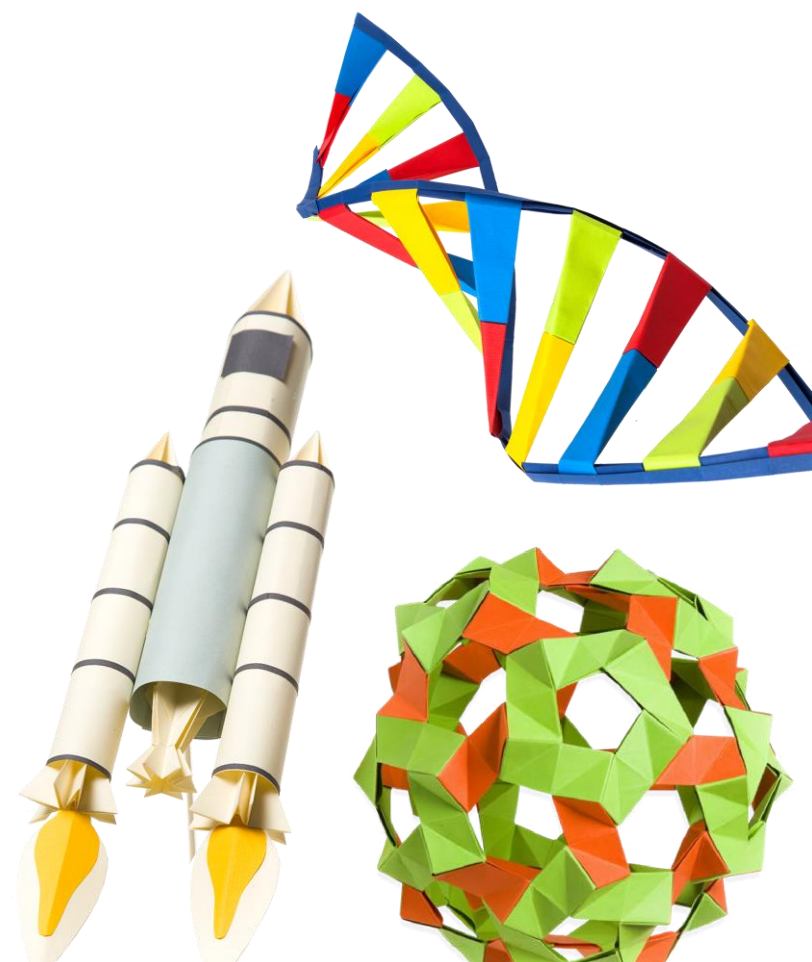


# GCSE Combined Science

Biology Exam Insights May/June 2024

1SC0-24O1/01

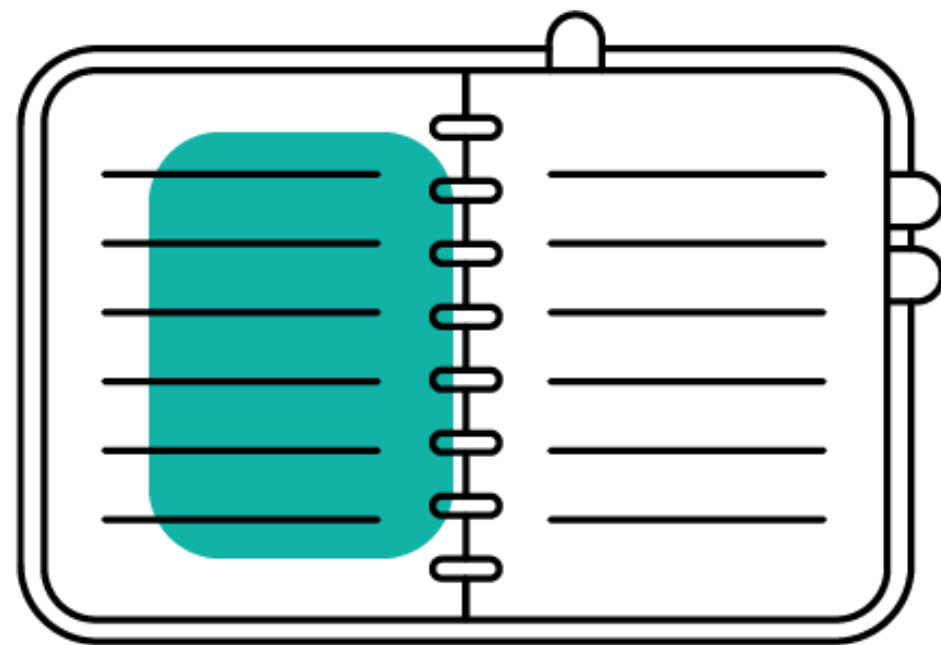




# Feedback from the Examiner Reports

In this session we will focus on:

- Key takeaways from analysis of the 2024 Combined Science Biology GCSEs
- Examples of questions and exemplar responses to illustrate the key takeaways
- Suggestions of Teaching and Learning strategies to address the challenges
- Subject Advisor support / future events



# Key takeaways



# Key takeaways

1. Command words
2. Practical work
3. Maths skills
4. Extended open response
5. Exam technique

# Key takeaway detail and exemplar responses



# Takeaway 1: Command words

## ***Positive comments included:***

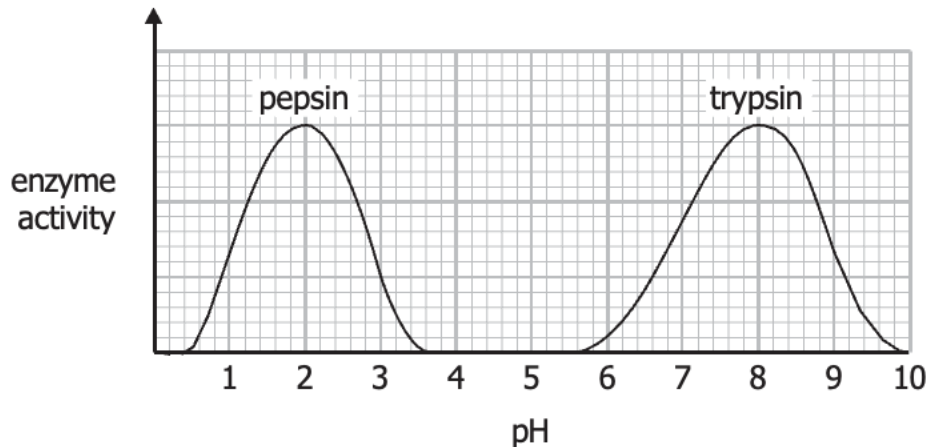
a number of candidates clearly showing an understanding of the response required where the command word 'explain' was used.

