



**Thursday 12 June 2014 – Morning**

**LEVEL 2 CAMBRIDGE NATIONAL IN SCIENCE IN THE  
WORKPLACE**

**R075/02** 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



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**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.

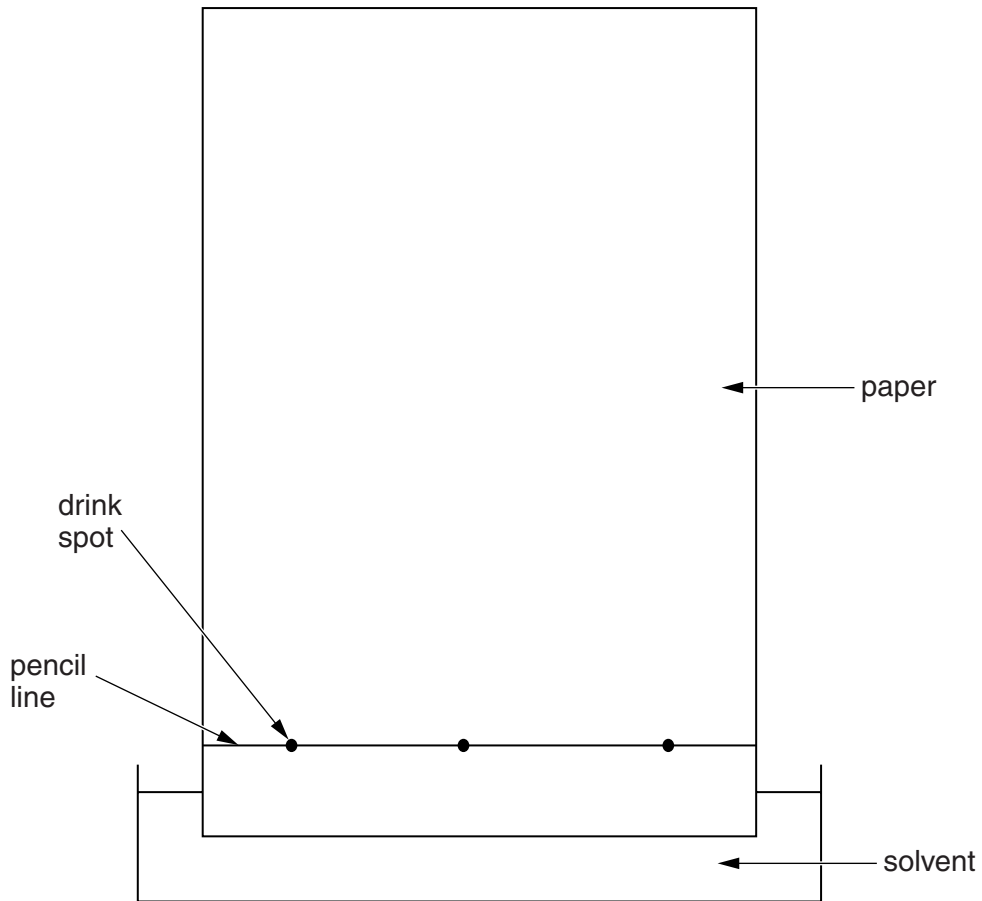
**INFORMATION FOR CANDIDATES**

- 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.

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Answer **all** the questions.

- 1 Philip works in the laboratory of a company making fruit and vegetable drinks. He is investigating the types of sugar in the drinks. He uses chromatography to do this, as shown in the diagram.



- (a) Look at the diagram and identify the **stationary** and **mobile** phases.

