CAMBRIDGE TECHNICALS

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CAMBRIDGE TECHNICALS LEVEL 3 (2016)

Examiners' report

APPLIED SCIENCE

05847–05849, 05879, 05874

Unit 2 Summer 2023 series

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Unit 2 series overview

This paper is quite different than has probably been seen before by some candidates. Historically candidates do not sit a paper that contains more than one science discipline in a Level 2 or 3 paper. This is also a paper based on practical and laboratory skills, so the style of questions may also be new to some candidates. However, most Centres are now familiar with the paper and in general candidates' performance is improving, even considering the difficulties of the last few years. Most candidates seem prepared for this style of paper.

There is a lot of application and understanding of contexts that some candidates may have found challenging. Centres are encouraged to use sample papers and any previously sat papers available with the candidates to give them practice at the style of paper and the questions within.

Some areas were answered well, and candidates showed good knowledge of chromatography and microscopy. They were also able to answer questions on the importance of using aseptic techniques. They did not do so well on calculations involved in quantitative techniques. They struggled to interpret a table of results. They also found evaluating a technique in an unusual context challenging. They struggled to calculate concentration of a solution.

In some cases, their lack of good scientific terminology prevented candidates answering questions to the required standard.

Candidates also struggled with conversion of units especially related to microscopy questions.

This is a techniques paper and so it is the techniques they need to know how to describe. Candidates who have had the opportunity to carry out and discuss the techniques are much more able to answer the questions successfully. Good use of demonstrations and video clips is also important.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• attempted all questions • read the question carefully • seemed to have experience of laboratory techniques • seemed to have practised exam technique • had good knowledge of chromatography • had good understanding of magnification using microscopes • could manipulate data in a table • could plot graphs • gave responses relating to context of the question • had practised mathematical skills • used accurate and precise science terminology.	• left questions blank • did not answer the question as set • evidenced little experience of the laboratory techniques required by the specification • were unable to demonstrate knowledge of chromatography • struggled with calculating magnification • could not correctly manipulate data in a table • struggled to correctly plot a graph • could not apply knowledge to new contexts • did not show mathematical working • used imprecise scientific terminology.

Question 1 (a) (i)

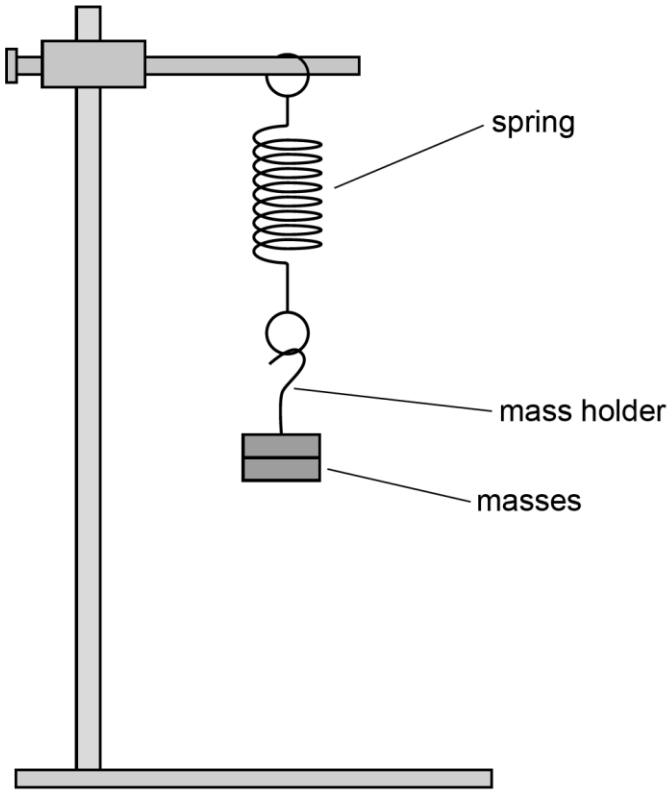
1 Amir is a technician working in a college science laboratory.

He is responsible for making sure that laboratory equipment is working correctly, and he also sets up equipment for practical investigations.

(a) A group of students are studying Hooke's Law.

Hooke's Law states that the extension of an elastic object is directly proportional to the force applied to it.

Amir sets up the equipment as shown below.



The students follow the method outlined below.

1. Record the length of the spring with the empty mass holder attached.
2. Add a 10 g mass to the holder and record the length of the spring.
3. Repate by adding 10 g masses until 50 g is reached.
4. Calculate the extension of the spring.

(i) Name the other piece of equipment needed for this investigation, not shown above.

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

Importance of reading the questions carefully

Most candidates correctly identified 'ruler' as the missing piece of equipment. Common incorrect answers were clamp stand and timer, which showed the candidates had not seemed to read the question carefully or looked at the diagram in detail.

Question 1 (a) (ii)

(ii) State **one** safety precaution that the students should take when completing this investigation.

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

Answer in relation to question context

Most candidates correctly suggested safety glasses. Incorrect answers often included general lab safety rules that would not be given, e.g. stand when working or put bags under tables. Others suggested wearing steel toed boots but these are unlikely to be available in this scenario. Candidates need to consider the context of the question.

