

**CAMBRIDGE TECHNICALS LEVEL 3 (2016)**

**Examiners' report**

# **APPLIED SCIENCE**

**05847–05849, 05879, 05874**

**Unit 1 January 2025 series**

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## 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 [Teach Cambridge](#).

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## Unit 1 series overview

It is clear that candidates are increasingly familiar with both the content of the Learning Outcomes (LOs) and exemplification statements held in the specification for Unit 1. They are also competent when following the rubric of the paper.

Candidates appeared to have sufficient time to complete the paper, and few found the need to use the additional pages available to write their responses. Where such pages were used, candidates often made clear links between the part-questions included on the additional pages and the response field within the paper. In general, candidates attempted to respond to almost all questions, but some were challenged by a number of questions and did not provide a response. These part-questions were identified as nil-response (NR) rather than zero marks. It was unusual to observe an NR for an objective-format question, e.g. tick the box or circle the correct formula.

Some of the chemistry-based questions presented a level of difficulty for a small number of candidates and this was also seen for some of the biology-based questions. In more recent series, candidates performed well for biology-based questions and less well for chemistry-based questions.

The final question was physics-based and focused on electronic circuits. Candidates were frequently successful when completing the calculations and were able to construct a realistic explanation for the use of copper as a conductor of electricity.

It is recommended that candidates are encouraged to show their working when completing calculations. A number of candidates were able to achieve marks for different steps for a calculation, even though the final answer may have been incorrect. Some questions were also allocated 'error carried forward' (ecf) marks, which were accessible for those candidates who showed their calculations.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
<ul style="list-style-type: none"> <li>• applied a sound understanding of the exemplification section of the specification, including Learning Outcome 1.3 (dot and cross models of covalent bonds) for Question 1 (c) (iii) and Learning Outcome 3.2 (function of lysosomes) for Question 2 (b) (ii)</li> <li>• responded well to some of the more challenging concepts, including the functional links between different types of RNA Question 2 (c) (iii) [Learning Outcome 3.2] and the role of manganese-containing enzymes Question 4 (c) (iii) [Learning Outcome 5.1]</li> <li>• demonstrated an effective approach when balancing equations [Question 19 (d) (i) and Question 5 (b) (iv)] and calculating the daily intake of manganese [Question 4 (d)]</li> <li>• showed a high level of understanding of neuron and myelin sheath function [Question 5 (c) (ii)].</li> </ul>	<ul style="list-style-type: none"> <li>• struggled to apply a full understanding of the exemplification section of the specification, including Learning Outcome 2.2 (displacement reactions) Question 1 (d) (ii) and Learning Outcome 2.2 (balancing equations) Question 5 (b) (iv)</li> <li>• tended to struggle when applying their skills and knowledge across different areas of the specification, including the role of catalysts Question 4 (c) (i) [Learning Outcome 2.3] and how to test for the elongation of polymers Question 6 (a) (ii) [Learning Outcome 6.1]</li> <li>• found the use of the Periodic Table to be difficult [Question 1 (a) (ii) and Question 1 (b) (ii)]</li> <li>• misinterpreted the rubric when drawing a second curve on a graph at a lower temperature [Question 4 (b) (ii)].</li> </ul>

### Question 1 (a) (i)

1 An atom is made up of protons, neutrons and electrons.

(a)

(i) Draw a straight line from each property to the correct subatomic particle.

Property	Subatomic particle
These particles reduce electrostatic repulsion in the nucleus.	Electrons
These particles are responsible for making bonds with other atoms.	Neutrons
The number of these particles is the atomic number of an element.	Protons

[3]

Most candidates did well with this question. No clear pattern of alternative responses was identified.

### Question 1 (a) (ii)

(ii) Complete the table to show the relative masses and charges of the subatomic particles in the atom.

	Relative mass	Relative charge
<b>Proton</b>	.....	.....
<b>Neutron</b>	.....	.....
<b>Electron</b>	.....	.....

[3]

This question was answered well by most candidates. The relative mass of electrons was also understood.

### Question 1 (b) (i)

(b) Phosphorus is an element in Group 5 of the Periodic Table and has an atomic number of 15.

(i) An isotope of phosphorus has a mass number of 31.

How does the mass of one atom of phosphorus-31 compare to the mass of one atom of carbon-12?

.....

..... [2]

Although many candidates successfully understood that the mass of phosphorus-31 was greater than one atom of carbon-12, relatively few appreciated the proportion of mass involved.

### Question 1 (b) (ii)

(ii) Determine the electronic configuration in terms of main energy levels of:

- a phosphorus atom .....
- a phosphide ion, P<sup>3-</sup> .....

[2]

Most candidates were able to determine the electronic configuration of a phosphorous atom (2,8,5) but some struggled with that for a phosphide ion, P<sup>3-</sup>.

