.....

..... **[1]**

(b) Leyla dips a white test-strip into each sample.

If the sample is an acid, the test-strip turns red. If the sample is an alkali, the test-strip turns blue.

Here are her results for four of the samples **W**, **X**, **Y** and **Z**.

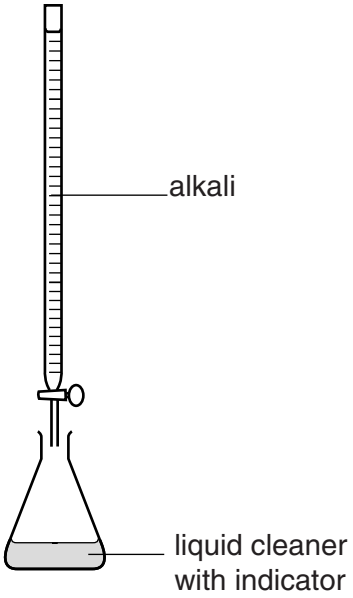
Sample	**W**	**X**	**Y**	**Z**
Colour of test-strip	red	blue	white	red

Complete the table below by putting one tick (✓) in each row to show whether the sample is an **Acid**, an **Alkali** or she **Cannot tell**.

Sample	**Acid**	**Alkali**	**Cannot tell**
W			
X			
Y			
Z			

[2]

(c) Leyla uses a titration to measure the concentration of acid in one of the liquid cleaners.



Leyla does a rough titration. She then repeats the titration several times.

She uses 25.0 cm^3 of cleaner for each titration.

(i) Leyla adds an indicator to the cleaner before doing the titration.

Explain why Leyla needs to use an indicator.

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..... **[2]**

(ii) Explain why Leyla repeats the titration.

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..... **[1]**

(iii) Here are her results.

Volume of alkali added in cm^3				
Rough	**Titration 1**	**Titration 2**	**Titration 3**	**Titration 4**
33.0	31.9	28.1	32.0	31.9

One of the results is an outlier.

Put a (ring) around this result. **[1]**

(iv) Suggest a reason for the outlier.

.....

..... **[1]**

(d) The test-strip Leyla used in part **(b)** gives a qualitative result, but the titration gives a quantitative result.

Explain the difference between **qualitative** and **quantitative**.

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..... **[2]**

[Total: 11]

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Turn over for the next question

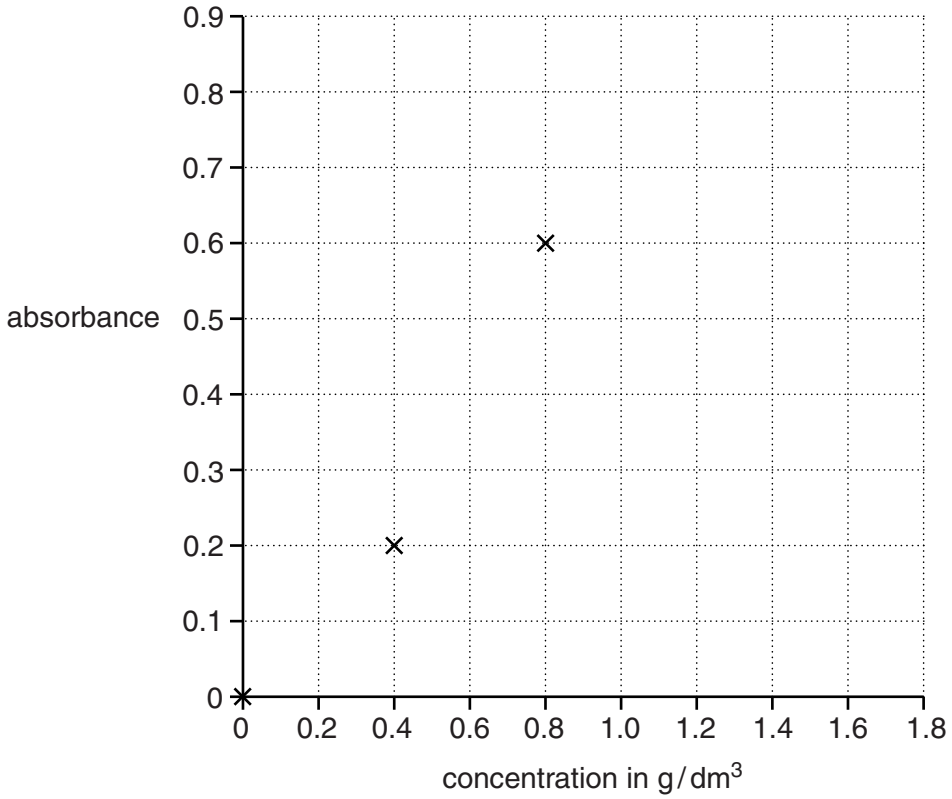
3 Jai works in a factory which makes coloured dyes for textiles.

