Exam Technique

Aims for today

I've chosen year 12 biology topics that have overlap with other topics, can be used to summarise concepts and that are covered by AQA, Edexcel A, Edexcel B and OCR

Students taking A-Level or AS biology this year: revise in a way that gets you thinking about answering questions in the exam
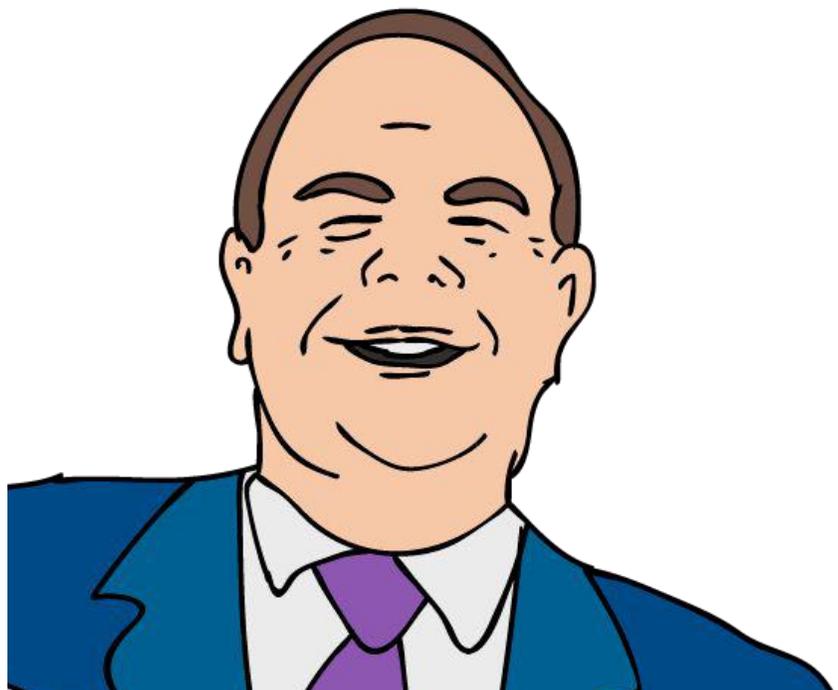
Year 12s taking A-Level biology: using what you've learnt this year, maximise your UNDERSTANDING to give you a good foundation for year 13

Exams this year   No exams this year

What are we going to cover?

- **Interpreting questions**

- How to **set out answers**

- Examples of **command words**

- Tried and tested **exam wisdom**

SNAPREVISE

What do the examiners say?

"Many students experienced difficulties by **missing important details** in both questions and their answers."

"There were a number of questions where it was obvious candidates had **not read** the **question** properly."

"The paper is set so that the **questions cover** the **specification** as **widely** as **possible** and **test** as many **skills** as possible."

Which information?

Context – this should help you identify the part of the specification that is relevant to the question

Q: Auxins are a group of plant hormones (plant growth substances).

Name the growth response that makes plants grow towards the source of light.

Commands – these tell you what form you must write your answer in

Directions – these tell you specifically what information you need to include in your answer

Interpreting Questions

You will find that questions tend to come in 7 different types:

- **Statement Questions.**   ~1 Mark
- **Simple Explanatory/ Descriptive Questions.**   ~2 Marks
- **Calculation Questions.**   ~2 - 3 Marks
- **Explanation/Qualitative Questions.**   ~3 Marks
- **Experimental & Data Analysis Questions.**   ~4 Marks
- **Extended Responses.**   ~5 - 6 Marks
- **Essay-style Questions (AQA only)**   ~25 Marks

Statement Questions

- Test of **rote learning** – your ability to **remember facts**.
- Questions usually require information from the **specification**.
- May have some **context** from which you will need to extract the **subject** of the question.

Command Words:

- **State**
- **Define**
- **Name**
- **Give**
- **Which**

Examples:

- Give the two types of...
- Name the...
- Which of the following...
- Define the term...

Statement Questions - Command Words

Name/State: Give a **simple** one word answer or a short sentence.

- **No justification** or **explanation** is required. You can lose marks for contradictory explanation.

- Make sure to use **scientific terminology correctly**.

2   Auxins are a group of plant hormones (plant growth substances).

    (a)   Name the growth response that makes plants grow towards the source of light.

       .... [1]

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(a)   Name the growth response that makes plants grow towards the source of light.

Positive Phototropism .... **[1]**

<u>Define</u>: Require a **short sentence** or **bullet-point** answer.

It's worth **memorising definitions** with **standard wording**.
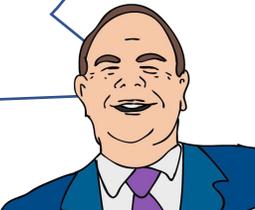
Be as **specific** as possible – including all necessary **key words**.

