CAMBRIDGE TECHNICALS

OCR
Oxford Cambridge and RSA

CAMBRIDGE TECHNICALS LEVEL 3 (2016)

Examiners' report

APPLIED SCIENCE

05847–05849, 05879, 05874

Unit 2 Summer 2022 series

Version 1

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. However, most centres are familiar with the style of paper and in general candidates' performance is improving, even considering the difficulties of the last two 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 laboratory safety in terms of taking blood samples. They were also able to answer questions on gas spectroscopy, as well as a range of techniques to identify compounds in an unknown sample. They did find carrying out calculations using numbers from a graph challenging. They understand the advantages and disadvantages of a range of microscopic techniques but did find questions on calculating magnification challenging. They did not do so well when describing titration and preparation of solutions. They also found interpreting agar plates containing different coliforms challenging. In some cases, their lack of good scientific terminology prevented them answering questions to the required standard.

Candidates who did well on this paper generally did the following:	Candidates who did less well on this paper generally did the following:
• attempted all questions • read the question carefully • had evidence of experience of laboratory techniques • had practised exam technique • had good knowledge of chemical tests • had good understanding of magnification using microscopes • 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 • did not seem to have laboratory techniques experience to draw upon • did not seem to have a good understanding of chemical tests • did not seem to acquire a range of skills and knowledge as outlined in the specification • found calculating magnification a challenge • did not show mathematical working • used imprecise scientific terminology.

Question 1 (a)

1 AIDS is an infectious disease caused by the human immuno-deficiency virus (HIV).

- The virus is spread from person to person through infected body fluids, such as blood.
- A phlebotomist is the name of a person trained to take blood samples from patients.
- Blood samples are taken from patients and tested to see if the patient has been infected with HIV.
- A blood sample is removed from the patient's arm, using a needle attached to a syringe.
- Each sample is collected in a small tube or vial.

(a) Phlebotomists must follow regulations set out in the Health and Safety at Work Act 1974.

Put a tick (✓) in the boxes that show **two** of the responsibilities of phlebotomists, when taking blood samples.

Take care of their own health and safety and that of others.	
Be paid more than the minimum wage.	
Co-operate with their employer on health and safety issues.	
Not work more than 8 hours.	
Take a rest break during the working day.	

[2]

Most candidates got both marks here. There was no pattern to incorrect answers.

Question 1 (b)

(b) The phlebotomists and their supervisors often carry out a risk assessment of the procedure for taking blood samples.

There are five steps involved in completing a risk assessment.

Complete the sentences using words from the list to show the five steps.

record **hazards** **review** **harmed** **risks**

1 Before completing the procedure, look for potential ....

2 Identify who might be .... and how.

3 Evaluate the .... and consider ways to reduce them.

4 Write up the findings of the assessment as a formal ....

5 Revise and modify the procedure as part of a ....

[2]

Misconception

Candidates used the terms hazard and risks in the incorrect order, meaning they were unable to be credited full marks here. This was a common misconception seen

Question 1 (c)

(c) State **two** hazards to the phlebotomist when taking blood samples.

1 ....

2 ....

[2]

Candidates confused hazards and risks again on this question. Many candidates stated 'getting cuts/stabbed or getting infection', which is a risk. We were looking for the hazards, which were the needle and the pathogen/HIV.

Question 1 (d)

(d) State **one** precaution that the phlebotomist could take to reduce the chances of infection by the blood.

.... **[1]**

Many candidates answered with generic PPE. They needed to give a precaution specific to the risk of being infected. They need to make sure they read the question carefully and give responses relevant to the question.

Assessment for learning

It is important for candidates to give precautions specific to the context they are given. This can include safe handling of blood, as well as practical procedures. Encourage candidates to practice identifying specific precautions for every practical they experience.

Question 1 (e)

(e) State how the phlebotomist should dispose of the needle safely.

