OCR
Oxford Cambridge and RSA

Friday 17 June 2016 – Morning

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

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R07501

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. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- 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 Izzy works in quality control for a company that supplies chemicals to schools.

The company sends many different chemicals to schools. Each chemical is sent in a plastic box.

More than one box of each chemical is sent each day.

Each day Izzy takes samples from the boxes for testing.

(a) (i) Which boxes does she take her samples from so that they are **representative**?

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

one box of each chemical ☐

every box of every chemical ☐

some boxes of one chemical only ☐

the whole contents from one box ☐ **[1]**

(ii) How does she ensure that the samples are not contaminated?

Put a tick (✓) next to the **two** correct answers.

uses clean containers ☐

uses a fume cupboard ☐

puts a lid on the containers ☐

uses the same apparatus for every test ☐

uses an accurate balance to weigh her samples ☐ **[2]**

(iii) Izzy puts each sample in a separate container.

What does she do to each container so that she doesn't get her samples mixed up?

.....

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

(b) Izzy does a number of tests using different pieces of apparatus.

In which test does she use each of these pieces of apparatus?

Draw **one straight line** from each piece of **apparatus** to the **test** in which it is used.

Apparatus	**Test**
Bunsen burner	anion test
filter paper	chromatography
burette	flame test
	titration

[3]

(c) The label on one box has come off and Izzy needs to find out what chemical compound is in the box.

She makes a solution of the compound by dissolving some of it in water.

Then she divides the solution into three test tubes, **A**, **B** and **C**.

She adds a test solution to each test tube.

Here are her results.

Test tube	Test solution added	Result
A	sodium hydroxide	blue precipitate
B	silver nitrate	no change
C	barium chloride	white precipitate

(i) Izzy refers to a book to help her identify the metal ion in the compound.

This is the data in the book.

Sodium hydroxide test:

Colour of precipitate	Metal ion present
white	calcium
green	iron(II)
blue	copper

Which metal ion is present?

Put a ring around the correct answer.

barium **calcium** **copper** **iron(II)** **sodium** **[1]**

(ii) Which ion can be identified using barium chloride?

Put a ring around the correct answer.

carbonate **chloride** **sulfate** **[1]**

(iii) What is the name of the compound in the box?

Explain your answer.

Name of compound .....

Explanation .....

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

(d) (i) Izzy's colleague says that she should use more than one technique to identify the compound.

Why is this a good idea?

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

to make the test faster ☐

to test different compounds ☐

to make her conclusion more secure ☐ **[1]**

(ii) Which technique would help Izzy identify the compound?

Put a (ring) around the correct answer.

chromatography colorimetry microscopy spectrophotometry

[1]

[Total: 13]

2 Magnifying glasses (hand lenses), light microscopes and electron microscopes are used to look at specimens so that more details can be seen.

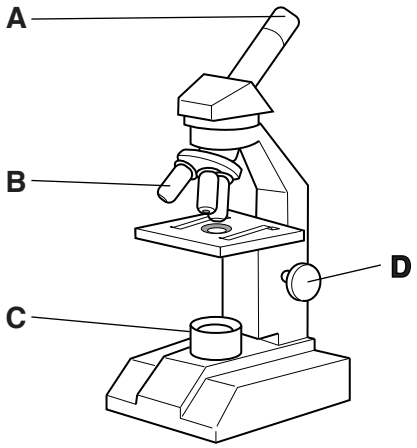
(a) Draw one straight line from each **specimen** to the best **apparatus** through which to view it.

Specimen	Apparatus
living human cells	electron microscope
the surface of a pollen grain	light microscope
the writing on a coin	magnifying glass

[3]

(b) Jake uses a light microscope to look at a specimen.

This is a diagram of the light microscope, with some of the parts labelled **A**, **B**, **C** and **D**.



(i) The specimen is not in focus.

Which part of the microscope does Jake adjust to make the specimen in focus?

Put a (ring) around the correct answer.

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

(ii) Jake wants to see more of the specimen in his view through the microscope.

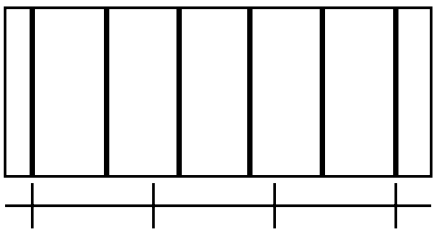
Which part does he adjust to see more?

Put a (ring) around the correct answer.

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

(c) Jake uses an electron microscope to examine part of an electronic circuit.

This is the image produced by the electron microscope.



