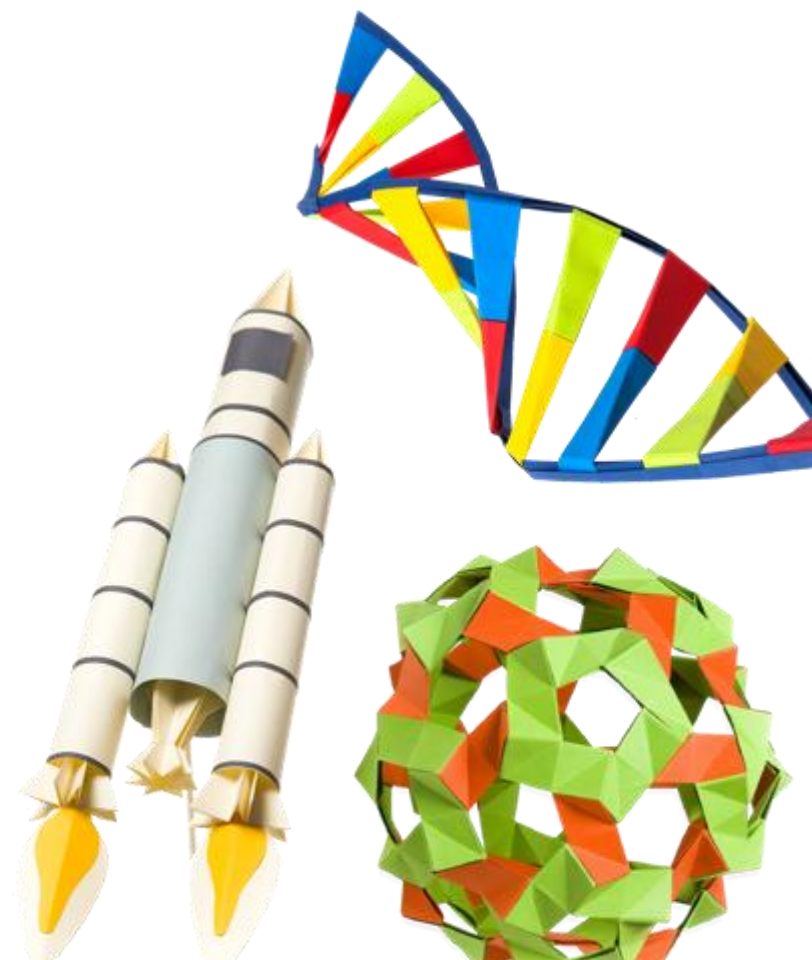


GCSE Combined Science

Tackling Extended Open
Response Writing



Welcome to this CPD session: Tackling Extended Open Response Writing

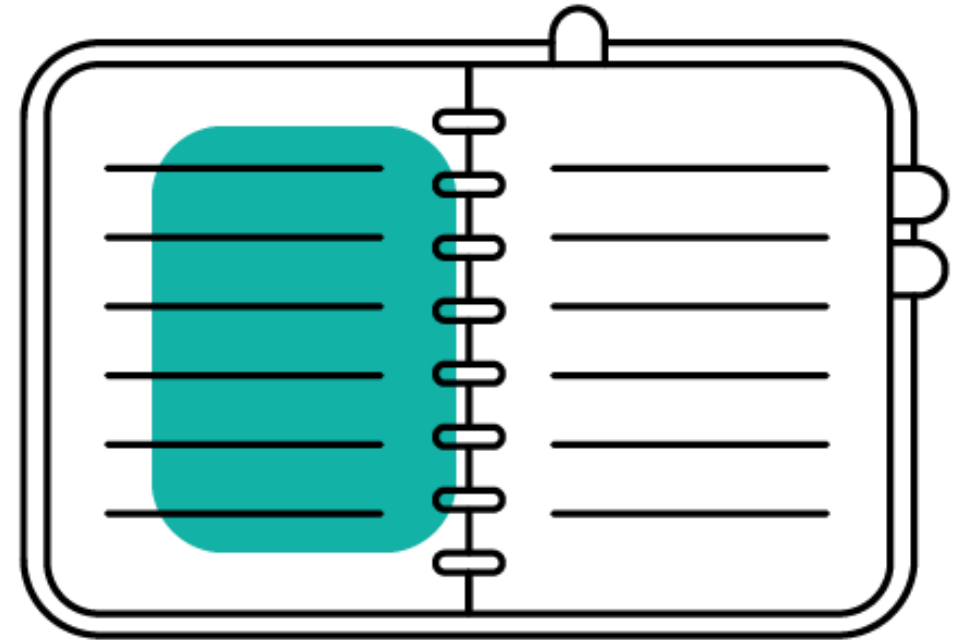
Introductions



Agenda

In this session we are going to:

