

# Edexcel International AS/A Level

## IAL Biology

Online YBI11-19IO1

## Getting Ready to Teach

Event Code:

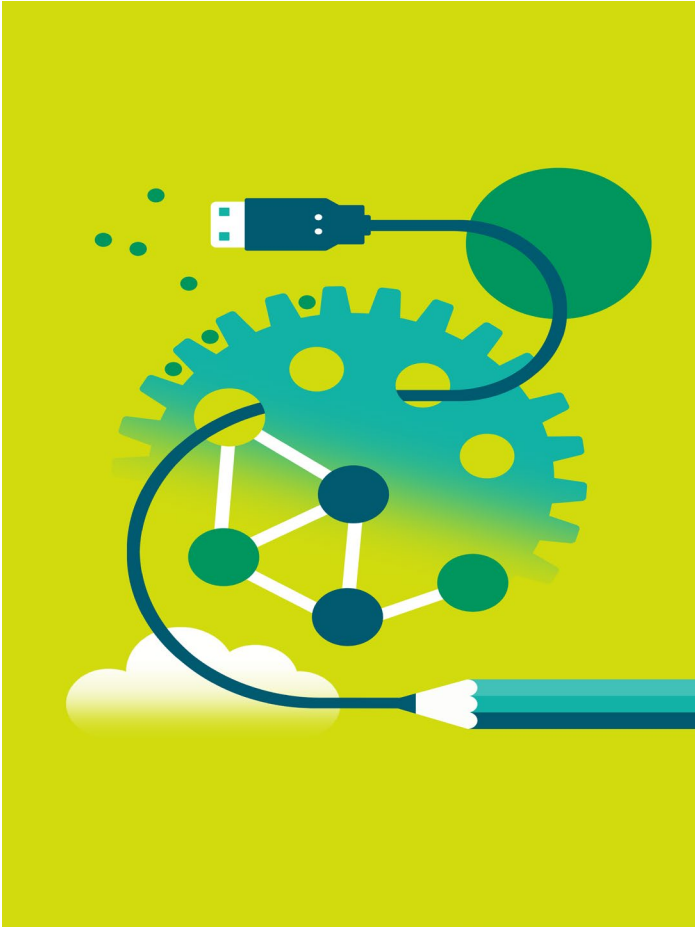
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First teaching in 2018, first assessment 2019

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# Your Online Environment



- Technical Difficulties & Support
- Recording
- Communication in an online environment
- Asking Questions
- Using Polls
- Downloading Documents

# Session Agenda

- 16:00 Welcome
- 16:10 The 2018 Assessment Model
- 16:40 Changes to Specification Content
- 17:30 Issues Strategies and Resources
- 18:00 Finish

# Polls to get to know the delegates.



# Aims and Objectives

Delegates will:

- Get an overview of the main changes in the new specification
- Consider approaches to teaching and learning
- Look at sample assessments and mark schemes
- Look at planning and organisation for the new specification
- Review resources and services that are available to support the new specification



# IAL Features

- International A Levels and AS Levels are created for International Students
- Globally recognised for progression to undergraduate studies.



# IAS and IAL 2018

## Biology, Chemistry and Physics

Reviewed and updated in light of GCE A level changes, with comparable content

Better defined application of Mathematical Skills to each subject

Opportunities for Core Practical activities throughout each subject

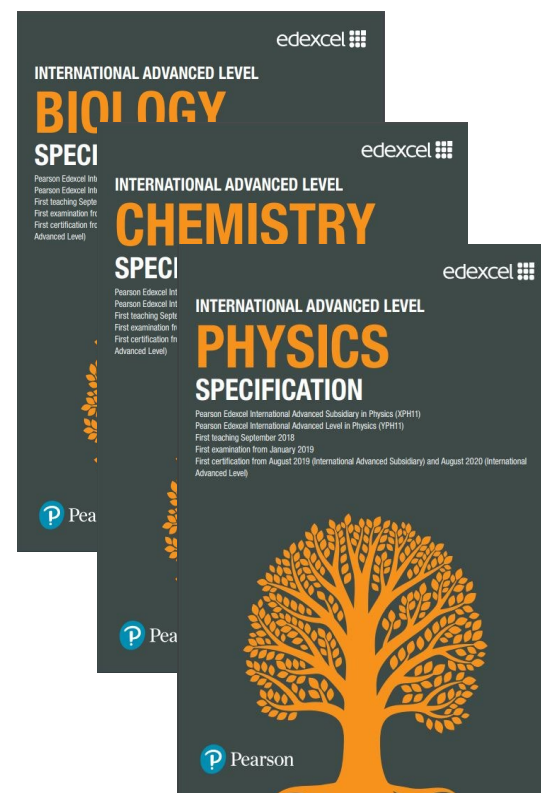
Practical Skills assessed through dedicated units (Unit 3 and Unit 6)