#### Misconception

?

A misconception was seen for phosphide ion, P<sup>3-</sup>, as 2,8,3 rather than 2,8,8.

## Question 1 (c) (i)

(c) Phosphorus can form both ionic and covalent compounds.

(i) Explain what **ionic bond** means.

.....

.....

..... [1]

The most successful candidates were capable of describing an ionic bond as the electrostatic attraction between positive ions and negative ions.

## Misconception



There was a tendency for many candidates to refer to metals and non-metals. This may be an example of an ionic bond but does not explain what the type of bond means.

## Question 1 (c) (ii)

(ii) Sodium phosphide is an ionic compound.

What is the correct formula of sodium phosphide?

Tick (✓) **one** box.

NaP<sub>3</sub>

Na<sub>2</sub>PO<sub>3</sub>

Na<sub>3</sub>P

Na<sub>3</sub>PO<sub>4</sub>

[1]

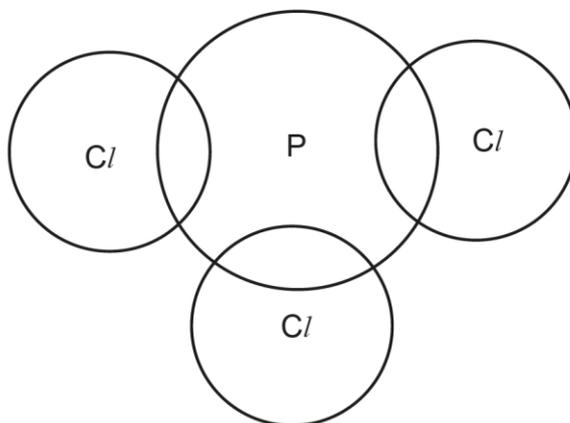
A number of candidates struggled to identify that Na<sub>3</sub>P is the formula for sodium phosphide. It is possible that some candidates assumed that the ionic compound was sodium phosphate (Na<sub>3</sub>PO<sub>4</sub>), but no clear pattern of alternative choices was observed.

**Question 1 (c) (iii)**

(iii)  $\text{PCl}_3$  is a covalent compound.

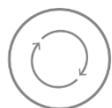
Complete the dot-and-cross diagram of  $\text{PCl}_3$ .

Only draw the outer shell electrons.



[2]

Candidates were often capable of drawing the dot-and-cross diagram and showed the correct arrangement and number of outer shell electrons.

**Assessment for learning**

Candidates may benefit from the use of simple diagrammatic models to reinforce the features of covalent compounds, including the position of pairs of bonding electrons in the points of overlap.

### Question 1 (c) (iv)

(iv) The P–Cl bond is polar.

Explain what **polar bond** means.

.....

.....

.....

..... [1]

The most successful candidates described the unequal sharing of electrons for a polar bond. No clear pattern of alternative responses was observed.

#### Assessment for learning



Candidates may benefit from the use of simple diagrammatic models to reinforce the features of the polar bond, with regards to the distribution of electrons.

### Question 1 (d) (i)

(d) Chlorine reacts with potassium bromide to form bromine and potassium chloride.

(i) Complete and balance the equation for the reaction.



[2]

Many candidates struggled to balance the equation, but some successfully showed both the correct number of atoms involved and their formulae. Some candidates were awarded 1 mark for the correct number of atoms, even with incorrect formulae.

### Question 1 (d) (ii)

- (ii) Explain why chlorine displaces bromine from potassium bromide (KBr) but iodine does not displace bromine from potassium bromide.

.....

.....

.....

..... [2]

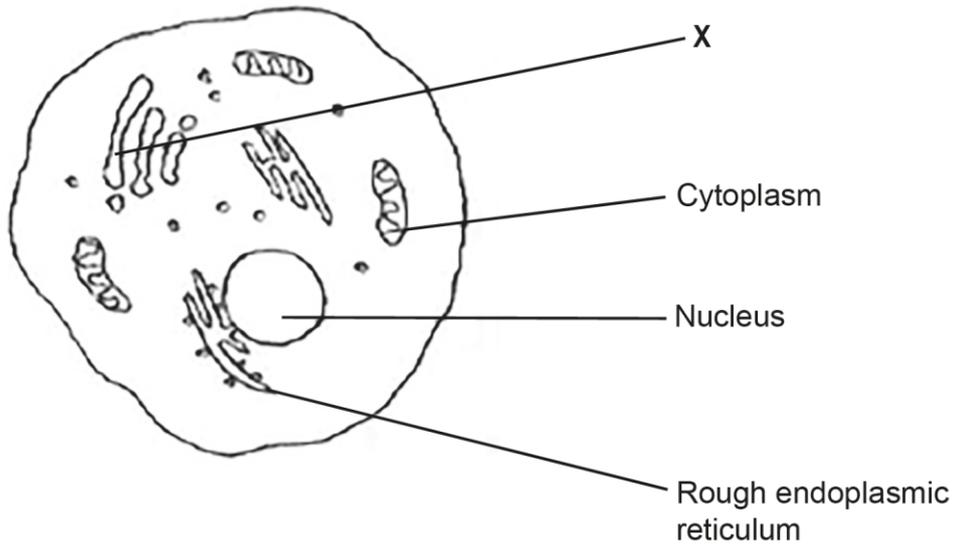
Some candidates were challenged by displacement reactions. However, a number presented very clear explanations of the reactive levels of chlorine, bromine and iodine in the context of displacement. No clear pattern of alternative responses was observed.

