Advice on how to revise for and approach examinations

Tips for revision

Know the syllabus

The *Cambridge International AS and A Level Biology* syllabus is divided into **sections**; each section is divided into **learning outcomes**. The advice here is relevant for both the AS and A Level examinations. It is useful to familiarise yourself with what you are expected to know for examination. You can access a copy of the syllabus on the Cambridge International Examinations website and you should always refer to the syllabus for the year you are entering the examination. Your class notes may contain extra background information to help you understand topics. Use the syllabus to refer to the learning outcomes and then extract the relevant points from class notes when you make **learning notes** (see below) and **revision notes**.

Syllabus sections are not all the same size. When planning your revision, allocate your revision time according to:

- the volume of learning
- how difficult each section has been for you.

Learn the wording of the learning outcomes that are definitions of biological terms – these could form the basis of some questions.

Exam questions can present you with a situation in a new context. You will be able to tackle these questions more confidently if you can identify the relevant learning outcomes that are being assessed. You will then need to apply your knowledge and understanding to answer the question.

Make learning notes

Many students learn by repetition. As you learn, you can reduce your class notes:

class notes → **learning notes** → revision notes

Each time you complete a topic, it's helpful to go back through your class notes and organise them in a way that suits your style of learning, to make your learning notes. The topic could be part of a learning outcome if you have found something particularly difficult, or as large as a syllabus section if you have found everything quite easy.

Learning notes are personal and specific to you. You can benefit from re-writing class notes using strategies that work for you – for example, using colours, flow diagrams, bullet points or concept maps.

To make learning notes:

- produce a shortened version of your class notes
- check your class notes against your coursebook
- leave out background, non-syllabus, information
- leave out, or reduce to a minimum, points that you know you will never forget; for example you know from earlier courses, such as the IGCSE®, the main differences between the structure of plant and animal cells, but a new fact such as 'the presence of centrioles in animal cells' needs to be emphasised
- avoid long, flowing sentences that contain many points
- use bullet points or short sentences, each containing one or two points that are likely to gain marks in an exam – 'mark points'
- use scientific terminology; for example diseased arteries 'may have a narrower lumen than a healthy artery', rather than 'may be clogged up'.

Many learning outcomes are linked to others within the syllabus. Your teacher may have covered topics in a different order to that in the published syllabus. This may also be a logical order for you. Make your learning notes for each topic on separate pieces of paper to put into your folder in your preferred order.

Making learning notes has benefits:

- repeating and reformatting class notes helps learning
- it is a first stage in revision for the exams
- notes are in your preferred style to optimise learning
- you can assess how well you understand each learning outcome.

Make revision notes

It is likely that you will be trying to cope with other subjects as the exam time approaches, so a stack of learning notes that is as thick as a textbook are not helpful. You can reduce your notes further to make revision notes.

class notes → learning notes → **revision notes**

Be sensible in your approach:

- modify and reduce your learning notes – revision notes should contain only the detail necessary to get your very best grade
- assess for each topic how much you have increased your understanding and knowledge
- check whether you have changed your style of learning
- think about how you want to set out your revision notes
- think about whether there is a better method to use for revision notes than you have used before – you may get ideas from your friends

- incorporate your experience of past-paper practice questions and their mark schemes into your notes
- get revision notes ready for one topic area and then try them out to see if you can revise from them successfully.

Know what to expect for each exam

Before you enter the exam room, you should know what to expect in the exam paper you are facing. Exam papers have different types of questions, including multiple choice, structured question and extended-answer questions. It is important to know how long the exam lasts and how many questions you need to answer.

The table shows the types of questions in each of the exam papers for the Cambridge International AS and A Level examinations.

Paper	Level	Types of questions
1	AS	multiple-choice questions
2	AS	structured questions
3	AS	practical examination that tests skills such as following instructions, observation and recording, data collection, data presentation (tables and graphs), analysis, calculation, evaluation and drawing
4	A	structured questions and an extended answer question (there are two questions requiring extended answers and you must choose one of these to answer)
5	A	questions that test the practical skills of planning, analysis and evaluation

Apart from multiple choice questions, it is rare for questions to be worded as straightforward questions with question marks. They generally have 'command terms'. A list with explanations of the most common command terms that you should understand is in the syllabus. Make sure you know exactly what is required for each command term.

Command terms that appear frequently in questions are:

- calculate
- compare
- describe
- discuss
- explain
- list
- outline
- state
- suggest.