- explore strategies to support students with extended response questions
- identify areas for improvement in extended response questions
- develop your understanding of how extended open response questions are marked
- understand the requirements of our open response questions with specific command words.



Key features of EOR questions



Extended Open Response (EOR) questions

- These questions have 6 marks
- One 6-mark question in combined science papers
- Two 6-mark questions in the separate science papers
- Usually found towards the end of the paper
- EOR questions are marked with an asterix*
- Designed to differentiate candidate ability

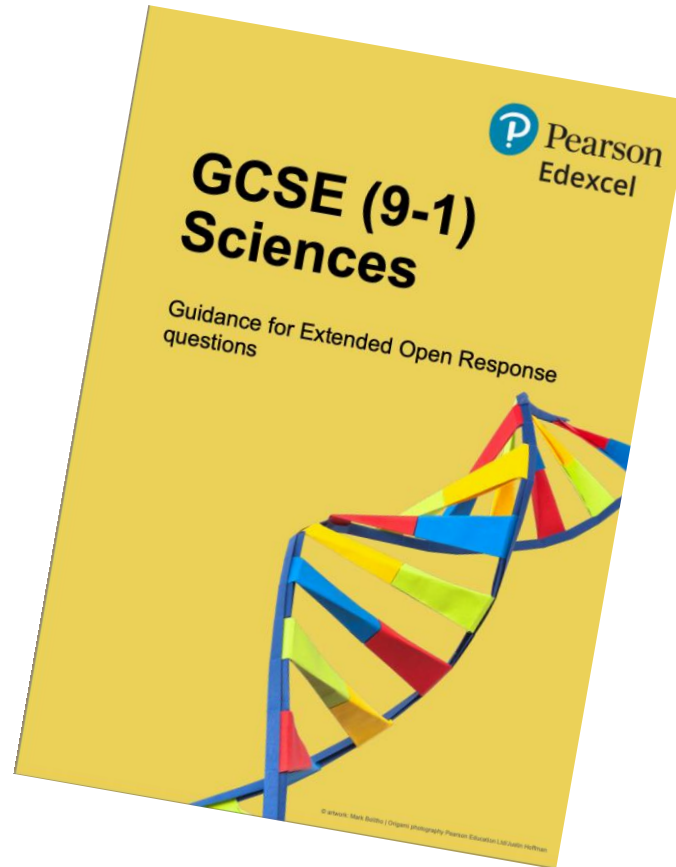
Extended Open Response (EOR) assessment

- The questions have a levels-based mark scheme
- Assessed against indicative content
- Assess how well construct 'clear, sustained lines of reasoning', meaning a response that is coherent in linking ideas/concepts
- Can test AO1, AO2, AO3, or a mix, but only a maximum of two Assessment Objectives per question