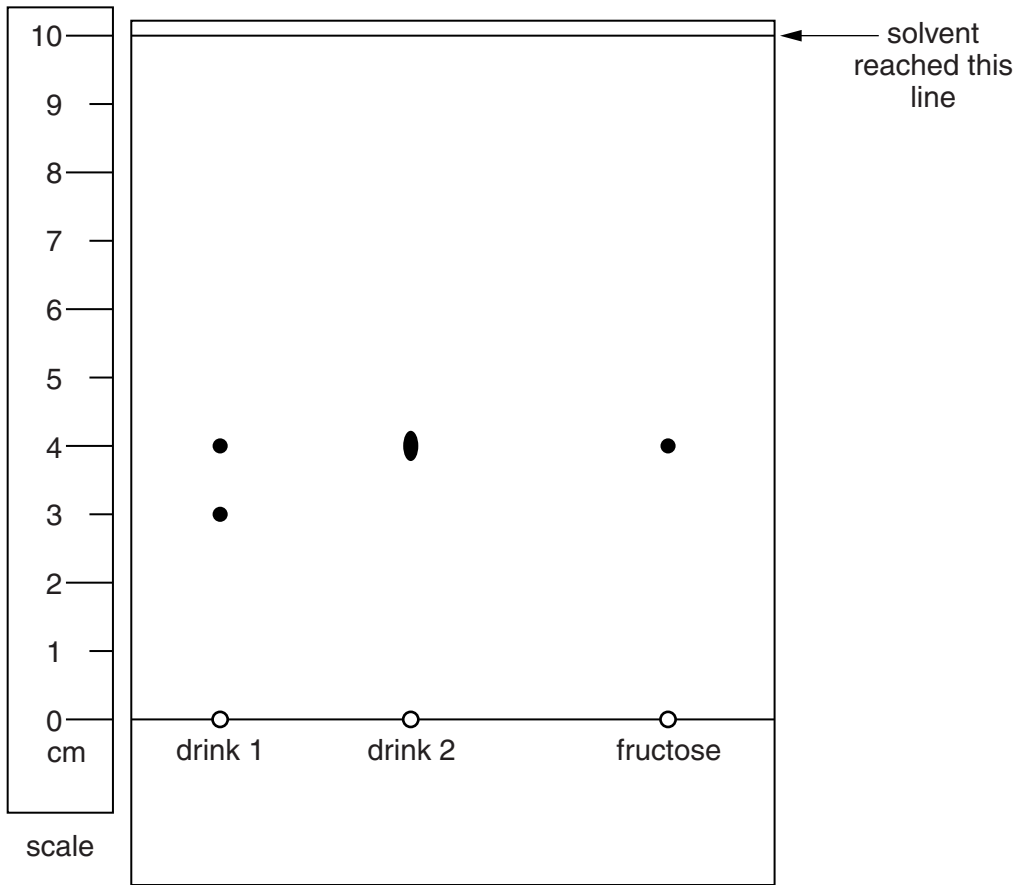
Stationary phase .....

Mobile phase .....

[2]

He tests drink 1, drink 2 and fructose. He puts a drop of each on the pencil line.

Here is the chromatogram he produces.



(b) (i) Explain what the chromatogram tells you about drinks 1 and 2.

**Drink 1** .....

.....

.....

**Drink 2** .....

.....

.....

[3]

(ii) Philip uses fructose as a **standard reference**.

Explain what is meant by standard reference.

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

(iii) The  $R_f$  value for each spot can be calculated by using the formula

$$R_f = \frac{\text{distance moved by drink spot}}{\text{distance moved by solvent}}$$

Use the scale on the chromatogram diagram to calculate the  $R_f$  value for the **lower** spot of **drink 1**.

Show your working.

$R_f$  value = ..... [2]

(iv) Philip looks in a data book for  $R_f$  values of other types of sugar.

