

# **Welcome to Pearson Edexcel International GCSE Biology:**

**Assessment objectives and Command Words  
with reference to International GCSE Human  
Biology and progression to International A  
Level in Biology**

# Welcome to Pearson Edexcel

Welcome to Pearson Edexcel,  
the world's leading learning company  
and the UK's largest awarding body.

We set the standard for worldwide  
recognised qualifications, built on the  
UK educational system and accepted  
by universities worldwide.

We have a simple mission:  
**to help make a measurable impact on improving people's lives through learning.**

*“We judge  
ourselves – and  
invite others to  
judge us – not by  
the products that  
we make but by the  
impact on  
learners.”*

**John Fallon,**  
Chief Executive Officer, Pearson



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9.00 Welcome and Introduction

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9.15 Using specifications and assessment objectives

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10.30 Break

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11.00 Using Assessment Objectives in your teaching

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12.30 Lunch

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13.30 The Language of Assessment - Command words

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15.00 Break

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15.30 Writing an Exam Question

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17.00 Finish

# Welcome and Introduction

# Aims of the Day

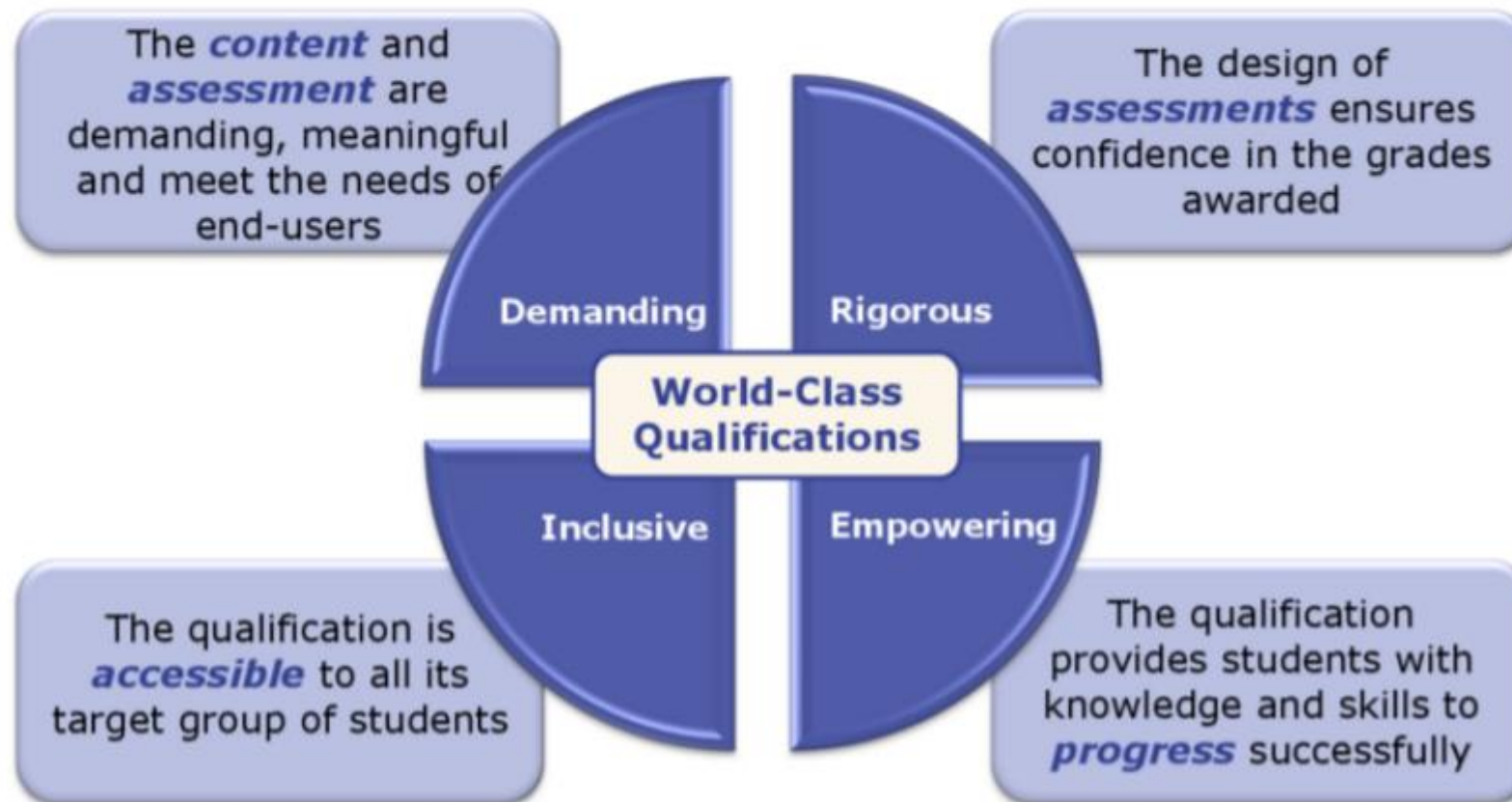
- To review the guidance that specifications give us
- To gain a better understanding of the assessment objectives
- To understand the importance of the command words used in questions

# About Pearson Edexcel

- ❖ As the UK's largest awarding organisation, we are best placed to provide qualifications that are most closely aligned to the British educational system.
- ❖ We are the most reliable awarding organisation in the UK, recognised and trusted by educators, learners and employers to provide high quality qualifications.
- ❖ By helping you to realise student potential, you can prepare and empower all your students to progress to further education, university and employment.
- ❖ Our technology capability allows us to provide you with more advanced support services, tools and resources to make life easier for school leaders, teachers and students.
- ❖ Pearson Edexcel are leading the way, challenging thinking and creating new ideas so you can be confident our qualifications will always be world-class.

# World Class Qualifications

Pearson's World Class Qualification design principles mean that all Edexcel qualifications are developed to be **rigorous, demanding, inclusive and empowering**.



# International GCSE and International AS & A Level Specifications in Biology

Pearson offers several different courses that cover Biology & biological sciences, these include:

## Level 2 Courses:

International GCSE :

- Biology
- Double Award Science
- Single Award Science
- Human Biology

All International GCSEs, except Single Award Science, are ideal preparation for iAS and iAL Biology or other Level 3 qualifications such as BTEC

## Level 3 Courses:

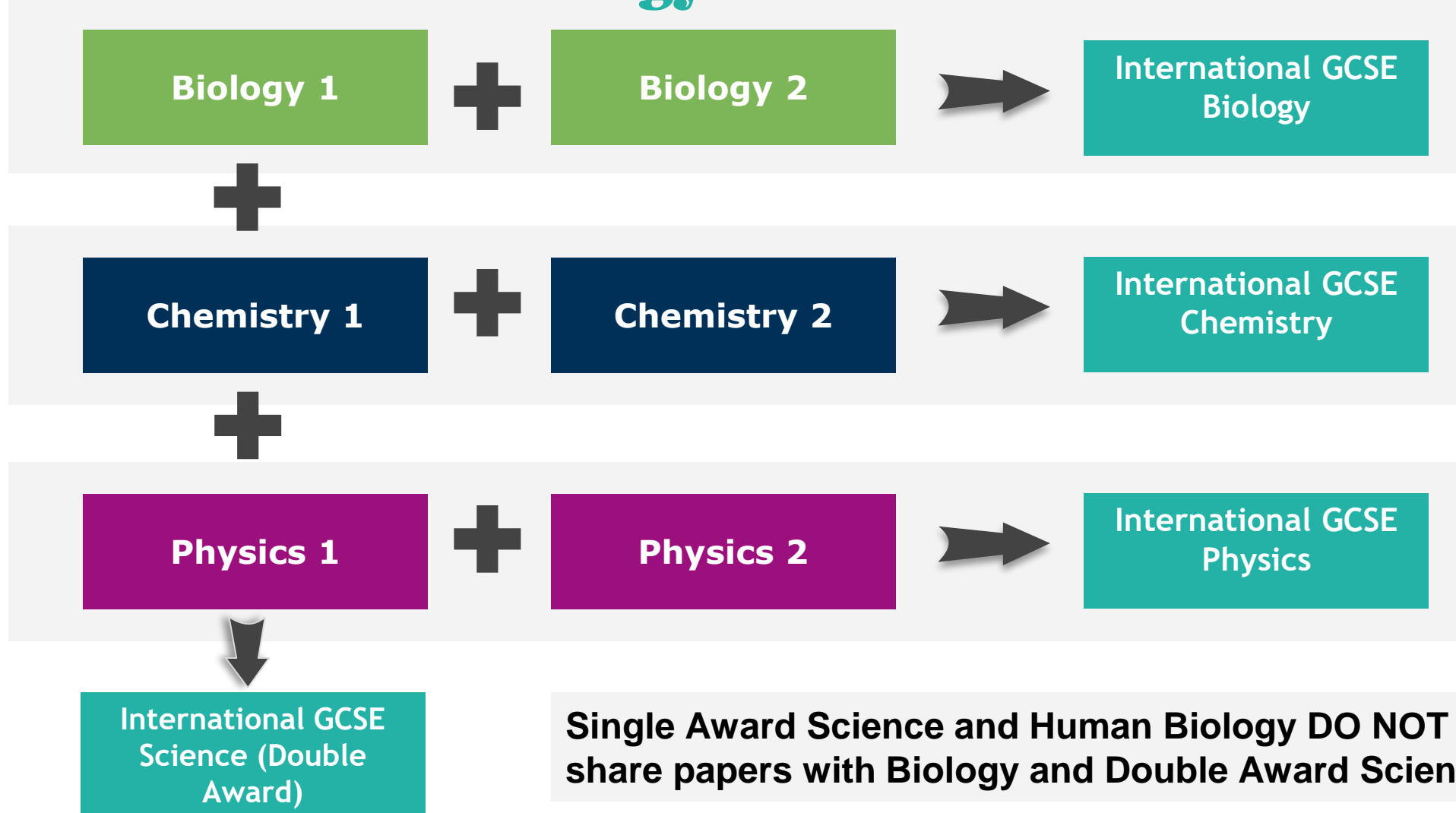
IAS and IAL

- Biology

IAS and IAL biology are level three courses that give an excellent foundation to study biology at a higher level.



# International GCSE Biology and Double Award Science



# Structure of qualifications and assessment: Linear and Modular

## International GCSE

All International GCSE exams are linear: this means all examinations are taken in the same examination series at the end of the course.

Examinations are available in January and May / June.

If there is more than one paper, all papers must be taken in the same examination series.

## International Advanced Subsidiary (IAS) and International Advanced Level (IAL)

These are unit based, modular courses. This means that students have the choice to sit examinations at the end of each unit or at the end of the course.

IAS Biology consists of 3 units (1, 2 & 3)

IAL Biology consists of 6 units - the IAS units (1,2,3) plus 3 A2 units 4, 5 & 6

Unit examinations are available in January, June and October

# International AS and A Level: resitting individual units

Students can resit any unit irrespective of whether the qualification is to be cashed in. If a student resits a unit more than once, only the better of the two most recent attempts of that unit will be available for aggregation to a qualification grade.