## **However...**

- Some students, particularly at Foundation tier, didn't appear to have a clear understanding of the different requirements for 'state/ give', 'describe' and 'explain' questions
- The majority of students had difficulty where 3 or more marks were available for an 'explain' question and had difficulty in developing responses into a detailed series of points
- Many students simply described and didn't move on to explain in response to an explain question, which showed that they hadn't responded to the number of marks available. Others added to the answer by describing again
- Some students responded to a 'describe' question by extending to also include an explanation, wasting their time
- Where students clearly did understand the structure of an 'explain' question, they sometimes failed to respond to the context in the question.

# Takeaway 1: Command words

Figure 8 shows the results of an investigation into the activity of pepsin and trypsin at different pH levels.



(ii) Describe the trend in the graph for the enzyme pepsin.

Use data from the graph to support your answer.

(3)

- The optimum pH of Pepsin was 2.
- The enzyme activity increased from pH's 0.2 to 2, which it then decreased from 2 to 3.6



A clear three mark response with the trend described and supported by salient data taken from the graph.

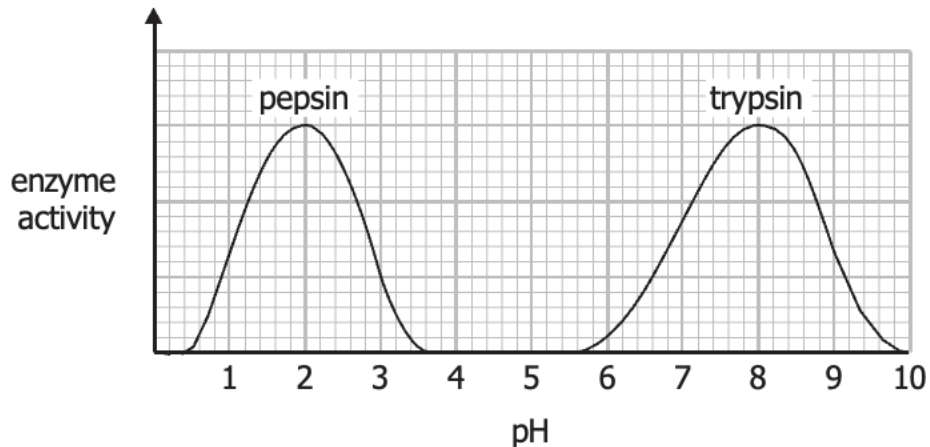


This item requires the candidate to describe how enzyme activity is affected by pH and so the easy part is to write that activity increases and then decreases. However this candidate has noted that data needs to be used to support the answer and so has stated the pH for key points from the graph as well as including the technical term 'optimum' to gain the maximum marks available.



# Takeaway 1: Command words

Figure 8 shows the results of an investigation into the activity of pepsin and trypsin at different pH levels.



The enzyme pepsin has an optimum pH of 2 and denatures at a pH of 3.4. It also works at a pH of 0.



Optimum pH of 2 is MP3. There is no reference to increase and decrease so no further marks can be awarded. There is no mark for enzyme denaturing as this is a describe question. 1 mark awarded.



If the question asks you to describe a graph it is the trends of the graph that are needed. Always quote data to achieve the maximum mark.

# Takeaway 1: Command words

(iv) Explain why there is no trypsin activity at pH 5.

(3)

When the pH level is too low  $\frac{1}{2}$  enzyme denatures and the active site changes shape and won't fit with the substrate and because of that there is no activity.



A good description covering all marking points to gain maximum marks for this item.



For all 'explain' items, remember that the word 'because' or equivalent should be used as a description cannot get all the marks available.

# Takeaway 1: Command words

(a) Describe how selective breeding has produced chickens that lay large numbers of eggs.

(3)

~~Two hens mother chickens that produce lay the most eggs are selected.~~ The A mother chicken that lays the most eggs per year is selected. A male chicken with a mother chicken that produces <sup>lays</sup> the most eggs is selected as well. The sperm and egg cell are then put together to create a chicken that lays a lot of eggs. This process is then repeated over and over for many generations.



**ResultsPlus**  
Examiner Comments

An excellent response showing a good understanding of the process to produce offspring with the desired traits. This candidate also bred a male and a female chicken unlike the vast majority of candidates who bred chickens that laid lots of eggs with other chickens that laid lots of eggs.



**ResultsPlus**  
Examiner Tip

When presented with a difficult concept / procedure, remember that there is large amount of information provided and to help make sense of the useful and relevant points, underline key words and information.

# Takeaway 1: Command words

(iii) Name two types of white blood cell.

(2)

- 1 Some white blood cells release antibodies
  - 2 Some white blood cells prevent blood poisoning
- Engulf antigens — Release antibodies



**ResultsPlus**  
Examiner Comments

These are functions and not the names of white blood cells so no marks were awarded.

# Takeaway 2: Practical work

## ***Positive comments included:***

Answers to some questions showed that candidates were familiar with the core practicals.

Performance on experimental design was improved on previous years.

Responses to practical questions (on microscopes and DNA extraction) showed improved understanding and improvement in the level of detail given.

## **However...**

- However, candidates did not always respond to the context/ question given, sometimes using different apparatus
- Some candidates did not understand the difference between control variables and dependent/ independent variables
- Many candidates incorrectly described controlling variables when asked to identify a control test/ experiment.

# Takeaway 2: Practical work



Describe how the student used the light microscope to view these cells at a magnification of  $\times 400$ .

(3)

A Student has placed the Cells onto a microscope slide and placed some solution onto the slide before placing the cells onto the slide and then they would place a cover ~~on~~ slide over the cells and place it onto the stand. The student then looks through the eye piece ~~that~~ when the magnification is ~~on~~ the lowest ~~on~~ magnification and the student then slowly builds up magnification while looking through the eye piece.



**ResultsPlus**  
Examiner Comments

This is awarded 1 mark for starting with the lowest objective lens. There are no marks for the preparation of the slide as the question is about the use of the microscope. Slowly building up the magnification is not enough for focusing.