Type of sugar	$R_f$ value
sucrose	0.36
glucose	0.32
galactose	0.30
maltose	0.25

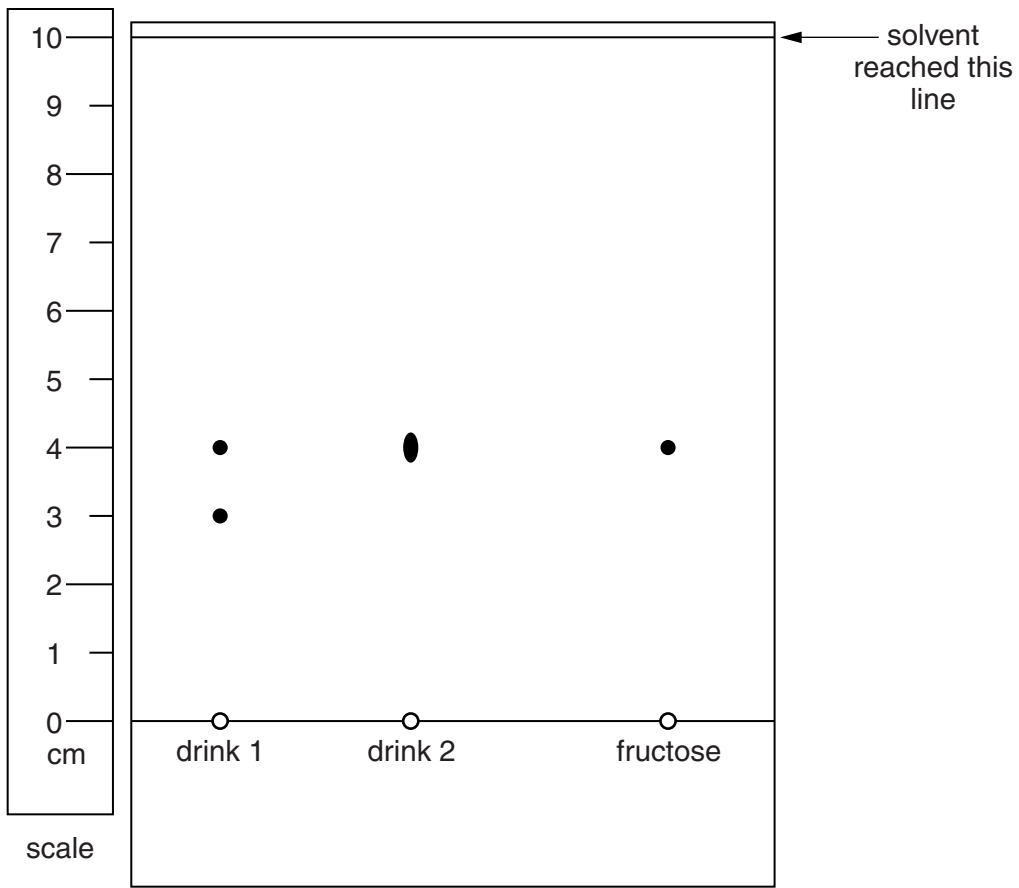
Use your calculated value of  $R_f$  for the lower spot of drink 1 to identify which type of sugar it is likely to be.

Name of sugar .....

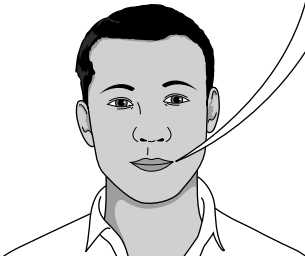
How certain can you be of your conclusion? Give reasons.

.....  
 .....  
 .....  
 .....  
 ..... [4]


(c) (i) Philip, Edward and Ann, discuss the results for drink 2.




They say why they think there is a bigger spot for drink 2.



**Philip**  
This shows that drink 2 contains more fructose than drink 1.



**Edward**  
There may be another type of sugar in drink 2 as well as fructose.



**Ann**  
You must have used a bigger drop of drink 2 on the pencil line than drink 1.

Who do you agree with? Put a ring around your choice.

**Philip**

**Edward**

**Ann**

Give a reason for your choice.

.....

.....

.....

[2]

(ii) Name another piece of apparatus Philip could use to identify the sugars in the drinks.

.....

How would this apparatus improve the conclusion?

.....

.....

[2]

[Total: 17]

2 Sunita is a science technician.

She finds two unlabelled bags of white powder.

(a) Sunita does three tests on each powder to identify its anion.

Here are her results for the anion in each bag.

Test	Results for Bag 1	Results for Bag 2
add dilute acid to the powder	fizzes and gives off a gas which turns limewater milky	no reaction
add dilute barium chloride to a solution of the powder	no reaction	no reaction
add dilute silver nitrate to a solution of the powder	no reaction	white precipitate

Complete this table to show which anion is present in each bag.