### Question 2 (a) (i)

2 A eukaryotic cell from an animal is shown in the diagram below.

The cell components are not drawn to scale.

Some of the organelles in the diagram have been labelled.



(a) Rough endoplasmic reticulum is shown in the diagram.

(i) Identify the organelles that cover the surface of rough endoplasmic reticulum.

Tick (✓) **one** box.

- |             |                          |
|-------------|--------------------------|
| chromosomes | <input type="checkbox"/> |
| ribosomes   | <input type="checkbox"/> |
| thylakoids  | <input type="checkbox"/> |
| vesicles    | <input type="checkbox"/> |

[1]

Most candidates correctly identified the ribosome as the organelle on the surface of rough endoplasmic reticulum.

**Question 2 (a) (ii)**

- (ii) Rough and smooth endoplasmic reticulum produce and process biological molecules in different ways.

Draw a straight line to link:

- each type of endoplasmic reticulum to the biological molecule produced.
- each biological molecule to the process at the endoplasmic reticulum.

Type of endoplasmic reticulum	Biological molecule	Process
rough	lipid	storage
smooth	protein	transportation

[2]

Most candidates correctly linked the type of endoplasmic reticulum with the biological molecule involved and the process. However, some candidates were unable to identify the correct link between the biological molecule and process. Other common errors were generally not observed. Candidates followed the rubric of the question in the correct manner.

## Question 2 (b) (i)

(b) Organelle **X** releases lysosomes.

(i) Identify the organelle labelled as **X**.

Tick (✓) **one** box.

chloroplast

cytoplasm

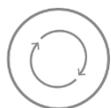
Golgi apparatus

plasma membrane

[1]

Although most candidates appreciated that the Golgi apparatus releases lysosomes, some were less confident. Again, no clear pattern of alternative responses was observed.

### Assessment for learning



Candidates may find the demonstration of diagrammatic models for the structure and function of organelles (listed in the specification) useful to enhance their level of understanding.

### Question 2 (b) (ii)

(ii) Describe the function of a lysosome within a eukaryotic cell.

.....

.....

..... [2]

Many candidates were aware that lysosomes can kill/destroy pathogens and break down unwanted organelles.

### Misconception

 Some candidates appeared to confuse the role of lysosomes with that of transporting vesicles (released by the smooth endoplasmic reticulum and Golgi apparatus) i.e. processing proteins/lipids.

### Question 2 (c) (i)

(c) The eukaryotic cell contains nucleic acids with different roles.

Two types of nucleic acids are DNA and RNA.

(i) Both DNA and RNA contain the same charged functional group in their structure.

Draw a ring around the charged functional group found in DNA and RNA.

nitrate

phosphate

sulfate

[1]

Although most candidates correctly understood that phosphate is the charged functional group in DNA and RNA, some incorrectly considered that nitrate was involved. Few incorrectly selected sulfate.

### Question 2 (c) (ii)

(ii) State **two** structural differences between DNA and RNA.

Difference 1 .....

.....

Difference 2 .....

.....

**[2]**

Many candidates recalled that DNA has a double-helix (and therefore has two strands) and that RNA is single-stranded. The more successful candidates progressed on to a comparison of nitrogenous/organic bases i.e. thymine in DNA versus uracil in RNA. No common error was observed.

### Question 2 (c) (iii)

(iii) Three types of RNA are messenger (mRNA), ribosomal (rRNA) and transfer (tRNA).

Describe how each of the types of RNA link the genetic sequence or gene held in the DNA to processes taking place at the ribosome.

.....

.....

.....

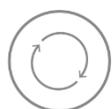
.....

.....

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

This was a challenging topic for many candidates, but some were able to correctly describe the roles of RNA for transcription in the nucleus and translation at the ribosome. However, other candidates were somewhat challenged and repeated the terms in the stem of the question without a clear or correct function.

#### Assessment for learning



It is suggested that this fascinating process can be explained to candidates via the construction of a series of diagrams.