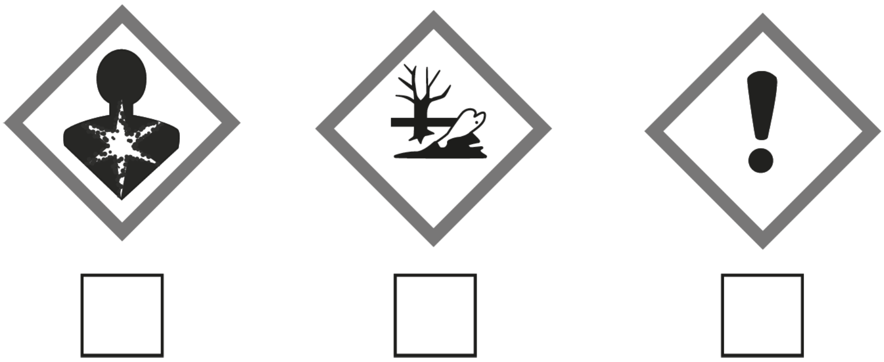
.... **[1]**

Many candidates knew the needles had to go in a specific bin but did not know what this bin was called. Many called it the yellow bin, which could not be credited. Even though the sharps bin is usually yellow it is not the correct name, and not all yellow bins are sharps bins.

Question 1 (f) (i)

(f) It is important to label substances with warning signs to inform others of the dangers.

(i) Put a tick (✓) under the correct symbol used by phlebotomists to identify the hazard of blood samples.



[1]

The warning signs have changed in recent years, and it is important that students are aware of the most up to date meanings. Many candidates incorrectly ticked the !

Question 1 (f) (ii)

(ii) Explain why the label on the blood sample has a code and not the patient's details.

.... **[1]**

Candidates had a good idea that this was about confidentiality. Some thought it was because some patients have the same name, but this was not creditworthy.

Question 1 (f) (iii)

(iii) The label must be attached to the side of the tube and not the lid.

Give a reason for this.

.... **[1]**

Prevention of spillages was a common correct response. Where candidates went down the 'prevent contamination' route, they only gained the mark if they were clear about what could be contaminated.

Question 1 (g)

(g) Suggest why the blood sample must be transported in a sealed bag.

....

.... **[1]**

Marks are only given here where it is clear what could be contaminated. It is important to teach students to state what is being contaminated in these cases. For this question it could have been the blood sample or people in contact with the sample.

Question 2 (a)

2 Environmental scientists study air samples to provide evidence of how humans affect the atmosphere.

One technique used to identify the chemicals in the atmosphere is GC-MS.

(a) Tick (✓) the box next to the correct meaning of GC.

Generic chemistry	
Gas chromatography	
Geographical climate	
Glacial constituent	

[1]

Candidates generally gained this mark and it was good to see most candidates attempted it. This is good exam practice as, with every multiple choice question, there is a chance of getting the right answer even if the candidate is unsure. A common wrong answer was geographical climate.

Question 2 (b) (i)

(b) GC-MS is frequently used to study pollutants in the atmosphere of cities.

In one such investigation, scientists analysed snow samples collected in a city park over the winter period. By studying the GC spectra of fresh snow and old snow, the scientists could compare the pollutants present in the snow.

Fig. 2.1 shows the GC spectra of old snow and fresh snow in the investigation.