Please refer to the Entry, Aggregation and Certification document on our website:  
[qualifications.pearson.com/IAL-entry-certification-procedures](https://qualifications.pearson.com/IAL-entry-certification-procedures)

# Using specifications and assessment objectives

# Specifications – What do they tell us?

Specifications show us many things:

- ❖ Content – the topics that must be covered.
- ❖ The structures of the papers – content that is covered by each paper.
- ❖ Assessment requirement: objectives – how we test candidates and how much emphasis we put on each assessment objective.
- ❖ Maths skills – all exams have a 10 % maths content.
- ❖ Command words – the words used to ask questions.
- ❖ What grades mean.
- ❖ Transferable skills
- ❖ Practical skills that need to be covered, and the core practicals that candidates need to know.
- ❖ Other things, e.g. prior learning, how candidates can use the course, administration

# Content

The specifications show us all the content that candidates need to cover.  
They also show us what content is assessed on each paper.  
All specifications are organised in the same way.

**International GCSE Biology:** Paper 1 only assesses content not in bold.  
Paper 2 assesses all content, including emboldened topics  
Double Award Science candidates are assessed on topics that are not in bold

**International GCSE Human Biology:** All topic areas are assessed on both papers.

**International Single Award Science:** All topic areas are assessed on the paper.

**International AS & A Level:** Each paper has different content assessed  
Paper 3 tests practical skills using content from all parts of AS  
paper 6 test practical skills using content from all parts of the AL

# International GCSE Biology

<b>(h) Transport</b>	
<b>Students should:</b>	
2.51	understand why simple, unicellular organisms can rely on diffusion for movement of substances in and out of the cell
2.52	understand the need for a transport system in multicellular organisms
<b><i>Flowering plants</i></b>	
2.53	describe the role of phloem in transporting sucrose and amino acids between the leaves and other parts of the plant
2.54	describe the role of xylem in transporting water and mineral ions from the roots to other parts of the plant
<b>2.55B understand how water is absorbed by root hair cells</b>	
<b>2.56B understand that transpiration is the evaporation of water from the surface of a plant</b>	
<b>2.57B understand how the rate of transpiration is affected by changes in humidity, wind speed, temperature and light intensity</b>	
<b>2.58B <i>practical: investigate the role of environmental factors in determining the rate of transpiration from a leafy shoot</i></b>	
..	

Content for Paper 1 is not in bold  
 All content is tested on Paper 2  
 Double Award Science assesses  
 only content that is not in bold



# International AS and A Level content

Each Topic lists

content that is  
assessed.

Core Practicals are  
in bold.

## Topic 1 – Molecules, Transport and Health

Students will be assessed on their ability to:

<b>1.1</b>	understand the importance of water as a solvent in transport, including its dipole nature
<b>1.2</b>	(i) know the difference between monosaccharides, disaccharides and polysaccharides, including glycogen and starch (amylose and amylopectin) (ii) be able to relate the structures of monosaccharides, disaccharides and polysaccharides to their roles in providing and storing energy <i><math>\beta</math>-glucose and cellulose are not required in this topic.</i>
<b>1.3</b>	<b>CORE PRACTICAL 1</b> <b>Use a semi-quantitative method with Benedict's reagent to estimate the concentrations of reducing sugars and with iodine solution to estimate the concentrations of starch, using colour standards.</b>
<b>1.4</b>	know how monosaccharides (glucose, fructose and galactose) join together to form disaccharides (maltose, sucrose and lactose) and polysaccharides (glycogen, amylose and amylopectin) through condensation reactions forming glycosidic bonds, and how these can be split through hydrolysis reactions
<b>1.5</b>	(i) know how a triglyceride is synthesised by the formation of ester bonds during condensation reactions between glycerol and three fatty acids (ii) know the differences between saturated and unsaturated lipids
<b>1.6</b>	understand why many animals have a heart and circulation (mass transport to overcome the limitations of diffusion in meeting the requirements of organisms)
<b>1.7</b>	understand how the structures of blood vessels (capillaries, arteries and veins) relate to their functions
<b>1.8</b>	know the cardiac cycle (atrial systole, ventricular systole and cardiac diastole) and relate the structure and operation of the mammalian heart, including the major blood vessels, to its function <i>Details of myogenic stimulation not needed at IAS.</i>



# Human Biology

All topics are assessed on  
each paper

## 1 Cells and tissues

Students should:	
1.1	recognise cell structures as seen with a light microscope and electron microscope (TEM images only), including nucleus, chromosomes, cell membrane, mitochondria, endoplasmic reticulum and ribosomes
1.2	describe the functions of the cell structures: <ul style="list-style-type: none"> <li>• nucleus</li> <li>• chromosomes</li> <li>• cell membrane</li> <li>• mitochondria</li> <li>• endoplasmic reticulum</li> <li>• ribosomes.</li> </ul>
1.3	describe the structure of a DNA molecule as: <ul style="list-style-type: none"> <li>• two strands coiled to form a double helix</li> <li>• containing nucleotides</li> <li>• strands linked by complementary bases</li> <li>• complementary bases linked by hydrogen bonds.</li> </ul>
1.4	describe DNA replication as the separation of DNA strands and the formation of a new strand by complementary base pairing of nucleotides, including the role of DNA polymerase
1.5	understand that a gene is a length of DNA containing a sequence of bases that code for a specific protein. <i>teaching should be limited to:</i> <ul style="list-style-type: none"> <li>• <i>the order of bases in DNA codes for the order of amino acids in a protein</i></li> <li>• <i>3 bases coding for one amino acid.</i></li> </ul>
1.6	know that RNA is a second type of nucleic acid that has the following features: <ul style="list-style-type: none"> <li>• single stranded</li> <li>• contains ribose</li> <li>• contains uracil and that it is used to take information from DNA in the nucleus to the ribosomes for the synthesis of proteins.</li> </ul>

# How can we help students with content?

- ❖ Give clear checklists for them each time we teach a topic.
- ❖ Encourage 'metacognition' by getting them to evaluate their own knowledge and learning of a topic.
- ❖ After tests and exams, get them to assess their 'weaker' topic areas by giving them a grid to write in their marks.

# Checklist for topics

Code	Topic	😊	😐	😞
7.1	know that the process of respiration releases energy in living organisms			
7.2	practical: investigate the difference between inspired and expired air for carbon dioxide concentration			
7.3	know the word equation and the balanced chemical symbol equation for aerobic respiration in living organisms			
7.4	know the word equation for anaerobic respiration			
7.5	explain the differences between aerobic and anaerobic respiration			
7.6	understand the role of ATP in energy transfer (addition and removal of a phosphate group and associated energy requirement and release)			

# Test grids

- ❖ Students fill in a test grid after getting their paper back.
- ❖ The grid gives the specification references so they can check any weaker areas.
- ❖ Assessment objectives are also shown to help them self-identify where they lose marks – we will look at this later!

**Test Grid**

Question	Spec Ref	Max Mark	My Score	AO1	AO2	AO3
1ai	2.54	3				
1aii	2.54	2				
1b	2.57B	3				
1ci	2.57B	1				
1cii	2.60	1				
1d	2.60	3				
1e	2.58B	6				
Total		19	/ 19	/ 5	/ 5	/ 9

# Assessment Information

# What is the Assessment Information in the Specification?

- ❖ It tells us how candidates are assessed.
- ❖ It tells us how much we weight each assessment objective.
- ❖ It is often ignored by students (and teachers!) – most focus only on the content of the specification.
- ❖ It is very important to know how we assess.

# Assessment Objectives: what are they and why are they important?

- ❖ They tell us the skills that we are assessing AND the proportion of marks that each is allocated to each.
- ❖ There are three Assessment Objectives (AOs) for International GCSEs and four Assessment Objectives for International AS & A Level.

# Delegate Exercise One

Do you know the different Assessment Objectives for International GCSEs and International AS and A Level?

Discuss in your groups:

1. What are the Assessment Objectives?
2. Which Assessment Objectives do your students find most difficult?
3. How do you know which Assessment Objectives your students find most difficult?
4. How do you prepare your students for each Assessment Objective?
5. How much emphasis do the International GCSE, IAS and IAL put on each?



# Assessment Objective 1 (AO1)

## International GCSEs:

**AO1** Knowledge and understanding of biology / science.

## International AS and A Level:

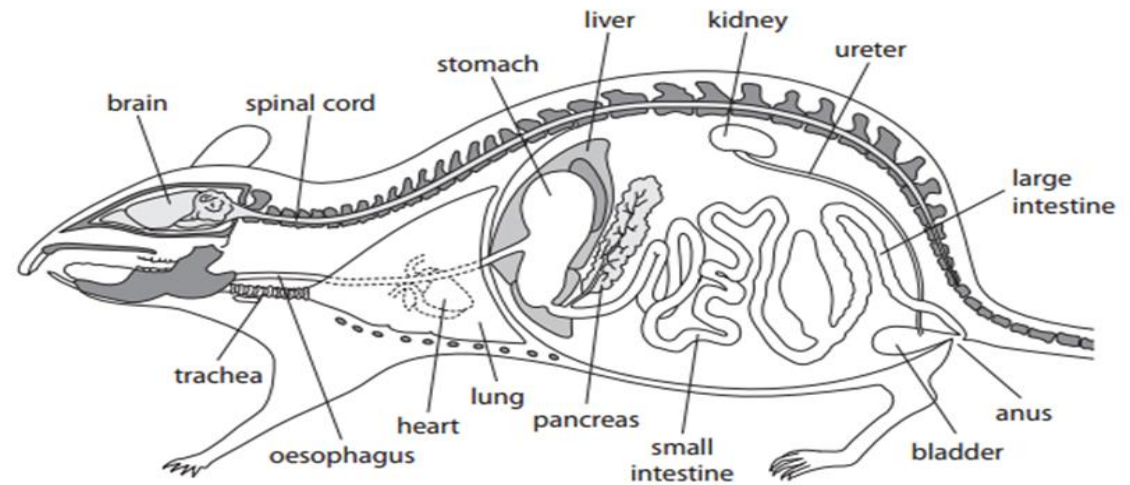
**AO1** Demonstrate knowledge and understanding of science.

These are obviously very similar!

- AO1 is about understanding content.
- Conscientious students like AO1 – they feel confident in learning detail and depth.
- Easy to revise – repetitions, mind maps, testing with flash cards and questions.

# Typical AO1 Questions

- 2 The diagram shows a section through a rat. Some of the rat's organs have been labelled.



- (a) (i) What is meant by the term **organ**?

(1)

- (ii) Name the organ labelled in the diagram that is part of the circulation system.