### Exemplar 1

The ~~mRNA~~ mRNA copies and identifies the desired gene needed for reproduction to be sent to the ribosome. The ribosomal RNA is responsible for the synthesis of proteins.

This was awarded 2 marks with a correct reference to mRNA and rRNA activity. The description of rRNA was incomplete.

### Question 2 (d) (i)

(d) Cisplatin is used in chemotherapy to treat cancer patients.

(i) Identify the metal ion in cisplatin.

..... [1]

Only some candidates correctly identified the metal ion in cisplatin as platinum. No clear pattern of alternative responses was observed, although metals such as iron or zinc were sometimes proposed.

### Question 2 (d) (ii)

(ii) Describe the action of cisplatin in the treatment of cancer patients.

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

Most candidates correctly noted that cancer cells were targeted by cisplatin. Relatively few progressed to outline the precise action as the interference of DNA replication/mitosis/cell division/multiplication. Some candidates repeated the wording provided in the stem of the question without a full description.

### Question 3 (a) (i)

3 Nitrogen is a vital element in biological organisms.

(a) The nitrogen cycle involves a series of steps.

(i) In the nitrogen-fixing step, nitrogen in the atmosphere is converted into  $\text{NH}_4^+$  ions in the soil by nitrogen-fixing bacteria.

Identify the name of the  $\text{NH}_4^+$  ion.

Tick (✓) **one** box.

ammonium

cysteine

methionine

nitrate

[1]

There was a tendency for candidates to correctly select ammonium or incorrectly select nitrate.

#### Misconception

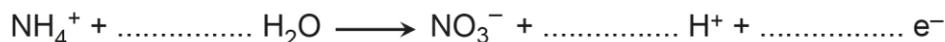


It is assumed that nitrate was a strong distractor since it is also a component of the nitrogen cycle.

### Question 3 (a) (ii)

(ii) The nitrogen-fixing bacteria convert  $\text{NH}_4^+$  ions into  $\text{NO}_3^-$  ions.

The half equation for the conversion of  $\text{NH}_4^+$  ions into  $\text{NO}_3^-$  ions is shown below.



- Complete the equation so that it balances.
- Explain in terms of electrons whether the conversion of  $\text{NH}_4^+$  ions into  $\text{NO}_3^-$  ions is oxidation or reduction.

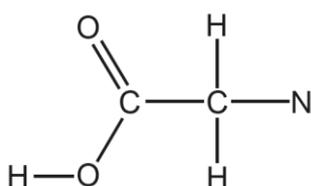
.....  
 ..... [3]

Many candidates correctly determined that 3  $\text{H}_2\text{O}$  molecules act as reactants for this conversion reaction. However, although some candidates correctly recorded that 10  $\text{H}^+$  ions are the products, they were unable to identify the number of electrons released. Some candidates progressed on to a correct description of oxidation and the release of electrons. Others incorrectly selected reduction.

### Question 3 (a) (iii)

(iii) In the assimilation step  $\text{NO}_3^-$  ions are absorbed by plants and converted into amino acids such as glycine.

Complete the diagram to show the correct structural formula of glycine.



[1]

Few candidates added two H ions to the nitrogen atom on the diagram. Some students incorrectly added three H ions and others added oxygen atoms.

### Question 3 (a) (iv)

(iv) Name the type of bond that forms between amino acids to form a protein.

..... [1]

Some candidates correctly named the peptide bond. A variety of incorrect names were seen, ranging from glycosidic to ester.

#### OCR support



It is suggested that candidates will benefit from the diagrammatic construction of dipeptides, as exemplified in the Unit 1 specification at **Learning Outcome 4.4**. This will also reinforce the structure of an amino acid, with reference to Question 3 (a) (iii).

### Question 3 (b) (i)

(b) Connective tissue is made up of protein.

(i) State the function of connective tissue.

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

Many candidates correctly referred to the binding/protection/supporting role of connective tissues between other tissues (or organs). No clear pattern of alternative responses was observed.