Define each of the following terms.

[2 marks]

Species _____

_____

Species richness _____

_____

"When asked to explain or define a scientific term do not take words directly from the stem of the question as you have not demonstrated to the examiner any additional knowledge."

Define each of the following terms.

[2 marks]

Species   A group of organisms which can interbreed to produce

fertile offspring.

Species richness A measure of biodiversity which gives the count of

the number of species present in a given habitat.

Simple Explanatory/Descriptive Questions

- Tests your **qualitative understanding** of biological phenomena
- May require you to **recall simple facts** and **link** your **own knowledge** to specific examples within the question
- May be combined with a **statement question**

Command Words:

- **Explain**
- **Describe**
- **Suggest**
- **Give reasons**

Simple Explanatory/Descriptive Questions - Command Words

Explain: Give **step-by-step logical reasoning** to show **how** or **why** a biological **phenomenon** or **effect** occurs.

| 0 | 4 | . | 3 |

Explain the role of the heart in the formation of tissue fluid.

[2 marks]

_____

_____

_____

- **Look carefully** at the **context** and **direction** of the question.

- Provide **reasons** or **causes** for a biological phenomena

- **Don't repeat content** from the **question** in your answer!

0 4 . 3 Explain the role of the heart in the formation of tissue fluid.

[2 marks]

Ventricular contraction of the heart results in a high hydrostatic

pressure in the blood. This high hydrostatic pressure forces water

out of the blood capillaries, along with dissolved substances.

Describe: Describe a **process** or **structure** in context of a **specific example**.

- Often involves describing a **process** or **test** then following with the expected **result**

- You do **not need** to **give** a **reason** for why something happens

0 2 . 2 Describe how you would test for the presence of a lipid in a sample of food.

[2 marks]

_____

_____

_____

_____

*"When describing a function, you need to describe **what they do** and **how they do it**."*

0 2 . 2 Describe how you would test for the presence of a lipid in a sample of food.

[2 marks]

The sample of food is dissolved in ethanol, and water is then added. If a lipid is present, a cloudy white emulsion is formed.

Suggest: **Apply** your **biological knowledge** and **understanding** to an **unseen context**

- Refer specifically to the **context** described in the question

- Give **reasons** for your **answer**

- Work out which **concept** is being **applied**

(c) The giant tortoise can survive for long periods without food.

Suggest why giant tortoises are able to survive better than mammals for long periods without food.

....

....

....

....

.... **[2]**

(c) The giant tortoise can survive for long periods without food.

Suggest why giant tortoises are able to survive better than mammals for long periods without food.

Giant tortoises are ectothermic and also have a lower metabolism

and move less than mammals. They therefore have lower

energy requirements.

[2]

Calculation Questions

- Test **quantitative** understanding

- Sometimes require recall of the **correct formulae**

- May require **interpreting** data sets, figures and graphs to obtain values of variables required for the calculation

Command Words

- **Calculate**

- **Show your working**

- **Determine**

Calculate Questions - Command Words

Calculate: Work out a **numerical** answer **mathematically**, usually using **data** supplied in the question.

- Include the correct **units** and number of **significant figures** in your answer

- You can also determine **equations** from the **units** used in the **question**

(b) Scientists measured the productivity of two types of forest and recorded the mass of carbon taken up per square metre per year ($gC \ m^{-2} \ y^{-1}$).

The table shows data on the mean net primary productivity (NPP) and mean gross primary productivity (GPP) of these two types of forest.

Type of forest	Mean NPP / $gC \ m^{-2} \ y^{-1}$	Mean GPP / $gC \ m^{-2} \ y^{-1}$	Ratio of NPP to GPP
Boreal	322	1013	0.32
Temperate deciduous	1301	2165	0.60

(i) Calculate the percentage increase in mass of carbon released due to respiration by temperate deciduous forests compared with that by boreal forests.

(3)

.... %

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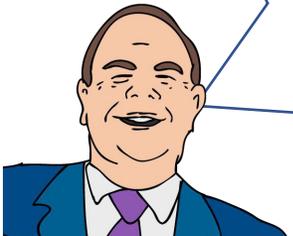
(3)

1013 – 322 = 691 (Boreal)
2165 – 1301 = 864 (Deciduous)
864 – 691 = 173 (difference)
(173 ÷ 691) x100% = 25.04%
deciduous release 25.04% more than boreal

_____25.04_____%

Words of Wisdom

*"If the answer line does not give a unit it is always a good idea to **write** the **correct units** next to your answer"*

*"Candidates should **substitute numerical values** into an equation **before re-arranging**, as this can show a correct use of the equation even if the final answer is incorrect."*

Explanation/Qualitative Questions

- Test of your **qualitative understanding** of biological phenomena.
- Tests your ability to describe **more complex processes** and **hypothesise** based on provided information.
- Includes longer explanations and multiple linked points

Command Words:

- **Explain**
- **Describe**
- **Outline**
- **Comment**

Examples:

- Using your knowledge, explain…
- Explain why…
- Analyse how…
- Comment on…

<u>Outline:</u> Write about the **main points** in a **topic**.