Better consistencies between examinations and use of command words across subjects

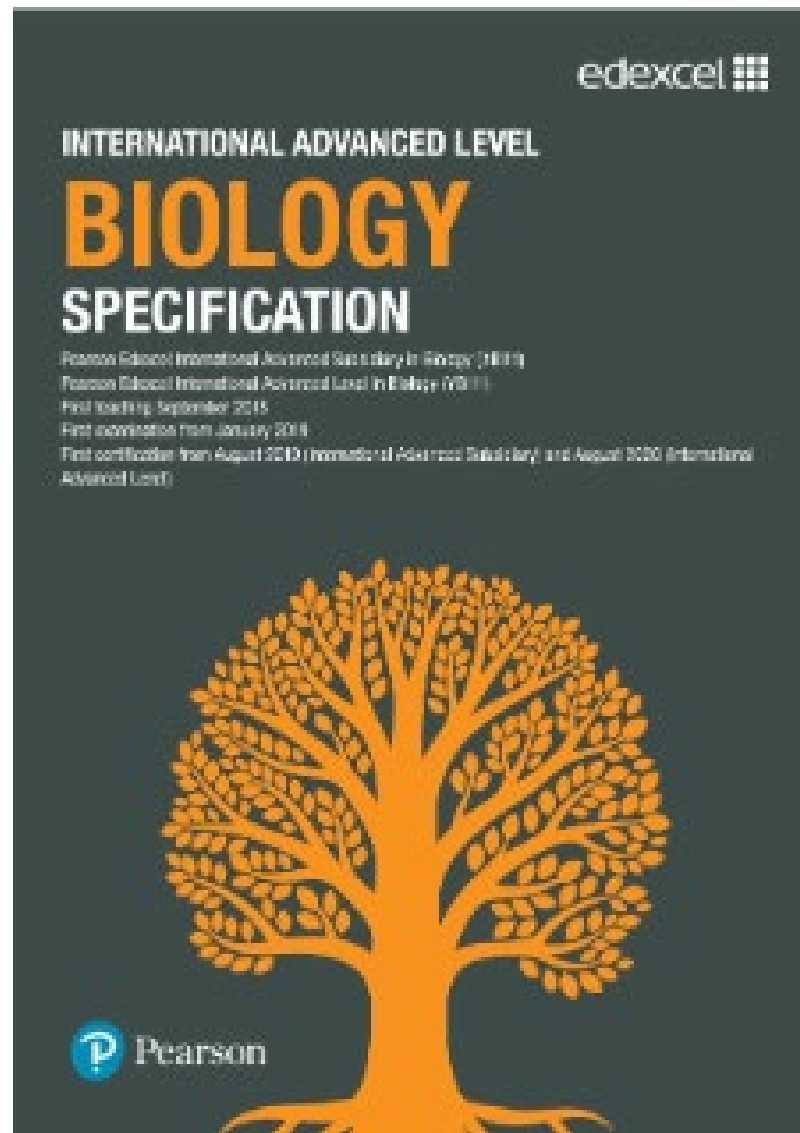
Fully modular with Examinations in January, June and October AS contributes to A level

Dedicated textbooks

[Teachingscience@pearson.com](mailto:Teachingscience@pearson.com)



# The New IAL Biology Assessment Model





## Introduction to the Assessment

### Content

Four units (1, 2, 4 and 5) have Specification content

Units 3 and 6 require students to develop practical skills through content in Units 1, 2, 4 and 5.

### Assessment Objectives

AO1 knowledge and understanding  
 AO2(a) application of knowledge and understanding  
 AO(b) analysis of information  
 AO3 practical skills

### Structure of Assessment

UNIT	MARKS	UMS
Unit 1	80	120
Unit 2	80	120
Unit 3	50	60
Unit 4	90	120
Unit 5	90	120
Unit 6	50	60

# Changes to Assessment Objectives



## Current specification

		AS (%)	IA2 (%)	IAL (%)
AO1	Knowledge and understanding of science and of How Science Works	30 - 40	26- 30	30 - 40
AO2	Application of knowledge and understanding of science and of How Science Works	34 – 40	42 - 48	38 – 44
AO3	How Science Works	28	26	27