He uses a colorimeter to measure the concentration of dyes.

(a) He calibrates the colorimeter using solutions of a red dye of known concentration.

Here are his readings.

Concentration in g/dm^3	0.0	0.4	0.8	1.2	1.6
Absorbance	0.0	0.2	0.6	0.6	0.8



Some of the data points have been plotted on the graph.

(i) Complete the graph by plotting the other points. **[1]**

(ii) **On the graph** draw the calibration line. **[2]**

(b) Jai takes three samples of a red dye.

He uses the colorimeter to find their concentration.

Here are his results:

Sample	Absorbance
1	0.28
2	0.32
3	0.30

(i) What is the **range** of his results?

range ..... **[1]**

(ii) Calculate the **mean** absorbance of his results.

Show your working.

mean absorbance = ... **[2]**

(iii) Using your answer to part **(ii)** and the graph in part **(a)** find the mean concentration of the samples.

mean concentration = ... g/dm^3 **[1]**

(c) Jai wants to know which textiles the red dye can be used on.

He decides to use secondary data instead of an experiment to find out.

Give an example of where he could find this secondary data.

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..... **[1]**

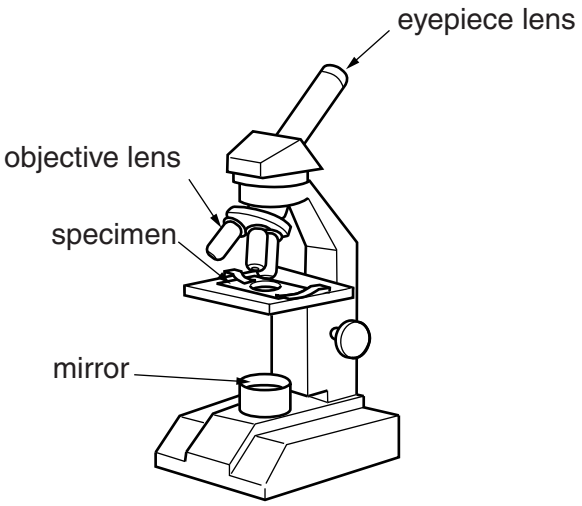
[Total: 8]

4 Matt works in a laboratory that monitors pollen in the air.

Sticky strips of tape are left outside to collect pollen grains from the air.

Matt puts each strip of tape on a microscope slide.

He uses a light microscope to look at the slides.



(a) Matt uses the microscope to look at the shape of the pollen.

He uses a lamp to illuminate the pollen.

In which direction does he shine the light from the lamp?

Put a tick (✓) in the box next to the correct answer.

onto the mirror ☐

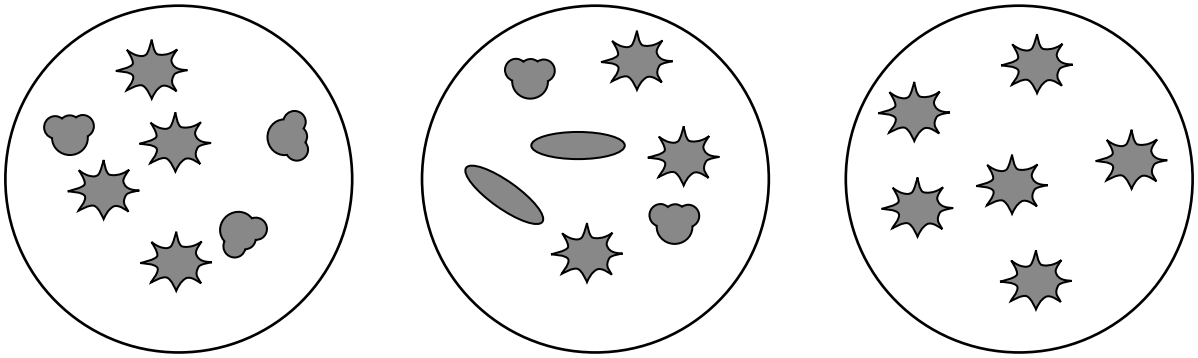
onto the objective lens ☐

through the eyepiece lens ☐

[1]

(b) He looks at the pollen on three strips of tape **A**, **B** and **C**.