Use past papers to help you revise

You will find it helpful to look at or practise past exam papers.

You will need to learn and practise the practical skills that are tested in the AS practical examination and the A level paper that concentrates on the skills of planning, analysis and evaluation.

Your teachers may have copies of past papers and mark schemes. Note that the mark schemes for many questions contain more mark points than the total mark allocated. This is because mark schemes accommodate all the various ways a topic may be taught. You are not expected to be familiar with all the mark points. For each question, just check that you know enough of the points to do well.

Approaching the examinations

Suggestions on how to approach multiple-choice question papers

Introduction

Points to note:

- as you proceed from one question to the next, you need to continually switch your focus to different areas of the syllabus
- some questions will be fairly straightforward and should not take much time, as they assess knowledge and understanding directly based on syllabus learning outcomes
- some questions may expect you to use your knowledge and understanding from a number of different learning outcomes, so keep an open mind
- you will need more time to concentrate on questions that require calculations, analysis, problem solving or application of knowledge (see next bullet point)
- at first sight, some questions appear to be not related to the syllabus at all, but can be understood and dealt with by using your existing knowledge and understanding.

Understanding multiple-choice questions

Each question may be posed on its own or may be preceded by some information. There are four answer options: **A**, **B**, **C** and **D.** You must choose which one is the correct answer.

Some questions have a simple construction in which the options **A**, **B**, **C** and **D** appear directly below the question. The options could be one or more sentences long. Other questions have a construction in which each option is a row in a headed table.

Some questions have a more complex construction, in which you are given a number of statements to read, usually marked as 1, 2, 3 etc. Each of the options **A** to **D** then offers you a particular combination of the numbered statements, and you have to decide which combination is correct.

During the exam

When tackling questions:

- read questions through more than once
- pay particular attention to the wording of the question – for example, are you being asked which of the four options is correct, or which is **not** correct?
- For questions that assess topics that you find difficult, try to recall the relevant section of your revision notes before looking at the options (**A**, **B**, **C** and **D**) available.

When choosing the correct answer:

- if the answer is not obvious, try to use a process of elimination to decrease your choices and increase your chance of success
- carefully read the wording in the options – on quick reading, a statement can appear to be correct, but with more analysis you may spot something that is incorrect
- stay confident when you have used correct reasoning to choose an option – do not let other options that appear to have impressive wording distract you
- if option **A** appears to be correct, read on and check the others before you confirm your choice
- do not look at the pattern of answers, **A**, **B**, **C** and **D** on the answer sheet to predict the correct option – you cannot expect there to be an equal number of each option letter in the whole exam.

Suggestions on how to approach papers with structured questions

Introduction

During the 'real' exam is not the time to work out your preferred strategy for coping with exam papers with structured questions. If you can, practise past papers beforehand and try different exam approaches to see what is best for you.

Exam papers aren't long enough to test your knowledge and understanding of all the learning outcomes. Ensure that you have revised well and are prepared for your less-favourite topics to turn up in the exam. In both of the papers, each main question can assess learning outcomes from **more than one syllabus section**.

Approaching the exam paper

The first question in a structured-question paper is usually a 'settling-in' question, which can be completed with relative ease and gives you confidence.

You should:

- check that this is suitable for you as your first question
- note that mistakes are easily made at the start of the exam, and the first question attempted should be checked carefully at the end.

What about the hardest question? Look at the following considerations and think about what suits you.

You could attempt the hardest question early on:

- in case you forget what you have learned by the time you reach the end
- in case you will be tired at the end and can't think clearly
- so you can forget about it and concentrate on the rest of the exam.

You could attempt the hardest question in the middle:

- so you can gain confidence and marks first on 'easier' questions
- so you can enjoy the rest of the exam after getting it done.

You could attempt the hardest question at the end:

- in case you need to spend more time on it
- so that you will build up your confidence from working on the questions you found easiest.

Difficult part-questions require extra thought, so take care not to spend a disproportionate time on them. If the mark allocation is low, consider leaving them and returning when you have completed the rest of the paper.

Tackling questions requiring extended answers

Structured question papers may include a question that requires an extended answer, e.g. the Cambridge A Level paper 4. You will need to decide when and how to tackle this question. It is generally worth more marks, and you must make sure that you have enough time to do a good job.

Think about the following statements and how they can help you to decide your strategy.

'One of the questions is better suited to me, so it is easy to make the choice.'

- No problem!