## New specification

		AS (%)	IA2 (%)	IAL (%)
AO1	Demonstrate knowledge and understanding of science	36 - 39	31- 34	34 – 37
AO2 (a)	Application of knowledge and understanding of science in familiar and unfamiliar contexts.	34 – 36	33 - 36	33 – 36
AO2 (b)	Analysis and evaluation of scientific information to make judgments and reach conclusions.	9 - 11	14 - 16	11 – 14
AO3	Experimental skills in science, including analysis and evaluation of data and methods	17 - 18	17 - 18	17 - 18

# Which Assessment Objective?

- Explain why oxygen molecules can pass directly through the cell membrane
- Describe how a triglyceride is synthesised
- Assess the contribution of lipoproteins to the risk of developing CVD. Use the information in the graph to support your answer.
- Devise a method that can be used to make a valid comparison of the tensile strengths of fibres from the same plant, treated with different concentrations of sodium hydroxide solution.

# Changes to Vocabulary



# Old vocabulary – staying

Current specification	New IAL
Compare, contrast, distinguish between	Compare and contrast
Describe	Describe
Discuss	Discuss
Explain	Explain
Name, State, Give	Give, State, Name
Suggest	Suggest

New Specification: Appendix 7 (Taxonomy)

# Changing vocabulary

Current specification	New IAL
Advantages, disadvantages	Assess
Analyse and interpret	Criticise
Appreciate	Determine
Distinguish	Devise
Recall	Evaluate
Summarise	Identify
	Justify

- *Using the information in ...*

# Assessment Structure





# Assessment model outline

- Modular, and using UMS to report marks
- 6 units or modules each with its own written examination
- IAS units 1, 2 and 3 and IA2 units 4, 5 and 6
- All six units will be offered in January, June and October
- Units can be resat when required – but only the two most recent attempts can be used to cash-in for a grade

# Mathematics requirement

- **All papers** will include a minimum of 10% of marks for mathematical concepts
- The mathematics to be assessed will be at Level 2
- Details of mathematical concepts to be assessed are provided in Appendix 6 of the specification .

# Units 1, 2 4 and 5

Unit	Title	IAL (%)	Length / minutes	Marks				
				Total	AO1	AO2(a)	AO2(b)	AO3
1	Molecules, Diet, Transport and Health	20	90	80	34-36	34-36	9-11	0
2	Cells, Development, Biodiversity and Conservation	20	90	80	34-36	34-36	9-11	0
4	Energy, Environment, Microbiology and Immunity	20	105	90	33-35	38-40	16-18	0
5	Respiration, Internal Environment, Coordination and Gene Technology	20	105	90	33-35	38-40	16-18	0

# Levels based questions

- Each of papers 1, 2, 4 and 5 will have one or two level based questions.
- Each level based question will be worth 6 marks.

# Units 3 and 6

Unit	Title	IAL (%)	Length / minutes	Marks				
				Total	AO1	AO2 (a)	AO2 (b)	AO3
3	Practical Skills in Biology I	20	90	50	4-6	0	0	44-46
6	Practical Skills in Biology II	20	80	50	4-6	0	0	44-46

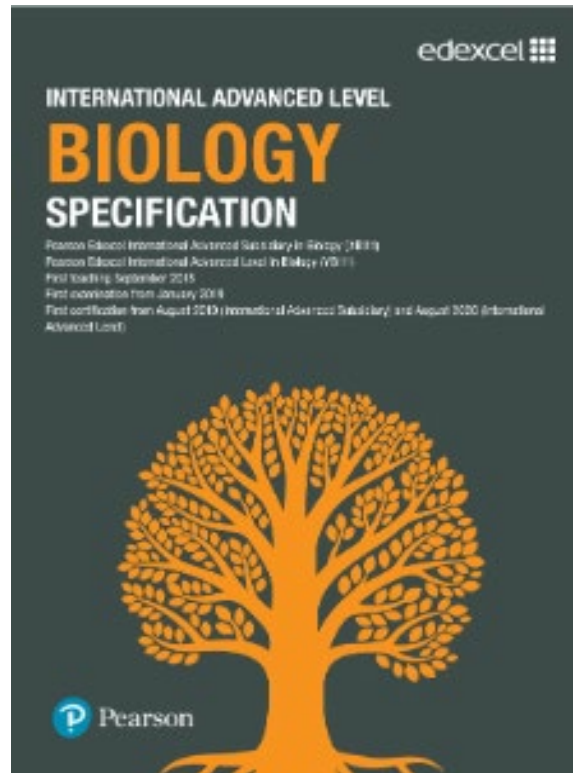
# Availability of new IAL units

Unit	2019			2020		
	January	June	October	January	June	October
1	✓	✓	✓	✓	✓	✓
2		✓	✓	✓	✓	✓
3		✓	✓	✓	✓	✓
4				✓	✓	✓
5					✓	✓
6					✓	✓
IAS cash-in		✓	✓	✓	✓	✓
IAL cash-in					✓	✓

# Specification Content



# Practical Activities





# Practical activities

This specification includes 18 core practical activities, which is the **minimum number** of practical activities that students will carry out.