Assessment objectives

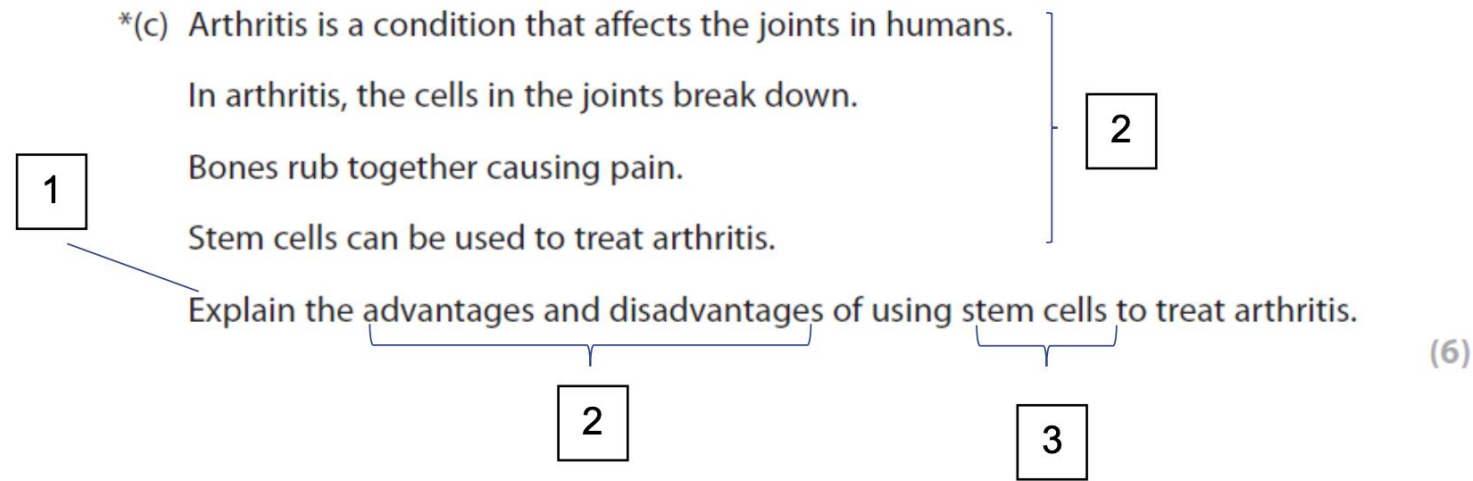
Objective		Weighting
AO1	Demonstrate knowledge and understanding of: <ul style="list-style-type: none">• scientific ideas• scientific techniques and procedures	40%
AO2	Apply knowledge and understanding of: <ul style="list-style-type: none">• scientific ideas• scientific enquiry, techniques and procedures	40%
AO3	Analyse information and ideas to: <ul style="list-style-type: none">• interpret and evaluate• make judgements and draw conclusions• develop and improve experimental procedures	20%

Extended Open Response: True or False?



<https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/teaching-and-learning-materials/pearson-edexcel-gcse-sciences-extended-open-response-guidance.pdf>

EOR question: key features



- 1. Command word:** this will determine the type of response given and the candidate will need to understand the command word to then provide the appropriate response. There are different types of command words used for EOR questions including Explain, Describe, Plan/Devise, Comment on.
- 2. Context/Information/instruction:** this may be in the form of tables or diagrams and could include data that the learner will need to use/make reference to in their response.
- 3. Key terminology:** look out for key terms used in the question stem, these will need to be used and/or applied in some way in a learner response.

Marking EOR questions



Components of EOR mark schemes

EOR questions are marked using a levels-based mark scheme, which covers three sections:

1. indicative content
2. level descriptors
3. additional guidance

Applying EOR mark schemes

To apply the mark scheme:

1. Start by reading the whole response to gain over all feel for the best fit level
2. Decide the level
3. Then consider the information and arguments and decide whether the lower or higher mark in that level is awarded.

In general, for the higher marks examiners are looking for:

- correct terminology appropriately used
- answers which have linkage/logical connections
- answers that include all relevant scientific theory

Applying EOR mark schemes tips

Good rules of thumb are:

- Level 1 are simple unlinked statements
- Level 2 contains linked or developed ideas
- Level 3 fully answers the question

- For 6 marks, perfection is not expected
- Teachers tend to mark these too harshly. Remember to compare this question to other ways candidates can get 6 marks throughout the paper
- Examiners ignore waffle and incorrect science as long as it does not directly contradict correct science the candidates have written
- Could refer to the Examiner Report and exemplars before marking own mocks

Marking EOR activity



Example EOR question

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

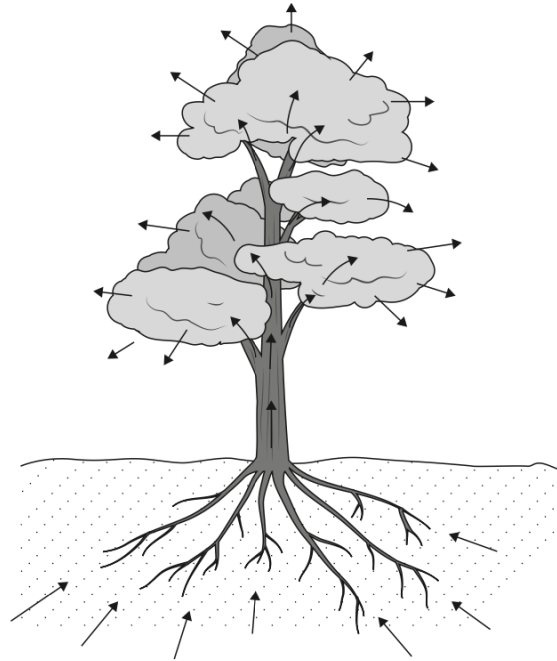


Figure 11

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

(6)