**ResultsPlus**  
Examiner Tip

Read the question carefully – this is about microscope use not slide preparation.



## Takeaway 2: Practical work

Describe how the student used the light microscope to view these cells at a magnification of  $\times 400$ .

(3)

The student would take the Swab and put it onto a Slip that has been cleaned with water. The student would then add a stain onto the cells so properly see them and then add a coverslip ~~on top~~ <sup>over</sup> of the cells. They would then turn on the microscope's light and use the lowest objective lens to focus and magnify to the cells initially and then increase the magnification by switching to the other lenses.



This response is awarded 2 marks. Starting with the lowest objective lens is the first marking point. The candidate has mentioned focusing so can be awarded a further mark. Any mention of focus can be awarded a mark as this shows knowledge of microscope use.

# Takeaway 2: Practical work

3 (a) A scientist decided to study the variety of living organisms in a garden.

(i) The scientist wanted to use a random sampling technique.

Devise a plan the scientist could use to randomly sample the number of plant species in the garden.

(3)

~~You can use~~ You can use quadrats to randomly sample the number of plant species in the garden. You can do this by turning the whole area in to 1 metre by 1 metre quadrats and use a random number generator to plot co-ordinates to randomly sample the number of plant species then once you do that you times it by the total number of quadrats to find the total amount.



This response scored two marks for the use of quadrats and the use of a random number generator. Randomly sampling plant species repeats the question so was not credited.



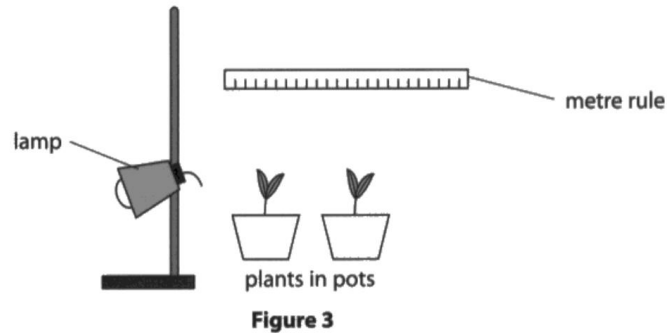
Avoid repeating information given in the question.



# Takeaway 2: Practical work

- (c) (i) Plan an experiment to investigate if plants grow faster when they receive more light.  
Use the equipment shown in Figure 3.

(3)



if you keep the lamp on the plant pots the plants will grow faster because they are always in sunlight.



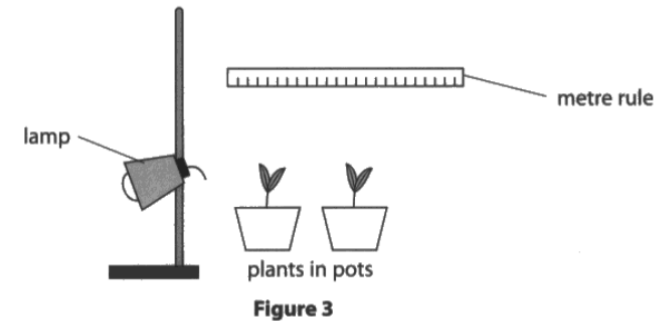
Instead of planning an experiment, this candidate has described the outcome of an experiment. The response scores zero marks.



Always read the question carefully and follow the instructions given. Writing about the results of an experiment was not required in this question.

- (c) (i) Plan an experiment to investigate if plants grow faster when they receive more light.  
Use the equipment shown in Figure 3.

(3)



you have plant A under a lamp for ten days and plant B in darkness for the same time and then measure each pot plant A and B and see which is taller.



This is a clearly written response that scores full marks. The candidate has described changing the light levels for the two plants, leaving them for a period of time (10 days), then measuring how tall they are.



Always think about the steps of a plan before you begin to write. If you run out of answer space, ask for a continuation sheet. Try to avoid writing below or around the answer space.

# Takeaway 2: Practical work

This question asked candidates to state one factor that would need to be kept the same in the photosynthesis experiment. It was disappointing that the majority of candidates were unable to do this. One of the most common mistakes was to give light intensity, the independent variable.

(ii) State **one** factor that you would keep the same in this experiment.

What How much water the plants receive



How much water the plants receive is insufficient to be given credit. A specific reference to the volume of water is required. The most common responses that scored marks were temperature and use the same type of plant.



Remember that if you refer to the quantity of something, always use terms such as mass and volume. In this example, the volume of water would score a mark.

# Takeaway 2: Practical work

4 A student investigated the effect of glucose concentration on the rate of anaerobic respiration in yeast.

(a) The student used five concentrations of glucose: 5 %, 10 %, 15 %, 20 % and 25 %.

A teaspoon of dried yeast was added to 20 cm<sup>3</sup> of the 5 % glucose concentration in a measuring cylinder.

A drop of washing up liquid was added and the mixture was stirred.

A reaction occurred and bubbles collected as foam on the surface of the mixture.

The height of the foam was measured after five minutes.

This method was repeated for each concentration of glucose.

(i) Describe how to set up a control for this investigation.

G

(2)

To Set up a control you need to  
make sure you are using the same volume of  
~~each~~ each concentration of glucose and use the  
exact same teaspoon of dried yeast.



This is a description of controlled variables not a control and did not gain the marks.



Know the difference between a control and controlled variables for practical work.

# Takeaway 3: Maths skills

## ***Positive comments included:***

Questions where marks could be gained by extracting and interpreting information from graphs were answered well