Centres are encouraged to include additional practical activities to develop students' practical skills further.

Practical skills will be assessed separately in Units 3 and 6.

# Unit 1: Molecules, Diet, Transport and Health

## NEW CORE PRACTICAL

1.3 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.

## RECOMMENDED ADDITIONAL PRACTICALS

Investigate the structure of a mammalian heart by dissection.  
Use a semi-quantitative method to estimate protein concentration using biuret reagent and colour standards.

Investigate tissue water potentials using plant tissue and graded concentrations of a solute.

# Unit 1: Molecules, Diet, Transport and Health

## MODIFIED CORE PRACTICAL

- 2.4 Investigate membrane properties including the effect of alcohol **and** temperature on membrane permeability.
- 2.8 Investigate the effect of **temperature**, **pH**, enzyme concentration and **substrate** concentration on the initial rate of enzyme-catalysed reactions.

# Unit 2 – Topics 3 and 4

## NEW CORE PRACTICAL

- 3.8 (i) use a light microscope to make observations and labelled drawings of suitable animal cells
- (ii) use a graticule with a microscope to make measurements and understand the concept of scale
- 4.6 Use a light microscope to:
- (i) make observations, draw and label plan diagrams of transverse sections of roots, stems and leaves
  - (ii) make observations, draw and label cells of plant tissues
  - (iii) identify sclerenchyma fibres, phloem, sieve tubes and xylem vessels and their location.

# Unit 2: Cells, Development, Biodiversity and Conservation

## RECOMMENDED ADDITIONAL PRACTICALS

Investigate factors affecting the growth of pollen tubes.

Investigate plant mineral deficiencies.

# Unit 4: Energy, Environment, Microbiology and Immunity

## NEW CORE PRACTICALS

- 5.8 Investigate the effects of light intensity, light wavelength, temperature and availability of carbon dioxide on the rate of photosynthesis using a suitable aquatic plant.
- 6.4 Investigate the rate of growth of microorganisms in a liquid culture, taking into account the safe and ethical use of organisms.

# Unit 5: Respiration, Internal Environment, Coordination and Gene Technology

## NEW CORE PRACTICAL

- 7.7 Use an artificial hydrogen carrier (redox indicator) to investigate respiration in yeast.

## MODIFIED CORE PRACTICALS

- 7.8 Use a simple respirometer to determine the **rate of respiration and RQ** of a suitable material (such as germinating seeds or small invertebrates).
- 7.15 Investigate the effects of exercise on tidal volume, breathing rate, respiratory minute ventilation, and oxygen consumption using data from spirometer traces.

# Unit 5: Respiration, Internal Environment, Coordination and Gene Technology

## RECOMMENDED ADDITIONAL PRACTICALS

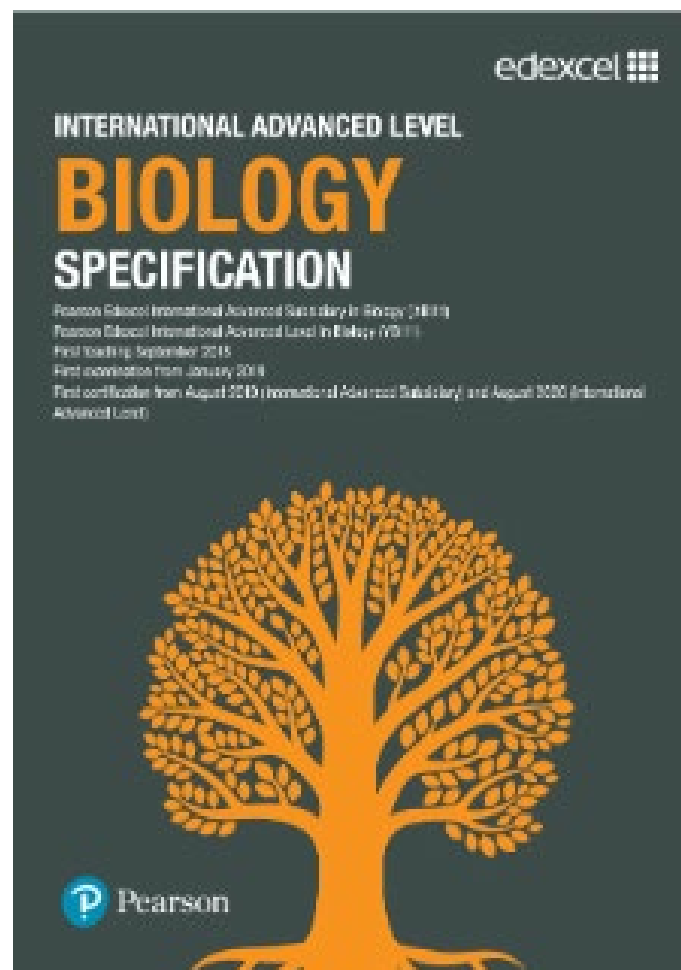
Investigate habituation to a stimulus.