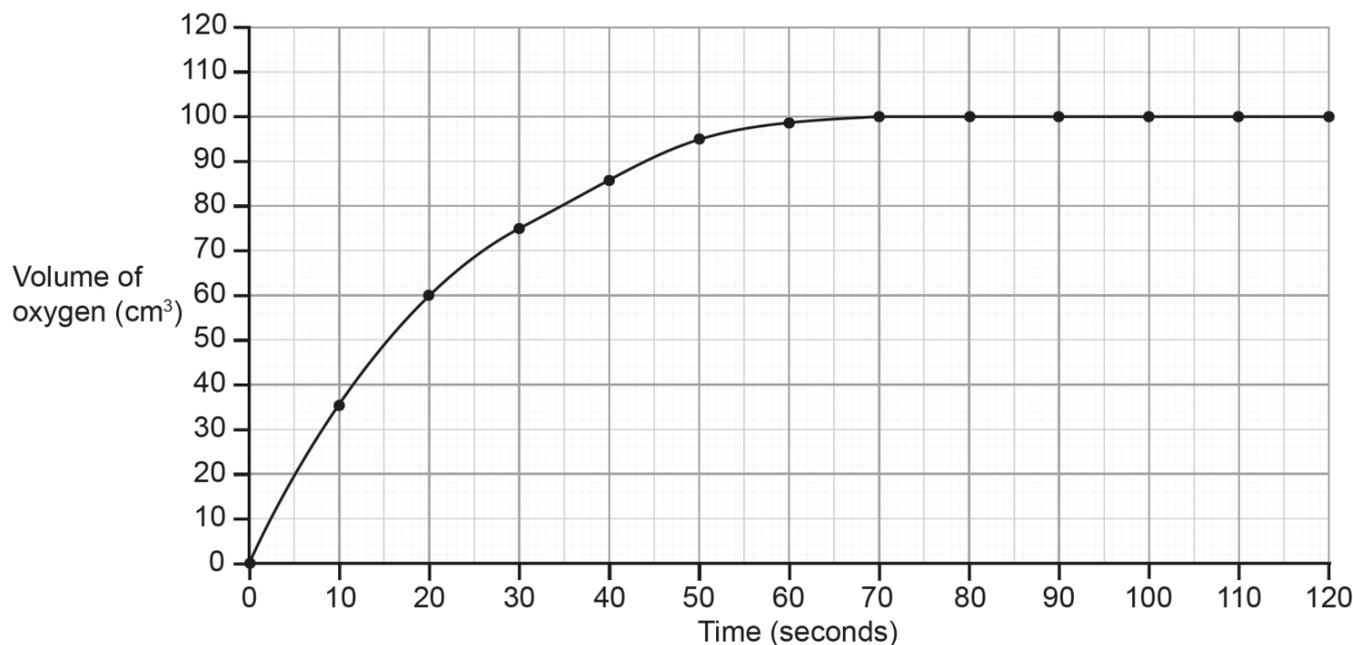


### Question 4 (b) (i)

- (b) In the presence of a catalyst, a solution of hydrogen peroxide decomposes into water and oxygen gas.

A student investigates the rate of decomposition by measuring the volume of oxygen gas produced over time.

A graph for the decomposition of a solution of hydrogen peroxide in the presence of a catalyst is shown below.



- (i) The average rate of decomposition at any given time can be determined by the equation:

$$\text{average rate (cm}^3 \text{ s}^{-1}\text{)} = \frac{\text{change in volume of oxygen gas (cm}^3\text{)}}{\text{change in time (s)}}$$

Calculate the average rate of reaction during the first 40 seconds, using the graph.

Average rate = ..... cm<sup>3</sup> s<sup>-1</sup> [2]

Most candidates completed the calculation correctly and determined the rate = 2.15 (cm<sup>3</sup> s<sup>-1</sup>). A range of values was acceptable (2.1 to 2.175), based on the candidate's selection of volume of oxygen read from the graph.

### Question 4 (b) (ii)

(ii) The student repeated the experiment at a lower temperature.

They used the same volume and concentration of hydrogen peroxide solution and the same catalyst.

Draw a second line on the graph to show how the curve would change.

[2]

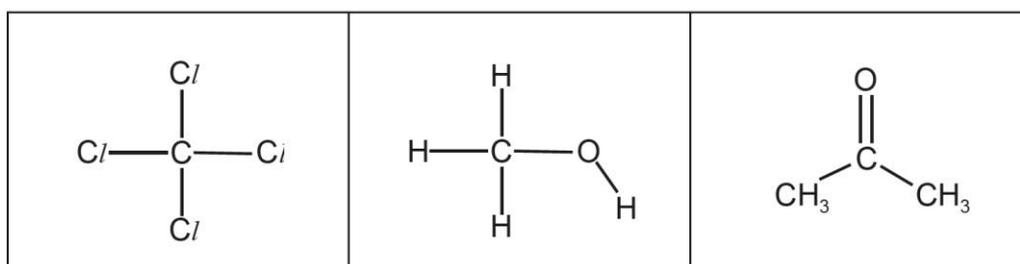
Many candidates obtained 1 mark for drawing their curve, starting at 0,0 and forming a line below the original curve. Some did not progress on to the second marking point because they continued their curve/horizontal line at a significant distance below the original, not approaching the volume of oxygen at 100cm<sup>3</sup>.

### Question 4 (b) (iii)

(iii) The solvent in the hydrogen peroxide solution is water.

The student makes the prediction that the rate of decomposition will decrease if the polarity of the solvent is decreased.

The diagram shows the structural formulae of three solvents.