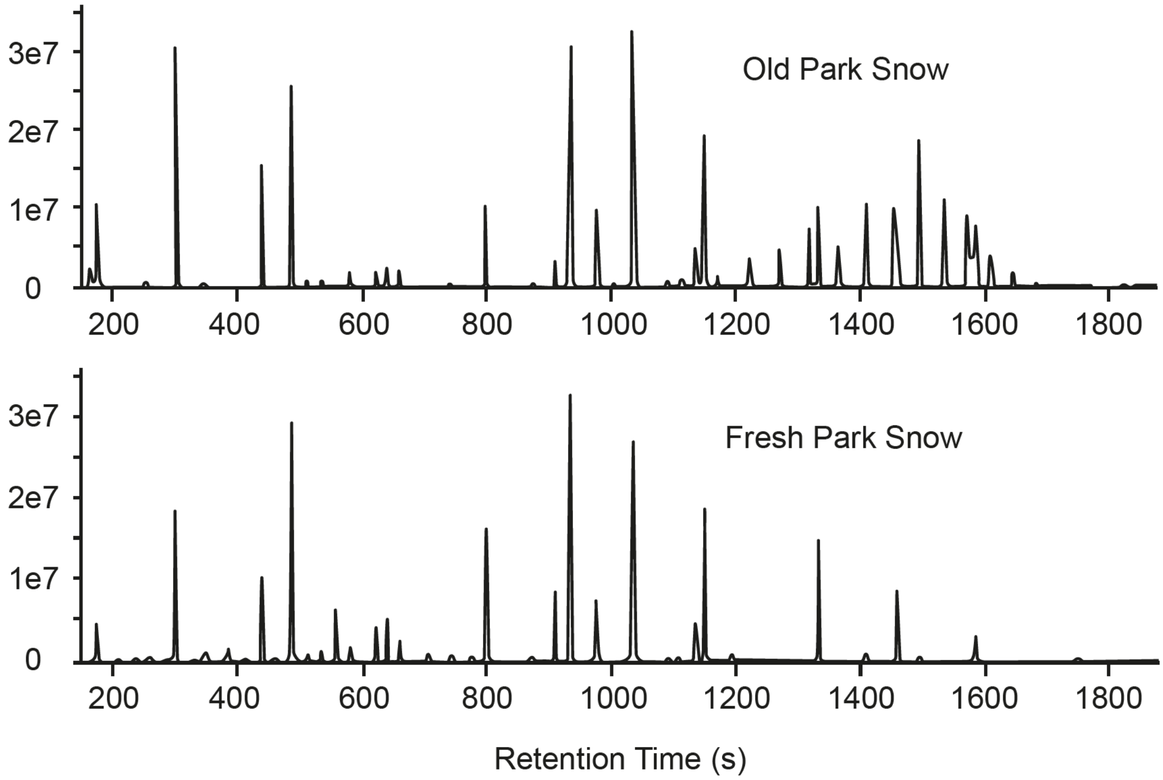


Fig. 2.1

(i) Explain how the results show that old snow is more contaminated than fresh snow.

....

.... **[1]**

Precise language is really important when answering any question on this paper. The response here had to relate to the spectra e.g., more peaks. Stating 'more contaminants', or 'the snow had been there longer' did not gain the mark.

Question 2 (b) (ii)

(ii) Using the spectra in **Fig. 2.1** put a tick (✓) for each retention time in the table to indicate if the compound is present in both fresh snow and old snow **or** if it is an additional pollutant in the old snow. You should only put **one** tick in each row.

Retention time (s)	Present in fresh and old snow	Additional pollutant
300		
800		
1500		

[3]

Most candidates were able to interpret the spectra correctly.

Question 2 (b) (iii)

(iii) One of the compounds identified in the GC spectrum of old snow has a retention time of 1210 s.

Write the letter **N** above the correct peak on **Fig. 2.1** to show its position on the spectrum.

[1]

It was good to see candidates being very clear about which was the correct peak.

Question 2 (b) (iv)

(iv) Complete the two sentences below using words from the list.

positive	**standards**	**aliquot**	**calibration**
area	**negative**	**dilutions**	**volume**

1 Peaks in a GC spectrum can be identified by comparing their retention times with the retention times of known ....

2 The amount of each substance can be determined from the .... under the peak.

To do this a .... curve is needed.

[3]

It was good to see most candidates attempt the question, using the words from the list, and not leave it blank. Where marks were gained it was for the first blank 'standards' and many candidates gained this mark. The majority of candidates found this question challenging and did not go on to gain full marks. As has been stated previously it is important to have a good understanding of the scientific terminology and language expected by the specification. Candidates will be expected to use precise terminology when describing or explaining a process.

Question 2 (c) (i)

(c) A mass spectrometer was connected to the GC machine so that each compound in the snow could be identified.

Fig. 2.2 is a block diagram of a mass spectrometer.