## NEW CORE PRACTICAL

8.12 Investigate the production of amylase in germinating cereal grains.



# Changes to Unit 1 Content



# Topic 1:

## Molecules, Transport and Health

- 1.9 (i) understand the role of haemoglobin in the transport of oxygen and carbon dioxide
- (ii) understand the oxygen dissociation curve of haemoglobin, the Bohr effect and the significance of the oxygen affinity of fetal haemoglobin compared with adult haemoglobin
- 1.13 understand the link between dietary antioxidants and the risk of cardiovascular disease (CVD)

# Topic 2:

## Membranes, proteins, DNA & gene expression

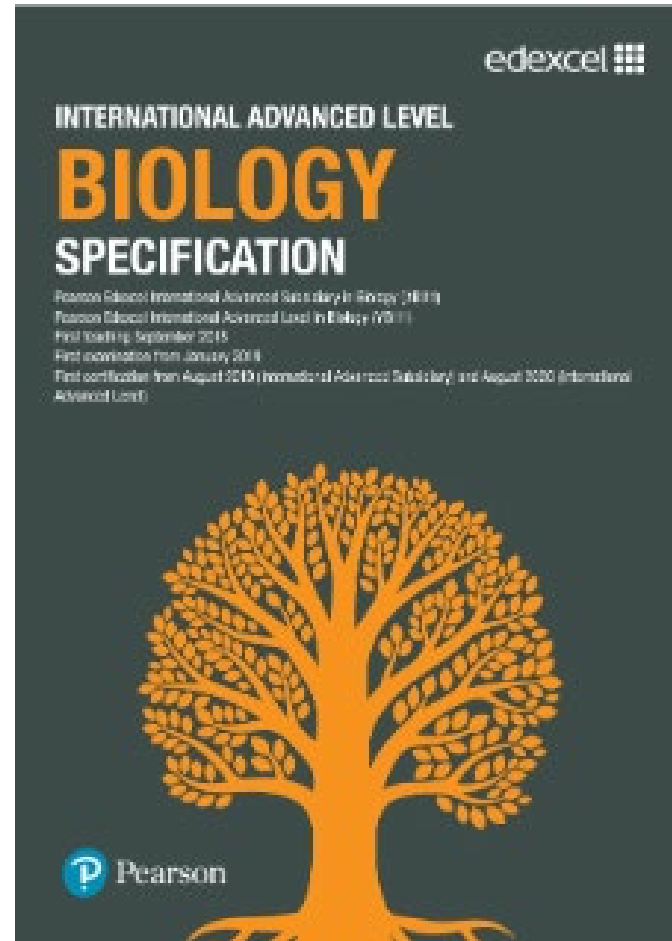
- 2.1 (ii) understand how the rate of diffusion is dependent on these properties and can be calculated using Fick's Law of Diffusion
- 2.4 understand what is meant by osmosis in terms of the movement of free water molecules through a partially permeable membrane, down a water potential gradient
- 2.6 (iii) understand the significance of a protein's primary structure in determining its secondary structure, three-dimensional structure and properties (globular and fibrous proteins and the types of bonds involved in its three-dimensional structure)

# Topic 2:

## Membranes, proteins, DNA & gene expression

- 2.11 understand the nature of the genetic code (triplet code, **non-overlapping and degenerate**)
- 2.14 (i) understand how errors in DNA replication can give rise to mutations (**substitution, insertion and deletion** of bases)
  - (ii) **know that some mutations will give rise to cancer or genetic disorders, but that many mutations will have no observable effect**
- 2.15 (i) understand what is meant by the terms gene, allele, genotype, phenotype, recessive, dominant, **codominance**, homozygote and heterozygote
  - (iii) **understand sex linkage on the X chromosome, including red-green colour blindness in humans**