Draw a ring around the solvent which would give the lowest rate of decomposition, based on the student's prediction.

[1]

Some candidates selected the correct structural formulae. No clear pattern of alternative responses was observed.

### Question 4 (c) (i)

- (c) The catalyst used in the decomposition of hydrogen peroxide solution is a compound of manganese.
- (i) Explain how a catalyst increases the rate of a reaction.

.....

.....

.....

..... [2]

Most candidates correctly referred to the lowering of activation energy. However, relatively few progressed onto the increase in 'successful' collisions. Some candidates provided an explanation based on the activity of enzymes, rather than the general features of a catalyst.

### Question 4 (c) (ii)

- (ii) Manganese ions are also found to have an important role within enzymes.  
Identify the role of manganese ions in an enzyme.

Tick (✓) **one** box.

cofactors	<input type="checkbox"/>
deactivators	<input type="checkbox"/>
pH regulators	<input type="checkbox"/>
receptors	<input type="checkbox"/>

[1]

Although many candidates understood that manganese ions were acting as cofactors, some incorrectly selected pH regulators. This may have been due to the common use of the term 'milk of magnesia' as an anti-acid.

### Question 4 (c) (iii)

(iii) Enzymes containing manganese ions have different functions.

State **two** ways in which manganese-containing enzymes are involved in biological processes.

1 .....

.....

2 .....

.....

[2]

Some candidates correctly stated that such enzymes were involved in the (matrix) formation of bone and/or choline formation (in the liver). Others continued to incorrectly refer to pH regulation, linked to their response in Question 4 (c) (ii).

### Question 4 (d)

(d) Hazelnuts are a source of manganese.

100 g of hazelnuts contain 5.7 mg of manganese. A person consumes 50 g of hazelnuts.

The recommended daily intake of manganese for adults is 2.30 mg.

Calculate the percentage difference between the amount of manganese that the person consumes and the recommended daily intake. Express this value as a percentage of the recommended daily intake.

Percentage difference = ..... % [3]

Some of the more successful candidates successfully completed this calculation and recorded the percentage difference as 23.91 (%). Although others did not give the correct answer, they were able to obtain marks for parts of their calculation.

#### Assessment for learning

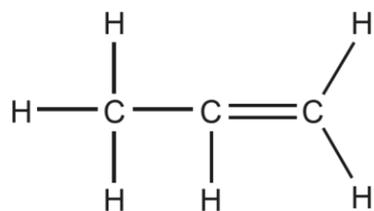


This reinforces the recommendation that candidates to show their working in the space provided.

## Question 5 (a) (i)

5

(a) The diagram shows the structural formula of an alkene with three carbon atoms.



The molecules of the alkene react together to form a polymer.

(i) Draw the structure of the polymer formed, showing **two** repeat units.

[2]

The more successful candidates were able to show two repeat units for the polymer. Some obtained 1 mark for presenting a line of carbon atoms with single bonds, even without the expected arrangement of H and CH<sub>3</sub>. This appeared to be a challenging question for many candidates.

## Assessment for learning



It is recommended that candidates are given a range of polymers to construct, based on two or three repeat units.

**Question 5 (a) (ii)**

(ii) Identify the type of polymerisation that alkenes undergo.

Tick (✓) **one** box.

addition

condensation

displacement

substitution

[1]

Most candidates correctly selected addition as the type of polymerisation of alkenes. No clear pattern of alternative responses was observed.

**Question 5 (b) (i)**

(b) Compounds **A** and **B** are two organic compounds which also have three carbon atoms.

<b>A</b>	<b>B</b>
$\text{CH}_3\text{COOCH}_3$	$\text{CH}_3\text{CH}_2\text{COOH}$

(i) Compounds **A** and **B** are isomers of each other.

Which type of isomers are **A** and **B**?

Tick (✓) **one** box.

geometric isomers

optical isomers

stereoisomers

structural isomers

[1]

Many candidates appreciated that compounds A and B were structural isomers. No clear pattern of alternative responses was observed.

## Question 5 (b) (ii)

(ii) Which type of compound is compound **A**?Tick (✓) **one** box.

aldehyde

alkyne

ester

ketone

[1]

Some candidates understood that compound A was an ester. No clear pattern of alternative responses was observed.

## Question 5 (b) (iii)

(iii) Name compound **B**.

..... [1]

Relatively few candidates identified propanoic acid as compound B. A range of alternative, incorrect responses was seen, ranging from alkene to ester. It appears that some candidates selected options from Question 3 (b) (ii) to answer this question.

## Question 5 (b) (iv)

(iv) Compound **B** reacts with sodium hydroxide.

Complete the equation to show the products of this reaction.