Maths questions showed a good level of understanding

Candidates' ability to calculate magnification is improving year on year

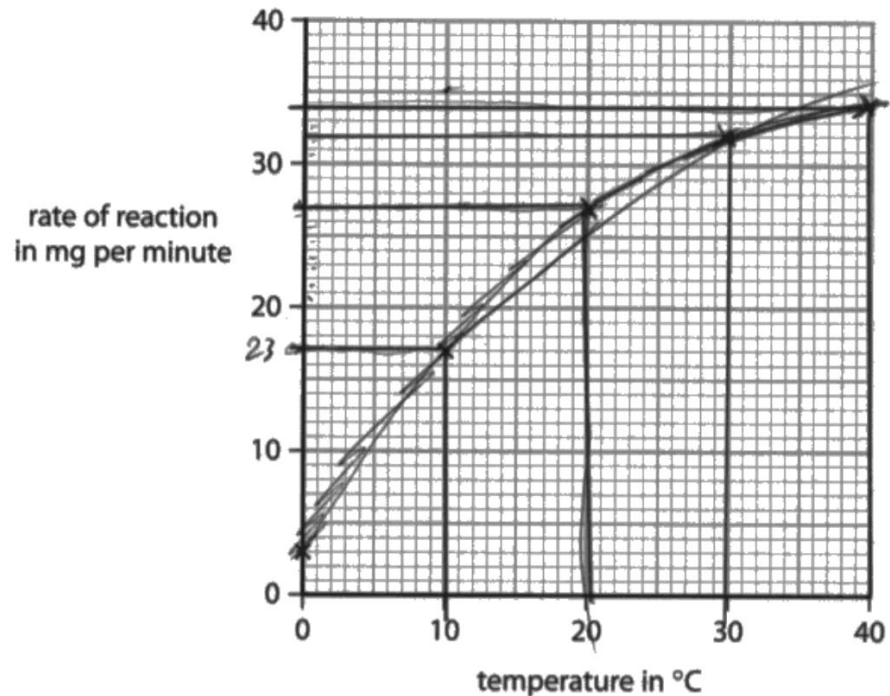
## **However...**

- Many candidates did not show working in calculations, meaning that error carried forward could not be applied
- Some candidates did not use units for measurements associated with the specification
- Some candidates did not give answers to the correct order of magnitude in calculations
- Many students did not follow instructions to give answers to a specific number of significant figures
- Some candidates made errors in calculation by rounding up too early or incorrectly
- Some candidates would have benefitted from identifying as many patterns as possible when describing data from tables, rather than repeating the same one.

# Takeaway 3: Maths skills

- (a) Complete the graph by plotting the results shown in Figure 7 and drawing a line of best fit.

The first two points have been plotted for you.



(2)



**ResultsPlus**  
Examiner Comments

Plotting point is awarded here, however, there are multiple lines drawn so MP1 is not awarded.



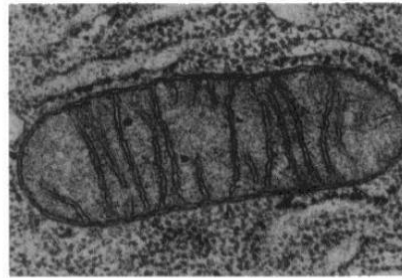
**ResultsPlus**  
Examiner Tip

If the instruction says draw **a line** OR **one line** ensure that you do not draw multiple lines.

# Takeaway 3: Maths skills

- (c) The migration patterns of humans can be tracked by analysing DNA in mitochondria.

Figure 5 shows a mitochondrion viewed using an electron microscope.



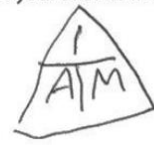
(Source: © CNRI/SCIENCE PHOTO LIBRARY)

**Figure 5**

- (i) At a magnification of  $\times 62\,000$  this mitochondrion has a length of 434 mm.

Calculate the actual length of this mitochondrion.

Give your answer in micrometres ( $\mu\text{m}$ ).

 
$$\frac{434}{62\,000} = 7 \times 10^{-3}$$
 
$$7 \times 10^{-3} \times 1000 = 7$$
 
$$\text{mm} \rightarrow \mu\text{m} = \times 1000 \quad \dots\dots\dots 7 \mu\text{m}$$
 (3)



Correct answer for 3 marks – this would be given 3 marks even if there was no working.

# Takeaway 3: Maths skills

(i) In year one, 9 199 people taking statins reported muscle pain.

Calculate the total number of people taking statins in this study.

Give your answer to 4 significant figures.

(3)

$$\begin{aligned}
 &14.8\% \text{ of } 9199 \\
 &= 1361.452 \\
 &= 1361.452
 \end{aligned}$$

$$\begin{aligned}
 &9199 = 14.8\% \text{ of } x \\
 &9199 \times 1.148 = 10560.452 \\
 &10560.5
 \end{aligned}$$

$$\begin{aligned}
 &14.8\% \text{ of } 10,000 = \\
 &14.8\% \text{ of } 62100 = 9190.8 \\
 &14.8\% \times 62160 = 9199.68 \\
 &0.68 \\
 &-0.8
 \end{aligned}$$

$$\begin{aligned}
 &62100 \\
 &1361.452 \\
 &62160 \text{ people}
 \end{aligned}$$



Correct answer on the answer line will always score full marks.

(i) In year one, 9 199 people taking statins reported muscle pain.

Calculate the total number of people taking statins in this study.

Give your answer to 4 significant figures.

(3)

$$\begin{aligned}
 &9199 = 14.8\% \uparrow \\
 &62148.4 = 100\% \\
 &62150
 \end{aligned}$$

62150 people



This response has used 14.8%. They have completed the calculation but rounded up too early. We awarded 2 marks for answers on the answer line of 62155, 62150, and 62200. 2 marks awarded.



# Takeaway 4: Extended open response

## ***Positive comments included:***

More candidates appeared to use the scaffolding provided, with a significant number using the diagrams, graphs and information in the stem of the question to guide their responses.

Most candidates were able to access the extended open response, demonstrating some good knowledge of attempted the EOR question showing that they had some knowledge (... of the principles of movement of water through plants / assisted reproductive technology including IVF).

## **However...**

- It was disappointing when so few students accessed higher levels when high levels of scaffolding were provided in the question
- Fewer candidates annotated information presented
- Candidates did not always use examples in answers, including specific data and examples from stimulus material.



# Takeaway 4: Extended open response



This response scores just two marks which is a pity as the information supplied is good. However, the stem of the question tells the candidate to reference / name neurones X, Y and Z and as they have not done so, they have not fulfilled the requirements and so cannot access higher than Level 1 marks.



The last instruction of the stem of the question states 'Include the name of neurones X, Y and Z in your answer'. Ensure that you fulfil all the instructions given, or you will limit the marks awarded for your response.

\*(ii) Beriberi can affect reflexes.

Figure 10 shows a reflex arc.