Mark Scheme – 3 parts

Question number	Indicative content	Mark
6 *(c)	<p>AO1 6 marks</p> <p>Roots</p> <ul style="list-style-type: none"> • water enters the roots • into root hair cells • which have a projection / large surface area • by osmosis • from a dilute solution in the soil to a more concentrated solution in the root cells. <p>Stem/trunk</p> <ul style="list-style-type: none"> • through xylem • which are long / thin / hollow / lignified / dead cells • because water is being pulled up • because of transpiration <p>Leaves</p> <ul style="list-style-type: none"> • water moves into the leaves • by osmosis • because the leaf cell contents are more concentrated than in the xylem • water evaporates / water moves out of the leaves • through the stomata • (into the air) by diffusion • reference to transpiration 	(6)

Level	Mark	Descriptor
	0	• no rewardable material.
Level 1	1-2	<ul style="list-style-type: none"> • demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • presents an explanation with some structure and coherence.
Level 2	3-4	<ul style="list-style-type: none"> • demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. • presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	<ul style="list-style-type: none"> • demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. • presents an explanation that has a well-developed structure which is clear, coherent and logical.

Level	Mark	Additional guidance	General additional guidance
	0	No rewardable material.	The level is driven by the areas covered in the response. The mark within the level is determined by the detail.
Level 1	1-2	<p>The answer refers to part of the route taken by water through the plant / tree</p> <p>The response includes a basic explanation of how water moves through the plant</p>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> • water leaves the plant through the leaves • water leaves the plant via evaporation from the leaves
Level 2	3-4	<p>The answer refers to more than one part of the route taken by water through the plant / tree</p> <p>The response includes an explanation of how water is moved into the roots, through the plant or through the leaves</p>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> • water moves into the root and up the stem • water moves into the root via osmosis and up the stem
Level 3	5-6	<p>The answer is detailed and refers to water moving into the roots, through the stem / branches and out of the leaves</p> <p>The response includes a detailed explanation of how water is moved into the roots, through the plant or out of the leaves</p>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> • water moves into the root. Water then moves up the stem in the xylem out of the leaves. • water moves into the root. Water then moves up the stem in the xylem to the leaves where it is lost to the air via transpiration

Exemplar 1 – 6/6



This is a very detailed response that shows a good understanding of the movement of water through plants. The route through the plant is detailed and includes references to root hair cells, xylem and guard cells. This is a Level 3 answer. The function of phloem has been explained and this does not detract from the overall quality of the response. Transpiration and the evaporation of water are given as explanations of water movement, so six marks can be awarded. The last sentence about meristems is irrelevant and can be ignored.

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

(6)

Root hair cells in the plant have hair-like structures that stick into the soil and absorb mineral ions and water which is transferred through phloem and xylem tubes to the rest of the plant including leaves and stomata. ^{Root hair cells also have a large surface area to absorb as much nutrients as they can,} Phloem tubes are tubes of elongated living cells that carry good substances, like sucrose, through the plant. Xylem tubes ~~are~~ ~~be~~ have dead cells that carry water and mineral ions through the plant. Guard cells control what goes in and out of the plant by swelling up with water. Then, transpiration occurs which is ~~when~~ the loss of water vapour ~~off~~ the plants leaves, and it is evaporated into the air. Meristems is where stem cells are made, which can differentiate into other cells to carry out different ^{functions}.