Question 1 (b) (i)

(b) The students prepare a table so that they can record their results during the investigation. Their table is shown below.

Mass (g)	Length of spring	Extension
0	20	.....
10	25	.....
20	31	.....
30	35	.....
40	40	.....
50	46	.....

(i) State the key piece of information not included in the table.

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

Misconception

Many candidates misunderstood this question and answered in terms of the missing values rather than recognising the units were missing.

Question 1 (b) (ii)

(ii) For each mass, calculate the extension of the spring and add the values to the table.

[1]

Misconception

Candidates struggled with this question. Many calculated the difference between each length of spring rather than the difference between new length and original length.

Question 1 (b) (iii)

(iii) The students analyse the results in the table to determine whether Hooke's Law applies to their investigation.

Suggest the most appropriate way they should do this.

.....

.....

.....

.....

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

This question was challenging and most candidates struggled. Less successful candidates described carrying out averages or doing repeats and so misunderstood what was being asked. More successful candidates recognised they should draw a graph but did not take this much further. Very few suggested calculating the ratio.

Question 1 (iv)

(iv) The students discuss how to write up their investigation.

List, in order, the **five** headings they should use.

1 .....

2 .....

3 .....

4 .....

5 .....

[3]

It was clear that candidates understood this but did not know the correct terminology to gain marks. This meant that they gave descriptions rather than headings and so did not gain marks. Methods, results, conclusion were the most common creditworthy answers.

Question 1 (c) (i)

(c) Another group of students plan to use electronic balances for a different investigation.

Amir calibrates the electronic balances before they can be used by the students.

(i) Describe the steps Amir should follow to calibrate the balances.

.....

.....

.....

.....

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

Assessment for learning

Most candidates understood that they needed to check a known mass, however they struggled to explain how. They knew to press Tare but often wrote this in the incorrect order and so were pressing Tare after placing mass on balance. Very few tested two masses. Most were unable to describe adjusting the reading on the balance.

It is important to discuss steps in any method used so candidates understand why they are doing a procedure in a particular way. This will help when answering method questions.

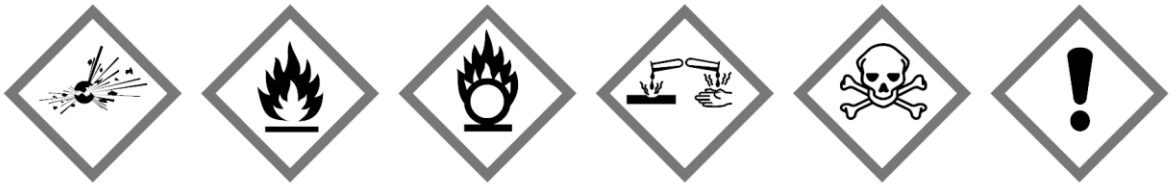
Question 1 (c) (ii)

(ii) The students are studying the oxidation of ethanol. They begin their experiment by weighing out a known mass of ethanol which they take from a labelled container.

Amir knows that ethanol is a highly flammable liquid which causes eye irritation.

Select the **two** hazard symbols from the images below which Amir must include on the ethanol container label.

Put a (ring) around each correct letter.



A **B** **C** **D** **E** **F**

[1]

Most candidates correctly circled B but then circled a second incorrect hazard sign. The most common incorrect answer was C.

Question 1 (c) (iii)

(iii) Suggest **one** safety precaution which the students need to take when using ethanol in the laboratory.

.....

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

Importance of reading the question

Candidates that read the whole question carefully recognised the importance of keeping the ethanol away from flames.

Question 2 (a) (i)

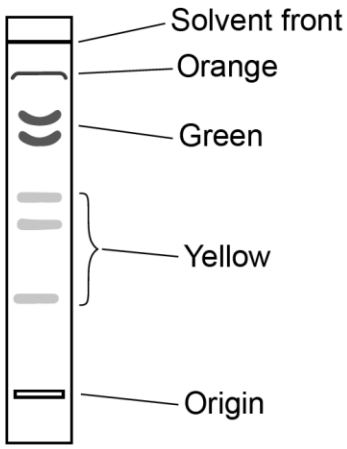
2 Tom is a trainee with a company involved in the extraction and analysis of plant components such as pigments, natural oils and pharmaceuticals.

(a) As part of Tom's induction programme, he analyses the pigments found in different vegetables.

- He chops up some spinach leaves and mixes the fine pieces with an organic solvent to extract the pigments.
- He uses thin layer chromatography (TLC) to separate the pigments extracted from the spinach leaves.

Fig. 2.1 shows the chromatogram Tom obtained for the spinach extract.

Fig. 2.1



(i) Tick (✓) all the advantages that TLC has compared to paper chromatography.

More reproducible results obtained using TLC ☐

TLC is cheaper ☐

TLC is easier to carry out ☐

TLC uses less extract ☐

[2]

Most candidates gained marks here. 'TLC is cheaper' was a common incorrect answer.