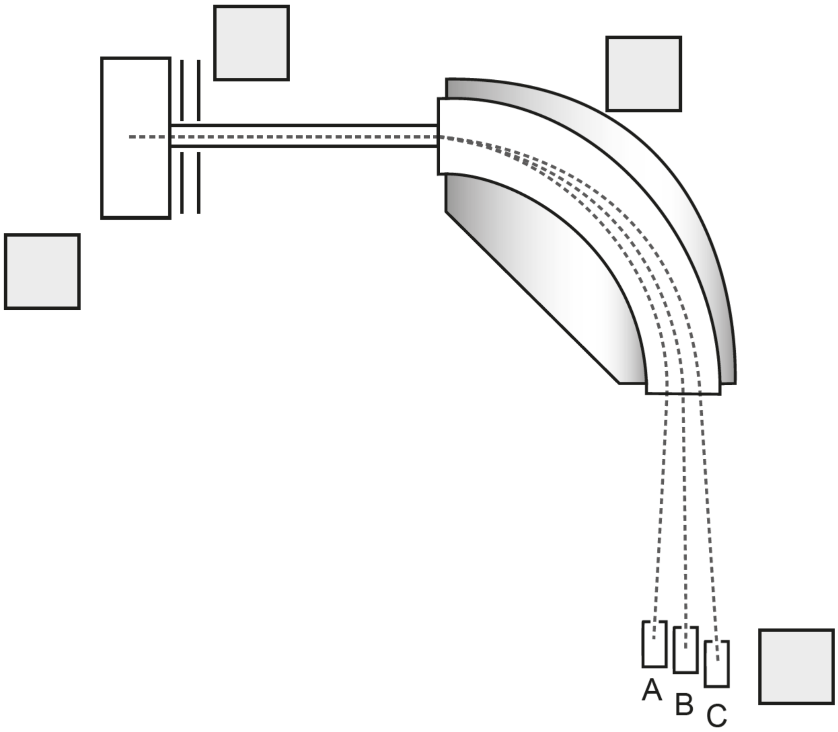


Fig. 2.2

(i) The statements (numbered 1 to 4) show the main parts of a mass spectrometer.

Put the number of the statement into each shaded box in **Fig. 2.2** next to where the statement applies.

1 The magnet separates the ions

2 The sample is ionised

3 The ions are detected

4 The ions are accelerated

[4]

It was good to see almost all candidates attempt this question. Nearly all candidates gained some marks.

Question 2 (c) (ii)

(ii) State which letter (A, B or C) indicates the position where the heaviest ion is registered.

.... **[1]**

Most candidates guessed A here, showing that they did not understand this technique.

Question 2 (c) (iii)

(iii) Explain how scientists can use mass spectrometry to identify an unknown compound.

....

.... **[1]**

Some candidates gained a mark for the idea of comparing against known ions. It was clear that most candidates did not know how to use a mass spectrometer to identify compounds.

Assessment for learning

As a practical subject it is important for candidates to know the theory behind techniques, and practice how to use and interpret results from the techniques.

Question 3 (a) (i)

3 Chemists use a variety of techniques to identify the compounds present in a sample.

(a) Ali is learning how to identify cations in unknown compounds.

- They carry out a flame test by placing a small amount of the powdered compound onto a wire loop.
- They then place the loop in a non-luminous flame and observes the colour of the flame.

(i) Circle the word that describes the charge on cations.

positive **negative** **neutral**

[1]

Most candidates gained the mark for 'positive'.

Question 3 (a) (ii)

(ii) The label on the bottle of powder is barium sulphate.

State the colour of flame that Ali should see.

.... **[1]**

It is good to see candidates using the correct and precise colour for this question, and many gained the mark for this question. Some candidates gave vague answers such as 'green/blue' or imprecise answers such as 'dark green'. These were not creditworthy.

Question 3 (a) (iii)

(iii) When Ali carries out the flame test, the flame colour is red.

Draw a circle around the cation that is likely to be present in the powder.

lithium **magnesium** **sodium** **potassium** **copper (II)**

[1]

Most candidates correctly circled lithium. Potassium was a common wrong answer.

Question 3 (b) (i)

(b) Emma works as a technician in an analytical laboratory.

- They measure the concentration of cations in soil samples to see if the soil is contaminated.
- Emma uses a technique called inductively coupled plasma-atomic emission spectroscopy (ICP-AES).
- They use this to measure the amount of lead in soil samples.

Emma shows Ali how to use ICP-AES. Ali asks about the advantages of ICP-AES over flame tests.

(i) Put ticks (✓) in the **two** boxes that show the advantages of using ICP-AES.

It is a very cheap way to determine the quantity of an element in a sample.	
It is a very reliable method of determining the quantity of an element in a sample.	
It can detect very small amounts of cations.	
It can detect anions as well as cations.	

[2]

It was common for candidates to gain one out of the two marks here. There was no pattern to the marks gained or to the incorrect answers chosen.

Question 3 (b) (ii)

(ii) Emma uses a diagram shown in **Fig. 3.1** to explain how ICP-AES works.

They label the diagram to indicate the four stages involved.

A Light is emitted from the sample when it is heated

B The wavelength of the emitted light is measured

C The sample is converted to an aerosol using argon gas

D The light is split into a spectrum

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Fig. 3.1

Write the letter **(A, B, C or D)** of the correct statement in the boxes in **Fig. 3.1** to indicate what happens at each stage.

[4]

It was good to see most candidates attempt this question. It did mean that most gained at least one mark. This is good exam technique, especially with this sort of multiple-choice question.