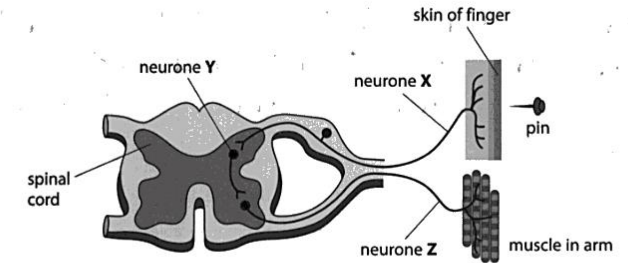


Figure 10

When the skin is pricked by a pin, electrical impulses travel through a reflex arc.

Describe the path taken by electrical impulses from the skin to the muscles in the arm.

Include the names of neurones X, Y and Z in your answer.

(6)

First the skin is pricked then the reflex arc sends an electrical signal in the covered in myelin sheath to speed up the transmission and to hinder any damages to the impulse. then it arrives at the synapse and a chemical is released to let the impulse jump across the junction and then the electrical impulse travels through the myelin sheath again until it reaches the muscles in the arm and the impulse tells the muscles to in the

arm to move causing the finger to move away from the pin to get the finger away from the danger. this reflex arc also passes through the spinal cord

# Takeaway 4: Extended open response

\*(c) The arrows in Figure 11 show the direction of water movement through a tree.

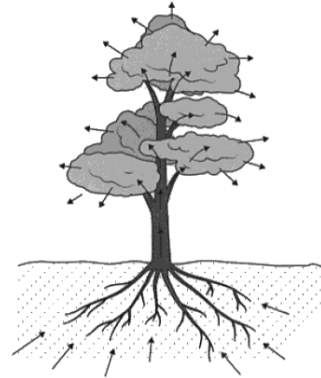


Figure 11

Explain how water is moved from the soil, through the plant and into the air.

(6)

it goes through the roots  
into the trunk ~~and~~ then  
goes up into the air



This is a very brief response, but it includes more than one part of the route taken by water through the plant. Therefore, this is a Level 2 answer scoring three marks. To score a mark at the top of the level the candidate would need to refer to a process involved in the movement of water, such as osmosis.

# Takeaway 4: Extended open response

\*(c) The arrows in Figure 11 show the direction of water movement through a tree.

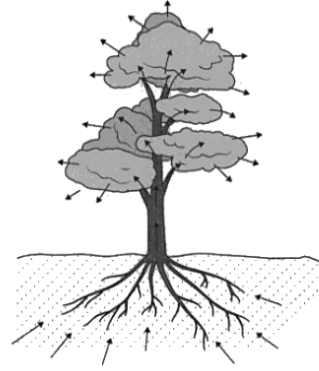


Figure 11

Explain how water is moved from the soil, through the plant and into the air.

(6)

- When it rains the soil soaks up the water underground.
- Then the roots of trees take in some of the water and the water travels through the tree roots.
- The water then travels through the main tree up into the branches.
- The water is then moved into the leaves and helps them grow.
- Some of the water then evaporates into the air.
- The process is then repeated.



This response describes the route taken by water through the plant. No additional detail about the route has been given eg a reference to root hair cells or xylem, so this is Level 2, not Level 3. There is a comment about water evaporating into the air. This is a simple explanation of water movement, which puts the response at the top of Level 2 and scores four marks.

# Takeaway 5: Exam technique

## ***Positive comments included:***

The number of candidates writing longer responses that resulted in part of their answer going 'out of clip' was better than previous years.

Written responses to a number of questions indicated that candidates had used past papers as part of their revision process

## **However...**

- Candidates do not always answer the actual question
- Fewer candidates annotated information presented
- Sometimes, students added to answers once answered, disqualifying a previous correct answer.
- Many students repeated information from the question stem in the answer rather than answering the question
- Often it was clear that students did not use number of marks available to guide answer as to the level of detail needed
- Many students left blank responses where the numbers/ answers could be guessed.

# Takeaway 5: Exam technique

Figure 4 shows some information about these birds.



information	red junglefowl	domesticated chicken
photograph	 (Source: © Jamil Bin Mat Isa/Shutterstock)	 (Source: © Tsekhmister/Shutterstock)
mass of adult in kg	0.75 to 1.2	2.5 to 3.0
number of eggs laid per year	10 to 15	250 to 300

Figure 4



A not uncommonly seen response from this candidate who has basically rephrased the information rather than addressed the task to explain how the chickens who lay high numbers of eggs per year have been produced through selective breeding.



From the task set, this item is clearly about selective breeding. When finished, or at the end when you have finished the paper, revisit these more difficult items and ask yourself: have I answered the question set.

(a) Describe how selective breeding has produced chickens that lay large numbers of eggs.

(3)

The <sup>domesticated</sup> chickens are now much larger and  
and weigh twice as much as the red  
junglefowl. So they are able to lay more  
eggs.



# Takeaway 5: Exam technique

(b) Figure 2 shows two photographs of bacteria.

Photograph A was taken through a light microscope.

Photograph B was taken using an electron microscope.

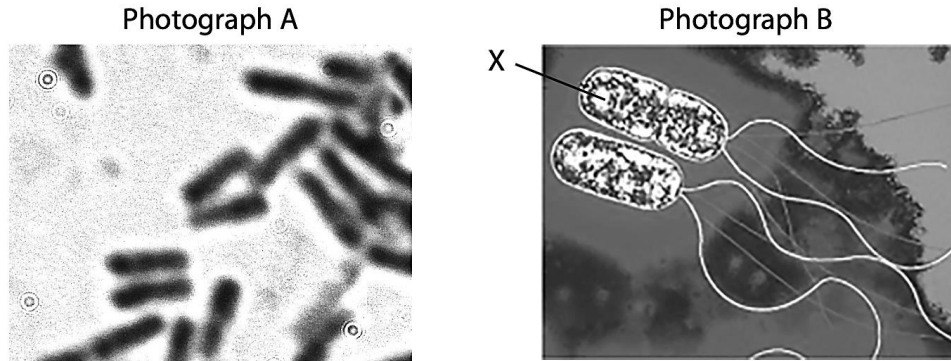
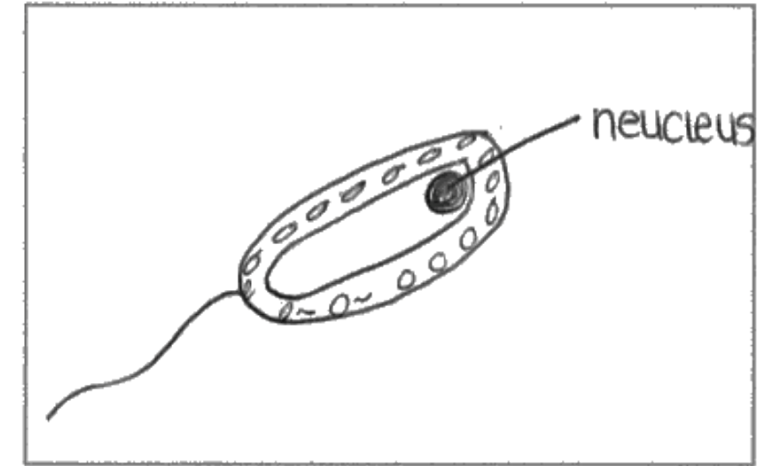


Figure 2

(i) Draw, in the box, the bacterial cell labelled X.