Question 2 (a) (ii)

(ii) Suggest how Tom can use thin layer chromatography to identify the different pigments extracted from the spinach leaves.

.....

.....

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

Importance of reading the question

Many candidates gained both marks. However, less successful candidates just described what they would see in term of separated 'dots'.

Question 2 (a) (iii)

(iii) The table shows the pigments found in the spinach leaf extract.

Name of pigment	Pigment type	Colour
β-carotene	carotene	orange
chlorophyll a	chlorophyll	green
chlorophyll b	chlorophyll	green
lutein	xanthophyll	yellow
cryptoxanthin	xanthophyll	yellow
zeaxanthin	xanthophyll	yellow

Take appropriate measurements in **Fig. 2.1** to calculate the R_f value of β-carotene.

R_f = ... **[2]**

Assessment for learning

This question was well answered. It is important that candidates made it clear which figure was the distance moved by pigment and which was distance moved by solvent front. It would also be useful for them to give their units as some clearly measured in cm and others in mm but did not state which. They were not penalised for this in this question but this could be a possible issue in future papers.

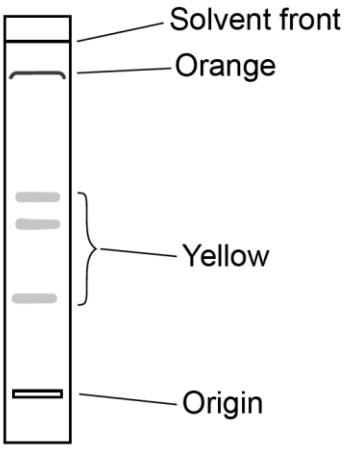
Candidates should practice using units.

Question 2 (a) (iv)

(iv) Tom then repeats the experiment using carrots instead of spinach.

Fig. 2.2 shows the chromatogram obtained for the carrot extraction.

Fig. 2.2



Identify the differences between the chromatograms in **Fig. 2.1** and **Fig. 2.2** and explain why carrots are orange but spinach leaves are green.

Differences:

.....

.....

.....

Why carrots are orange but spinach is green:

.....

.....

[3]

Most candidates gained some marks here. Most missed the idea that green would mask orange.

Question 2 (b)

(b) The company is researching how active ingredients in plant herbal remedies can be used to develop drugs to treat diseases.

Tom is trained to carry out high performance liquid chromatography (HPLC) and gas chromatography (GC) to separate and identify the components of plants.

HPLC and GC use different stationary and mobile phases.

Use the words below to complete the following sentences.

The words may be used once, more than once or not at all.

Gaseous **Liquid** **Solid**

HPLC uses a ..... stationary phase and a ..... mobile phase.

GC uses a ..... stationary phase and a ..... mobile phase.

[2]

Importance of practical experience

This question was not well answered. It was clear that a lot of candidates did not understand these types of chromatography.

Question 2 (c) (i)

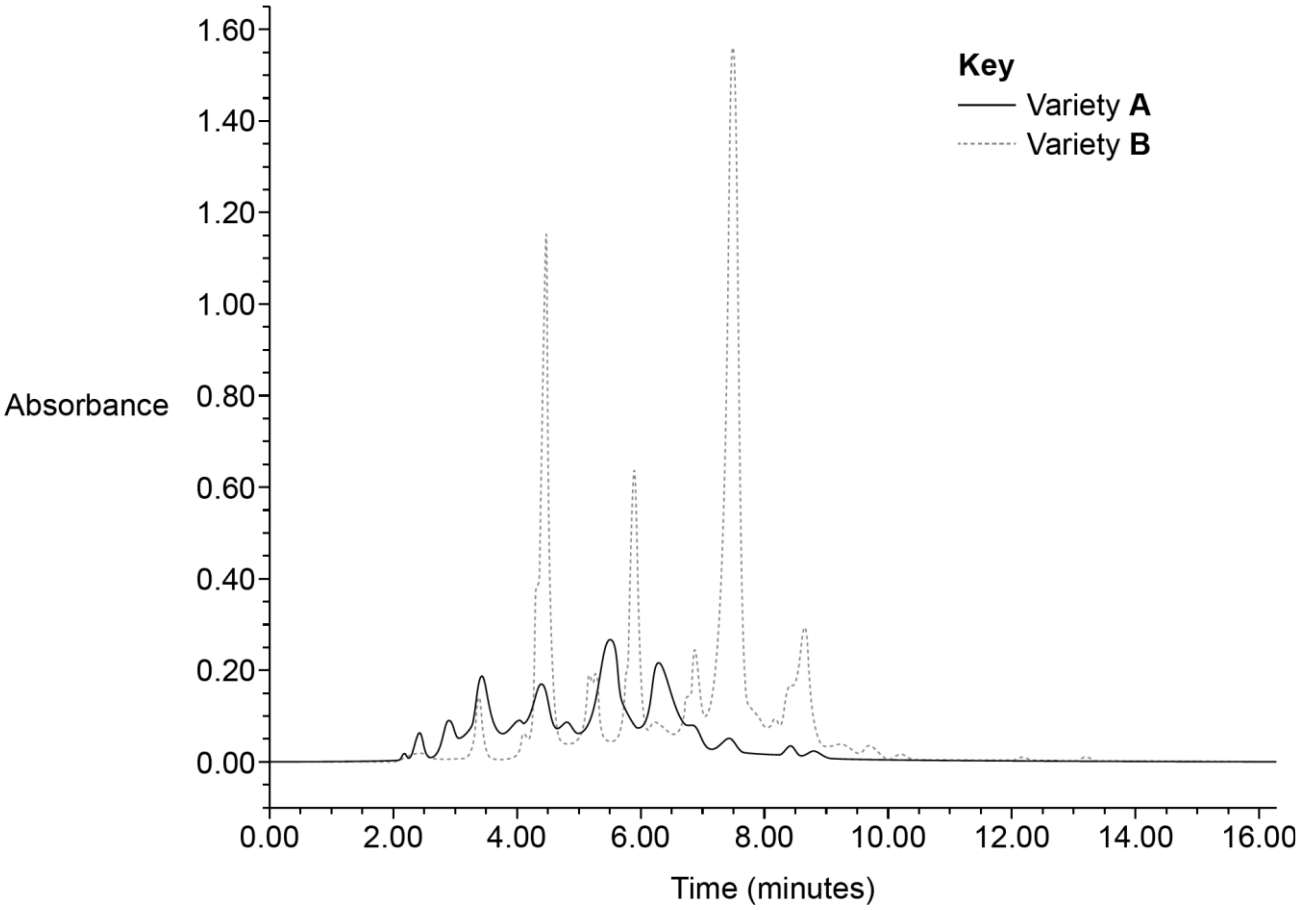
(c) *Artemisia annua* is a plant used in herbal remedies to limit the development of some forms of cancer.