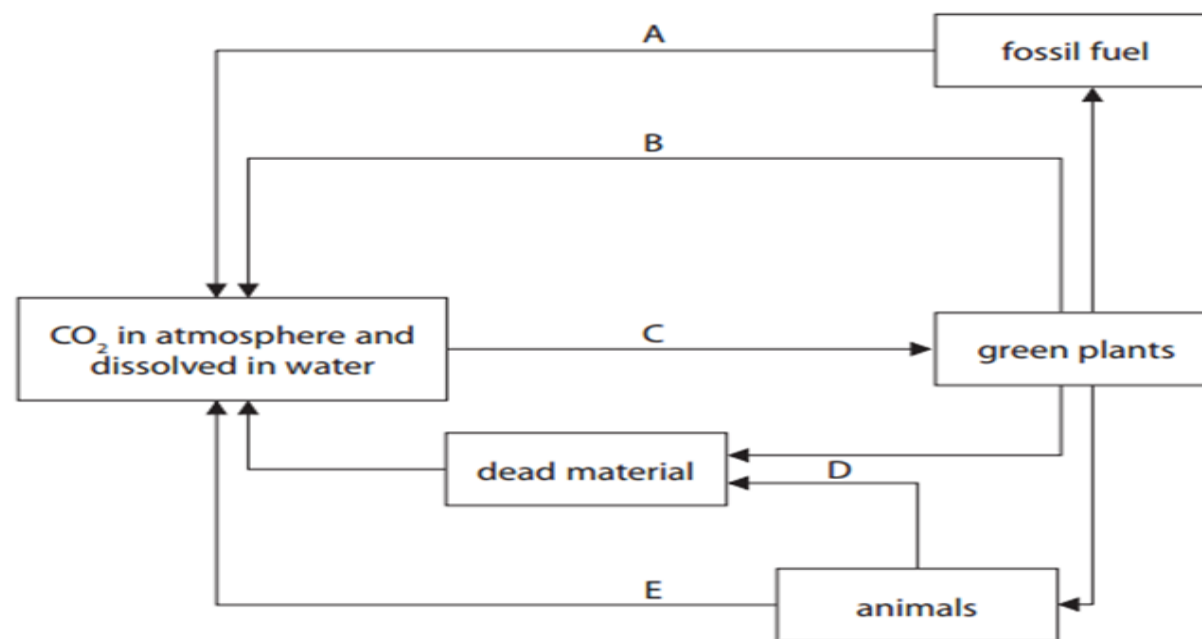
(1)

- (iii) Name three other systems shown in the diagram.

(3)

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_

10 The diagram shows the carbon cycle.



(a) (i) Identify the processes labelled A, B, C, D and E.

(5)

- A .....
- B .....
- C .....
- D .....
- E .....

# Assessment Objective 2 (AO2)

## International GCSEs:

**AO2** Application of knowledge and understanding, analysis and evaluation of biology.

## International AS and A Level:

**AO2** (a) Application of knowledge and understanding of science in familiar and unfamiliar contexts.  
(b) Analysis and evaluation of scientific information to make judgements and reach conclusions

For AS and A Level, AO2 is split into two sections but the same theme is present.

- ❖ AO2 is about **application** of knowledge to familiar and unfamiliar contexts.
- ❖ Can require quantitative (calculations, graphs, analysis of tables with data) or qualitative analysis
- ❖ Can require higher cognitive levels – evaluate, assess, discuss.
- ❖ Can be challenging for less confident students. ‘You never taught us about birds in the winter!’

# Typical AO2 Question

11 Farmers in Asia add fertiliser to their crops to increase the yield.

Fertilisers usually contain nitrate, phosphate and potassium.

The table shows the farmers' crop yield when the crops are given a fertiliser lacking one of these three minerals.

A figure of 100% is the maximum yield with all three minerals given.

Crop	Yield (%)			
	No nitrate	No phosphate	No potassium	All three minerals added
lowland rice	73	97	99	100
barley	52	66	72	100
rye	44	70	68	100
wheat	46	69	72	100
upland rice	46	66	90	100
potato	47	47	70	100

(a) (i) State the mineral that has the greatest effect on crop yield. (1)

.....

(ii) Explain why this mineral has the greatest effect on crop yield. (2)

.....

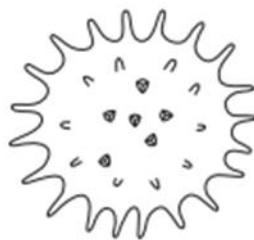
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(b) Which crop is most affected by the lack of potassium? (1)

- (b) The drawing shows a pollen grain from an insect-pollinated flower as seen using a microscope.



Suggest how the structure of this pollen grain shows it is from an insect-pollinated flower.

(2)

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# Assessment Objective 3 (AO3)

## International GCSEs:

**AO3** Experimental skills, analysis and evaluation of data and methods in biology / science / human biology

## International AS and A Level:

**AO3** Experimental skills in science, including analysis and evaluation of data and methods

These are very similar!

- AO3 is about experimental skills.
- Can include core practicals (but this could be classed as AO1)
- Can include general practical themes, variables, accuracy, repeatability, valid planning, evaluating practical methods and data.
- AS and A Level requires a higher level compared to International GCSE (more about this tomorrow!)

# Typical AO3 Questions

(b) The table shows the results the student obtained from her investigation.

Colour of light	Number of gas bubbles released in one minute			
	trial 1	trial 2	trial 3	average
Red	23	26	25	
Blue	19	18	21	19
Green	12	16	6	14

(i) Complete the table by calculating the average rate of photosynthesis for red light.

(1)

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(ii) Explain whether the results for each colour are reliable.

(2)

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# Typical AO3 Questions

Micropropagation (tissue culture) is a method in which small pieces of plants (explants) are grown *in vitro* using nutrient media.

Design an investigation to find out if adding more amino acids to the nutrient media increases the growth of the plants.

Your answer should include experimental details and be written in full sentences.

(6)

# Weighting of Assessment Objectives

International GCSEs – they are all the same!!

		International GCSE
<b>AO1</b>	Knowledge and understanding of biology	38–42%
<b>AO2</b>	Application of knowledge and understanding, analysis and evaluation of biology	38–42%
<b>AO3</b>	Experimental skills, analysis and evaluation of data and methods in biology	19–21%
		100%

		International GCSE
<b>AO1</b>	Knowledge and understanding of human biology	38–42%
<b>AO2</b>	Application of knowledge and understanding, analysis and evaluation of human biology	38–42%
<b>AO3</b>	Experimental skills, analysis and evaluation of data and methods in human biology	19–21%
		100%

		International GCSE
<b>AO1</b>	Knowledge and understanding of science	38–42%
<b>AO2</b>	Application of knowledge and understanding, analysis and evaluation of science	38–42%
<b>AO3</b>	Experimental skills, analysis and evaluation of data and methods in science	19–21%
		100%

		International GCSE
<b>AO1</b>	Knowledge and understanding of science	38–42%
<b>AO2</b>	Application of knowledge and understanding, analysis and evaluation of science	38–42%
<b>AO3</b>	Experimental skills, analysis and evaluation of data and methods in science	19–21%
		100%

# International AS and A Level

Similar to GCSEs in terms of weightings.

AS and A Level are similar to each other.

Different papers have different weightings.

AO3: ONLY Units 3 and 6

AO1: Units 4 and 5 have less than Units 1 and 2

AO2: Units 4 and 5 have more AO2b than Units 1 and 2 – more evaluation (higher order thinking)

## Relationship of assessment objectives to units for the International Advanced Subsidiary qualification

Unit number	Assessment objective (%)			AO3
	AO1	AO2a	AO2b	
Unit 1	17–18	17–18	4.5–5.5	0
Unit 2	17–18	17–18	4.5–5.5	0
Unit 3	2–3	0	0	17–18
<b>Total for International Advanced Subsidiary</b>	36–39	34–36	9–11	17–18

## Relationship of assessment objectives to units for the International Advanced Level qualification

Unit number	Assessment objective (%)			
	AO1	AO2a	AO2b	AO3
Unit 1	8.5–9.0	8.5–9.0	2.2–2.8	0
Unit 2	8.5–9.0	8.5–9.0	2.2–2.8	0
Unit 3	1–1.5	0	0	8.8–9.2
Unit 4	7.3–7.8	8.4–8.9	3.6–4.0	0
Unit 5	7.3–7.8	8.4–8.9	3.6–4.0	0
Unit 6	1–1.5	0	0	8.8–9.2
<b>Total for International Advanced Level</b>	34–37	33–36	11–14	17–18

# Delegate Exercise 2

Guess the Assessment Objectives!

- ❖ Look at the questions in the packs and identify the assessment objectives being tested.
- ❖ The first two questions are International AS Level questions
- ❖ The third question is an International GCSE Human Biology question

# How to identify areas that students need to develop

Tests – use exam wizard to focus on topics or AOs.

Get pupils to self-identify areas for development.

Results Plus – identify areas for development by cohort or class.

Access to Scripts – candidates / centres have free access to scripts.

# ExamWizard Home page

**examWizard**[Find Past Papers](#)[Build a paper](#)[My Papers](#)

## examWizard

examWizard is a free exam preparation tool containing a bank of past Edexcel exam questions, mark schemes and examiners' reports for a range of GCSE, GCE, Functional Skills subjects & BTEC sectors.

- Saves you time by enabling you to create your own mock exams, topic tests, homework or revision activities in minutes.
- Links directly to associated examiner reports and mark schemes!

### General Qualification subjects

[Proceed to login](#)

### BTEC & Functional Skills

[Proceed to login](#)

- ❖ Tests and questions can be made to test a particular topic or AO.
- ❖ Mark schemes and examiner reports are generated automatically.

**examWizard**
[Find Past Papers](#)
[Build a paper](#)
[My Papers](#)
[Help](#)
[Log out](#)

<b>Qualification</b> <input type="text" value="International Advanced Level fro"/>	<b>Specification</b> <input checked="" type="checkbox"/> Select one or more	<b>Year</b> <input checked="" type="checkbox"/> Select one or more	<b>Series</b> <input checked="" type="checkbox"/> Select one or more
<b>Unit</b> <input checked="" type="checkbox"/> Select one or more	<b>Topic (click here)</b> <input checked="" type="checkbox"/> Select one or more	<b>Skill</b> <input checked="" type="checkbox"/> Select one or more	<b>Question type</b> <input checked="" type="checkbox"/> Select one or more
<b>Assessment objective</b> <div> <input checked="" type="checkbox"/> Select one or more           <div> <input type="checkbox"/> <b>Select all</b> <input type="checkbox"/> AO1             <input type="checkbox"/> AO2             <input type="checkbox"/> AO3           </div> </div>			

# Test Grids

Test grids can be made that students fill in after receiving a marked test back. They fill in their marks and then identify the topics and AOs that require development.

Test Grid						
Question	Spec Ref	Max Mark	My Score	AO1	AO2	AO3
1ai	2.54	3				
1aai	2.54	2				
1b	2.57B	3				
1ci	2.57B	1				
1cii	2.60	1				
1d	2.60	3				
1e	2.58B	6				
Total		19	/ 19	/ 5	/ 5	/ 9



# Delegate Exercise 3:

## What would this student need to focus on?

Discuss with your group what this student would need to focus on.

Test Grid

Question	Spec Ref	Max Mark	My Score	AO1	AO2	AO3
1ai	2.54	3	3	3		
1aii	2.54	2	0		0	
1b	2.57B	3	2			2
1ci	2.57B	1	1	1		
1cii	2.60	1	1	1		
1d	2.60	3	1		1	
1e	2.58B	6	2			2
Total		19	10 / 19	5 / 5	1 / 5	4 / 9

AO1: Seems fine – has learnt content well.

AO2: Only one mark out of five – application needs development

AO3: Four out of nine – suggests some development of practical skills.