Question 3 (c) (i)

(c) Ali and Emma then test some soil samples to determine the amount of lead present.

They start their investigation by producing a calibration graph using known concentrations of lead. The graph is shown in **Fig. 3.2.**

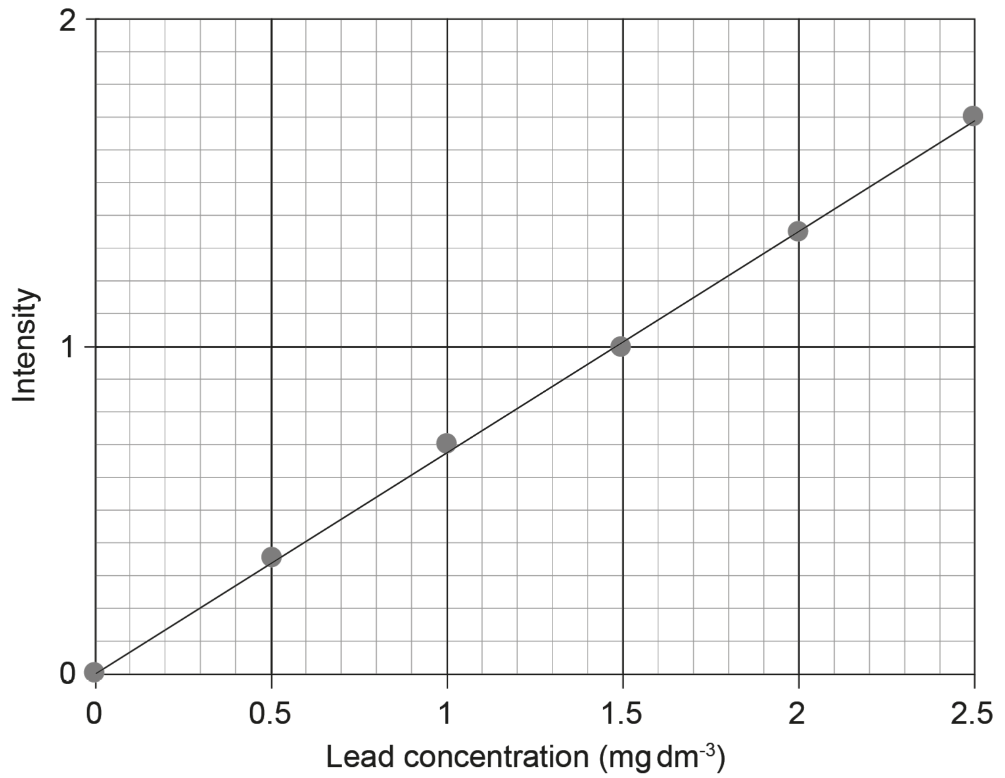

Fig. 3.2

Below is a summary of the method they use to test the soil sample.

- Add 10 cm^3 of nitric acid to 1.5 g of soil and heat the mixture for 20 minutes.
- When all the lead compounds in the soil have dissolved, filter the mixture to remove any solids.
- Add distilled water to the filtrate until the total volume is 50 cm^3.
- Place the sample solution in the ICP-AES machine and measure the light intensity.

(i) The soil sample gave a light intensity of 0.60.

Determine the concentration of lead in the sample solution.

Show on the graph how you arrived at your answer.

Concentration of lead in sample solution = ... mg dm^{-3} **[2]**

The question clearly states 'Show on the graph…' so, candidates needed to show their interpolation lines on the graph in order to gain both marks. If they gave the correct response without the lines, they could only gain the mark for 0.9.

Question 3 (c) (ii)

(ii) Calculate the mass of lead in the 50 cm^3 sample.

Mass of lead = ... mg **[2]**

Most candidates did not show an understanding that they needed to do a conversion and so did not multiply the correct numbers of $0.9 \times 10^{-3} \times 50$ mg.

Question 3 (c) (iii)

(iii) The safe allowable level of lead in soil is 22 mg per kilogram of soil. Above this value, the soil is classed as being contaminated.

State if the soil sample was contaminated, justifying your answer with an appropriate calculation.

....

....

.... **[2]**

Assessment for learning

Candidates need to read and understand the command words; State and Justify. They then need to make sure they do both these things. They needed to use their answer from (c)(ii) and state that this was the level of lead in 1.5g of soil. They should then have shown their working to justify that the soil was/was not contaminated based on this answer. It was not enough to say it was higher than 22 mg, so it was contaminated.