Label **one** part of the bacterial cell on your diagram.



This response scores one mark for the correct shape of the bacterial cell. Bacterial cells do not have a nucleus and the candidate has only drawn one flagellum.

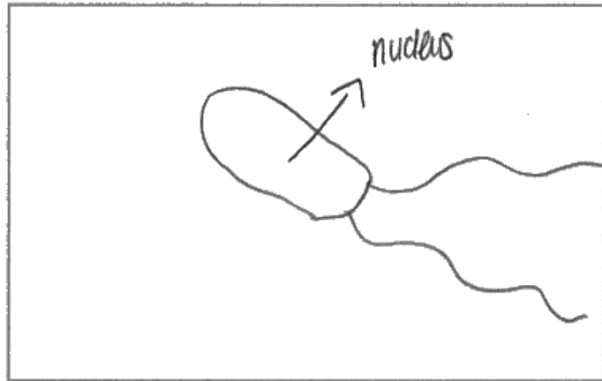


Draw what you can see in the photograph. In this case, just the outline of the cell is sufficient. Do not add details that might only be seen in other types of cell.

# Takeaway 5: Exam technique

(i) Draw, in the box, the bacterial cell labelled X.

Label **one** part of the bacterial cell on your diagram.

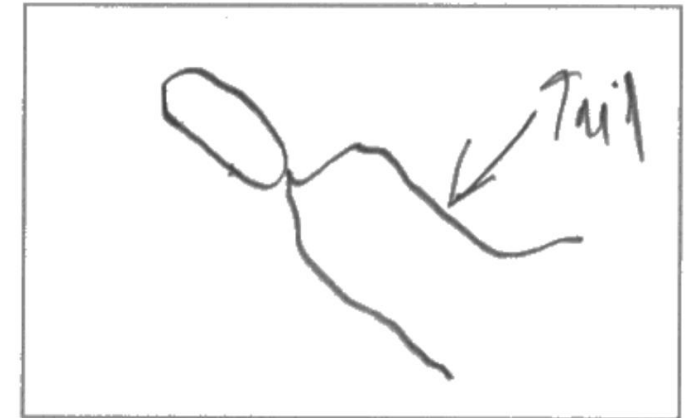


This response scores two marks for drawing the basic outline of the cell with two flagella. The nucleus label can be ignored.

(3)

(i) Draw, in the box, the bacterial cell labelled X.

Label **one** part of the bacterial cell on your diagram.



This is a simple drawing that scores all three marks. Tail is an acceptable alternative label for flagellum.

# Takeaway 5: Exam technique

(b) A student studied the water plant *Elodea*.

The student used a light microscope to observe the cells of the plant in tap water and in a 10% salt solution.

Figure 3 shows *Elodea* cells in tap water and in a 10% salt solution.

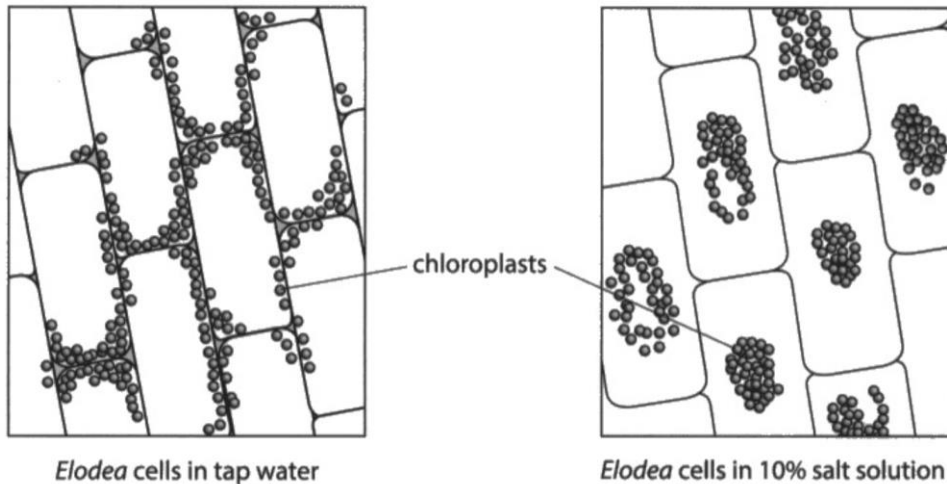


Figure 3

(i) Describe **two** ways that the *Elodea* cells in the 10% salt solution are different from the *Elodea* cells in tap water.

- (2)
- 1 In the tap water they are more close to the cell membranes
- 2 In the 10% salt solution they are clumped together in circle like shapes



This response did not refer to the chloroplasts and it cannot be implied from the question which asks about *Elodea* cells. In order to gain the marks the response would need to have referred to the chloroplasts at least once. Many responses seen referred to the *Elodea* cells moving and not the chloroplasts.



Do not use terms such as 'it' or 'they' in your answers. Make sure you are clear what you are referring to.



# Addressing the challenges – T& L strategies



# Takeaway 1: Command words – addressing the challenges

## ***Challenges:***

Describe, explain, state / give

## ***Possible strategies:***

- Matching activities of command words and definitions and then command words and exemplar answers to reinforce what needed for each
- Reinforcing uses of 'because' and 'therefore' in 'explain' answers and using consistent approaches across the department (and wider school)
- Use of sentence starters and connectives to scaffold answers
- Practice 'say what you see' for each 'describe' or 'explain' answer so that the potentially simpler answer is not missed
- Use examples of 'what a good one looks like' ('WAGOLL') to demonstrate good responses before expecting students to improve answers or produce them independently
- Revisit command words and ensure all are a focus through KS3 and 4.