	Name of anion
<b>bag 1</b>	
<b>bag 2</b>	

[2]

(b) Sunita does a flame test on each powder.

(i) The powder from both bags gives a lilac coloured flame.

Which cation is present in both bags?

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

Barium	<input type="checkbox"/>
Calcium	<input type="checkbox"/>
Potassium	<input type="checkbox"/>
Sodium	<input type="checkbox"/>

[1]



(ii) Sunita uses a platinum wire loop to do the flame tests.

She dips the loop in concentrated hydrochloric acid before putting it in the powder sample.

Explain why she does this.

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

(iii) She does the flame test again for each bag and gets the same results.

Complete each of these sentences.

Identifying a cation by observing the colour of a flame is an example of a

..... technique.

Getting the same result each time the test is done means that it is ..... [2]



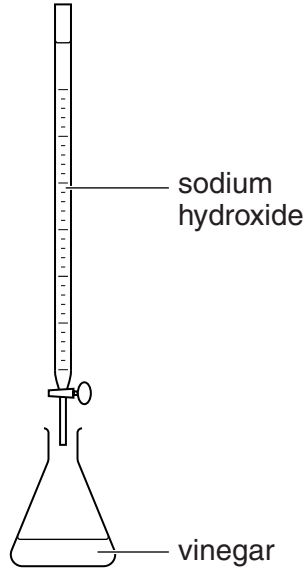
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**Question 3 begins on page 12**  
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- 3 The Food Standards Agency suspects that some fast food outlets add more water to their vinegar than they should.

George tests some samples of vinegar in a laboratory.

He titrates vinegar with sodium hydroxide.



- (a) (i) The vinegar is a **weak acid** and sodium hydroxide is a **strong base**.

What indicator should he use?

..... [1]

- (ii) How does the indicator show that the end point of the titration has been reached?

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

(b) Vinegar is a solution of ethanoic acid in water.

To get readings for his calibration graph George used the following procedure:

- dissolved 2.0 g of ethanoic acid in 100 ml of water to produce an acid solution
- took 25 ml of this acid solution and put it in the beaker
- titrated the sodium hydroxide into the acid solution
- repeated the procedure using three 25 ml samples from the same acid solution
- repeated the whole procedure for 4.0 g, 6.0 g and 8.0 g of ethanoic acid.

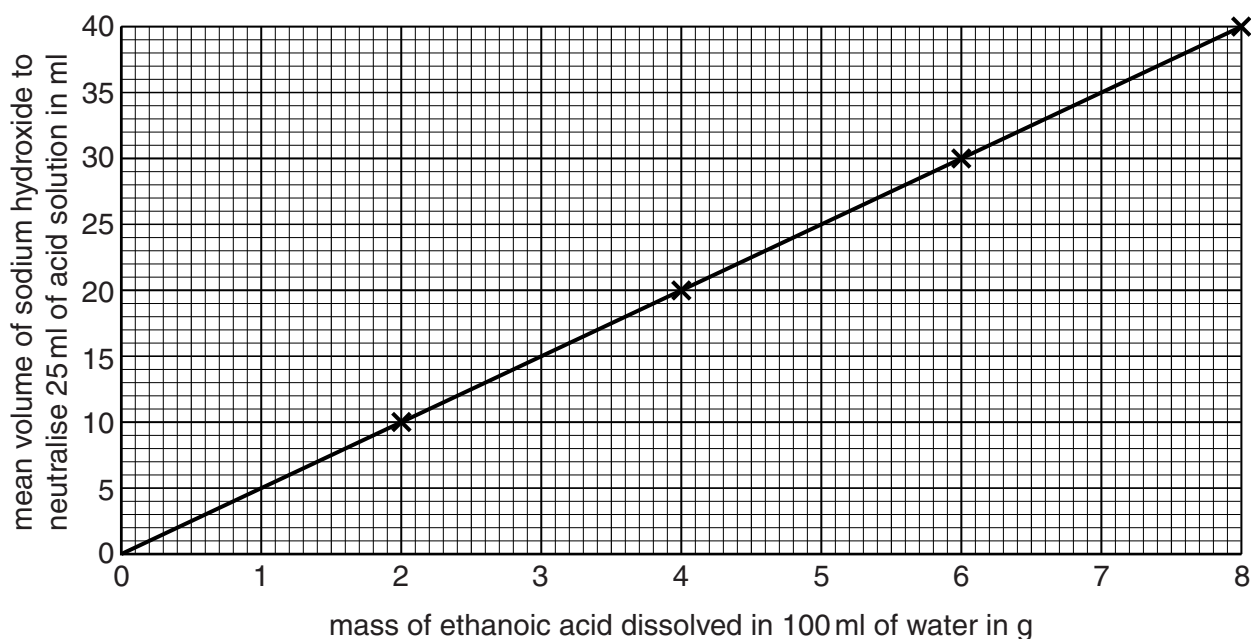
Are each of the following a controlled variable, dependent variable, independent variable or not a variable?