'I like part (a) of one question but part (b) of another.'

- You have to choose **one whole question**.
- Check the mark allocation for each of these part-questions; it is probably best to go for the question in which the part-question you like has the higher allocation.
- Check that you can make a reasonable attempt at the rest of the question.

'I have revised well but if I do structured questions first, I am the sort of person who may forget the topic areas assessed in the extended-answer question.'

- Consider doing the extended-answer question first.
- Alternatively, write out an essay plan for the extended-answer question first, to remind you of the main points later after you have completed the other questions.

'I want to settle into the exam before I write an extended response, as I find these more difficult.'

- Do the structured questions first so that you know you have already built up marks, and then you can work with more confidence on the extended-answer question.

'I know my syllabus well, enjoy writing mini-essays and prefer to start with something that is straightforward to answer.'

- Consider doing the extended-answer question first, as it is based on syllabus knowledge and understanding.

During the exam

In the first five minutes of the exam:

- look through the exam paper and decide if you should tackle the questions in order
- check the mark allocation for each main question and allocate the same number of minutes to complete that question.

In the last few minutes:

- take two or three minutes to check through your answers to each main question
- check that you have not left any part-questions blank.

If you are running out of time, aim to gain as many marks as possible in the time left. Choose those part-questions that involve one or more of the following:

- less reading and information to assimilate
- a larger allocation of marks
- a topic that you have revised well.

When writing a response:

- make sure that every word can be read easily by the examiner
- refer back continually to the question to stop yourself straying
- use concise sentences, either in continuous prose or in bullet points
- make each sentence a different mark-worthy point
- check the mark allocation – one long sentence about one point may only earn one mark, but if two or three marks have been allocated you need to think of other relevant points
- unless you have large handwriting, there is enough room to answer on the lines provided and get full marks – extending beyond the printed lines may mean you are spending too long on your answer
- state the most obvious points, briefly, if you think that you need to set the scene
- build up your response so that you answer the question fully
- always use scientific terminology
- do not repeat word-for-word answers that you have seen in mark schemes from previous papers – modify them to suit the question
- read your answer – does it match up to the actual question?

Skills needed to answer questions on all papers

Remember that each question can assess one or more of the skills outlined in the following table.

Skill	Can you …
knowledge, with understanding shown, of one or more syllabus learning outcomes	• recognise and remember what you have learned? • write a response that puts together what you have learned in an organised and meaningful way? • show that you know the correct scientific terms to use?
application of knowledge and understanding	• demonstrate all of the above? • cope with questions set in a different context? • use your current knowledge and understanding to give a reasoned response to the question?
ability to write in a sequential way	• spot when answers need to be organised in a particular order of mark points? • make each step follow on logically from the last? • construct flow diagrams?
ability to use information and transfer information from one form to another	• carry out calculations? • extract and describe information (data), both words and numbers, from diagrams, photographs, tables, graphs and charts? • describe trends and patterns? • draw conclusions? • spot things that look out of place? • draw flow charts, diagrams and complete charts and tables using information provided?

Types of question

Calculation questions

Read the syllabus information about the mathematical knowledge that you should have, as you can be asked to make calculations using this knowledge.

Calculations might involve:

- magnification
- actual sizes
- percentages
- rates
- differences in percentages and other values.

Read each question carefully.

- Does it ask you to give the answer to the nearest whole number?
- Does it tell you what units to give in your answer?
- Does it ask you to use units appropriate to the answer?
- Does it ask you to show your working?

As a check, estimate what the answer is likely to be before using your calculator. Make sure you have given your answer to a sensible number of decimal places.

Use a ruler when drawing tangents to curves on a graph (for calculating rates).

Questions involving graphs

Know the difference between 'describe' and 'explain':

- students doing other subjects such as mathematics and chemistry could **describe** the results on a graph
- only you, the biologist, can **explain** the results

When asked to 'describe', you might include:

- the general trend
- precise details within the overall trend
- the way in which altering the variable plotted on the *x*-axis affects the variable plotted on the *y*-axis
- extraction of values, often requiring both *x* and *y* readings
- calculations, for example rates, percentage increase or decrease.

When asked to 'explain', your answer you:

- will require biological knowledge and understanding
- should account for the results obtained
- may include extraction of values to support an answer.