Content – no clear weaker topic area although 2.58B could be need development

Test Grid

Question	Spec Ref	Max Mark	My Score	AO1	AO2	AO3
1ai	2.54	3	3	3		
1aii	2.54	2	0		0	
1b	2.57B	3	2			2
1ci	2.57B	1	1	1		
1cii	2.60	1	1	1		
1d	2.60	3	1		1	
1e	2.58B	6	2			2
Total		19	10 / 19	5 / 5	1 / 5	4 / 9

# ResultsPlus

**ResultsPlus is the free online results analysis tool for teachers - it provides analysis features that other similar solutions don't**

- Provides a detailed breakdown of student performance in Edexcel exams.
- Helps identify topics where the student can benefit from further learning and allows this knowledge to inform teaching strategies and approaches.
- Provides a comparison of student performance at regional level.
- Allows you to view your school's performance against other Pearson Edexcel schools in your country. You can also find student results analysis from their previous Pearson Edexcel school.
- Mock exams results can also be fed into the system to produce an analysis.
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- Access additional video guides here:
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  - [ResultsPlus - Cohort Analysis](#)
  - [ResultsPlus - Mock Analysis](#)
  - [ResultsPlus - Global Analysis](#)

# Access to Script (ATS) – Online Portal

**Access to Scripts (ATS) is a free online portal which allows teachers to immediately access electronically marked exam papers**

Provides enhanced transparency and

- ❖ Offers transparent approach to marking process
- ❖ Provides better understanding of marking before requests for enquiries about results are made
- ❖ Provides excellent aid for teaching and preparing other cohorts for examinations by helping you to evaluate a student's performance on particular questions in relation to what they have been taught.

Available instantly from results day for all our examination series, for a defined window, you can view and download scripts which have been marked online free of charge from our Self-Service Portal.

**For more information on ATS, and the post results windows, visit our [post-results pages here](#).**



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- Advertise jobs at your school or find job opportunities
- Download free resources
- Sign up for events.

Sign up today at:

[community.pearsoninternationalschools.com](https://community.pearsoninternationalschools.com)



# Delegate Exercise 4:

## How do we develop skills for each AO?

Discuss in your groups how you could develop the skills of students for each AO.

For each, suggest what skills we need to develop and two or three methods of developing them.

- A01
- A02
- A03

# How do we develop skills for each AO?

## AO1:

- Factual knowledge tests
- Revision notes / mind maps / lists
- Blank page revision – students start with a blank page and write down what they know about a particular topic. Missing facts are then looked up.
- Students teaching each other – a good way to learn is to teach someone else!
- **Vocabulary** – ALWAYS use key vocabulary (photosynthesis, digestion, emulsification, hydrolysis etc.) The more students use it, the more they become confident with using it. Less confident students are often ‘too scared’ to use scientific vocabulary, ‘I can’t use that because I am not a real science student.’

Make key vocabulary lists at start of topics and keep referring to them when teaching.

NEVER assume that students know all vocabulary – ALWAYS reintroduce words when teaching each topic.

When teaching complex concepts, gradually build up a picture rather than doing everything in one go.

# How do we develop skills for each AO?

## AO2:

- Give students regular data analysis questions.
- Encourage them to think about contexts that are not on the specifications.
- Start developing graph skills, numerical skills and analytical skills from a young age – Year 7 ideally.
- Confidence is key to student performance.
- When evaluating encourage them to see both sides – look for data that supports and does not support.
- When writing up practicals, use scaffolding for conclusions:
  - *‘Describe the patterns show by the graph, then explain the patterns using the words: respiration, oxygen, carbon dioxide production, anaerobic, aerobic.’*
- Give out data exercises as quick starter activities – these can be differentiated for different ability groups / age groups.



# Differentiated data analysis

‘Shrews are small warm blooded mammals. Here is some data to show the rate of oxygen use by different species of shrew.’

‘Discuss the rates of oxygen use by the different species of shrew.’

**OR**

1. Describe how the masses of the shrews changes going down the table.
2. Describe how rate of oxygen use of the shrews changes going down the table.
3. Identify the relationship between body mass and rate of oxygen use.
4. Explain how the mass of shrews will affect the surface area to volume ratio.
5. What will happen to the speed that the shrews will lose heat if their surface area to volume ratio is higher?
6. Explain the data in terms of body mass, heat loss, surface area to volume ratio and respiration rate.

Type of shrew	Body mass of shrew in g	Oxygen used in cm <sup>3</sup> per g per hour
Masked	2.5	10.8
Wandering	4.5	8.6
Monterey	6.5	7.2
Sonoma	11.5	5.2
Short-tailed	20.0	4.0

# How do we develop skills for each AO?

- ❖ **AO3 (more about this tomorrow!):**
- ❖ Do LOTS of practical work – you do not need to restrict them to the core practicals. A significant proportion of marks is about practical skills and understanding – it needs teaching as much as factual content.
- ❖ Start early: pupils can begin to plan practicals from a very early age and become familiar with key vocabulary such as accurate, variable, repeatability.
- ❖ There is no such thing as bad data. Even if experiments don't work, students can learn from it – 'discuss why the results didn't seem to show what was expected.'
- ❖ Put together class data to compare data. This means that students can identify anomalies, investigate ranges of results and discuss how reliable the results are.
- ❖ Don't assume that they have the maths skills from maths lessons!
- ❖ Even if you can't do a particular practical – students can still plan it or analyse data about it.

# Planning practicals

When planning practicals, give lots of guidance for weaker or younger students

"The independent variable is \_\_\_\_\_"

"Two variables I need to control are \_\_\_\_\_"

Give them the hypothesis as a gap fill.

"As the light intensity \_\_\_\_\_, the rate of oxygen production by the pond weed will \_\_\_\_\_"

"Circle any anomalous values"

"Two sources of error are \_\_\_\_\_"

"To make the investigation more reliable I need to \_\_\_\_\_"

# Planning practicals

For stronger and students who are familiar with planning, gradually reduce the scaffolding:

“Plan an investigation into \_\_\_\_\_. Explain how you will ensure that the results are reliable and enable you to make a valid conclusion.”

“Evaluate your results and the strength of your conclusion.”

If they have progressed through the years, by the time they reach International AS and A Level, they will understand how to plan, carry out and analyse.

# General strategies for all Assessment Objectives

- Get students to spot Assessment Objectives on past papers.
- Get students to write their own questions and mark schemes. We will look at this later.

# The Language of Assessment – Command Words

# Command words – What they are and why they are important

- ❖ Every question should have a command word.
- ❖ It is an instruction to candidates, telling them what we want them to write.
- ❖ It is critical that candidates know what each command word means so that they can answer the question effectively.
- ❖ Many candidates do not fully understand what each command word means – ‘Describe’ and ‘Explain’ are often confused with each other.

# Where do we find out about command words?

1. Specifications – all Pearson specifications give a glossary of command words.
2. Sample assessment material (SAMS) – these contain examples of all command words.
3. Past papers and mark schemes – these will show the command words; the mark schemes illustrate how answers should be written for each command word.



# Are command words the same for all papers?

## International GCSE:

All science specifications have a common glossary.

## International AS and A Level:

All science specifications have a common glossary. Many command words are the same as, or very similar to, International GCSE command words.

# Delegate Exercise 5 – what are the command words?

- ❖ Try to identify each command word by its definition for the International GCSE and International AS and A Level specifications

# International GCSE

Command word	Definition
Add/Label	Requires the addition or labelling of a stimulus material given in the question, e.g. labelling a diagram or adding units to a table.
Calculate	Obtain a numerical answer, showing relevant working.
Comment on	Requires the synthesis of a number of variables from data/information to form a judgement.
Complete	Requires the completion of a table/diagram.
Deduce	Draw/reach conclusion(s) from the information provided.
Describe	To give an account of something. Statements in the response need to be developed, as they are often linked but <b>do not</b> need to include a justification or reason.
Determine	The answer must have an element that is quantitative from the stimulus provided, or must show how the answer can be reached quantitatively. To gain maximum marks, there must be a quantitative element to the answer.
Design	Plan or invent a procedure from existing principles/ideas.
Discuss	<ul style="list-style-type: none"> <li>Identify the issue/situation/problem/argument that is being assessed within the question.</li> <li>Explore all aspects of an issue/situation/problem/argument.</li> <li>Investigate the issue/situation etc. by reasoning or argument.</li> </ul>
Draw	Produce a diagram either using a ruler or freehand.

Estimate	Find an approximate value, number or quantity from a diagram/given data or through a calculation.
Evaluate	Review information (e.g. data, methods) then bring it together to form a conclusion, drawing on evidence including strengths, weaknesses, alternative actions, relevant data or information. Come to a supported judgement of a subject's quality and relate it to its context.
Explain	An explanation requires a justification/exemplification of a point. The answer must contain some element of reasoning/justification – this can include mathematical explanations.
Give/State/Name	All of these command words are really synonyms. They generally all require recall of one or more pieces of information.
Give a reason/reasons	When a statement has been made and the requirement is only to give the reason(s) why.
Identify	Usually requires some key information to be selected from a given stimulus/resource.
Justify	Give evidence to support (either the statement given in the question or an earlier answer).
Plot	Produce a graph by marking points accurately on a grid from data that is provided and then draw 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.
Predict	Give an expected result.
Show that	Verify the statement given in the question.
Sketch	Produce a freehand drawing. For a graph, this would need a line and labelled axes with important features indicated. The axes are not scaled.
State what is meant by	When the meaning of a term is expected but there are different ways for how this can be described.
Suggest	Use your knowledge to propose a solution to a problem in a novel context.



# International AS and A Level

Command word	Definition
Add/Label	Requires the addition or labelling to stimulus material given in the question, for example labelling a diagram or adding units to a table.
Assess	Give careful consideration to all the factors or events that apply and identify which are the most important or relevant. Make a judgement on the importance of something, and come to a conclusion where needed.
Calculate	Obtain a numerical answer, showing relevant working. If the answer has a unit, this must be included.
Comment on	Requires the synthesis of a number of factors from data/information to form a judgement. More than two factors need to be synthesised.
Compare and contrast	Looking for the similarities <b>and</b> differences of two (or more) things. Should not require the drawing of a conclusion. Answer must relate to both (or all) things mentioned in the question.  The answer must include at least one similarity and one difference.
Complete/Record	Requires the completion of a table/diagram/equation.
Criticise	Inspect a set of data, an experimental plan or a scientific statement and consider the elements. Look at the merits and/or faults of the information presented and back judgements made.
Deduce	Draw/reach conclusion(s) from the information provided.
Derive	Combine two or more equations or principles to develop a new equation.
Describe	To give an account of something. Statements in the response need to be developed as they are often linked but do not need to include a justification or reason.
Determine	The answer must have an element which is quantitative from the stimulus provided, or must show how the answer can be reached quantitatively.
Devise	Plan or invent a procedure from existing principles/ideas.

Discuss	Identify the issue/situation/problem/argument that is being assessed within the question.  Explore all aspects of an issue/situation/problem.  Investigate the issue/situation/problem etc. by reasoning or argument.
Draw	Produce a diagram either using a ruler or using freehand.
Estimate	Give an approximate value for a physical quantity or measurement or uncertainty.
Evaluate	Review information then bring it together to form a conclusion, drawing on evidence including strengths, weaknesses, alternative actions, relevant data or information. Come to a supported judgement of a subject's qualities and relation to its context.
Explain	An explanation requires a justification/exemplification of a point. The answer must contain some element of reasoning/justification, this can include mathematical explanations.
Give/State/Name	All of these command words are really synonyms. They generally all require recall of one or more pieces of information.
Give a reason/reasons	When a statement has been made and the requirement is only to give the reasons why.
Identify	Usually requires some key information to be selected from a given stimulus/resource.
Justify	Give evidence to support (either the statement given in the question or an earlier answer).
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.
Predict	Give an expected result or outcome.
Show that	Prove that a numerical figure is as stated in the question. The answer must be to at least 1 more significant figure than the numerical figure in the question.
Sketch	Produce a freehand drawing. For a graph this would need a line and labelled axes with important features indicated, the axes are not scaled.
State what is meant by	When the meaning of a term is expected but there are different ways of how these can be described.
Suggest	Use your knowledge and understanding in an unfamiliar context. May include material or ideas that have not been learnt directly from the specification.
Write	When the questions ask for an equation.