Put a tick (✓) in **one** box in **each** row.

	<b>Controlled variable</b>	<b>Dependent variable</b>	<b>Independent variable</b>	<b>Not a variable</b>
25 ml of acid solution used in each titration				
100 ml of water used to make acid solution				
mass of ethanoic acid dissolved in 100 ml of water				
repeating the titrations for the same acid solution				
volume of sodium hydroxide needed to neutralise the acid solution				

[5]

- (c) This is the calibration graph George gets from his results of titrating ethanoic acid with sodium hydroxide.



He tested samples of vinegar from three food outlets.

Here are the results for his tests:

Outlet	Volume of sodium hydroxide to neutralise 25 ml of vinegar in ml					
	Test 1	Test 2	Tests 3	Test 4	Mean	Range
Allgoods	20.0	20.2	20.7	20.3	20.3	0.7
Bests	17.8	17.7	18.0	17.9		
Crinkles	25.0	15.0	25.2	25.1		

The quality of the data is judged by the range of the readings.

Range of readings in ml	Quality of data
up to 0.20	excellent
0.21 to 0.40	good
0.41 to 0.60	fair
greater than 0.60	poor

Vinegar with less than 4.0 g of ethanoic acid in 100 ml has too much water added.

Calculate the **means** and **ranges** of the data in the table and **decide** if the vinegar from each outlet has too much water in it, taking the quality of the data into account.



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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

**[Total: 13]**

4 Beatrice works in a forensics laboratory.

She looks at some hair on a piece of cloth.

She can use a magnifying glass (hand lens), a light microscope or an electron microscope.

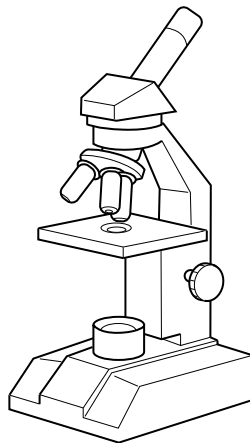
(a) Which of these pieces of apparatus would be best to do the following tasks?

Draw a straight line from each **Task** to the best **Apparatus** to use.

Task	Apparatus
count the number of hairs on the piece of cloth	electron microscope
measure the width of one hair	magnifying glass
view the internal structure of a hair	light microscope

[2]

(b) This is a diagram of a light microscope.



(i) Why is the stage moved up and down?

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

(ii) Why are there three objective lenses on the rotating mount?

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



(c) Beatrice finds a plant seed on the piece of cloth.

She looks at the seed with a light microscope. This is what she sees.



Measure the **longest** length of the image of the seed using your ruler.

Longest length of image = ..... mm

The seed's longest length is 1.4 mm.

Using your measured length, calculate the magnification of the image of the seed.

Show your working.

Magnification of image = X ..... [2]

(d) Using a light microscope has advantages and disadvantages over using an electron microscope.

Write down one advantage and one disadvantage of using a light microscope rather than an electron microscope.

**Advantage** of light microscope .....

**Disadvantage** of light microscope .....

[2]

[Total: 8]

**END OF QUESTION PAPER**

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**19**  
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