- There are two varieties of *Artemisia annua*, **A** and **B**, which contain an active ingredient.
- The company plans to separate the active ingredient from other components found in the plant.

Tom uses HPLC to separate the components in the two varieties.

Fig. 2.3 shows the chromatogram of the two different varieties of *Artemisia annua*.

Fig. 2.3



(i) The compound with a retention time of 4.5 minutes is the active ingredient.

Write the letter **X** on the peak in **Fig. 2.3** which corresponds to this compound. **[1]**

Most candidates gained this mark. There was no pattern to incorrect answers.

Question 2 (c) (ii)

(ii) Which variety (**A** or **B**) contains more of this compound assuming that equal amounts of the two varieties were analysed?

Tick (✓) the correct box.

Variety **A** ☐

Variety **B** ☐

[1]

Most candidates correctly selected B.

Question 2 (c) (iii)

(iii) Use **Fig. 2.3** to estimate how much more of the active ingredient is found in the variety identified in **(a)(ii)** compared to the other variety.

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

Most candidates did not realise they needed to use the scale on the y axis to calculate the difference. Many gave answers that used measured distances instead.

Assessment for learning

It would be useful for candidates to practice interpreting chromatograms.

Question 2 (c) (iv)

(iv) The active ingredient can be positively identified by linking up the HPLC equipment to a mass spectrometer (MS).

Assume that the active ingredient is **not** on the database of known compounds.

Explain how the mass spectrum can be analysed to identify the compound.

.....

.....

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

Importance of reading the question

Very few candidates gained any marks. Those that did gained a mark for the fact the mass spectrum tells us the molar mass. Many suggested comparing to known values.

Question 3 (a) (i)

3 Yoghurt is produced by bacterial fermentation of milk.

During the fermentation process, the lactose in milk is converted into lactic acid which is a weak acid.

Jack works at a dairy farm producing plain and fruit yoghurts. One of his jobs is to determine if fermentation in plain yoghurt is complete. He does this by titrating samples against sodium hydroxide.

(a) Jack first prepares a standard solution of sodium hydroxide.

(i) Use the Periodic Table to determine the relative formula mass of sodium hydroxide, NaOH.

Relative formula mass = ... $g\,mol^{-1}$ **[1]**

This question was well answered. 20 was a common error.

Question 3 (a) (ii)

(ii) Calculate the mass of NaOH required to make 250 cm^3 of 0.05 mol dm^{-3} NaOH(aq).

Mass = ...g **[2]**

A lot of candidates did not realise they needed to use the RFM from question 3(a)(i). Overall this question was not well answered. Candidates knew they had to do a conversion but they often did this for the wrong numbers or used 100 rather than 1000.

Assessment for learning

Practice common calculations including unit conversions.

Question 3 (a) (iii)

(iii) Name **two** pieces of **measuring** equipment required to make an accurate standard solution.

Put a tick (✓) in the boxes next to the measuring equipment.

2 decimal place balance	☐
25 cm^3 graduated pipette	☐
25 cm^3 one-mark pipette	☐
50 cm^3 burette	☐
250 cm^3 conical flask	☐
250 cm^3 volumetric flask	☐

[2]

Importance of reading the question

Less successful candidates thought they were suggesting equipment for a titration and so ticked pipette and burette.