Exemplar 2 – 3/6

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

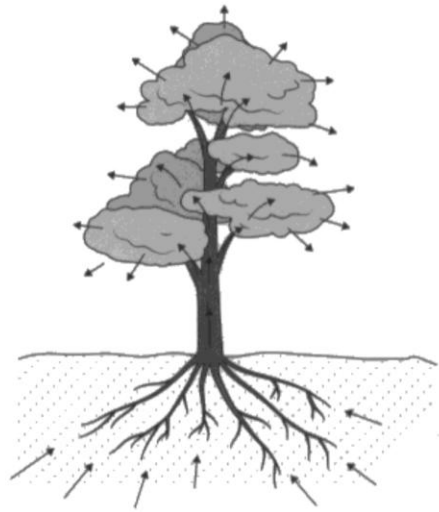


Figure 11

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.

Marking Activity

Choose **1 or 2** of the exemplars available in the 'Delegate Pack':

- Biology:** Combined Science Paper 2 Higher Tier (2024)
Chemistry: Combined Science Paper 1 Foundation Tier (2024)
Physics: Combined Science Paper 1 Higher Tier (2023)



10 minutes

- Mark your chosen question(s) using the relevant mark scheme – make a note of the mark you have awarded
- Once the time is up, please record the mark awarded into the relevant poll.

Marking Activity

Biology: Combined Science Paper 2 Higher Tier, 2024, Q6b



This was a good effort to identify Clomifene. Linking a named hormone (LH or FSH) correctly to maturing or releasing an egg is sufficient. However, this response links FSH to releasing the egg so it is not sufficient or detailed. The response then describes IVF including using a dish for fertilisation and placing the embryo into the uterus so it is classed as detailed. Detailed IVF and brief Clomifene is Level 2, as they name IVF making a link they can be awarded the top of the level.

Marking Activity

Biology: Combined Science Paper 2 Higher Tier, 2024, Q6b

Question 6 (b)

The final question of the paper was the extended open-response question. Candidates were asked to explain how assisted reproductive technology (ART) can be used to increase the chances of a woman becoming pregnant. The main two components of the indicative content relate to IVF and to the use of hormones to increase ovulation including Clomifene therapy. The level was determined by the detail given in the response for the use of hormones or an explanation of IVF. If their explanations of the processes were linked to the names of the processes the top of the level could be awarded.

Marking Activity

Chemistry: Combined Science Paper 1 Foundation Tier, 2024, Q6c

This is an example of a level 3 response.

If the response had only included the information written around the table then that alone would have been enough to award four marks.

All three solids are correctly identified in the table, as is the test for hydrogen.

The candidate has then given more information to support their conclusion including that limewater is used to test for carbon dioxide, the blue solution is copper solid and the black solid is leftover copper oxide. Although there are no equations in the answer there is enough correct detail for full marks to be awarded.

Marking Activity

Chemistry: Combined Science Paper 1 Foundation Tier, 2024, Q6c **Question 6 (c)**

The six mark question on the paper gave information about the reaction of different solids with sulfuric acid and asked candidates to identify the solids and explain their choices. It was intended that the information given would help with answering the question, but the majority of candidates still found this to be a challenging question and seemed to score some marks through luck or very basic knowledge rather than being able to use the data to inform their conclusions. As always a large proportion of responses to this question were simply left blank.

Candidates were often able to identify the gas tests for hydrogen and carbon dioxide, but were not able to successfully use this to identify the correct solid with many candidates stating that Solid A was hydrogen and Solid C was carbon dioxide. The solid that was most commonly identified correctly was C as sodium carbonate but again, this wasn't always well linked with the data from the table.

Solid B was often incorrectly identified as leftover powdered zinc even though the preparation of copper sulfate crystals using copper oxide is one of the core practical activities.

Very few responses attempted any form of equation at all, and a lot of candidates simply wrote out information from the table.

Marking Activity

Physics: Combined Science Paper Higher Tier, 2023, Q6c



The diagram shows the equipment needed and this reaches Level 1 straight away.

The candidate then describes how the weights apply a force and how this force can be changed. This description of a procedure brings the answer to level 2.

There is a short description of how the light gates are used to determine the acceleration. This brings the answer to Level 3.