# Takeaway 2: Practical work – Addressing the challenges

## ***Challenges:***

Not responding to the context in the question, identifying variables, control variables vs control

## ***Possible strategies:***

- Use retrieval to revisit core practicals, for example in lessons starters and independent learning
- Focus on variables in any relevant investigation, starting at KS3
- Ensure focus on control test is planned into the curriculum, starting at KS3
- Use slow practicals and demonstrations to teach and assess understanding of the purpose of method steps
- Use 'suggested practicals' from the spec to practice answering in different contexts
- Include application questions in all assessments, starting at KS3.

# Takeaway 3: Maths skills – Addressing the challenges

## ***Challenges:***

Not showing working, units, order of magnitude in calculations, significant figures, rounding

## ***Possible strategies:***

- Develop consistent approaches across the department and with maths
- Plan repetitive practice of these skills as standalone, for example practicing just showing answers as a number of sig. fig. or decimal places, for example in starter activities or independent learning
- Promote showing working from KS3, including providing space and prompts for working out
- Reward showing working in internal assessments, starting at KS3
- Audit the curriculum across KS3 and 4 for coverage and explicit teaching of these skills.

# Takeaway 4: Extended open response – Addressing the challenges

## ***Challenges:***

Failing to make use of stimulus material, lack of annotation and planning, not responding to instructions

## ***Possible strategies:***

- Use common systems for annotating questions and stimulus material
- Use modelling, such as walking talking mocks and use of visualizer to demonstrate processes of accessing questions and any specific instructions
- Provide scaffolding to support, such as writing frames and structure strips, where needed and gradually remove this support over time
- Engage students with past paper exemplar answers and mark schemes to show WAGOLL and what responses are expected
- Include extended answer questions in assessments from KS3 (eg 4-mark question)
- Promote and reward planning extended answers, providing space and marks for a plan, from KS3
- Encourage verbal discussion and planning before answering in writing.

# Takeaway 5: Exam technique – Addressing the challenges

## ***Challenges:***

Not answering in the context of the question, lack of annotation, repeating the question stem, adding additional information that contradicts, not being guided by the number of marks, blank responses

## ***Possible strategies:***

- Practice looking for 'clues' in questions to help to identify relevant parts of the specification
- Encourage a system of a final check on answers to check the correct context
- Use common systems for annotating questions and stimulus material and use modelling to demonstrate, including reference to the number of marks available
- Use past paper questions and mark schemes
- Take away time pressure in assessments to encourage attempting all questions before introducing time limits
- Allow students to verbally plan and make improvements before committing to writing
- Build confidence using mini whiteboards to plan and answer questions before committing to paper.

# Examiner Report Summaries



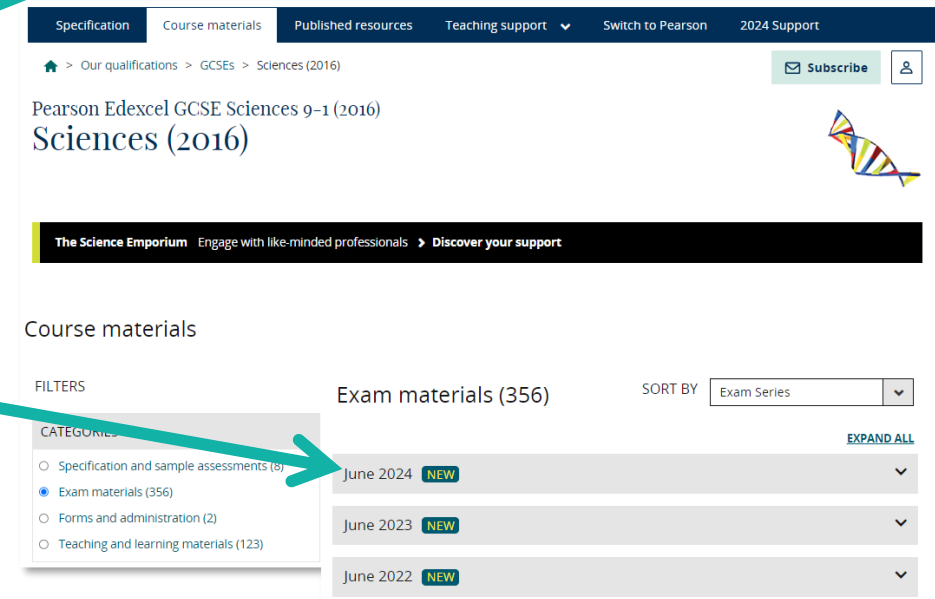
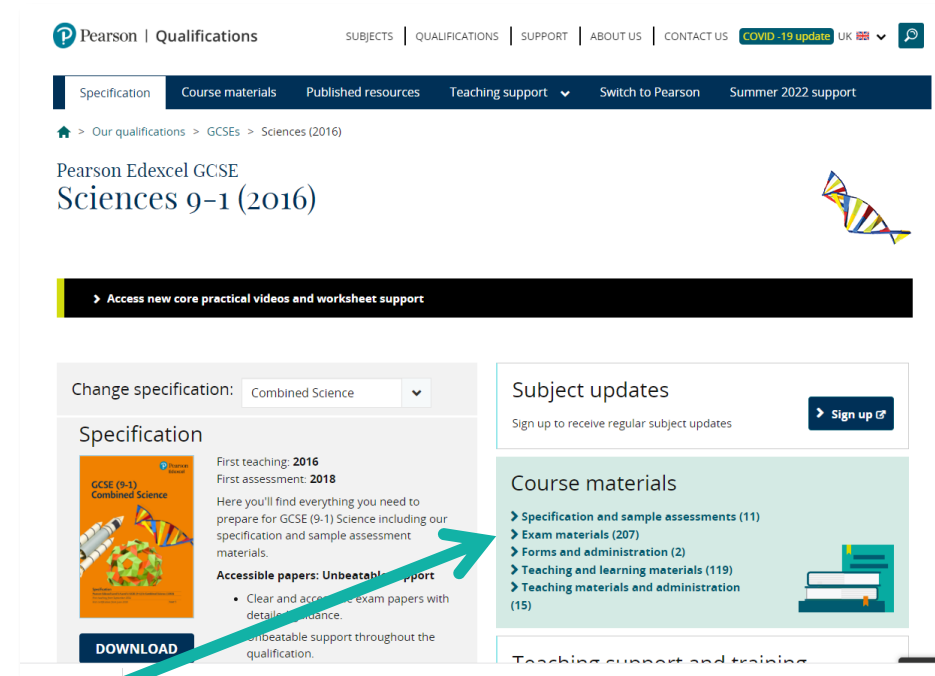
# Find the reports

You can find the full examiners reports for the 2024 series by following this link:

<https://qualifications.pearson.com/en/qualifications/edexcel-gcses/sciences-2016.html>

(or search 'Edexcel GCSE Science')  
...and selecting the 'exam materials' link to take you to this page

The most recent series (June 2024) are 'padlock-protected'. Ask your exams officer for a log-in username and password to enable you to access them.