Jake estimates that the black lines are 2.5 micrometres apart.

Use the image and the scale to do a calculation to see if Jack is correct.

Explain your method.

distance apart = ... micrometres **[3]**

(d) Give **one disadvantage** of using an electron microscope compared with using a light microscope.

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

[Total: 9]

3 Mike and Abi work for a company that monitors the quality of medicines.

They test different types of antacid tablets.

Excess acid in the stomach can cause pain. Antacid tablets contain a base that neutralises this acid.

(a) Mike dissolves one antacid tablet in water in a beaker.

He uses universal indicator to test the pH of the solution.

Here is the chart he uses to interpret his results.

4	5	6	7	8	9	10	11
orange	yellow	yellow-green	green	green-blue	blue	blue-purple	purple

He does the same experiment for two different types of tablet, **A** and **B**.

Here are his results.

Tablet	**Colour of solution**
A	green-blue
B	blue-purple

Mike concludes that the solution of tablet **B** has pH 10.

What is the pH of the solution of tablet **A**?

Put your answer in the table below.

Tablet	**pH**
A	
B	10

[1]

(b) Abi does the experiment using the same method.

Here are her results.

Tablet	**Colour of solution**
A	green-blue
B	purple

Suggest a reason why Mike and Abi do not get the same colours for tablet **B**.

.....

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

(c) Mike and Abi repeat the test using a pH meter instead of universal indicator.

(i) Give **one advantage** of using universal indicator compared with using a pH meter.

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

(ii) Here are their results.

Tablet	pH
A	7.8
B	10.5

Explain why the solution of tablet **A** makes universal indicator turn green-blue rather than green.

.....

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

(iii) What name is given to describe the results from the pH meter?

Put a (ring) around the correct answer and explain your choice.

accurate **quantitative** **repeatable** **reproducible**

Explanation .....

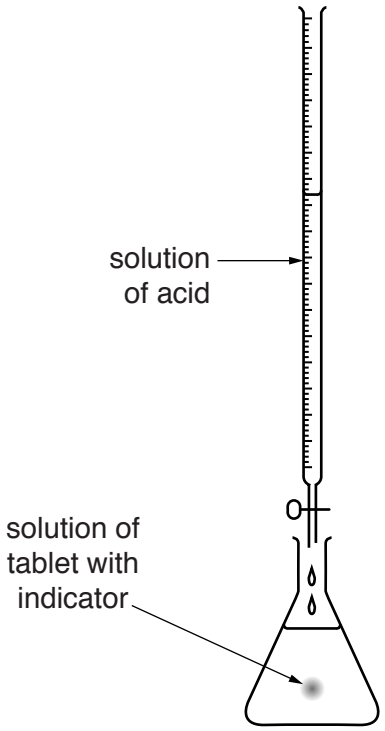
..... **[2]**

(d) Mike investigates another antacid tablet.

He uses a titration to find out how much acid can be neutralised by the tablet.

Mike dissolves the tablet in 25.0 cm^3 of water and puts the solution in a flask with an indicator.

He uses the same solution of acid in each titration.



Mike makes two solutions from the antacid tablets.

One solution contains 1 tablet.

The second solution contains 2 tablets.

Mike does a rough titration before doing the titration three times for each solution.

Here are his results.

Solution	**Volume of acid added (cm^3)**					
	Rough trial	**1st test**	**2nd test**	**3rd test**	**mean**	**range**
1 tablet	33.0	32.1	32.5	32.3	32.3	0.4
2 tablets	65.6	64.4	64.9	65.1		

Mike makes this hypothesis: 'The solution made from 2 tablets will neutralise twice the amount of acid.'

Use the data to calculate the mean and range for the 2 tablets solution.

Decide whether or not the data supports Mike's hypothesis.

Give reasons for your decision.

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

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

[Total: 12]

4 Grace works in the safety department of an airline.

She tests the concentration of anti-freeze used in aircraft fuel.

She uses a colorimeter to measure the concentration of the anti-freeze.

(a) Grace calibrates the colorimeter at the start of her test.

Why does she do this?

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

to find out if the apparatus is working ☐

to get quantitative results ☐

to make her results accurate ☐ **[1]**

(b) Grace tests the concentration of anti-freeze 4 times for the same fuel.

Here are her results.

Test	Absorbance
1	0.32
2	0.33
3	0.23
4	0.31

Grace does not use all four results when she calculates the mean of the absorbance.