Question 3 (b)

(b) Jack then fills up a burette with the sodium hydroxide solution.

Describe how Jack should wash out his burette before using it in the titration.

.....

.....

.....

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

Many candidates suggested water but did not specify distilled water. Very few knew to rinse again with the sodium hydroxide.

Importance of practical experience

Again this shows the importance of not only carrying out practicals but discussing the purpose of each step.

Question 3 (c) (i)

(c) Fermentation is complete when the lactic acid concentration is between 85 and 90 mmol dm^{-3}.

Jack uses the following method to determine whether fermentation is complete.

- Weigh out 10.30 g of plain yoghurt into a conical flask.
- Add a few drops of indicator.
- Titrate against 0.05 mol dm^{-3} sodium hydroxide.
- Repeat the titration until concordant titres are obtained.

(i) The indicator that Jack uses turns from colourless to pink at the end point.

Put a tick (✓) in the box next to the name of this indicator.

bromothymol blue	☐
litmus	☐
methyl orange	☐
phenolphthalein	☐
universal indicator	☐

[1]

It was good to see most candidates gaining this mark. There was no pattern to incorrect answers.

Question 3 (c) (ii)

(ii) Explain what **concordant titres** means.

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

Candidates generally had an idea that concordant titres were similar. Unfortunately, very few gave the specific 0.1cm^3 volume.

Question 3 (c) (iii)

(iii) The mean volume of 0.05 mol dm^{-3} NaOH used in the titration was 17.50 cm^3.

Calculate the concentration of lactic acid, in mol dm^{-3}, in the yoghurt.

Assume that:

- all the acid present in the yoghurt is lactic acid
- 10.30 g of yoghurt has a volume of 10.0 cm^3
- 1 mole of lactic acid is neutralised by 1 mole of NaOH.

Concentration of lactic acid = ... mol dm^{-3} **[3]**

This question was not well answered. Most struggled with the conversions and multiplied by 1000 when they should have divided. Many candidates did not show their working so could not be given credit for any correct steps if their answer was incorrect.

Question 3 (c) (iv)

(iv) Use the value obtained for **(c)(iii)** to explain how Jack knows that fermentation is complete.

.....

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

Most candidates attempted this question but were unable to access the mark because they had not realised the units were different.

Question 3 (c) (v)

(v) Jack is asked to determine the lactic acid concentration in a pot of strawberry flavoured yoghurt.

Suggest **two** reasons why Jack's method would **not** be suitable.

1 .....

.....

2 .....

.....

[2]

A lot of candidates were not credited here because they did not use correct terminology or fully explain their answer. For point one they stated there were other substances in strawberry yoghurt but did specify other acids. For point two they stated it was difficult to see colour change but did not explain that this was due to the colouring of the yoghurt.

Question 4 (a)

4 Mei is a researcher studying different blood disorders, which cause abnormalities of blood cells.

The magnification of blood samples is essential to examine the cells in blood.

Mei can use different pieces of equipment, ranging from electron microscopes and light microscopes to hand lenses when carrying out his research.

(a) The first column of the table lists features of the three pieces of equipment used for magnification.

Put a tick or ticks (✓) in each of the four rows to show the piece or pieces of equipment that have each feature.

Feature	Electron microscope	Light microscope	Hand lens
Easiest to use outside the laboratory			
Highest magnification			
Cheapest			
Can be used to view living blood cells			

[4]

Most candidates gained at least 3 marks here. There was no pattern to incorrect answers.

Question 4 (b) (i)

(b) Sickle cell disease is a disorder of red blood cells and one of the symptoms of this disease is pain.

Mei uses a light microscope to take the images of blood cells shown in **Fig. 4.1** and **Fig. 4.2**.

Fig. 4.1 is sickle cell blood and **Fig. 4.2** is normal blood.

Fig. 4.1 **Fig. 4.2**

(i) Light microscopes use an eye-piece lens and an objective lens to achieve the magnification required.

The images of blood cells in **Fig. 4.1** and **Fig. 4.2** are 400× magnification.

Tick (✓) the box next to the correct combination of lenses used to obtain the 400× magnification.

Eye-piece lens	Objective lens	
×40	×10	
×100	×4	
×10	×40	

[1]

Most candidates gained this mark. The top box was the most common incorrect answer.

Question 4 (b) (ii)

(ii) State **one** feature of cells visible when using a light microscope but **not** visible when using an electron microscope.

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

Importance of reading the question carefully

This is an example where candidates did not read the question carefully. We were looking for a feature of a cell, so the candidates that stated they could see living cells did not answer the question and so were not credited a mark. Most were credited for colour and a few named a living process such as movement.