Marking Activity

Physics: Combined Science Paper Higher Tier, 2023, Q6c

Question 6 (c)

The question asked candidates to describe a core practical and many candidates were able to do so. A good answer often included equipment added to the diagram such as light gates next to the runway and a interrupter card on the trolley. It would also show weights on a string passing over a pulley and attached to the trolley. This put the candidate well on the way to scoring several marks and indeed, Level 1 could be reached by simply stating some of these items or showing them on the diagram. To reach level 2, there needed to be some detail of the procedure. This could be, for example, how the light gate(s) are used or how the runway can be slightly sloped to compensate for friction. Level 3 answers would continue to describe at least one other procedure together with mention of some additional facts about the equipment to be used or how the results could be processed. Although some very good answers were often seen, many candidates were unclear about how the acceleration was measured; vague statements such as “use a stopwatch to find the acceleration” were common. There was also considerable uncertainty about where to place additional weights and their purpose. Lastly, it was often not clear about how a steady force can be applied and suggestions involving pulling the trolley by hand were not uncommon.

Making the most of the Examiner Reports

Examiners' Reports include:

- Question commentary – giving general oversight of how candidates did
- Exemplar answers – including some answers awarded full marks and others demonstrating common errors and 'examiner tip'
- Examiner Report Summaries – containing suggestions for students, based on feedback from the exam series

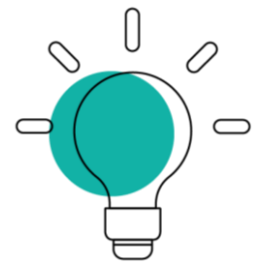
National challenges



National challenges

Challenges...

- Not using scientific terminology in answers, including topic-specific vocab and command-word specific responses
- Many leaving EOR blanks, especially in Chemistry and Physics, even more noticeably in practical questions
- Fewer candidates annotated questions or stimulus information
- Lack of any planning, leading to jumbled responses
- Not using the scaffolding provided, not referring to the diagrams, graphs and information in the stem of the question to guide responses, even when specific instructions were given



Responding to different command words



Understanding the command words

Could your pupils match the command words and definitions?

Command word	Definition
Compare & contrast	a. Give an account of something, or link facts, information, events or processes in a logical order
Describe	b. Say how or why something happens; 'because' will be an important part of your answer
Explain	c. Look at the information in the question and bring it together to make a decision and come to a conclusion with evidence from the question
Evaluate	d. Give similarities and differences between several things, not just one

Understanding the command words

Could your pupils match the command words and definitions?

Command word	Definition
Compare & contrast	d. Give similarities and differences between several things, not just one
Describe	a. Give an account of something, or link facts, information, events or processes in a logical order
Explain	b. Say how or why something happens; 'because' will be an important part of your answer
Evaluate	c. Look at the information in the question and bring it together to make a decision and come to a conclusion with evidence from the question

GCSE Sciences: What are you being asked to do in the exams?

These are the command words you might see in different questions throughout your exam



Command word	Definition
Add/Label	Show information or name something on a graph, diagram or table.
Give/State/Name	Recall one or more pieces of information.
State what is meant by	Write down what the term in the question means.
Draw	Produce a diagram with or without a ruler. Simple line diagrams for scientific equipment and circuit symbols for a circuit diagram.
Write	When the questions ask for an equation e.g. a balanced symbol equation.
Plot	Produce a graph by marking points accurately on a grid from data that is provided and then drawing a line of best fit through these points. A suitable scale and appropriately labelled axes must be included if these are not provided in the question.
Sketch	Produce a drawing without a ruler e.g. sketch a rough graph with axes and a line.
Complete	Add values to a table or diagram.
Estimate	Find a rough number or amount from the information given in the question.
Identify	Choose key details from information given in the question.
Calculate	Work out your answer using the numbers in the question. Include units in your answer.
Show that	Prove the statement in the question is right.
Determine	Use information in the question and give a numerical answer or show how the answer can be reached quantitatively.
Deduce	Come to a decision based on information in the question.
Give a reason	Say why something happens; only write the number of reasons the question asks for.
Describe	Give an account of something, or link facts, information, events or processes in a logical order.
Explain	Say how or why something happens; 'because' will be an important part of your answer.
State and explain	Make a point and link ideas to justify that point.
Comment on	Look at data or information and decide what it shows.
Compare and contrast	Give similarities and differences between several things, not just one.
Predict	Say what you think will happen based on what you know.
Discuss	Pick out the situation or argument in the question, explore all aspects of it, investigate it and come to a conclusion.
Justify	Give evidence to support an answer.
Assess	Read the information in the question carefully and pick out the most important parts to help you answer the question or come to a conclusion.
Evaluate	Look at the information in the question and bring it together to make a decision and come to a conclusion with evidence from the question.
Devise	Plan a method or experiment using your knowledge.
Suggest	Always used with another command word, e.g. Suggest an explanation. <i>Suggest</i> tells you that you need to apply your knowledge to a new situation, and in this case to give a possible explanation.