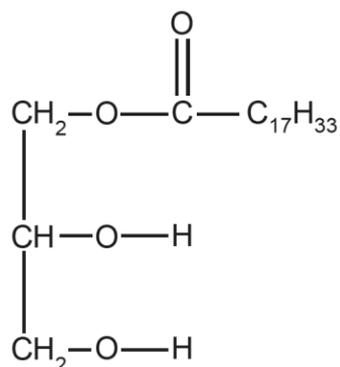
[2]

The more successful candidates were able to present the formula for  $\text{CH}_3\text{CH}_2\text{COONa}$ . However, many realised that one of the products was  $\text{H}_2\text{O}$ .

## Question 5 (c) (i)

(c) Glycerides are large organic compounds which have the same functional group as compound **A**.

(i) The diagram shows a monoglyceride.



Monoglyceride molecules are produced when one molecule of glycerol combines with one molecule of a fatty acid.

Draw the structural formulae of glycerol and of the fatty acid that make the monoglyceride.

<b>glycerol</b>	<b>fatty acid</b>

[2]

Few candidates obtained any marks for this question. They were challenged to reconstruct the glycerol. Some candidates were almost correct with the formula for the fatty acid but made a common error when including a CH<sub>2</sub> at the end of the molecule. On occasion, candidates presented their formulae in the incorrect box, e.g. fatty acid in the glycerol box.



## Exemplar 2

The function of a neuron is to sense things. For example when something touches a person nerve cells send a message to the central nervous system which ~~has~~ ~~neurons~~ has neurons. The role of the myelin sheath is to send messages from the top to the bottom. But since it's ~~damaged~~ damaged it cannot do that. This means it can't send messages properly.

The candidate included a number of generalised statements in this response, such as 'the function of a neuron is to sense things.' This was not judged to be creditworthy. However, the candidate did refer to nerve cells and to 'sending messages.' Sending messages (ideally transmitting impulses) is a valid point and the link to the nervous system is appropriate, although somewhat unclear. The role of the myelin sheath is incompletely described (without a reference to speeding up the rate of nerve impulse transmission, protection or insulation) but the impact of damage to the myelin sheath (i.e. 'it can't send messages properly' was acceptable but lacked the level of detail expected. Overall, this response was marked at Level 2 and obtained 3 marks.

### Question 6 (a) (i)

6 Glycerol is a colourless, odourless liquid.

When glycerol is added to a starch-based biodegradable polymer it acts as a plasticiser. The addition of glycerol changes the mechanical properties of the polymer.

A technician tests samples of the polymer containing different percentages of glycerol. The technician uses the results to determine the elongation and Young's Modulus of each sample.

The following results are obtained when three different polymer samples are tested.

Percentage of glycerol by weight (%)	Elongation (%)	Young's Modulus (MPa)
15	47.3	279.1
20	85.0	153.1
25	195.5	77.5

(a)

(i) Suggest **one** feature of the three polymer samples that must be controlled when making this comparison.

.....

..... [1]

Some candidates correctly gave the feature of temperature or type of polymer. No clear pattern of alternative suggestions was observed.



### Question 6 (b)

(b) Describe the property of a material measured by Young's Modulus.

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

Most candidates struggled to describe the property measured by Young's Modulus. No clear pattern of alternative responses was observed but some candidates incorrectly used terms such as ductility or elasticity.

### OCR support

 The specification at **Learning Outcome 6.1** provides a useful description of Young's Modulus.

### Question 7 (a)

7

(a) An electrical current is the rate of flow of charge through a conductor.

The current in an electrical circuit is 3.0 A.

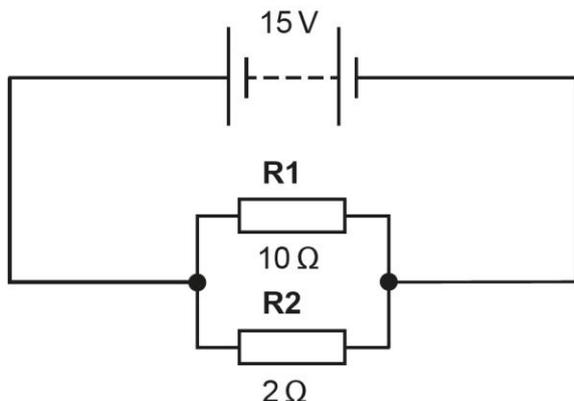
Calculate the charge, in Coulombs, that flows past a point in the circuit over a period of 10 minutes.

Charge = ..... C [2]

Most candidates completed this calculation correctly and determined the charge as 1800(C). Some did not apply the time conversion (to seconds) but did obtain 1 mark for current x time.

### Question 7 (b)

(b) A 15V battery is connected to resistors **R1** and **R2**.



Calculate the total power dissipated in the resistors.