# Changes to Unit 2 Content



# Topic 3:

## Cell Structure, Reproduction and Development

- 3.1 know that all living organisms are made of cells, sharing some common features
- 3.3 (ii) and 3.5(ii) understand the function of the organelles listed in (i)
- 3.7 (i) know how magnification and resolution can be achieved using light and electron microscopy
  - (ii) understand the importance of staining specimens in microscopy
- 3.16 be able to calculate mitotic indices

# Topic 3:

## Cell Structure, Reproduction and Development

- 3.17 (i) understand what is meant by the terms stem cell, pluripotent and totipotent, **morula** and **blastocyst**
- (ii) be able to discuss the ways in which society uses scientific knowledge to make decisions about the use of stem cells in medical therapies
- 3.19 understand how one gene can give rise to more than one protein through post-transcriptional changes to messenger RNA (mRNA)
- 3.20 (ii) know how epigenetic modification, including DNA methylation and histone modification, can alter the activation of certain genes

# Topic 4: Plant Structure and Function, Biodiversity and Conservation

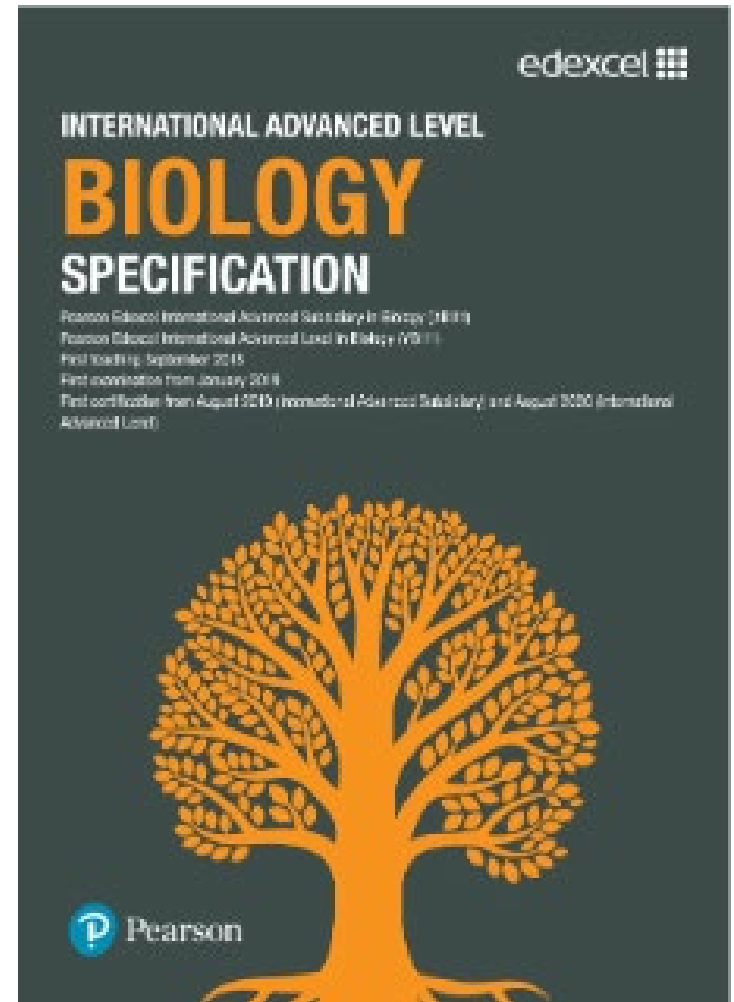
- 4.2 be able to recognise the organelles in 4.1 from electron microscope (EM) images
- 4.10 understand the conditions required for bacterial growth
- 4.11 know that substances derived from plants can have antimicrobial and other therapeutic properties
- 4.15 know that, over time, the variety of life has become extensive but is now being threatened by human activity



# Topic 4: Plant Structure and Function, Biodiversity and Conservation

- 4.17 know how biodiversity can be measured within a habitat using species richness, and within a species using genetic diversity **by calculating the heterozygosity index**
- 4.18 understand how biodiversity can be compared in different habitats using the formula to calculate an index of diversity (D).
- 4.20 (i) understand how the Hardy-Weinberg equation can be used to see whether a change in allele frequency is occurring in a population over time
  - (ii) understand that changes in allele frequency can come about as a result of mutation and natural selection
  - (iii) understand that reproductive isolation can lead to accumulation of different genetic information in populations, potentially leading to the formation of new species

# Changes to Unit 4 Content



# Topic 5:

## Energy Flow, Ecosystems & the Environment

- 5.3 understand the light-dependent reactions of photosynthesis, including how light energy is trapped by exciting electrons in chlorophyll and the role of these electrons in generating ATP, reducing NADP in **cyclic** and **non-cyclic** photophosphorylation and producing oxygen through photolysis of water
- 5.6 understand what is meant by the terms *absorption spectrum* and *action spectrum*
- 5.7 understand that chloroplast pigments can be separated using chromatography and the pigments identified using  $R_f$  values