When describing graphs that do not have a time element, avoid using terms such as 'fast', 'slow', 'faster', 'slower', 'rapidly', 'slowly', and so on. For example, when describing a graph showing the percentage of cells in mitosis at increasing distances from the root tip, instead of saying the curve 'drops rapidly, then goes down more slowly', you should write that the graph shows 'a steep decrease followed by a more gentle decrease'.

Use a ruler to read across to or from the *y*-axis, and vertically to or from the *x*-axis, to take readings from a graph – don't rely on 'by eye' judgements.

Give the units stated on the axes when stating values from the graph in your response.

'Suggest' questions

Questions that ask you to 'suggest' a response:

- are not directly based upon the learning outcomes
- require you to apply your knowledge and understanding to answer the question – remember to also use your GCSE knowledge (and AS knowledge at A Level)
- are often easier if you have good background knowledge – you may know the answer!
- may be based on social, economic, technological, ethical or cultural topics, so keep an open mind and think more broadly than the syllabus
- may assess your ability to think about a problem and come up with a sensible suggestion; you do not always have to come up with a 'right' answer to gain marks.

Making comparisons

When asked for **similarities** between two things, make it clear which features they both have in common; for example, for haemoglobin and collagen, you might answer: 'Both are proteins that show quaternary structure.'

When asked for **differences**, a particular approach may be required.

- Choose a feature that both possess and give a comparative sentence, for example 'Haemoglobin is composed of four polypeptide chains whereas collagen is composed of three polypeptide chains.'
- Think of a feature possessed by one of the two that is absent in the other, for example 'Haemoglobin has a prosthetic group but collagen does not.'
- If there are a number of differences, consider whether constructing a table like one of those shown below will make your answer clearer.

Haemoglobin	Collagen
four polypeptide chains	three polypeptide chains

or

Feature	Haemoglobin	Collagen
number of polypeptide chains	four	three

When asked to **compare**, this may require you to give both similarities and differences.

Check whether the question asks you to focus on one area, for example **structural** similarities and differences or **functional** similarities and differences.

Remember to give a full comparative answer; for example, 'Eukaryotic cytoplasmic ribosomes are **larger than** prokaryotic ribosomes.' An answer that focuses only on one of the items to be compared – such as 'Eukaryotic ribosomes are large' – does not fully address the question.

Compare the **same** feature each time; for example, 'In photosynthesis, ATP production occurs at the thylakoid membranes of chloroplasts, whereas in respiration it occurs on the inner mitochondrial membrane' and **not** 'ATP production involves thylakoid membranes, whereas the Krebs cycle occurs in the matrix.'

Drawing a diagram

In some questions, drawing a diagram is requested or hinted at, in which case there will be a blank space allocated for your use. If a diagram is not requested, you might still want to use one in your answer. Bear the following points in mind.

- A diagram is not necessary if you have given the same mark points in writing.
- A diagram may save time or make it easier to get your ideas across.
- A diagram may require labelling and/or annotating to explain what it shows.
- You may want to draw a diagram just to help you plan your written answer and save time overall.
- If there is no allocated space, draw the diagram in a nearby space, with a clear link to the particular answer.

Questions containing diagrams

Some questions contain references to diagrams; for example, 'In Figure 1 …'.

- These diagrams can either be essential for you to answer the question or are there as a stimulus to jog your memory and help you plan your answer.
- Spend time and make sure you understand fully what the diagram is showing you, read the question and refer again to the diagram before responding.
- If there is an instruction to refer to a particular diagram, don't ignore it – make it clear that you are using the diagram in your response.

- Carefully read the instruction to see if you need to add to the diagram; for example, you may be asked to add labels or label lines (no arrow heads), write names of structures, or fill in blank boxes on the diagram.
- If it will help, add ideas to diagrams to prepare your answer.
- If you add labels or annotations to a printed diagram as part of your response, refer to this fact in your answer.

Suggestions on how to approach the AS practical examination

Introduction

The practical question paper assesses practical skills. Some skills are only assessed in the practical paper. For example, obtaining the correct results for a practical means that you are likely to have:

- followed exactly the instructions given
- used apparatus and equipment with skill and precision
- made measurements and observations with accuracy, skill and precision.

Some skills that are essential for the practical examination are also required for paper 5 that tests skills of planning, analysis and evaluation. Some of these skills are making calculations, completing tables, analysing data and writing conclusions.

Be prepared to be adaptable and remain flexible in your approach to the questions on the AS practical examination.