Question 4 (a) (b) (c) (d) (e)

4 Bryozoans are microscopic sea creatures that can form layers on surfaces.

- They are important because they affect the performance of submersed man-made structures by fouling them.
- They are also an important part of ecosystems and if they die this can indicate pollution.

Fig. 4.1 shows an electron micrograph of a layer of bryozoans. **Fig. 4.2** is a light micrograph of a layer of bryozoans. In both images a single bryozoan has been labelled **B**.

1 nm = 1 × 10^{-9} m

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Fig. 4.1

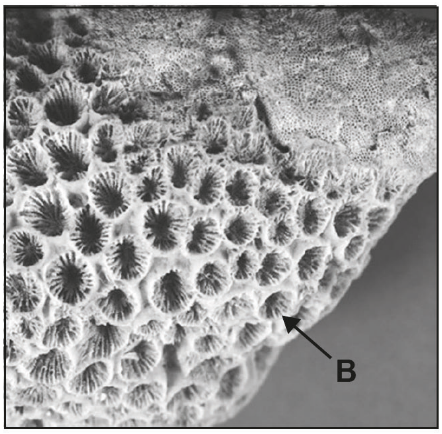

Fig. 4.2

Electron microscopy and light microscopy have different advantages.

(a) State **one** advantage of electron microscopy shown in **Fig. 4.1**.

.... **[1]**

(b) With reference to **Fig. 4.1** and **Fig. 4.2**, state **two** advantages of light microscopy.

1 ....

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

(c) State **one** disadvantage of light microscopy that is **not** shown in **Fig. 4.2**.

.... **[1]**

(d) Other than cost, suggest **one** advantage of using a hand lens to view bryozoans.

.... **[1]**

(e) Put a tick (✓) in the **two** boxes that are types of electron microscopes.

Scanning	
Sonorous	
Tangential	
Transmission	

[2]

Most candidates had a good understanding of the advantages and disadvantages of different types of microscopy. It was important to read the questions. For questions 4(b) and 4(c) they needed to take into consideration what was shown in Figs 4.1 and 4.2. Candidates that did not do that ended up losing marks. For example, in question 4(c) they gave disadvantages that could be seen in Fig 4.2 such as low resolution, which could not gain the mark.

Question 4 (f)

(f) Use the scale bar of 400 nm in **Fig. 4.1** to estimate the actual size of a bryozoan.

Use the bryozoan labelled **B** in the centre of the electron micrograph image.

Using a ruler, measure the widest part of the bryozoan.

Give your answer in metres.

Width = ... m **[2]**

It was important to show working here. It would have been useful for candidates to make it explicit what the numbers they were using referred to; for example width of bryozoan or width of scale bar. It was not always clear what the numbers being used were which made it difficult to give working marks if the final answer was incorrect. Candidates should also give the units they are using as some gave measurement that were possibly in cm rather than mm. Without the clear units it is not possible for an examiner to know what the candidate has done.

Question 4 (g)

(g) Use a ruler to estimate the width of the image of the bryozoan labelled **B** in **Fig. 4.1** and in **Fig. 4.2**.

Use the widest part of each bryozoan to complete your measurements.

Calculate how many times greater the magnification of the electron microscope is than that of the light microscope.

Electron microscope = ... x greater magnification **[2]**

It is important to show working and units. Without these it is difficult to credit working within an response that does not give the expected answer. It would be useful to state which number was the width of the EM bryozoan and which was the width of the LM bryozoan. The clearer the answer the easier it is for an examiner to give working marks. It also helps candidates check their working to ensure their response is correct.

Question 4 (h)

(h) A student is using a light microscope.

The microscope has a x10 eyepiece lens and a x40 objective lens.

Calculate **in nanometres** the actual length of an object that will appear 3 mm long when viewed by the student using the microscope.

Give your answer in standard form.

Actual length = ... nm **[4]**

In many cases marks were credited for responses with incorrect responses but some correct work at an interim stage, demonstrating the importance of showing their working. It is also important for the candidate to check if an response needs to be in a specific number of significant figures/decimal places/standard form. They can often be credited a mark if they do this correctly. These questions also show the importance of candidates having a ruler and a calculator. They should also check their calculated values against what they know about the size of objects under a microscope to see if their response is reasonable.

Question 5 (a) (i)

5 Acid rain is caused by emissions into the atmosphere when fossil fuels are burned.

(a) A science student is doing a project on acid rain.