Question 4 (b) (iii)

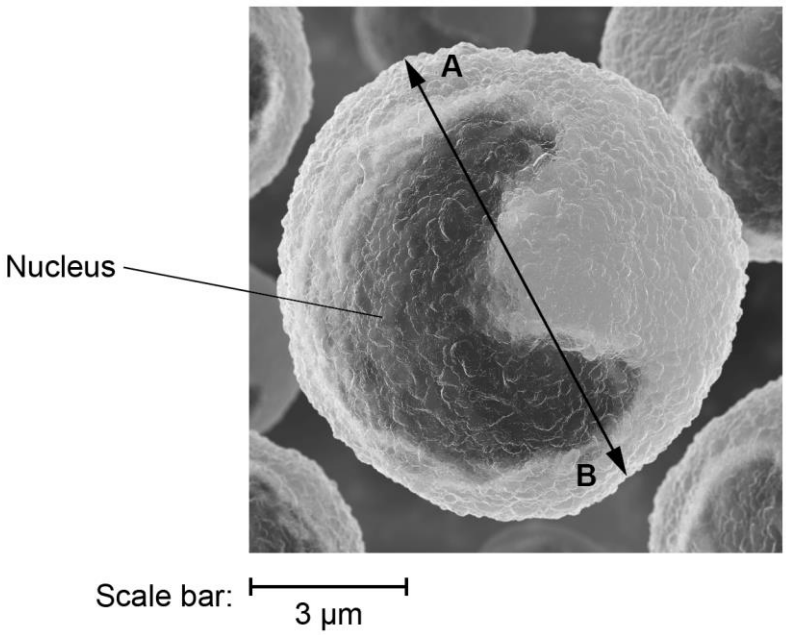
(iii) Suggest why the red blood cells in **Fig. 4.1** may get stuck and cause painful blockages in narrow blood vessels.

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

Some answers given were too vague, e.g. different sizes or shapes. We were looking for specific shapes or description of shapes that cause the problem.

Question 4 (c) (i)

(c) Mei takes an image of a white blood cell using an electron microscope, shown below.



(i) Determine the measured and actual diameter of the white blood cell (**A** to **B**).

Firstly, use a ruler to measure the diameter (**A** to **B**).

Give your answer in mm.

Measured diameter of white blood cell = ...mm

Secondly, use the scale bar under the image and your measurement to calculate the actual diameter (**A** to **B**) of the white blood cell.

Give your answer in µm.

Actual diameter of white blood cell = ...µm

[1]

The units were given here so it is important that candidates measured in mm and gave an actual diameter in µm. It was clear that some candidates did not measure the line provided. Again it is important to read the question carefully so these mistakes are not made.

Question 4 (c) (ii)

(ii) Calculate the magnification of the image.

Use the values obtained in **(c)(i)** and the equation

$$\text{Magnification} = \frac{\text{measured size}}{\text{actual size}}$$

Give your answer to **1** decimal place.

Magnification = ... × **[2]**

Misconception

Many candidates were unable to be credited one of the marks because they did not realise that they needed to convert the figures used to the same units. They were still able to access the second mark if they gave their calculated answer to 1 decimal place. However, it is important that this is correctly rounded and so some candidates were unable to be credited for incorrect rounding. Other candidates used the recurring dot above the last figure in their answer. This implies an answer to infinite decimal places and so could not be given. We recommend not using the recurring dot symbol. In questions that require specific number of decimal places or significant figures this would stop a mark from being credited. In questions where significant figures or decimal places are not required, we would usually accept any number of significant figures/decimal places as long as rounding was correct and was appropriate for the numbers in the question.

Question 4 (c) (iii)

(iii) Suggest why it is more reliable to estimate the diameter of the white blood cell than to estimate the length of the nucleus.

.....

.....

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

Misconception

Most candidates recognised that the white blood cell is uniform. However, many thought the nucleus could not be measured because it was too small, even though we are using a microscope, or it was inside the cell and could not be seen. This showed a misunderstanding of how microscopes work.

Question 4 (c) (iv)

(iv) State the type of electron microscope used to create the image.

Explain your answer.

.....

.....

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

This was a well answered question. 3D images was a common correct answer. Some candidates confused the microscope with a transmission electron microscope.

Question 5 (a) (i)

5 Beth is a technician working in an analytical chemistry laboratory.

(a) One of Beth's tasks is to detect metal ions in food using AES and ICP-AES.

(i) What does AES stand for?

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

Science terminology

It is important that candidates know the correct terminology and names for equipment. Many candidates clearly guessed what AES stood for.

Question 5 (a) (ii)

(ii) Put a (ring) around each element from the list whose cations can be tested using ICP-AES but **not** AES.

iridium **platinum** **potassium** **rubidium** **sodium**

[1]

Candidates struggled to identify the correct cations in this question. There was no pattern to the incorrect answers. It is important that candidates know how different analytical equipment works.