- There is one question that will involve you using a microscope.
- Other combinations of questions are possible; for example, it is possible to have a short experiment that involves using the microscope in one question, and another short experiment, possibly with photographs to interpret, in another question.
- Where there are appropriate links, you can be assessed on your knowledge and understanding of the AS syllabus.
- Remember that you may come across unfamiliar material. Application of knowledge and understanding is expected here.
- Gauge your practical abilities, to help you plan your time in the exam. For example, are you adept at using a microscope and so likely to be quicker for this section of the exam? Or are you someone who follows instructions and implements practicals very efficiently? Do you need more time to draw graphs, complete tables and write responses, but are an efficient practical worker?

During the exam

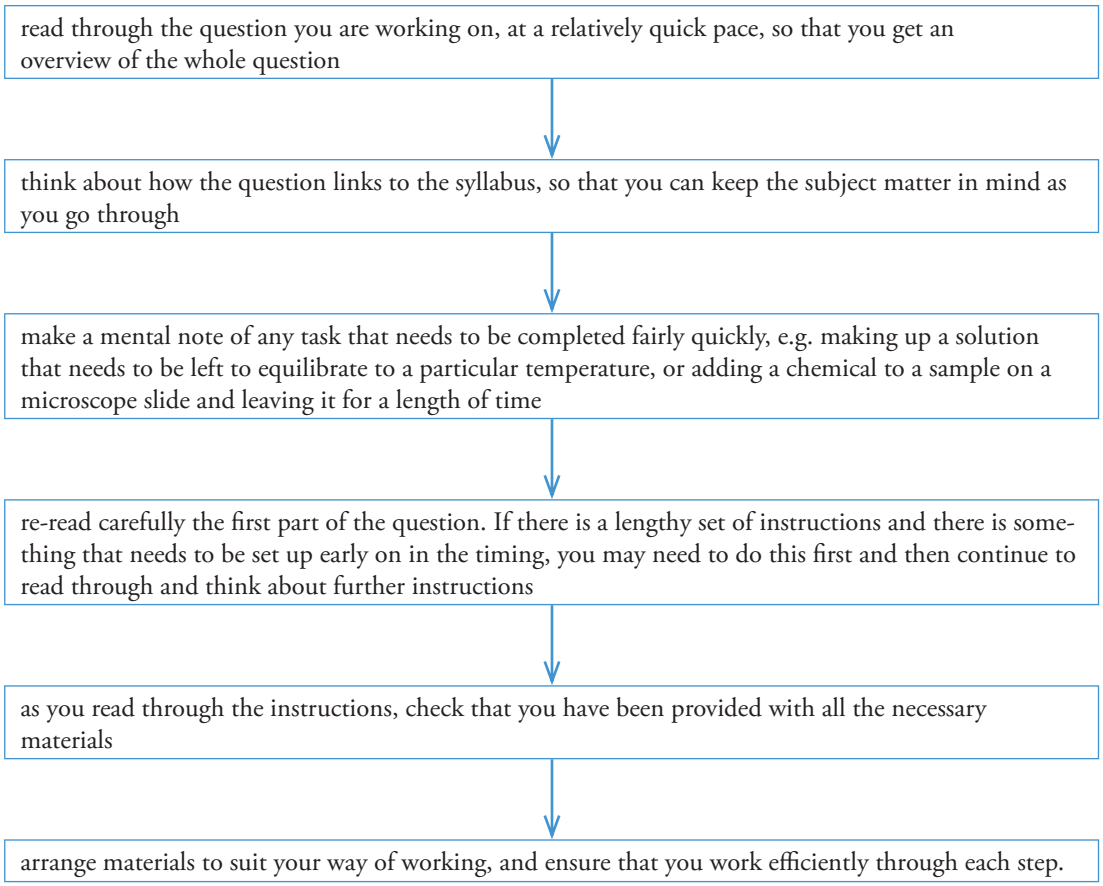
Compared with other question papers, practical exams offer less flexibility, as there will be a portion of the exam that has sequential stages to carry out. Also, students at many centres have to share microscopes, and this means you will be told which question you will do first, with a 'swap-over' at the halfway stage of the exam.

It is important to remember that, no matter how well your practical has gone, **you can only be assessed on what you have written on your exam paper**. Spending too long carrying out a practical experiment or using the light microscope may jeopardise your chances of a high mark in this paper if you run out of time and have to leave sections blank.

Here are some questions to ask yourself before you start answering the questions on the paper.