They decide to carry out a titration to determine the concentration of acid in samples of rainwater.

They plan to use 0.2 mol dm^{-3} sodium hydroxide for the titration.

(i) The student asks the science technican to prepare 250 cm^3 of a 0.2 mol dm^{-3} solution of sodium hydroxide (NaOH).

Explain how the technician should do this accurately.

In your answer you should include a calculation to work out the mass of sodium hydroxide they would need and the apparatus they should use. The molar mass of NaOH is 40 g mol^{-1}.

....

....

.... **[4]**

This is a standard operating procedure within a laboratory. Candidates that were credited marks, did so for the calculations. It was clear that a majority of candidates were unable to explain the procedure. It is recognised that candidates may not have had as much access to practical work as with previous cohorts, but it is still important in this qualification to understand how and why laboratory procedures are carried out the way they are.

Question 5 (a) (ii)

(ii) Write a method to describe how the student should carry out the titration accurately.

They have access to normal glassware available in a teaching laboratory.

You may include a labelled diagram of the apparatus.

[6]

This is a Level of Response question (LOR). It is marked holistically rather than being given a mark a point. The command is to 'Write a method', so in order to gain full marks they must write a method that works and gives accurate results. Many candidates only gave basic information such as naming equipment. This is why it is important for candidates to have experience of different techniques and also to have the opportunity to consider how to ensure accuracy within a technique.

Assessment for learning

A Level 1 candidate will give some basic correct statements about a titration such as naming equipment or individual steps. They will not link the ideas and it would not be possible to follow their response to carry out an accurate titration.

A Level 2 candidate will have a method that could yield results even if they have not considered accuracy.

A Level 3 candidate will provide a method that yields accurate results.

Remember not everything has to be covered for full marks. There is a lot of indicative content and only 6 marks available.

In this case we would expect the candidate to state what was in the burette and what was in the conical flask. Many did not write a method for the titration of the acid rain, but for acids in general. This was not penalised. Vague responses such as put the solution in the burette were unlikely to gain credit as it was not clear if this was acid or alkali. It was expected that basic steps were covered such as add indicator, pour slowly, record endpoint for a Level 2 response. For Level 3 they should also explain how a particular step ensure accuracy e.g., swirl so acid and alkali fully mix so excess alkali is not added.

They could use a diagram to gain credit, but it is important to label this correctly.

Nearly all candidates attempted this question and is it good to see that many are clearly with titration procedures.

Most candidates drew a diagram, and this often gained them some credit. Most knew the equipment needed. Some were able to write a plan that would gain some results. There were some very good answers that included a plan to get appropriate results with some idea of how to ensure accuracy.

Question 5 (b) (i)

(b) Commercial scientific laboratories often use autotitrators to analyse chemicals.

(i) Autotitrators are very accurate.

Suggest **two** other benefits that autotitrators can give to an analytical company.

1 ....

2 ....
[2]

Most candidates gained at least one mark here. This was often for it being quicker or needing less labour. Some stated it is automatic, which although true, is in the name and was not worthy of credit, as just repeating the name.

Question 5 (b) (ii)

(ii) Suggest **one** disadvantage of autotitrators that might explain why the teaching laboratory does not have one.

.... **[1]**

Candidates seemed to have a good idea about the advantages and disadvantages of using an auto titrator. Many stated that they were not used in teaching laboratories because you had to be trained on them first. This shows a misunderstanding, as a teaching laboratory would be an ideal place to train someone on this equipment.

Question 6 (a) (i)

6 Pollution levels in rivers can be determined by studying bacteria in the water.

- The bacteria studied often include coliforms such as *Escherichia coli*.
- The presence of coliforms indicates that the water has been contaminated by faeces. The source may be from sewerage.
- The more bacteria present, the greater the level of pollution.

(a) A technician prepares 60 agar plates to grow bacteria.

(i) Tick (✓) the box next to the most appropriate method to sterilise the agar for the plates.

Autoclaving	
Dry heating	
Filtration	
Flaming	

[1]

Most gained this mark, there was no pattern to the incorrect answers.

Question 6 (a) (ii)

(ii) Explain why the technician needs to sterilise the agar before it is made into plates.

....

....

.... **[2]**

Candidates gave lots of vague ideas about not being contaminated. These vague ideas are not creditworthy. The mark scheme is looking for 'kill' bacteria present so only bacteria 'inoculated' grows. A response such as' so it is not contaminated' would not get the mark as it does not fully answer the question and shows no evidence of understanding sterilisation or why it is carried out before the agar is made into plates. Some candidates did gain a mark for killing bacteria.