Question 5 (a) (iii)

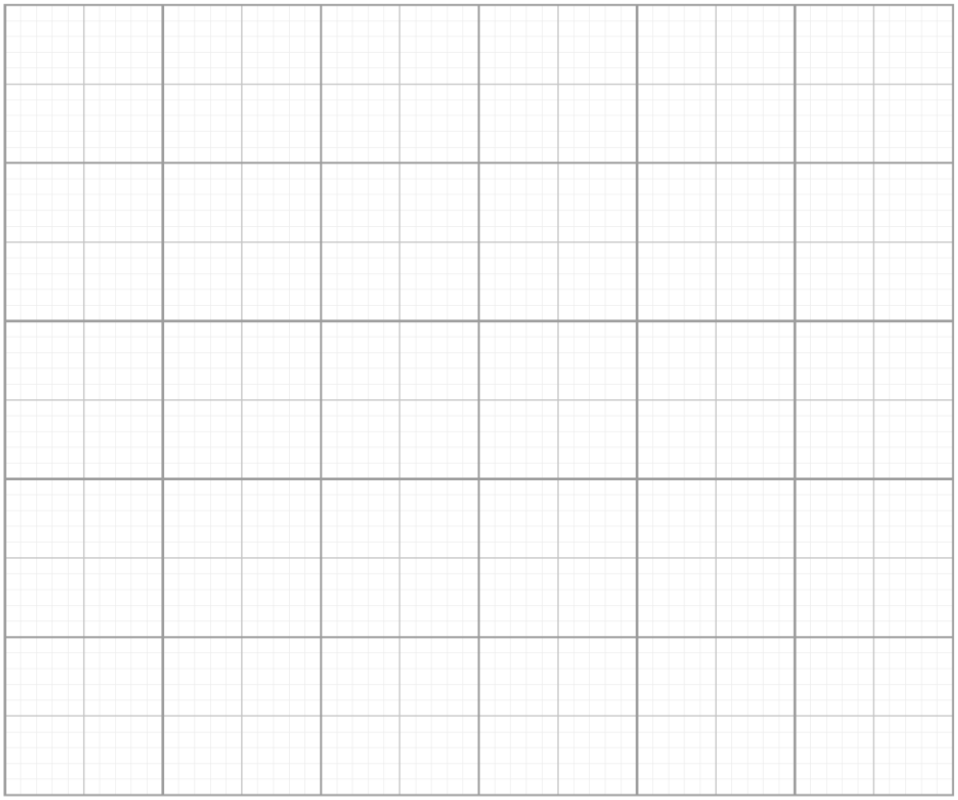
(iii) Beth investigates the quantity of arsenic in rice using ICP-AES.

She prepares a series of arsenic standard solutions to produce a calibration graph.

The table shows the absorbance of the arsenic standards.

Concentration of arsenic ($\mu g\,dm^{-3}$)	Absorbance (AU)
0.0	0.00
1.0	0.08
2.0	0.13
3.0	0.20
4.0	0.27
5.0	0.33

Use the values in the table to plot a calibration graph on the grid below.



[4]

The most common error here was swapping the X and Y axis. Overall this question was answered well. Candidates that used sensible scales were able to easily plot the graph. Most drew a good line of best fit although some forgot to extend it to the origin. It was nice to see candidates use sharp pencils and draw small crosses to make sure marks could be given.

Question 5 (a) (iv)

(iv) Beth carries out the method below to prepare rice for analysis.

- Weigh out 2.0 g of rice.
- Extract the arsenic from the rice using 100 cm^3 of solvent.
- Measure the absorbance of a sample of this solution using ICP-AES.

She measures the absorbance of this sample as 0.23 AU.

Use your calibration graph to determine the concentration of arsenic in the sample, showing clearly on the graph how you obtain your answer.

Concentration of arsenic = ...$\mu g\,dm^{-3}$ **[2]**

Most candidates gained marks here. Those that didn't, tended to not draw their guidelines. There is a mark for these on this paper.

Question 5 (a) (v)

(v) The maximum permitted level of arsenic in rice is 0.20 $\mu g\,g^{-1}$.

Calculate the mass in µg of arsenic in 1.0 g of the rice and determine whether the rice is safe to eat.

Mass of arsenic in 1.0 g of rice = ... $\mu g\,g^{-1}$

Is the rice safe to eat? .....

[2]

Assessment for learning

Candidates did not do well here. They did not realise they needed to convert their answer from 5(a)(iv) to grams. Good exam technique would be to circle all units in a question so it is clear where conversions are needed.

Candidates should be given the chance to practice these skills.

Question 5 (b)

(b) Beth is learning how to analyse ionic compounds using flame tests and chemical tests.

She has access to the equipment needed for flame tests and she can use a selection of the following solutions for the chemical tests.

- Barium chloride
- Hydrochloric acid
- Nitric acid
- Silver nitrate
- Sodium carbonate
- Sodium chloride
- Sodium hydroxide
- Sulfuric acid

Beth's supervisor gives her two white solids **X** and **Y**.

The supervisor tells Beth that **X** is aluminium sulfate, $Al_2(SO_4)_3$, and that **Y** is lithium bromide, LiBr.

Describe how Beth should test the two samples to check whether her supervisor is correct.

Include details of how you would carry out the tests.

.....

.....

.....

.....

.....

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

Candidates that did well here set out their work clearly. They discussed each ion in turn and described the test and result. Candidates that did not do this often got confused and conflated two or more tests/results and so could not be given as it was not clear what ions they were referring to.