This is what he sees.



(i) Which strip contains only **one** type of pollen?

Put a (ring) around the correct answer.

A **B** **C** **[1]**

(ii) One of the strips contains a type of pollen that is not seen on either of the other two strips.

Which strip is it?

Put a (ring) around the correct answer.

A **B** **C** **[1]**

(c) Matt measures the diameter of a pollen grain as seen through the microscope.

It measures 5 mm. He is using a magnification of ×100.

Which is the correct expression to calculate the actual diameter of the pollen grain in mm?

Put a (ring) around the correct answer.

$\frac{5}{100}$ $\frac{100}{5}$ 100×5 100×5^2 **[1]**

(d) Matt collects some pollen from three unknown plants **X**, **Y** and **Z**.
He wants to identify the plants.

He knows that the pollen grains from different plants have different diameters.

He uses this information from a book about plants.

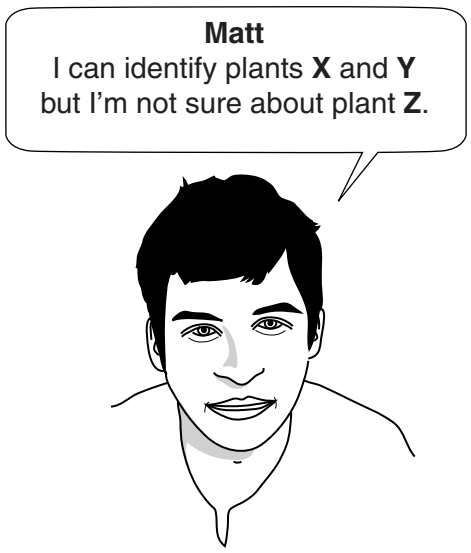
Plant pollen	Mean diameter in micrometres	Range of diameter in micrometres
Daisy	20	10 to 30
Willowherb	70	50 to 90
Lily	100	90 to 110

He measures the diameter of some pollen grains from each unknown plant.

These are his results.

Plant	Range of diameter in micrometres
X	95 to 105
Y	15 to 25
Z	85 to 105

Matt talks about his results.



Use the information to identify plants **X** and **Y**, and explain your reasoning.

Explain why it is difficult to identify plant **Z**.

The quality of written communication will be assessed in your answer.

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..... **[6]**

[Total: 10]

5 Maria works for a drinks company.

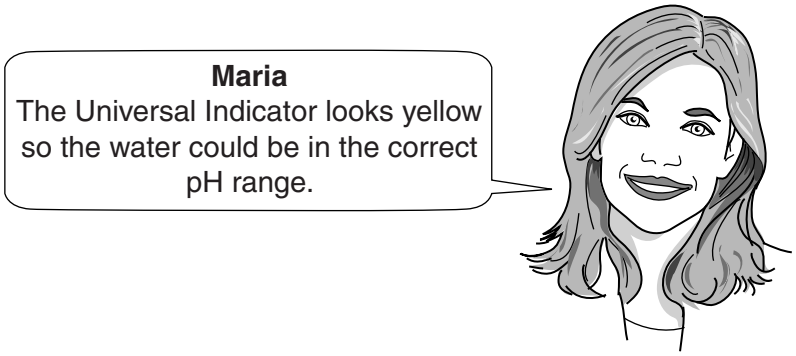
She tests the water used to make the drinks.

The water needs to have a pH value in the range from 5.8 to 6.2.

(a) She uses Universal Indicator to test the pH of the water.

Here is the colour chart she uses.

4	5	6	7	8	9
red	orange	yellow	green	green-blue	blue



(i) Explain why Maria **cannot be certain** that the water's pH value is between 5.8 and 6.2.

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..... **[2]**

(ii) Maria then uses a **pH meter** to test the water.

Give **two** advantages of using a pH meter instead of Universal Indicator for this test.

Advantage 1 .....

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Advantage 2 .....

.....

[2]

(b) The water to make the drinks may contain ions.

Maria tests the water for ions.

Here are some of her results.

Test solution used	Result
Barium nitrate	No effect
Silver nitrate	White precipitate formed
Sodium hydroxide	Blue precipitate formed

Which ions do these tests show are in the water?

Put a (ring) around each of the **two** correct answers.

carbonate **chloride** **copper** **potassium** **sodium** **[2]**

[Total: 6]

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