# Summary and action planning

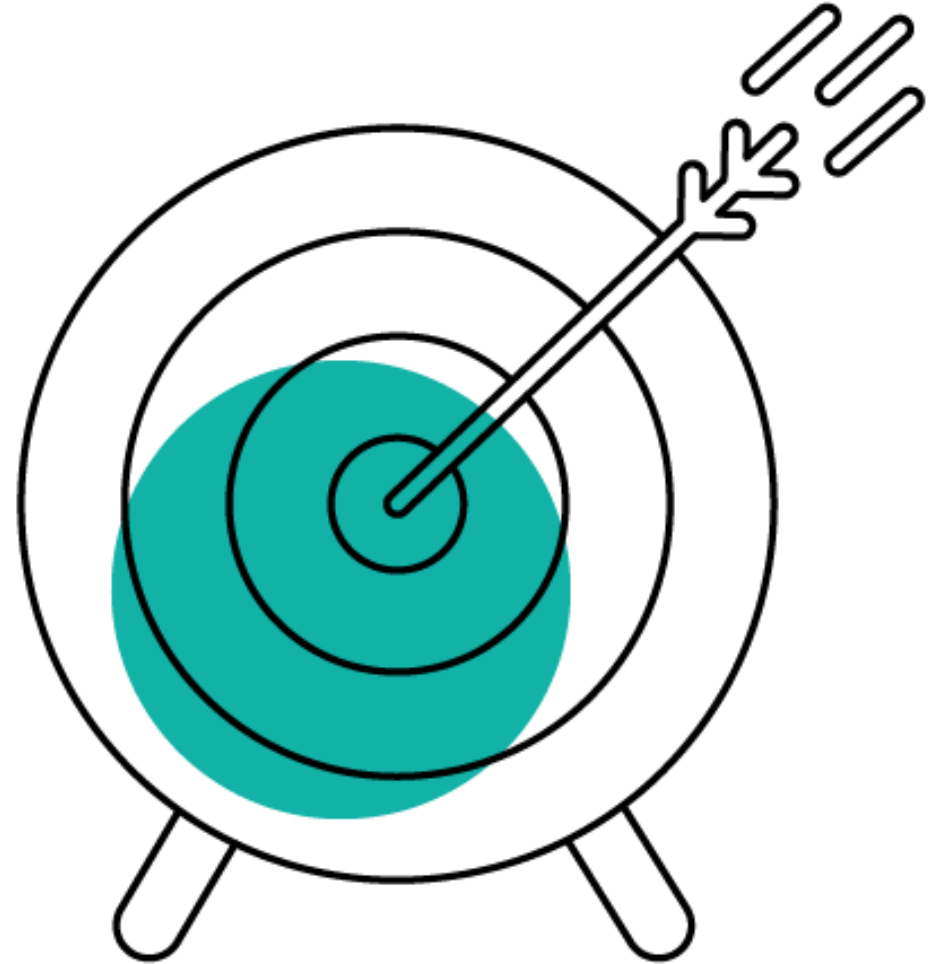


# Summary and next steps

In this session we focused on:

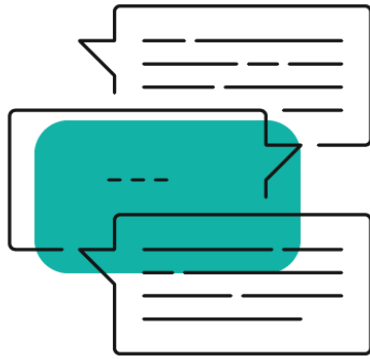
- Overview of exam performance in Combined Science Biology 2024 with identified key takeaways
- Analysis of questions and exemplar responses to demonstrate each takeaway challenge
- Suggested strategies to support or avoid each challenge

Make a note of any actions resulting from today's session.



# Subject Advisor Support

Our subject advisors are experts in their fields and are here to support you throughout the year.



Find the Subject Advisor for your area [here](#) and sign up to receive regular updates from your Subject Advisor on qualification news and support for your subject [here](#).

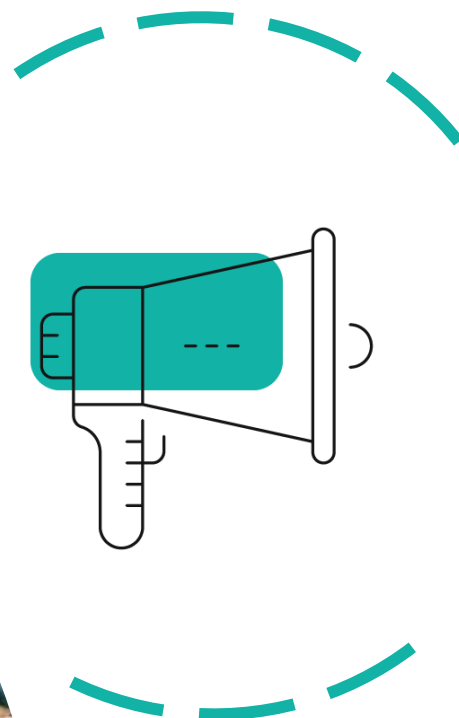




# Find out more

For more professional development courses please see Pearson's [Professional Development Academy](#)





# Your Feedback Matters

Following this event, you will receive an invitation to share your thoughts about the session. Your feedback is invaluable to us, as it helps us tailor our professional development materials to better meet your needs. Please don't hesitate to let us know what you'd like to see more of and what areas you think could be improved.



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