Starting with describe and explain?

1. Explore what each of these means
 1. E.g. matching definitions, pair talk, using non-science examples.
2. Model and share what a good response looks like (WAGOLL),
 1. E.g. using visualizer, providing 2 good examples and asking to pick out what makes them good
 2. E.g. use of 'because', 'therefore' for 'explain, 'say what you see' for 'describe
3. Pupils try to improve answers provided
4. Pupils write their own answers

Strategies to support with EOR answers



Teaching strategies (1)

- Common systems for annotating and accessing questions (e.g. BUG, BLAST, highlight command word etc.)
- Modelling, visualiser, walking talking mocks
- Scaffold, with a view to reducing scaffolding, e.g. fill in gaps, writing frames, structure strips, sequencing
- WAGOLL, including sharing succinct answers and use of bullet points and examples of annotation
- Scribble a plan / discuss/ annotate the question stimulus material **before** showing the specific question
- Encourage verbal discussion and planning before answering in writing (use mini whiteboards)
- Link extended writing to practical questions (as exams often do)

Teaching strategies (2)

- Reinforce that these are not necessarily the hardest qu on the paper. Even towards the end and at medium demand on F Tier, some marks could be awarded for 'low demand' responses
- Encourage to write ***anything*** linked with the question topic or stimulus material – the only sure way to be awarded zero is to write nothing
- Bust the myth that all of the lines need to be filled (could encourage crossing out/ giving fewer lines in teaching/ exam prep)
- Highlight student/ exemplar answers to show mark-worthy material in one colour, material that simply repeats the qu stem a different colour, additional unnecessary info another colour etc.
- Include extended answers in KS3 assessments
- Promote and reward annotating and planning from KS3

Sequencing

Pour 40cm³ of 1.0M sulphuric acid into a 100cm³ beaker.

Set up a Bunsen burner on a heatproof mat with tripod and gauze over it. Place the beaker with the acid on the gauze. Heat gently until almost boiling.

Then turn the Bunsen burner off.

Place the hot beaker on a heatproof mat. Add copper oxide one spatula at a time, stirring with a glass rod.

Fold and place filter paper inside a funnel and filter the blue copper sulfate solution into a conical flask.

Next, pour the solution into an evaporating basin and heat over a water bath until about half of the solution has evaporated.

Finally, using tongs, pour the solution into a crystallising dish and leave for crystals to form.

0 1 . 4

The human digestive system breaks down protein and fat in the drink.

Describe how **protein** and **fat** are digested.

You should include:

- the enzymes involved protease, lipase
- where the enzymes are produced. pancreas

[6 marks]

- Protease breaks down proteins into amino acids
- Lipase breaks down fats into fatty acids and glycerol
- They are both produced in the pancreas
- The long chain of protein must be broken down as it's too big to digest. Protease breaks it down into smaller amino acids which are small enough to be absorbed into the blood stream
- Lipase does the same, breaking down large fats into smaller fatty acids and glycerol
- This means that they are small enough to be absorbed into blood

This response clearly describes both fat and protein digestion, so was able to access Level 2. There is sufficient information in the first six lines to merit the award of full marks.



What other winning strategies do you use to
support EOR?
Add ideas to chat.