- What question am I starting with?
- Have I arranged my work area to accommodate the order in which I am tackling each question?
- Have I set aside an area where I can write and complete the exam paper with ease?
- Have I looked through the paper to see if I can gauge the actual time I am going to need for each question?
- Have I noted any 'stand-alone' sections that can be completed when I have a spare few minutes, for example, in the time between taking measurements during an experiment?

For the first few minutes of each question:



Start completing the paper as you carry out the practical work, and remember that there is always something that you can be doing. For example, instructions such as 'Prepare the space below to show …' generally mean that you should construct a table into which you can write result.

- There is usually no time to write down your data and then construct a table; you should always prepare a table with column headings and units (use pencil if unsure) before collecting results.
- If time will be short to implement the practical, at least do an outline of a table and add details of column headings later.
- You can always make the table look neater later on if you have time.
- Add results to the table as they occur.

If you are working well on the first main question and have a few minutes to spare, see if there are other part-questions that you can be thinking about.

- Is there a part-question on modifications and improvements, about which you already have ideas?
- If you will need to do a graph later, can you start to think about the axes and the scale intervals?
- Is there another set of generated data on which additional calculations or comments are required?
- Is there a photograph, photomicrograph or electron micrograph for which additional part-questions have been set?
- Is there anything in the other main question (the 'stand-alone' sections mentioned above) on which you can start working without getting confused?

If you are on the second main question and you have spare minutes, some of the above points will still be relevant, and in addition you can start checking the first question.

- Re-read the part-question and check that your answer is relevant.
- Check calculations.
- Check your graph to see if axes are labelled correctly and points are plotted accurately.
- On diagrams, check that labels are correct and label lines point exactly to the structures.
- Check that tables have been completed using the correct conventions.

Skills needed to answer questions

A practical exam paper is not usually constructed to test each skill in turn; for one skill there may be a number of part-questions where marks can be gained that add up to the final allocation. It is beneficial, but not always easy in an exam situation, to identify the particular skill that is being assessed. This means that you can focus on the correct techniques or terminology that you have learned for that skill and adapt them to suit the exam.

The final column in the table below contains examples of the various different tasks that might be used in an exam to assess each main skill area. When you look through past papers, you can add more examples to the list in the final column.

Main skill area	Individual skills	Examples of how the skill can be assessed from your written responses
manipulation, measurement and observation	successfully collecting data and observations	• give tabulated results similar to expected results or trends • extract data correctly from graphs • draw diagrams with correct details as would be seen using the microscope (i.e. not textbook theory) • draw diagrams that correspond to the instruction to use low- or high-power objective lenses • draw diagrams as instructed • draw plan diagrams correctly, i.e. no individual cells • measure dimensions accurately from drawings and scales in order to calculate actual sizes
	making decisions about measurements or observations	Evidence of decisions about: • experiment timings • sampling during an experiment – how many, how often? • when to record results (colours) from food tests • numerical data presentation in tables • which values to take off graphs to calculate rates • measurements or estimates of sizes, to draw accurate drawings of specimens. • labels added to diagrams.
presentation of data and observations	recording data and observations	• construct tables correctly, with correct headings and using a ruler • present data or observations for an experiment or investigation in a single table (unless instructed otherwise) • complete tables fully and to the required level of detail (e.g. all to same number of decimal places) • organise Venn diagrams etc. correctly to show data
	displaying calculations and reasoning	• give the formulae used for calculations • show working • round answers correctly • show the key steps in your reasoning
	data layout	• plot an accurate graph, with carefully chosen scales and good use of space • draw accurate, labelled drawings, with good use of space

Main skill area	Individual skills	Examples of how the skill can be assessed from your written responses
analysis, conclusions and evaluation	interpreting data or observations and identifying sources of error	• describe patterns or trends • identify anomalous results • comment on the confidence that can be placed in your conclusions • use a graph to make interpolations or extrapolations • make comparisons between specimens • describe controls that could be carried out • identify sources of error, e.g. with use of experimental equipment, sample removal, result recording (e.g. judging end-points) • calculate percentage errors
	drawing conclusions	• use biological knowledge to explain results • use biological knowledge to answer questions about diagrams etc. • comment on predictions and hypotheses
	suggesting improvements	Suggest: • variables not controlled and how to control them • taking replicates (repeat readings) and calculating means • ways to modify an experiment to improve accuracy, reliability, etc. • extensions to an experiment.