Many candidates only described a flame test and did not specify which ion they were testing for, or the result expected. This meant they could not gain credit above Level 1.

It is even more important in this question to use correct science terminology. For example, there is a difference between 'going white' and 'producing a white precipitate' that could limit a candidate within a level or stop them reaching the next level.

Candidates should have as much practical experience as possible in order to answer this style of questions.

Question 6 (a) (i)

6 The maintenance of sterile conditions and the use of aseptic techniques is essential for many areas of medicine and scientific research such as surgical operations, cloning plant tissues and space exploration.

(a) The conditions in a hospital operating theatre must be as sterile as possible.

(i) Draw lines to connect the features of the operating theatre to the most appropriate sterilisation method.

Feature of the operating theatre	Sterilisation method
Walls and floors	Irradiation with ultraviolet light
Metal surgical instruments	Autoclave
The air	Wipe down with disinfectant or pesticide

[2]

This question was generally well answered. Matching air to irradiation and walls to autoclave were common errors.

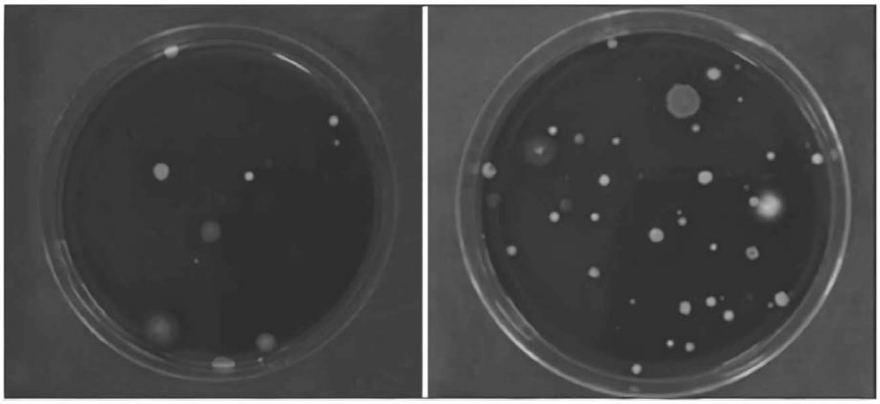
Question 6 (a) (ii)

(ii) **Fig. 6.1** and **Fig. 6.2** show two settle plates used to monitor air quality.

Blood agar (settle) plates are left open in the operating theatre for 30 minutes.

Microorganisms in the air settle on the plates and grow to form colonies.

Fig. 6.1 **Fig. 6.2**



Describe and explain **two** differences that can be seen between the settle plates in **Fig. 6.1** and **Fig. 6.2**.

Difference 1 .....

Explanation .....

.....

Difference 2 .....

Explanation .....

.....

[4]

Candidates struggles to answer this question because they were not clear about the difference and the reason linked to it. Most understood there were more colonies but stated because there were more white dots. Some said there were different types of colonies but not that there were more different types. Some thought this was about growing cultures rather than microorganisms landing on the plate from the air. They had not read the question and so gave reasons in terms of growing cultures and this did not gain marks. Others suggested aseptic techniques had not been used and so had also misunderstood the question.

Question 6 (a) (iii)

(iii) Suggest why it is important that all surgical instruments are sterilised before and after use.

Before use .....

.....

After use .....

.....

[2]

Context of question

This question needed to be answered in terms of the current patient and any future patients/staff involved in surgery. Many answers were too vague. Many just mentioned the need not to cross contaminate but did not state cross contaminate what.

Question 6 (b) (i)

(b) Many different types of plants can be grown to form tissue cultures.

Aseptic conditions must be followed when creating and maintaining the tissue cultures.

Banana plant tissue cultures can be used to form clones.

Gros Michel is a variety of banana. All *Gros Michel* banana plants are clones.

(i) Explain what **clone** means.

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

We were looking for specific definition of clone here. Vague answers such as an identical copy did not gain the mark.

Question 6 (b) (ii)

(ii) Suggest **two** advantages of cloning bananas.

1 .....

2 .....

[2]

Most candidates gained at least 1 mark here. Many gave vague answers such as cheaper or more bananas that did not gain credit. Produce bananas more quickly would have gained a mark.

Question 6 (b) (iii)

(iii) Suggest **two** disadvantages that cloning bananas could have for banana growers.

1 .....

2 .....

[2]

Many gave answers such as loss of jobs which shows they do not seem to understand the disadvantages of cloning.

Question 6 (b) (iv)

(iv) The banana plants can be cloned without using aseptic conditions.

Suggest **one** advantage this would have for banana plant breeders.

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

This question was well answered.

Question 6 (c)

(c) Azmi is an engineer working for the European Space Agency.

Azmi is working alongside a team of scientists to build a rover to land on the surface of a planet to search for life.

The construction of the rover vehicle is carried out in a clean room environment.

Suggest why it is important that the rover is not contaminated with microorganisms.

.....

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

A well answered question in general. However, vague answers re cross contamination did not gain marks unless it was clear what was being contaminated.

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