Question 6 (a) (iii)

(iii) The technician sterilises the agar and makes a set of plates.

The plates are placed in a refrigerator.

After storing the plates for two days, the technician notices that some of them look like the plate shown in **Fig. 6.1**.

Fig. 6.1

Draw **one** line to connect the **problem** shown in **Fig. 6.1** with the **course of action** the technician should take.

Problem	Course of action
Contamination	Use the plates as they are
Past 'best before' date	Re-sterilise the plates and then use them
Inoculation	Destroy the plates by autoclaving
Plasmolysis	Leave the plates until the problem corrects itself and then use them

[2]

See commentary under Question 6c.

Question 6 (b) (i)

(b) The following method is used to sample bacteria in river water.

- 50 cm^3 of river water is collected into a sterilised plastic bottle.
- The river water is filtered through a sterilised filter to collect the bacteria onto the filter.
- Each filter is then transferred to an agar plate that will allow **only** coliforms to grow.
- The plates are incubated to allow the coliform colonies to grow. It is assumed that each colony on the plate came from one coliform collected on the filter.

Fig. 6.2 shows an agar plate of a water sample collected from a site on a river **before** the water had flowed past a farm.

Fig. 6.3 shows an agar plate of a water sample collected from a second site on the same river **after** the water had flowed past the farm.

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Fig. 6.2

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Fig. 6.3

(i) State and explain **two** differences between the plates shown in **Figs 6.2** and **6.3.**

Difference 1 ....

....

Explanation 1 ....

....

....

Difference 2 ....

....

Explanation 2 ....

....

....

[4]

It was good to see most candidates attempt this question. They tried to describe what they could see and tried to explain these observations. Unfortunately, they struggled to gain marks, often due to lack of use of scientific language. Instead of discussing bacteria, coliforms or morphologies, candidates discussed number of dots and sizes of dots. This gave no evidence that they knew what the dots were. Rather than state what the results showed they tried to make a conclusion about the farm's effect on the river bacteria content. This all led to very confused responses. Candidates need practice in noting observations and explaining them. This is a different skill to making conclusions. In this more colonies means more bacteria present not that the farm put bacteria into the river. Many also stated more colonies means more contamination, which wouldn't get the explain mark and show clear misunderstanding of the results.

Question 6 (b) (ii)

(ii) Tick (✓) the box next to the conclusion that can be drawn from the two agar plates in **Figs 6.2** and **6.3.**

The river water is not safe to swim in.	
The river water upstream of the farm is not contaminated with faeces.	
The farm is the source of the pollution.	
The river water is more polluted downstream of the farm than upstream.	

[1]

Many candidates gave the third option as their response assuming correlation means causality. Understanding this is not the case is a high-level skill but is worth discussing with students.

Question 6 (b) (iii)

(iii) Use **Fig. 6.2** to calculate the number of coliforms present in every 100 cm^3 of river water upstream of the farm.

Number of coliforms in 100 cm^3 of river water = ... **[2]**

Most candidates understood that they needed to double the number counted on the second plate. Again, it was useful to show working as, even if they had counted incorrectly, if they showed they had to multiply by 2 they could gain one of the marks.

Question 6 (c)

(c) Draw **one** line to link what the technician should **do** with the plates when the test is completed with the **reason** for doing it.

To do	**Reason**
Store the plates in a fridge for 3 years	To prevent people coming in direct contact with pathogens
Reuse the plates	To make sure the plates are fixed and the results cannot change
Heat the plates in an oven for 50 minutes	So that the results can be checked if there is a problem
Autoclave the plates and dispose of them	To save money and reduce waste

[2]

Both Questions 6(a)(iii) and 6(c) ask candidates to draw one line. In many cases they drew four. There were 2 marks for each of these questions: 1 mark for where the line starts and 1 mark for where the line ended. Even if these lines were correct the examiner did not know which line the candidate thought answered the question so could not give marks. Again, this shows the importance of reading the question carefully and following the instructions.

Question 6 (d)

(d) State **one** other type of laboratory task requiring aseptic technique.

.... **[1]**

Nearly all the candidates attempted this. Some gave responses similar to the task in the question so did not gain the mark. However, many gained the mark. Ideas of microbiology or medical procedures were the most common correct answers.

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