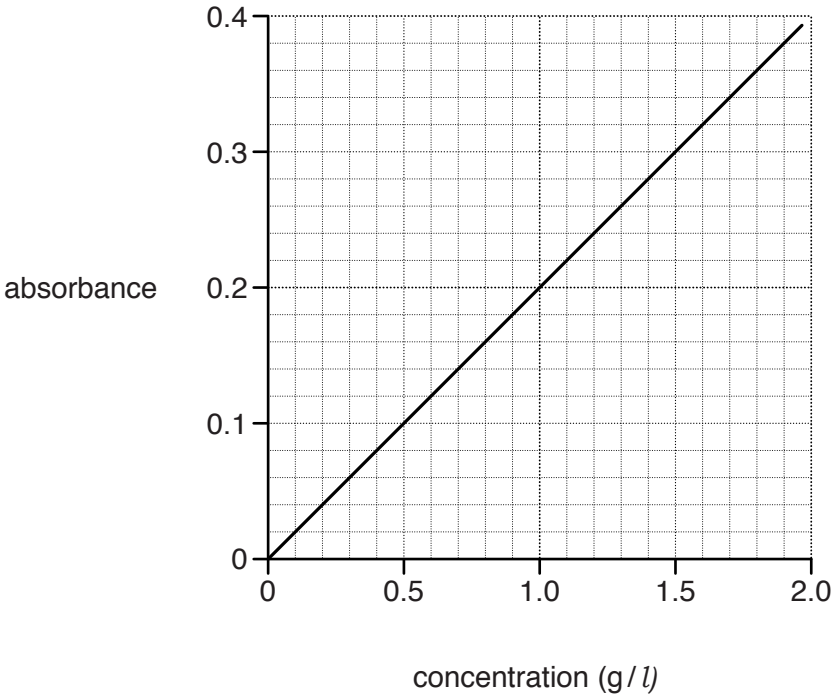
(i) Put a (ring) around the result in the table that she should **not** use. **[1]**

(ii) Explain why Grace does not use this result.

.....

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

(c) Here is Grace's calibration graph.



Use the graph and the mean absorbance of 0.32 to find the mean concentration of anti-freeze in the fuel.

mean concentration = ...g/*l* **[1]**

(d) Grace decides to look for secondary data about the anti-freeze.

Where should she look to find secondary data?

.....

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

[Total: 5]

5 Dan works for the Food Standards Agency.

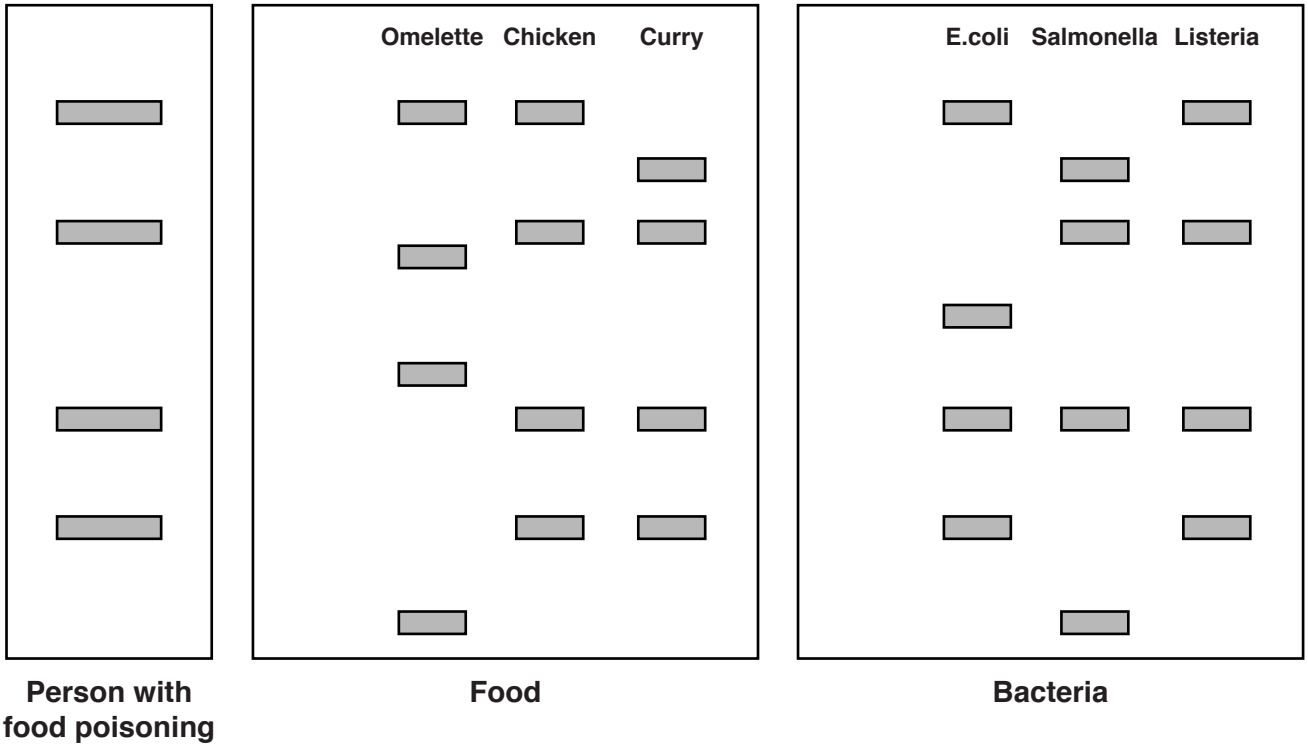
He is investigating a case of food poisoning.