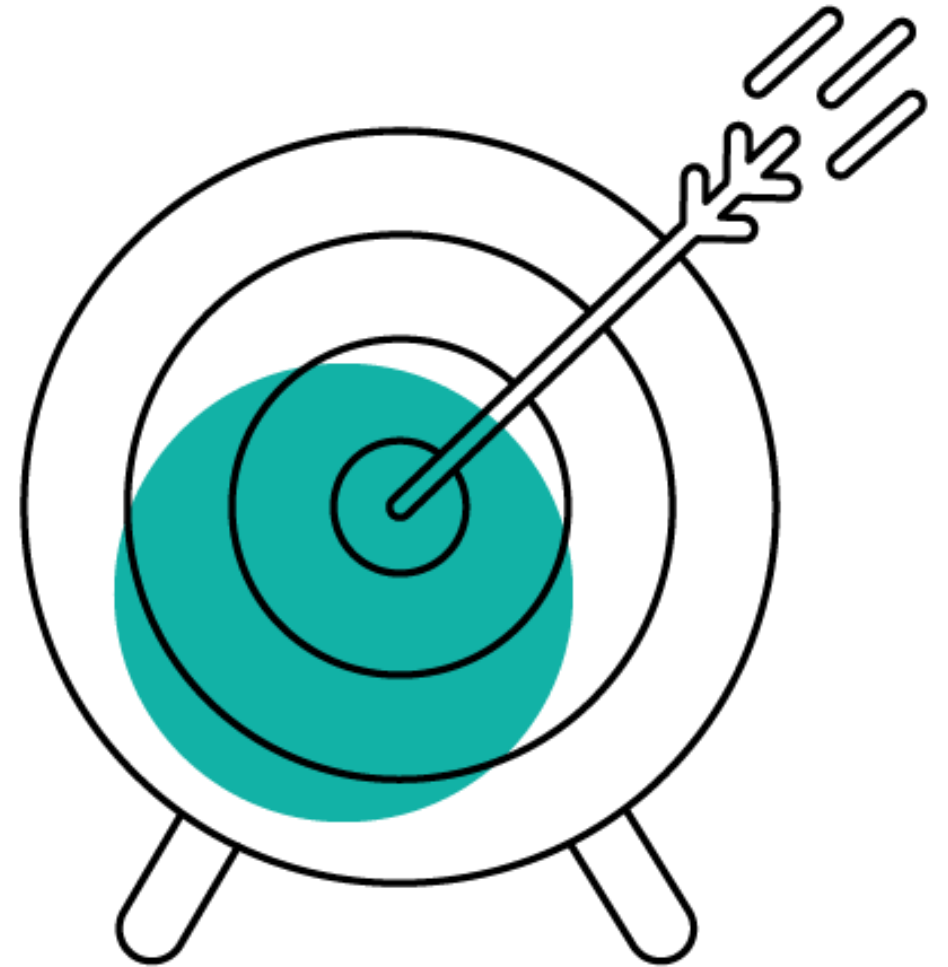


Summary and reflection

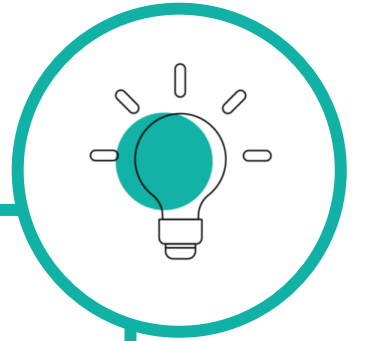
Summary

In this session, we looked at the following objectives:

- explore strategies to support students with extended response questions
- identify areas for improvement in extended response questions
- develop your understanding of how extended open response questions are marked
- understand the requirements of our open response questions with specific command words.



Reflection



Identify any changes that you can make, either:

- individually or
- at whole department level

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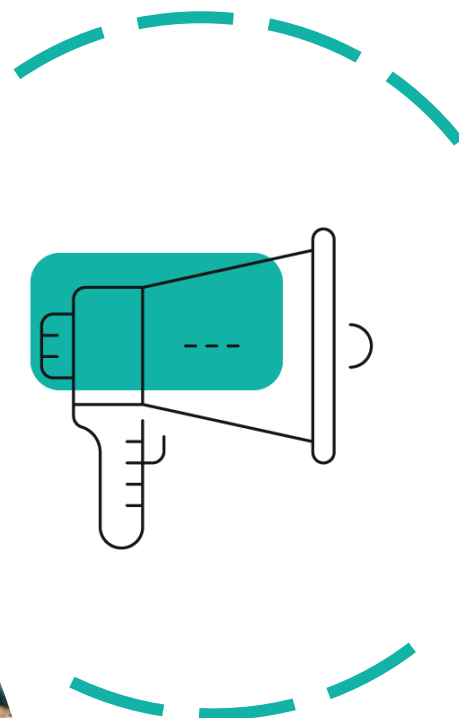
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Your Feedback Matters

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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