- Ensure to use **correct terminology**

- **Bullet points** can help you structure your **answers**

*"**Read your answer back** and check if it fully answers the question asked."*

(c) Outline the reasons why insects and other animals need well-developed transport systems.

....

....

....

....

....

....

....

.... **[3]**

(c) Outline the reasons why insects and other animals need well-developed transport systems.

Animals have high metabolic demands for which they need a

large oxygen supply. Diffusion is insufficient by itself as their

surface area to volume ratio is low. Transport systems bring

the required metabolites to cells and remove waste from

cells at an efficient rate.

[3]

Data Analysis Questions

- Test of **applied** and **experimental skills** in **unseen contexts**.

- May ask you to **analyse** and **evaluate** (including **comparison**) data and figures.

- **Data** and **information** (including extraneous info) will be provided in the **context** of the question.

Command Words:

- **Describe**

- **Explain**

- **Summarise**

- **Analyse**
- **Deduce**

Data Analysis Questions - Command Words

Describe and explain: Write **what** the **data shows** and **give reasons** for **why** it shows that

- Present **relevant figures** when describing data

- Give a well-developed line of **reasoning** which is **clear** and **logically structured**

- Use your **own knowledge** or **information** from the **context** of the **question** to **back up** your **reasoning**

2 A technician investigated the effect of temperature on the rate of an enzyme-controlled reaction. At each temperature, he started the reaction using the same volume of substrate solution and the same volume of enzyme solution.

Figure 2 shows his results.

Figure 2

Concentration of product in mixture / g dm⁻³

Time after start of reaction / s
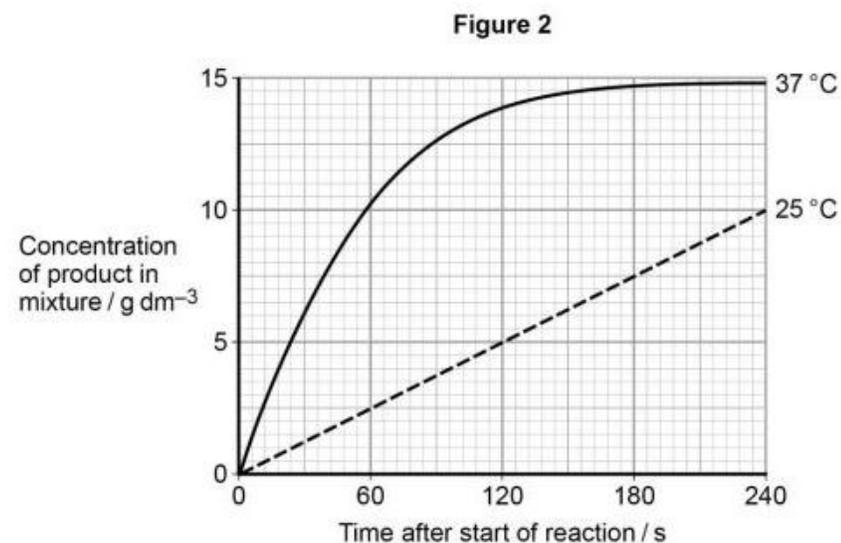
0 2 . 3 Describe and explain the differences between the two curves.

[5 marks]

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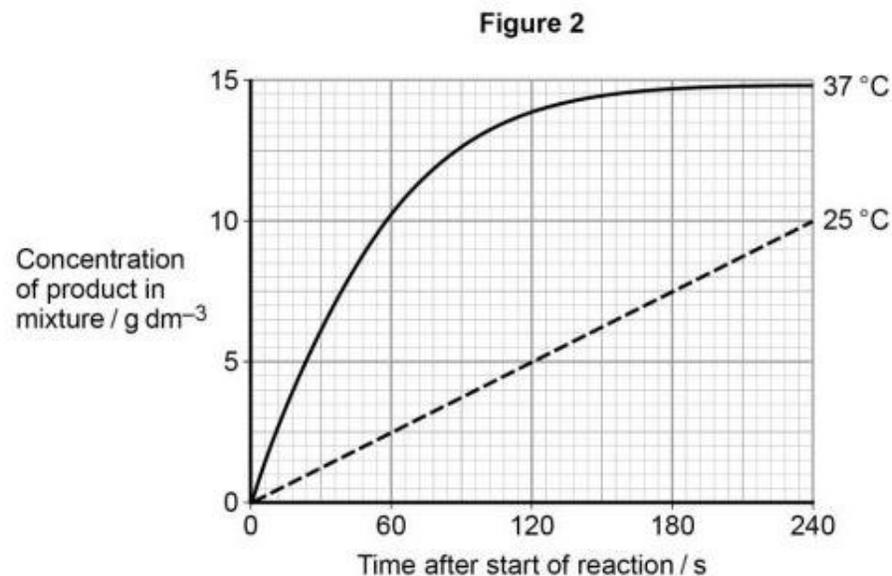
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[5 marks]