Dan uses electrophoresis to identify which bacteria have caused a person to develop food poisoning.

He takes a sample from the person and compares the pattern produced in the test with patterns from various foods that the person has eaten.

He uses the same method to compare the patterns from some harmful bacteria.

Here are the results for the sample taken from the person and from food eaten by the person.



What conclusions can you make from these results?

Explain your reasoning.

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

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

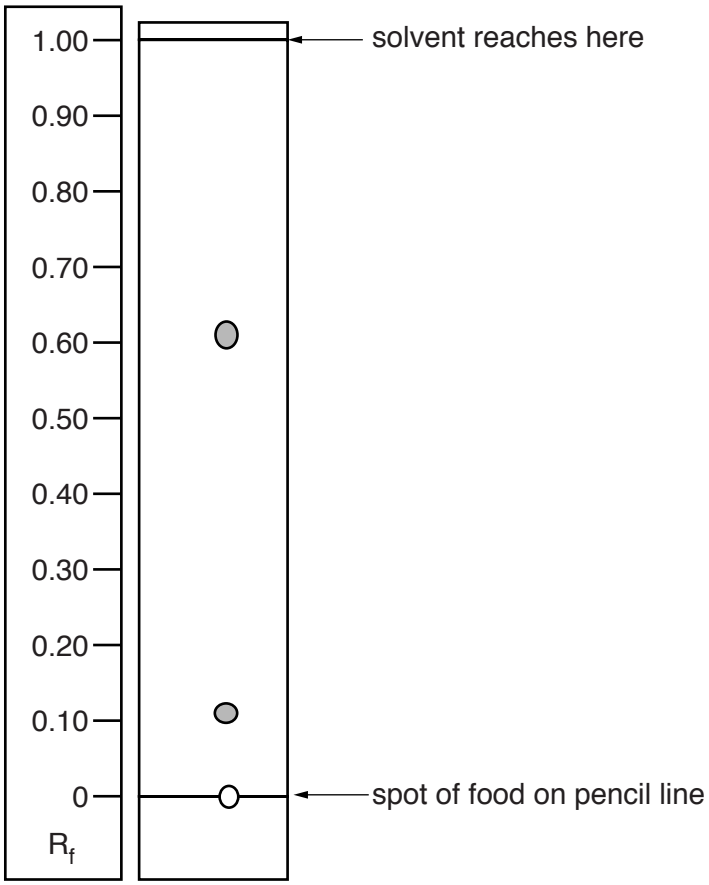
[Total: 6]

6 Kris works for a health diagnostic company.

He tests food to identify which amino acids are present.

He uses chromatography to test a sample of a food.

This is the chromatogram he produces.



He uses this data table to identify the amino acids.

Amino acid	**R_f value**
Histidine	0.10
Isoleucine	0.72
Methionine	0.55
Tryptophan	0.66
Valine	0.60

(a) Kris concludes that the food contains histidine and another amino acid.

(i) Explain why he concludes that the food contains **histidine**.

.....

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

(ii) Explain why he concludes that there is another amino acid in the food.

.....

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

(iii) What is the name of the other amino acid?

Put a (ring) around the correct answer.

Isoleucine **Methionine** **Tryptophan** **Valine** **[1]**

(b) Kris follows the procedure below to do his chromatogram, but the steps are in the wrong order.

A	Draw a pencil line on the chromatography paper.
B	Wait for the solvent to reach nearly the top of the chromatography paper.
C	Put the bottom of the chromatography paper in the solvent.
D	Put a spot of food on the pencil line.
E	Remove the chromatogram from the solvent and let it dry.

Fill in the boxes to show the correct order of the steps he follows.

The position of step **C** has been filled in for you.

		C		

[2]

[Total: 5]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).