# Words and definitions that are the same or very similar between International GCSE and International AS & A Level

- Add / Label
- Calculate
- Comment on – AS & A Level needs more than two factors need to be synthesised
- Complete
- Deduce
- Describe
- Determine
- Discuss
- Draw
- Estimate
- Evaluate
- Explain
- Give / State /Name
- Give a reason
- Identify
- Justify
- Plot
- Predict
- Show that
- Sketch
- State what is meant by
- Suggest

# Command words only found on International AS and A Level

- Assess
- Compare and contrast
- Criticise
- Derive
- Devise
- Write

# Cognitive Demand of Command Words

Some command words have different cognitive demands:

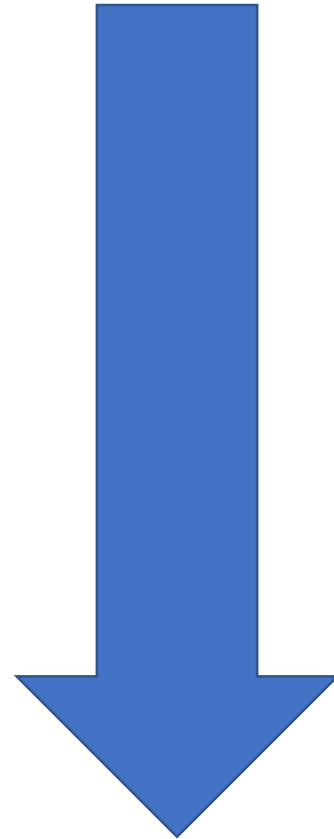
State

Describe

Compare and contrast

Explain

Assess / Evaluate / Discuss



Increasing demand

# Mark Schemes

## International GCSEs

All mark schemes are 'points based.'

## International AS and A Level

Most questions have 'points based' mark schemes.  
Some questions have 'level based' mark schemes.



# Describe and explain

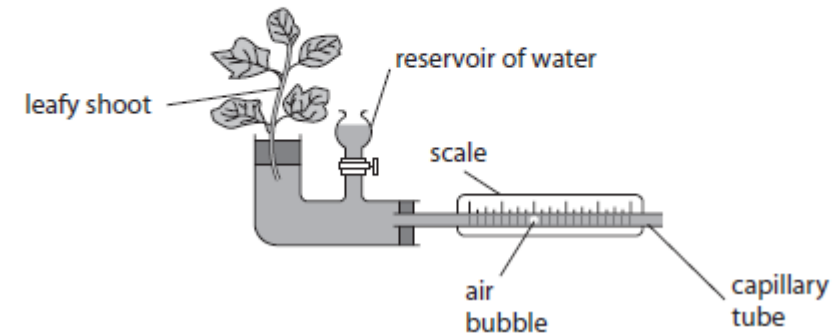
- Describe and explain are often confused by candidates.
- Describe requires a descriptive account.
- Explain requires some level of reasoning or justification.
- Explain answers should be:

‘It is this **BECAUSE OF** this....’

What would the difference between describe and explain be for this question?

- 4 A student investigates the effect of wind on the rate of transpiration of a leafy shoot using a potometer.

The diagram shows her apparatus.



(b) The table shows the student's results.

Experiment	Rate of transpiration in mm per minute	
	still air	wind
1	0	3
2	1	4
3	1	3

Explain the difference in the rate of transpiration in wind and in still air.

(2)

# Describe and explain

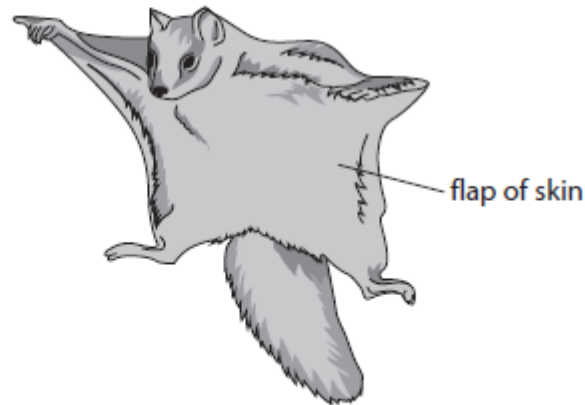
6 Flying squirrels are small mammals that live in forests.

They have evolved a flap of skin that acts like a parachute to allow them to glide from one tree to another.

Flying squirrels are thought to have evolved from tree squirrels.

Tree squirrels do not have a flap of skin and cannot glide.

The drawing shows a flying squirrel.



(a) Explain how flying squirrels may have evolved from tree squirrels.

(4)

(b) Most mammals give birth to live offspring.

During development the embryo grows in the uterus.

Describe the role of the placenta in the development of the embryo.

(5)

# Suggest

*‘Use your knowledge to propose a solution to a problem in a novel context.’*

(ii) Suggest how woodlice benefit from the bacteria in their digestive system.

(2)

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(iii) Suggest how the bacteria benefit from living in the gut of the woodlice.

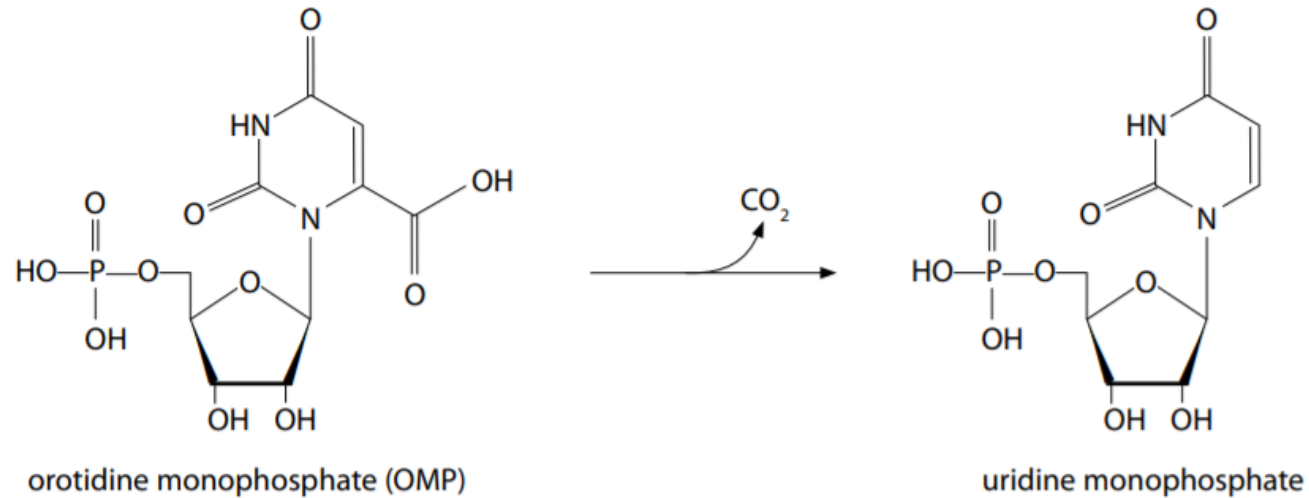
(1)

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# Suggest (International AS Level)

(a) The diagram shows the reaction catalysed by OMP decarboxylase.



(i) Which sugar is present in uridine monophosphate?

- ☐ **A** deoxyribose
- ☐ **B** galactose
- ☐ **C** glucose
- ☐ **D** ribose

(1)

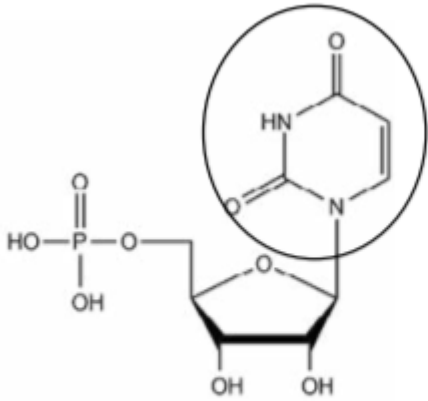
(ii) Draw a circle around the base in uridine monophosphate.

(1)

(iii) Suggest one way in which cells use uridine monophosphate.

(1)

# Mark Scheme

Question number	Answer	Mark
2(a)(ii)	 <p>The diagram shows the chemical structure of Adenosine monophosphate (AMP). It consists of a phosphate group (HO-P(=O)(OH)-O-) attached to a ribose sugar ring. The ribose sugar has hydroxyl groups (OH) at the 2' and 3' positions. Attached to the 1' position of the ribose is an adenine base, which is a purine derivative. The adenine base is circled in the diagram.</p>	(1)
Question number	Answer	Mark
2(a)(iii)	<ul style="list-style-type: none"><li>• synthesis of RNA</li></ul>	(1)

# State and Explain (International AS Level)

(b) The enzyme OMP decarboxylase increases the rate of carbon dioxide removal from orotidine monophosphate by  $10^{17}$  times.

(i) State how OMP decarboxylase increases the rate of this reaction.

(2)

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(ii) Explain why OMP decarboxylase catalyses this reaction only.

(3)

# Mark Scheme

Question number	Answer	Additional guidance	Mark
2(b)(i)	<p>An answer that includes the following points:</p> <ul style="list-style-type: none"><li>• OMP decarboxylase acting as a biological catalyst (1)</li><li>• it lowers the activation energy of this reaction (1)</li></ul>	Allow forms an enzyme - substrate complex	(2)

Question number	Answer	Mark
2(b)(ii)	<p>An explanation that includes the following points:</p> <ul style="list-style-type: none"><li>• OMP decarboxylase is specific (for this substrate) (1)</li><li>• because the active site of this enzyme has a particular shape (1)</li><li>• therefore binds only with orotidine monophosphate (1)</li></ul>	(3)

# Comment on

*“Look at data and information and decide what it shows”*

(b) Seawater is warmed if hot water from power stations is released into the sea.

A scientist investigates the effect of water temperature on the concentration of oxygen dissolved in water.

He also investigates the effect of water temperature on the oxygen used by a fish.

The table shows his results.

Water temperature in °C	Dissolved oxygen in arbitrary units	Oxygen used in cm <sup>3</sup> per hour
5	7.8	10
10	6.8	15
15	6.0	40
20	5.6	100
25	5.2	150
30	5.0	200
35	4.6	220

(i) The scientist concludes that hot water pollution affects the population of fish living near a power station.

Comment on this conclusion.

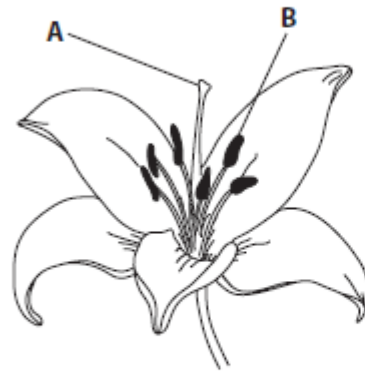
(5)



# Identify

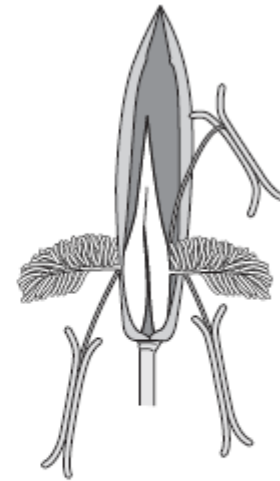
*“Choose key details from information in the question”*

8 The diagrams show two flowers from different species.



magnification  $\times 0.5$

**Flower 1**



magnification  $\times 10$

**Flower 2**

(b) Identify the method of pollination used by each flower.