Use the equations:

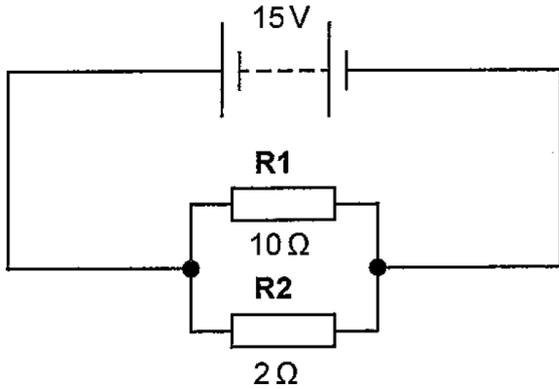
$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2}, \quad V = IR \text{ and } P = VI$$

P = ..... W [3]

The more successful candidates correctly calculated the total power dissipated as 134.85 (C) or equivalent. For those candidates who struggled, they were often able to obtain 1 mark for  $1/10 + 1/2$  and move on to a second mark for ecf, e.g.  $15 \times n$ , as seen in the exemplar below.

Exemplar 3

(b) A 15V battery is connected to resistors R1 and R2.



Calculate the total power dissipated in the resistors.

Use the equations:

$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2}, V = IR \text{ and } P = VI$$

$$\frac{1}{10} + \frac{1}{2} =$$

$$\frac{3}{5} \text{ or } 0.6$$

$I = \frac{V}{R}$

$$V = I \times R$$

$$\text{Voltage} = 15V$$

$$I = \frac{V}{R} = \frac{15}{0.6} = 25$$

$$25A$$

$$P = 15 \times 25$$

P = ..... 375 ..... W [3]

$$\frac{1}{10} + \frac{1}{2} = 0.6$$

$$0.6$$

$$\frac{15}{0.6} = 25$$

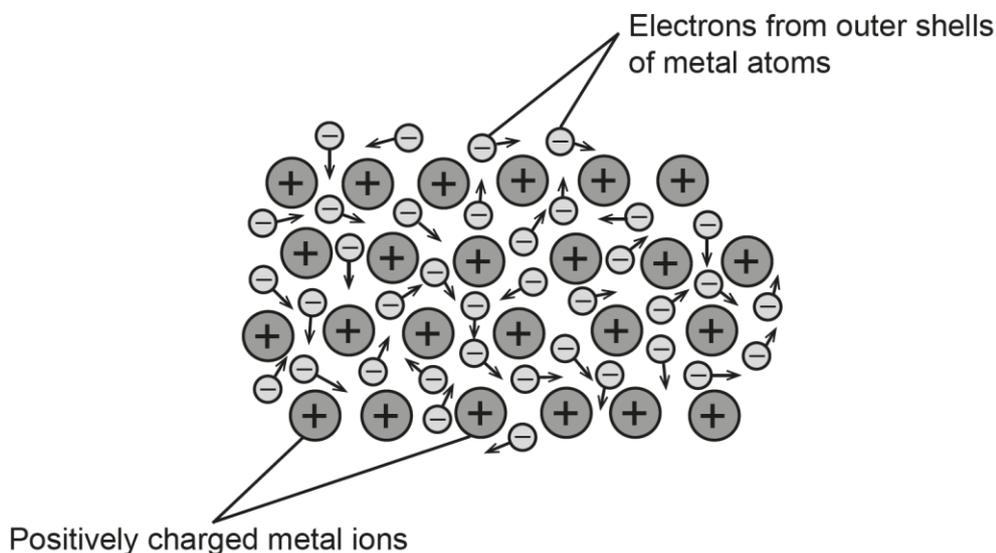
$$25 \times$$

The candidate was able to obtain 1 mark for  $1/10 + 1/2$  and move on to a second mark for ecf.

### Question 7 (c)

(c) Copper is a good electrical conductor and has a high melting point.

The diagram below shows the structure of a typical metallic lattice.



Use the diagram to explain why copper conducts electricity and has a high melting point.

- Copper conducts electricity because .....
- .....
- .....
- .....
- Copper has a high melting point because .....
- .....
- .....
- .....

[4]

The diagram clearly provided sufficient scaffolding to enable candidates to obtain 2 or 3 marks for this question. Many correctly referred to delocalised electrons and considered the strong bonds in the lattice. This type of response resulted in 3 marks. No clear pattern of alternative responses was observed.

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# Online courses

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## Enhance your skills and confidence in internal assessment

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With these online courses you will:

- learn about the key principles and processes of internal assessment and standardisation
- gain a deeper understanding of the marking criteria and how to apply them consistently and accurately
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- the principles and methods of standardisation
- the best practices for collecting, storing and submitting evidence
- the common issues and challenges in internal assessment and how to avoid them.

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- the assessment objectives and marking criteria for the NEA units
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Alternatively, you can email us on  
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