Suggestions on how to approach the A level paper that assesses practical skills

Introduction

This paper assesses the practical skills that you have developed during your course. It is not a practical examination, but it does assess the following skills:

- planning of experiments and investigations
- analysing data from experiments or observations
- making conclusions from these data
- evaluating experimental procedures, investigations and data.

The questions in this paper are based on themes chosen from topics in the syllabus of both A and AS. For example, you may need to use your knowledge and understanding of enzymes to answer questions on immobilised enzymes and respiration if these are the themes for the questions.

The planning skill is assessed by a piece of extended writing that can be presented in a variety of ways. It does not have to be a piece of continuous prose. Often a plan could contain a numbered list of instructions for carrying out an investigation.

Advice on tackling the questions

To familiarise yourself with the contents of the entire paper and to avoid running out of time and missing some part-questions that you would find easy to answer, you should check through the entire paper before you start.

You could:	Benefit	Disadvantage
skim through the entire exam	quick overview	quick skim may miss something or may not allow full understanding of what you have to do
read carefully through the entire exam	gives a chance to digest and take on board what you have to do	may take too long and give you less time to write

Try to estimate how long each question will take to answer. It may seem that you have a lot of time, but there is a lot of reading and thinking involved. A rough guide is to calculate a time for each question that allows two minutes per mark, then you should still have 15 minutes for reading the entire paper at the beginning and then at the end to check responses and add any extra points.

You may decide that one question will be easier for you than the other(s), and according to your preference, decide which question you want to answer first.

Each question needs to be given careful attention.

You could:	Benefit	Disadvantage
read the entire first question before re-reading and responding to each part-question	better overview of what is required, and some later part-questions may be of some help for earlier parts	overall reading time may be slightly longer
read each part-question once, consider a response, re-read and give a written response	you can focus all your attention on the part-question in hand	you may write something that is more relevant for a later part-question

During the exam

At the start you should:

read the paper

↓

estimate the time required for each question

↓

decide on the order in which you will complete the questions

↓

write down the time you have allocated for each question next to the question (either as 'minutes allowed' or work out the actual start and end clock times).

During the exam you should: keep referring back to the basics of prediction/hypothesis, planning, analysing and evaluating. The paper can ask questions assessing understanding of these areas; although each paper will be based on different topics, the same basic principles still apply.

The planning exercise often requires an extended answer, so ensure that your response, in sentences or bullet-point form, is concise and clear. Use side headings to help you organise your response. Sometimes you will need to give a sequential account, and you should think through or jot down your ideas before you answer.

Although you should plan an experiment that it would be possible for you to implement, you are not restricted to the equipment that you have at your school or college. When you write out a plan, re-read what you have written to make sure that someone else could carry it out by following your steps.

Skills needed to answer questions

A reminder from the advice on the AS practical exam papers:

- the exam is not constructed to test each skill in turn
- for one skill there may be a number of part-questions where marks can be gained
- try to identify the particular skill that is being assessed and think back to basic principles.

Examples of what you may have to do in order for each main skill area to be assessed are in the table below. Use past papers to see if you can add any others to the list.

Main skill area	Individual skills	Examples of how the skill can be assessed from your written responses
planning	defining the problem	• give a prediction or hypothesis • sketch out a curve on a graph to show the expected results of an experiment • identify the independent variable • identify the dependent variable • identify variables that need standardising
	methods	• carry out risk assessments • describe how to vary the independent variable • describe how to measure the dependent variable • describe the experimental set-up • give a sequential account of how you would carry out the practical, including how to make up solutions • describe and explain any control experiments • state or show how results (raw data) collected could be organised (e.g. into tables or graphs) • describe what you would look for in your organised results to help you draw conclusions
analysis, conclusions and evaluation	dealing with data	• suggest which calculations and/or statistical tests need to be carried out • carry out calculations • carry out statistical tests and explain the meaning of the results of these tests • add calculated data to tables • produce graphs with error bars (e.g. from standard error)
	evaluation	• identify and/or explain the cause(s) of anomalous results that appear in tables and graphs • suggest ways to handle anomalies so that valid conclusions can be drawn from the results • explain why replicates are required • comment on the effect of the design of an experiment in producing reliable and valid results • make links back to the prediction or hypothesis to comment on the quality of the experimental design
	conclusion	• make links back to the prediction or hypothesis • use results and calculated data to draw conclusions • use biological knowledge to explain results and support conclusions • suggest ways to improve the design of the plan so that conclusions can be better supported