Include features shown on the diagram to support your answer.

(4)

# Evaluate

***Evaluate:*** ‘Review information (e.g. data, methods) then bring it together to form a conclusion, drawing on evidence including strengths, weaknesses, alternative actions, relevant data or information. Come to a supported judgement of a subject’s quality and relate it to its context.’

# Evaluate

The scientists concluded that letrozole is a safe and effective treatment for male infertility.

Evaluate this conclusion.

(6)

Factors measured	Group 1 (letrozole)		Group 2 (no treatment)	
	Start	After 6 months	Start	After 6 months
Sperm concentration/number per cm <sup>3</sup>	450	$1.4 \times 10^6$	475	450
Percentage of moving sperm	2	18	2	2
Blood testosterone level/arbitrary units	249	1198	266	266
Blood oestrogen level/arbitrary units	44	0	44	48
Number of men with side effects	0	8	0	0

# Mark Scheme

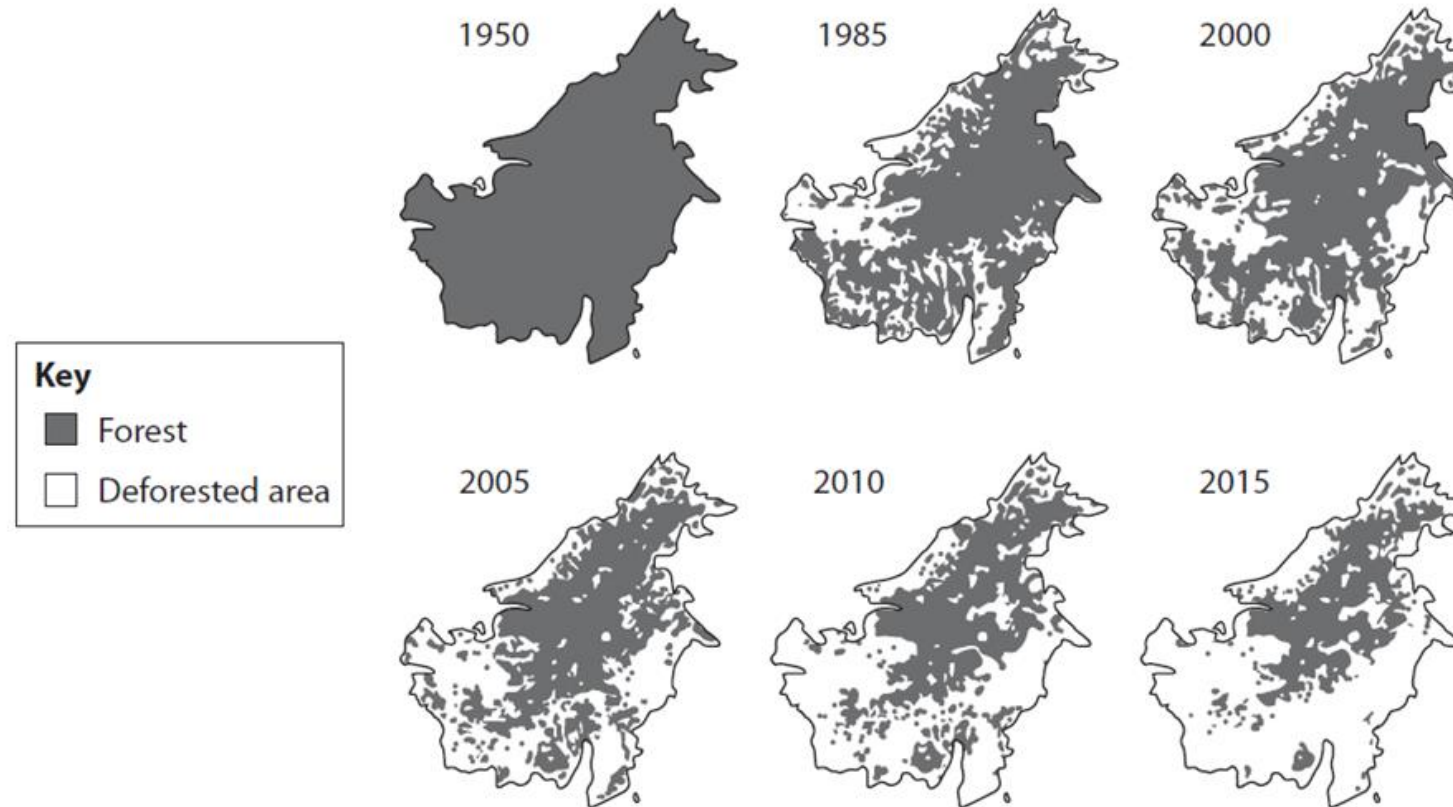
Question number	Answer	Additional guidance	Mark
8	<p>An evaluation that makes reference to the following points:</p> <ul style="list-style-type: none"><li>• letrozole does improve male fertility (1)</li><li>• sperm concentration increases/sperm motility increases (1)</li><li>• letrozole increases testosterone levels/decreases oestrogen levels (1)</li><li>• letrozole causes side effects/equivalent (1)</li><li>• need to know group size (1)</li><li>• matched groups (1)</li><li>• need to know other factors controlled (1)</li></ul>	<p>e.g. age, diet, smoking, drugs</p>	6

# Discuss

- *Identify the issue/situation/problem/argument that is being assessed within the question.*
- *Explore all aspects of an issue/situation/problem/argument.*
- *Investigate the issue/situation etc. by reasoning or argument.'*

3 Borneo is an island in Asia that used to be covered by rainforest.

The diagram shows the loss of this rainforest by deforestation since 1950.



(a) A conservationist states that all deforestation should be stopped.

Discuss this statement.

(6)

# Mark Scheme

The mark scheme shows that all aspects of the question are discussed

**3(a)**

An answer that makes reference to six of the following points:

Three from:

- wood for building construction (1)
- wood for manufacture of paper / furniture (1)
- road construction (1)
- farming crops / cattle (1)
- grow other crops to produce useful products (1)
- economic benefit (1)

Three from:

- global warming / greenhouse effect (1)
- loss of trees increases carbon dioxide (1)
- cattle release methane (1)
- soil erosion (1)
- flooding (1)
- loss of species / extinction (1)

**6**

# Justify

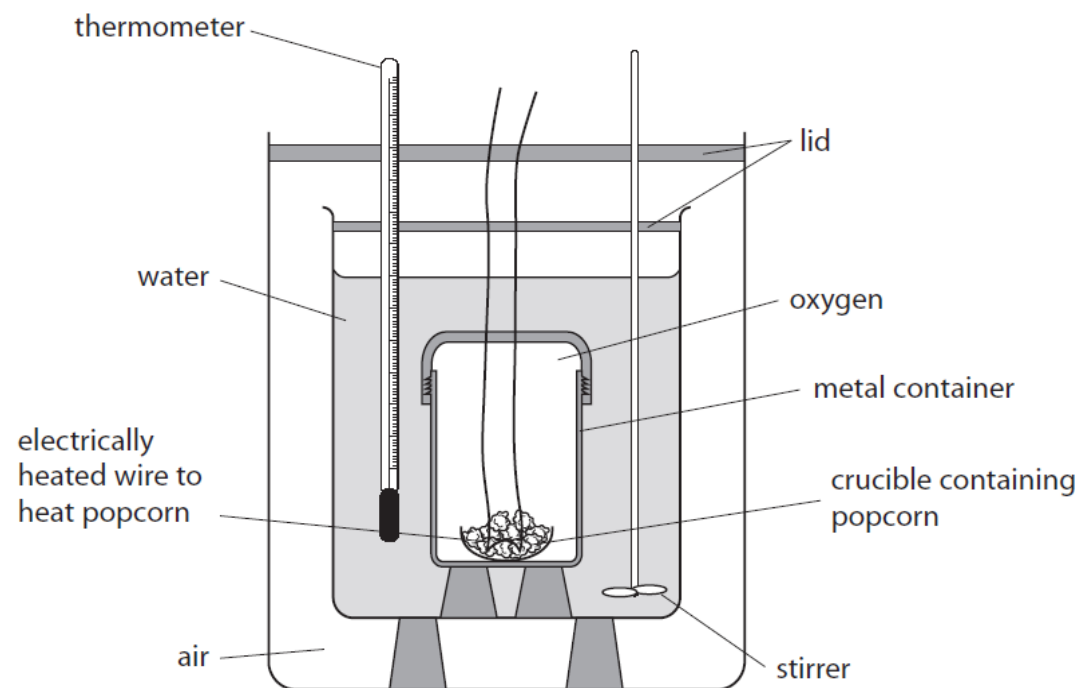
Justify: *'Give evidence to support (either the statement given in the question or an earlier answer).'*

Often used with practical questions.



- (b) The result the student calculates for the energy content of the popcorn was much lower than the value given on the popcorn packet.

His teacher suggests that if he repeats his investigation using this calorimeter his result will be more accurate.



Justify how using this calorimeter will produce a more accurate result.

(6)

# Mark Scheme

An answer that makes reference to six of the following points:

- lid reduces heat loss / provides insulation (1)
- use of oxygen means complete combustion (1)
- using wire means no energy loss in transfer (1)
- surrounding with water means more energy transferred to water (1)
- use of stirrer means even temperature of water (1)
- use of air means less heat loss / provides insulation (1)
- metal container allows heat transfer to water (1)
- thermometer has a precise scale (1)

# Compare and Contrast (International AS Level)

*'Looking for the similarities and differences of two (or more) things. Should not require the drawing of a conclusion. Answer must relate to both (or all) things mentioned in the question.*

*The answer must include at least one similarity and one difference.'*

(c) Compare and contrast exocytosis and endocytosis.

(3)

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# Mark Scheme

To gain full credit, candidates must give both similarities and differences

Question number	Answer	Additional guidance	Mark
1(c)	<p>An answer that includes the following points:</p> <p>similarities:</p> <ul style="list-style-type: none"> <li>• both used to transport large particles / large quantities of material (1)</li> <li>• both involve (phospholipid) membrane vesicles (1)</li> </ul> <p>difference:</p> <ul style="list-style-type: none"> <li>• exocytosis is export and endocytosis is import of material (1)</li> </ul>	Accept a description of both processes	(3)

# Criticise (International AS Level)

*‘Inspect a set of data, an experimental plan or a scientific statement and consider the elements. Look at the merits and/or faults of the information presented and back judgements made.’*

# Criticise

(iii) The table shows the results of this investigation.

Temperature /°C	Intensity of the red colour / a.u.						
	Student 1	Student 2	Student 3	Student 4	Student 5	Mean	Standard deviation
0	0.20	0.15	0.30	0.00	0.13	0.16	0.11
10	0.00	0.14	0.06	0.03	0.12	0.07	0.06
20	0.03	0.08	0.04	0.04	0.02	0.04	0.02
30	0.20	0.04	0.04	0.04	0.06	0.08	0.07
40	0.18	0.04	0.04	0.04	0.07	0.07	0.06
50	0.10	0.26	0.00	0.60	0.18	0.23	0.23
60	0.60	0.89	0.80	0.80	0.55	0.72	0.15
70	0.75	0.50	0.75	0.75	0.70	0.69	0.11

The graph showing the relationship between temperature and the mean intensity of red colour is incomplete.