# Topic 5: Energy Flow, Ecosystems & the Environment

- 5.10 know how to calculate the efficiency of **biomass** and energy transfers between trophic levels
- 5.11 understand what is meant by the terms population, community, habitat and ecosystem
- 5.21 understand the effect of temperature on the rate of enzyme activity and its impact on plants, animals and microorganisms, to include  $Q_{10}$
- 5.24 understand how isolation reduces gene flow between populations, leading to **allopatric** or **sympatric** speciation

# Topic 5: Energy Flow, Ecosystems & the Environment

- 5.26 understand how reforestation and the use of sustainable resources, including biofuels, are examples of the effective management of the conflict between human needs and conservation

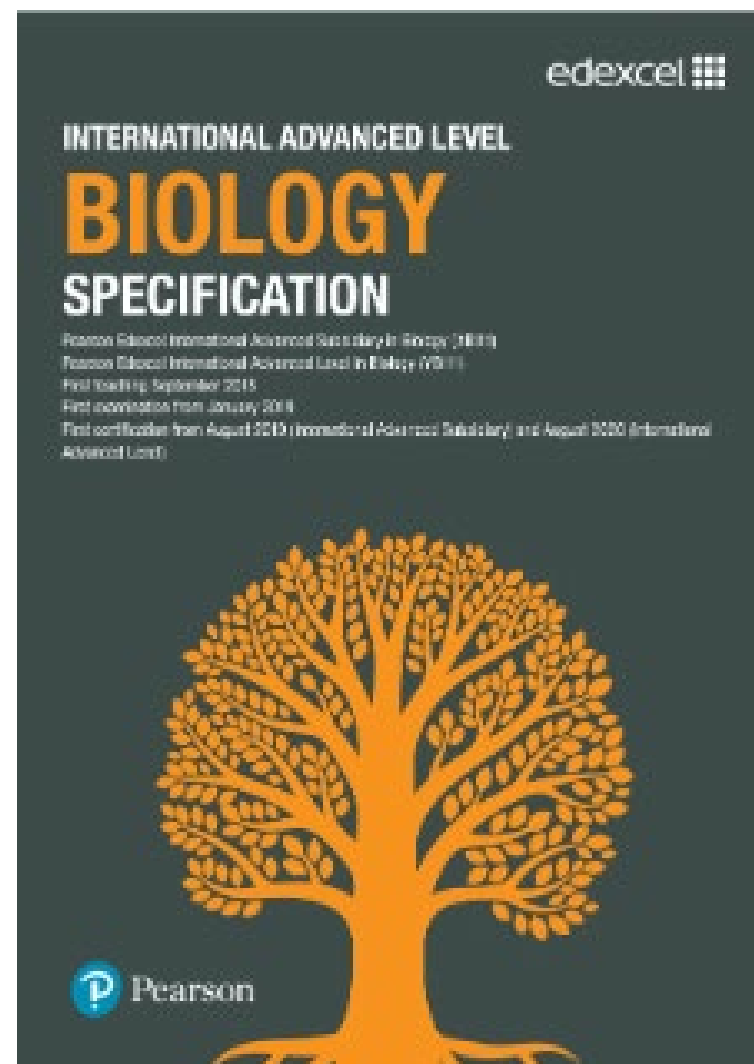
# Topic 6: Microbiology, Immunity and Forensics

- 6.1 understand the principles and techniques involved in culturing microorganisms, using aseptic technique
- 6.2 understand the different methods of measuring the growth of microorganisms, as illustrated by cell counts, dilution plating, mass and optical methods (turbidity)
- 6.3 understand the different phases of a bacterial growth curve (lag phase, exponential phase, stationary phase and death phase) and be able to calculate exponential growth rate constants

# Topic 6: Microbiology, Immunity and Forensics

- 6.5 (i) be able to compare the structure of bacteria and viruses (nucleic acid, capsid structure and envelope) with reference to Ebola virus, tobacco mosaic virus (TMV), human immunodeficiency virus (HIV) and lambda phage ( $\lambda$  phage)
- (ii) understand what is meant by the terms lytic and latency