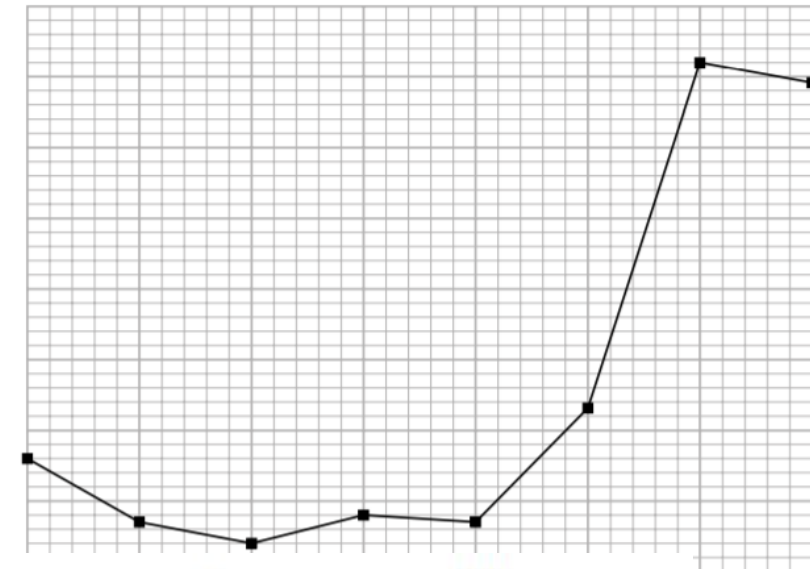
Complete the graph.

(v) The students concluded that as temperature increases, membrane permeability increases.

Using the information in the table and graph, criticise this conclusion.

The graph showing the relationship between temperature and the mean intensity of red colour is incomplete.

Complete the graph.



# Mark Scheme

Question number	Answer	Mark
3(b)(v)	<p>An answer that includes any five of the following points:</p> <ul style="list-style-type: none"><li>• (overall) the intensity of the red colour increases as temperature increases (1)</li><li>• but from 0 °C to 40 °C, the SDs overlap so no significant effect (1)</li><li>• at 50 °C the mean is higher than that at 40 °C but SDs overlap so there is no case for saying the difference is significant (1)</li><li>• at 60 °C the mean is higher than that at 50 °C and the SDs do not overlap so this difference can be regarded as significant (1)</li><li>• at 70 °C the mean degree of redness falls from that at 60 °C but the SDs overlap so temperatures above 60 °C appear to have no further effect (1)</li><li>• there are no data above 70 °C so cannot say what any further rise in temperature would cause (1)</li></ul>	(5)

# Assess (International AS Level)

*‘Give careful consideration to all the factors or events that apply and identify which are the most important or relevant. Make a judgement on the importance of something, and come to a conclusion where needed.’*

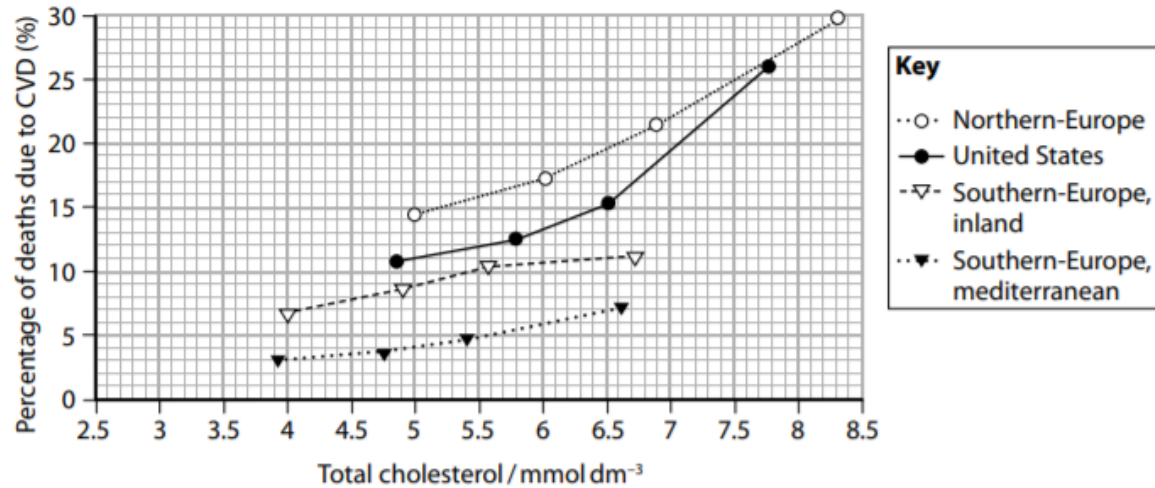


# Assess

\*(c) Cholesterol is transported in the blood as lipoproteins LDL and HDL.

In one study, the relationship between total blood cholesterol and the risk of death from CVD was investigated.

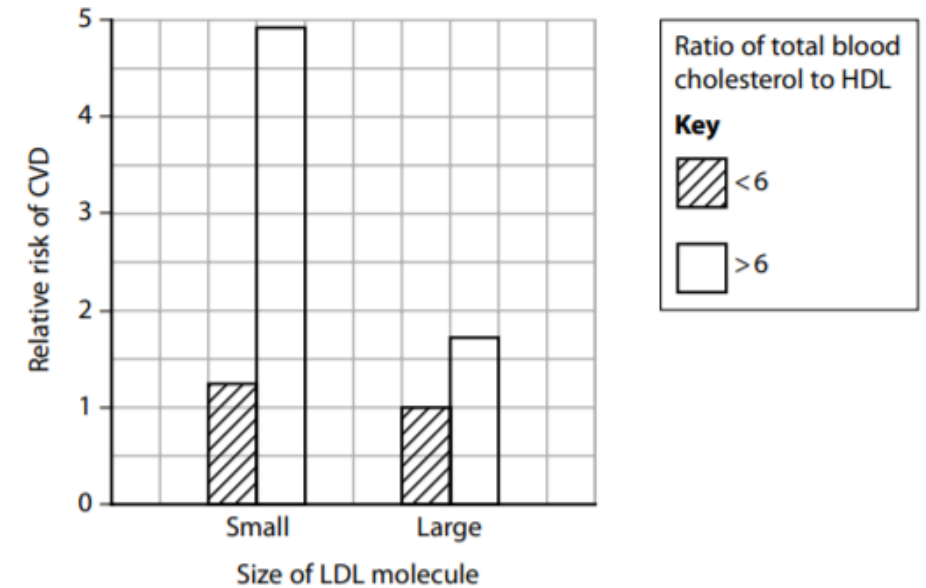
The results are shown in the graph.



Graph 1

In another study, the effect of the size of LDL and the ratio of total blood cholesterol to HDL on the relative risk of CVD was investigated.

The results are shown in the graph.



Graph 2

Assess the contribution of lipoproteins to the risk of developing CVD. Use the information in the graph to support your answer.

(6)

# Mark Scheme

This is an example of a '6 mark' level based mark scheme.

Indicative content is given – these are correct statements that candidates may give but candidates may give additional relevant comments and are not required to give every statement in the indicative content.

Question number	Answer	Additional guidance	Mark
8(c)	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p><b>Indicative content</b></p> <ul style="list-style-type: none"><li>• increased cholesterol increases chance of dying from CVD</li><li>• cholesterol concentrations are different in different countries</li><li>• same cholesterol level does not confer same risk in different countries</li><li>• greater the cholesterol to HDL ratio, the greater the risk of CVD</li><li>• the smaller the diameter the LDL, the greater the risk of CVD</li><li>• individuals at greatest risk of CVD are those with a large cholesterol to HDL ratio and small LDL diameter and a high cholesterol concentration</li><li>• not possible to say if different risks for a particular cholesterol concentration in the first study are due to differences in cholesterol to HDL ratio / diameter of LDL</li></ul>	<p>Allow differences in the first study may be due to differences in cholesterol to HDL ratio / diameter of LDL</p>	(6)

A generic mark scheme is given that shows what is required to attain each level.

Level	Marks	Descriptor
	0	No awardable content.
1	1-2	<p>A scientific assessment is made of a factor, supported by the application of limited relevant evidence from the scientific information provided.</p> <p>No conclusion is attempted.</p>
2	3-4	<p>A scientific assessment is made of some of the factors, supported by the application of some relevant evidence from the analysis and with some interpretation of the scientific information.</p> <p>A conclusion, where needed, is made, demonstrating linkages to elements of biological knowledge and understanding, with some evidence to support the assessment being made.</p>
3	5-6	<p>A scientific assessment is made of the factors, supported throughout by sustained application of relevant evidence from the analysis and interpretation of the scientific information.</p> <p>A conclusion, where needed, is made, demonstrating sustained linkages to biological knowledge and understanding, with sufficient evidence to support the assessment being made.</p>

# Delegate Exercise 6

Write mark schemes for the questions in the packs.

## IAL

Fatty acid	Number of double bonds between carbon atoms	Number of carbon atoms
butyric	0	4
stearic	0	18
palmitoleic	1	16
linoleic	2	18

Explain which of these fatty acids would have the lowest risk of causing CVD, if included in a diet in equal masses.

(2)

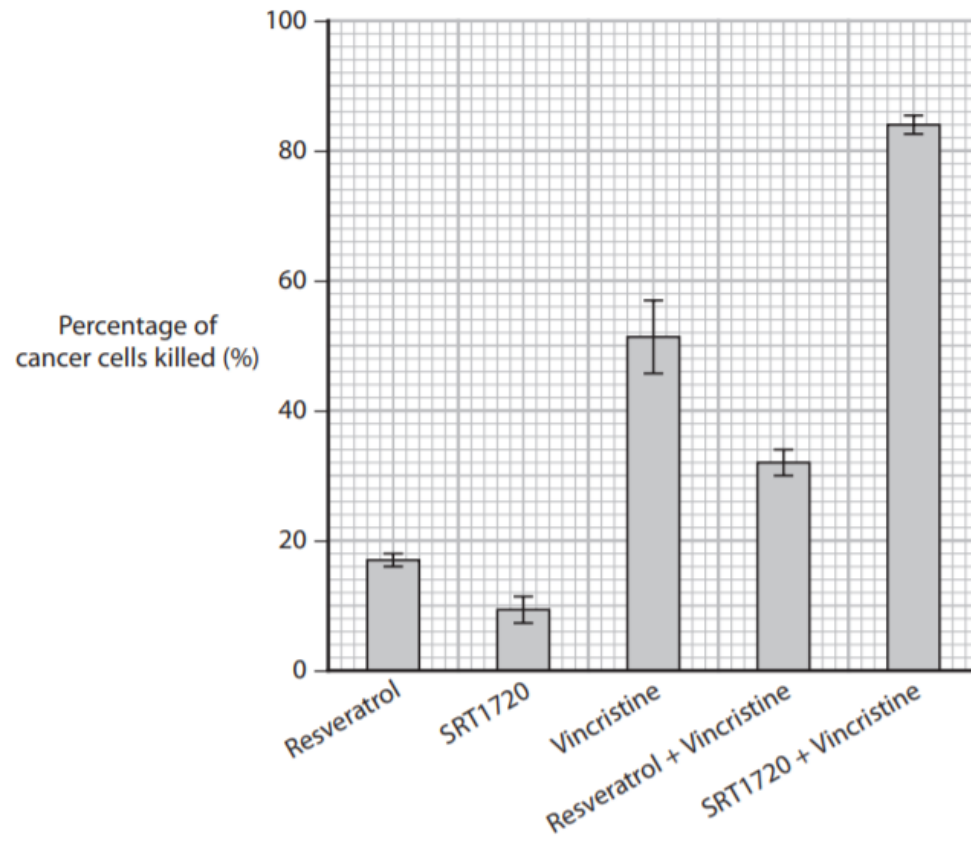
Question number	Answer	Additional guidance	Mark
2(a)(iii)	<p>An explanation that includes the following points:</p> <ul style="list-style-type: none"> <li>• palmitoleic and linoleic (acid) (1)</li> <li>• because they {are unsaturated fatty acids / have double bonds (between carbon atoms)} (1)</li> </ul> <p><b>OR</b></p> <ul style="list-style-type: none"> <li>• linoleic (acid) (1)</li> <li>• because it has {two / the most} double bonds (between carbon atoms) (1)</li> </ul>	<p><b>ACCEPT</b> converse in the context of butyric acid and stearic acid having the lowest risk</p> <p><b>IGNORE</b> chain length</p> <p><b>ACCEPT</b> polyunsaturated</p> <p><b>IGNORE</b> chain length</p>	(2)

- (c) Ewing's sarcoma is a type of cancer.

Resveratrol, SRT1720 and Vincristine are drugs used to kill cancer cells.

An investigation was carried out to determine the most effective treatment for patients with Ewing's sarcoma.

The graph shows the results of this investigation.



- (ii) Evaluate the effectiveness of the three drugs used in this investigation.

Use the information in the graph to support your answer.

(4)



Question Number	Answer	Additional guidance	Mark
<b>3(c)(ii)</b>	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>Vincristine is the most effective and SRT1720 is the least effective (when given on their own) (1)</li> <li>Resveratrol reduces the effectiveness of Vincristine / Vincristine increases the effectiveness of Resveratrol (1)</li> <li>SRT1720 increases the effectiveness of Vincristine / Vincristine and SRT1720 is the most effective treatment (tested) (1)</li> <li>comment on variability of data (1)</li> </ul>	<p>Accept description of correct order (V&gt;R&gt;SRT) Ignore drug combinations</p> <p>Accept Resveratrol and Vincristine more effective than Resveratrol by itself / Resveratrol and Vincristine less effective than Vincristine by itself</p> <p>e.g. {range / SD / error} bars do not overlap / size of error bars</p>	<b>(4)</b>



- (c) If the mineral ions are not absorbed, they are egested in the faeces.

The faeces of genetically modified (GM) farm animals contain less phosphate than the faeces of normal farm animals.

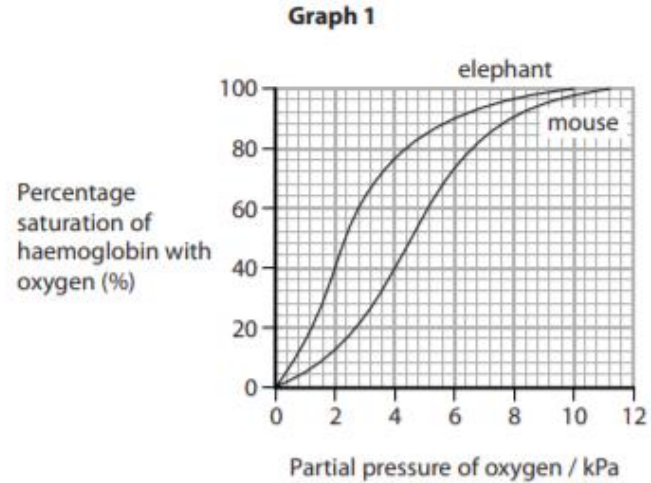
- (i) Some people catch fish from rivers near farm land.

Discuss why these people might support the genetic modification of farm animals.

(4)

Question Number	Answer	Additional guidance	Mark
4(c)(i)	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>• fewer plants / fewer algae / less eutrophication (1)</li> <li>• (more) light <b>and</b> (more) photosynthesis (1)</li> <li>• (less) <u>decomposition</u> / <u>decomposed</u> / <u>decomposers</u> (1)</li> <li>• (more) oxygen / not anoxic / less BOD (1)</li> <li>• respiration (ONCE) (1)</li> <li>• (catch) more fish / fewer fish killed / better catch / fish survive / fish do not suffocate / eq (1)</li> </ul>	Allow converse for all Mps	4

\*(c) Graph 1 shows the oxygen dissociation curve of haemoglobin for a mouse and for an elephant.



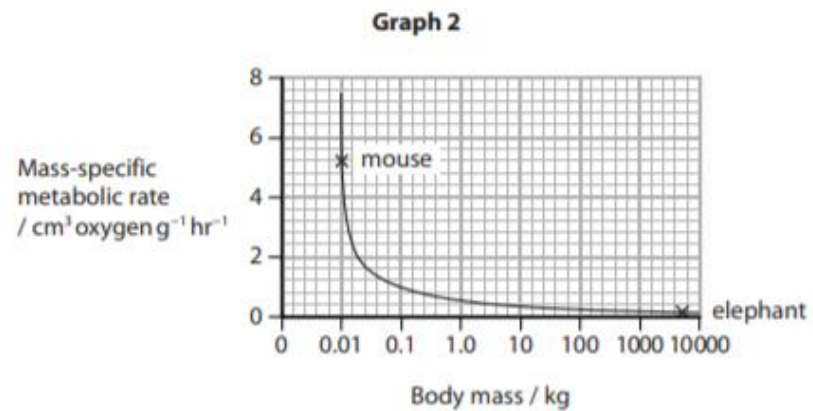
Explain the difference in the oxygen dissociation curves of haemoglobin for a mouse and for an elephant.

Use the information in both graphs to support your answer.

(6)

Graph 2 shows the mass-specific metabolic rate for a mouse and for an elephant.

Mass-specific metabolic rate is a measure of how much oxygen is needed for chemical reactions per gram of body tissue.



	<b>Indicative content</b> <ul style="list-style-type: none"> <li>• oxygen dissociation curve for the mouse is shifted to the right</li> <li>• mouse haemoglobin has a lower affinity for oxygen than the elephant haemoglobin</li> <li>• therefore haemoglobin can supply oxygen to the tissues at lower pp of oxygen</li> <li>• because the rate of respiration in the mouse is higher</li> <li>• a mouse has a higher mass-specific metabolic rate than the elephant</li> <li>• because the mouse loses more body heat</li> <li>• because it has a larger surface area to volume ratio</li> <li>• because the mouse is more active</li> <li>• because it has to escape predators</li> <li>• the rate of respiration of the mouse is going to be greater than the elephant</li> <li>• therefore pp of oxygen in mouse tissues will be lower</li> <li>• therefore haemoglobin needs to be releasing oxygen</li> <li>• when blood cannot supply oxygen at a fast enough rate</li> </ul>	
<b>Level</b>	<b>Marks</b>	
	0	No awardable content.

1	1-2	<p>An explanation may be attempted but with limited interpretation or analysis of the scientific information and with a focus on mainly just one piece of scientific information.</p> <p>The explanation will contain basic information, with some attempt made to link knowledge and understanding to the given context.</p>
2	3-4	<p>An explanation will be given, with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information.</p> <p>The explanation shows some linkages and lines of scientific reasoning with some structure.</p>
3	5-6	<p>An explanation is made that is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information.</p> <p>The explanation shows a well-developed and sustained line of scientific reasoning, which is clear and logically structured.</p>

# Familiarising students with command words.

How do you teach candidates about command words?

- ❖ Give them a list of definitions.
- ❖ Practising past papers with mark schemes.
- ❖ Underlining command words.
- ❖ Get them to mark exemplar answers.
- ❖ Get them to write their own questions and mark schemes.



# Cone of Learning

After 2 weeks we tend to remember		Nature of Involvement
<b>90%</b> of what we say and do	Doing the Real Thing	<b>Active</b>
	Simulating the Real Experience	
	Doing a Dramatic Presentation	
<b>70%</b> of what we say	Giving a Talk	
	Participating in a Discussion	<b>Passive</b>
<b>50%</b> of what we hear and see	Seeing it Done on Location	
	Watching a Demonstration	
	Looking at an Exhibit Watching a Demonstration	
	Watching a Movie	
<b>30%</b> of what we see	Looking at Pictures	
<b>20%</b> of what we hear	Hearing Words	
<b>10%</b> of what we read	Reading	

# Delegate Exercise 7: Writing an Exam Question

Getting students to write their own exam questions is a very good way of getting them to think about the wording of questions.

In your groups, you are going to write an exam question consisting of several parts (1ai, 1aii, 1b etc.) for an International GCSE Biology Paper 1 or 2.

Total number of marks: 14.

The questions should have a mix of target grades:

- 1 – 3
- 4 – 6
- 7 – 9

Each question should have some AO1, AO2 and AO3 in the proportions:

- AO1: 4 - 6 marks
- AO2: 4 – 6 marks
- AO3: 4 – 6 marks

You should use at least three different command words.

A mark scheme should be completed for each part with no more than one extra mark point for the mark allocations, e.g. 4 mark points for a three mark question.

You have a set of experimental data to base your question on.

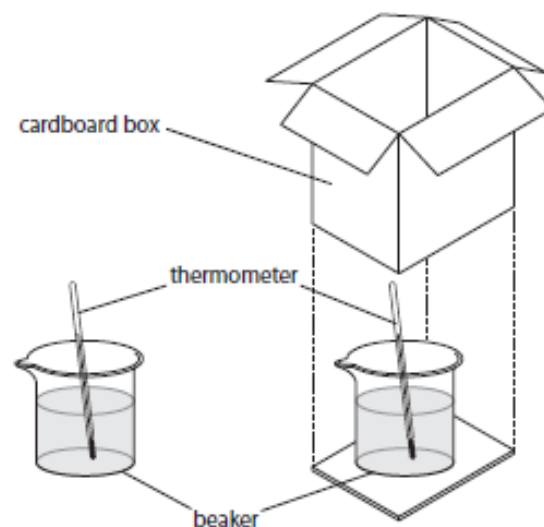
We will share our questions and mark schemes with each other.

Use the specification to identify topics that you can include.

No question marks unless it is a multiple choice question!!!



A student was told that farming animals outdoors was less efficient than keeping them indoors (factory farming). The student investigated this idea, using beakers of hot water to represent the animals, with the apparatus shown below. The cardboard box was used to represent keeping animals indoors.



The beakers were filled with the same volume of hot water and the temperature in each beaker was measured at intervals of 10 minutes over a period of 30 minutes. The investigation was repeated five times. The results are shown in the table.

Trial	Temperature in °C for each beaker							
	Outside box				Inside box			
	0 min	10 min	20 min	30 min	0 min	10 min	20 min	30 min
1	70	55	49	44	70	59	51	46
2	68	56	49	43	68	57	52	45
3	62	50	45	20	62	50	45	41
4	70	56	45	38	70	54	48	40
5	67	55	48	43	67	60	53	48

# End of Day One!

Today, we have considered:

- How to use specifications
- Assessment Objectives
- Command Words
- How to write questions

Tomorrow we will be looking at:

- Marking some candidate responses
- Developing practical skills
- Developing transferable skills

# Thank you for your time

Find out more about us at:  
<http://qualifications.pearson.com>