# Changes to Unit 5 Content





# Topic 7: Respiration, Muscles and the Internal Environment

- 7.2 understand the roles of glycolysis in aerobic and anaerobic respiration, including the phosphorylation of hexoses, the production of ATP by **substrate level phosphorylation**, reduced coenzyme, pyruvate and lactate. (Details of intermediate stages and compounds are not required.)
- 7.3 understand the role of the link reaction and the Krebs cycle in the complete oxidation of glucose and formation of carbon dioxide ( $\text{CO}_2$ ) by decarboxylation, ATP by substrate level phosphorylation, reduced NAD and reduced FAD by dehydrogenation (names of other compounds are not required) and that **these steps take place in mitochondria**, unlike glycolysis which occurs in the cytoplasm

# Topic 7: Respiration, Muscles and the Internal Environment

- 7.6 understand what is meant by the term respiratory quotient (RQ)
- 7.12 (i) know the myogenic nature of cardiac muscle
- (ii) understand how the normal electrical activity of the heart coordinates the heartbeat, including the roles of the sinoatrial node (SAN), the atrioventricular node (AVN), the bundle of His and **the Purkyne fibres**
- (iii) understand how the use of electrocardiograms (ECGs) can aid in the diagnosis of **abnormal heart rhythms**

# Topic 7: Respiration, Muscles and the Internal Environment

- 7.13 (i) be able to calculate cardiac output
- 7.14 understand the role of adrenaline in the fight or flight response
- 7.16 (i) understand what is meant by the terms negative feedback and **positive feedback** control

# Topic 7: Respiration, Muscles and the Internal Environment

- 7.18 know the gross and microscopic structure of the mammalian kidney
- 7.19 understand how urea is produced in the liver from excess amino acids (details of the ornithine cycle are not required) and how it is removed from the bloodstream by ultrafiltration
- 7.20 understand how solutes are selectively reabsorbed in the proximal tubule and how the loop of Henle acts as a countercurrent multiplier to increase the reabsorption of water

# Topic 7: Respiration, Muscles and the Internal Environment

- 7.21 understand how the pituitary gland and osmoreceptors in the hypothalamus, combined with the action of antidiuretic hormone (ADH), bring about negative feedback control of mammalian plasma concentration and blood volume
- 7.22 understand how genes can be switched on and off by DNA transcription factors, including the role of **peptide hormones** acting extracellularly and **steroid hormones** acting intracellularly

# Topic 8:

## Coordination, Response and Gene Technology

- 8.7 understand how the effects of drugs can be caused by their influence on nerve impulse transmission, illustrated by **nicotine**, **lidocaine** and **cobra venom alpha toxin**, the use of L-DOPA in the treatment of Parkinson's disease and the action of MDMA (ecstasy)
- 8.10 know that the mammalian nervous system consists of the central and peripheral nervous systems

# Topic 8:

## Coordination, Response and Gene Technology

- 8.11 understand how **phytochrome**, auxin (IAA) and **gibberellins** bring about responses in plants, including their **effects on transcription**
- 8.14 know the location and main functions of the cerebral hemispheres, hypothalamus, **pituitary gland**, cerebellum and medulla oblongata of the human brain

# Topic 8:

## Coordination, Response and Gene Technology

- 8.18 understand how recombinant DNA can be produced, including the roles of restriction endonucleases and DNA ligase
- 8.19 understand how recombinant DNA can be inserted into other cells
- 8.20 know how microarrays can be used to identify active genes
- 8.21 understand what is meant by the term bioinformatics



# Planning, teaching and learning support

[Getting Started Guide](#): gives you an overview of the Edexcel IAL in Biology to help you understand the changes to content and assessment

- [Course planner](#) and [scheme of work](#): saves you time in planning and helps you put together teaching strategies for delivering the specification content.
- [Mapping documents](#): highlight key differences between the new and legacy qualifications to help you understand the changes made to the new specifications.

*Practical Skills and* [Mathematical Skills Guides](#): helps you ensure that students are developing these skills, both of which form a key part of the assessment for the new IAL

- [Topic Guide](#): Epigenetics
- [Printed textbooks and digital teaching resources](#) – promote ‘any time, any place’ curriculum matched publishing to improve student motivation and encourage new ways of working.

**Other support services:**

[ResultsPlus analysis: here](#)

[ResultPlus - Individual Student Analysis](#)

[ResultsPlus - Cohort Analysis](#)

[ResultsPlus - Mock Analysis](#)

[ResultsPlus - Global Analysis](#)

[ExamWizard](#)

[Access To Scripts](#)

# Contact your dedicated Subject Advisor

Your Science Subject Advisor is Irine Muhiuddin

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[Science community](#) – Join the community for a place to chat, share resources and ideas, ask questions and start your own discussions

**Thank you for your time**

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**International Advanced Level [qualification page](#).**