At 37 °C, the initial rate of reaction is faster due to more kinetic energy. Higher kinetic energy means more collisions between the enzymes and substrates. Unlike the graph at 25°C, the graph reaches a plateau at 37 °C because all the substrate has been used up.

An investigation was carried out into the effect of adding different volumes of water on the survival of seedlings. There were 60 seedlings in each group. The results are shown in Table 18.

Summarise: **Present only** the **main points** in **outline only**

- Does **not require reasoning** behind conclusions

- Use all the **information provided** in the **data set**

Volume of water added to soil (cm^3)	Day	Number of seedlings surviving
10	3	60
	6	59
	9	59
	12	58
	15	57
	18	57
20	3	60
	6	57
	9	54
	12	54
	15	54
	18	53
30	3	60
	6	58
	9	56
	12	50
	15	50
	18	48
40	3	60
	6	48
	9	40
	12	34
	15	26
	18	20
60	3	60
	6	41
	9	21
	12	6
	15	2
	18	2

(i) Summarise the conclusions that can be drawn from these data.

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Up to day 3, the volume of water has no effect on the survival

of seedling. Past day 3, as the volume of water increases, the

lower the survival of seedlings. For example, at day 18, 57 out

of 60 seedlings had survived at 10cm³ of water but at 60cm³ of

water, only 2 seedlings had survived to day 18.

.... [3]

Extended Answer Questions

- Tests ability to **write** and structure **longer answers**
- Marks available for **structure** and **coherence** of arguments, along with **relevant points**
- Longer questions can also ask you to **plan** and describe your own experiment, including by **drawing diagrams**.

Command Words:
- **Evaluate/Discuss**
- **Compare/Contrast**
- **Explain**
- **Describe**
- **Devise/Design**

*"If the question asks for risks and benefits to be evaluated, make sure that the **risks** are **not just disadvantages** – there is a difference."*
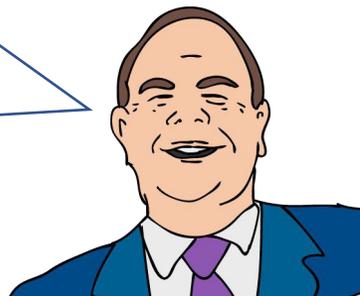
<u>Contrast</u>: Compare techniques, processes
or **evidence** to identify **differences**

- Marks will not be given for similarities

- Present **relevant information** to support
  your claims

1 0 . 1 Contrast how an optical microscope and a transmission electron microscope work **and** contrast the limitations of their use when studying cells.

[6 marks]

1 0 . 1 Contrast how an optical microscope and a transmission electron microscope work **and** contrast the limitations of their use when studying cells.

[6 marks]

Optical microscopes work by firing light at the cell, whereas TEMs fire a beam of electrons that travels through the cell. TEMs are higher resolution so small organelles can be seen, whereas with optical microscopes you can only see large organelles such as the nucleus, which is a limitation. TEMs also have a much higher magnification than optical microscopes. TEMs fire electrons in a vacuum so the cells must be dead which is a limitation, while optical microscopes can view living tissue. Optical microscopes can produce color images while TEM only produces black and white images. Optical light microscopy also has a simple sample preparation procedure, whereas TEM is more complex.

Evaluate/Discuss: Present **key points** from a **range** of **arguments** or the **strengths** and **weaknesses** of an **argument/data set**

- Be sure to consider more than one side of the argument

- Provide a **detailed** account of the arguments

0 3 . 2 Scientists investigated changes in the use of artificial fertiliser in India between 1970 and 2005. They also investigated changes in the **fertiliser response ratio**. This ratio shows how many kg of grain are produced for each kg of fertiliser used.

Figure 4 shows their results in the form the scientists presented them. (A hectare is a unit of area commonly used in agriculture)

Figure 4

Use the data in **Figure 4** to evaluate the use of artificial fertilisers on grain-producing crops in India.
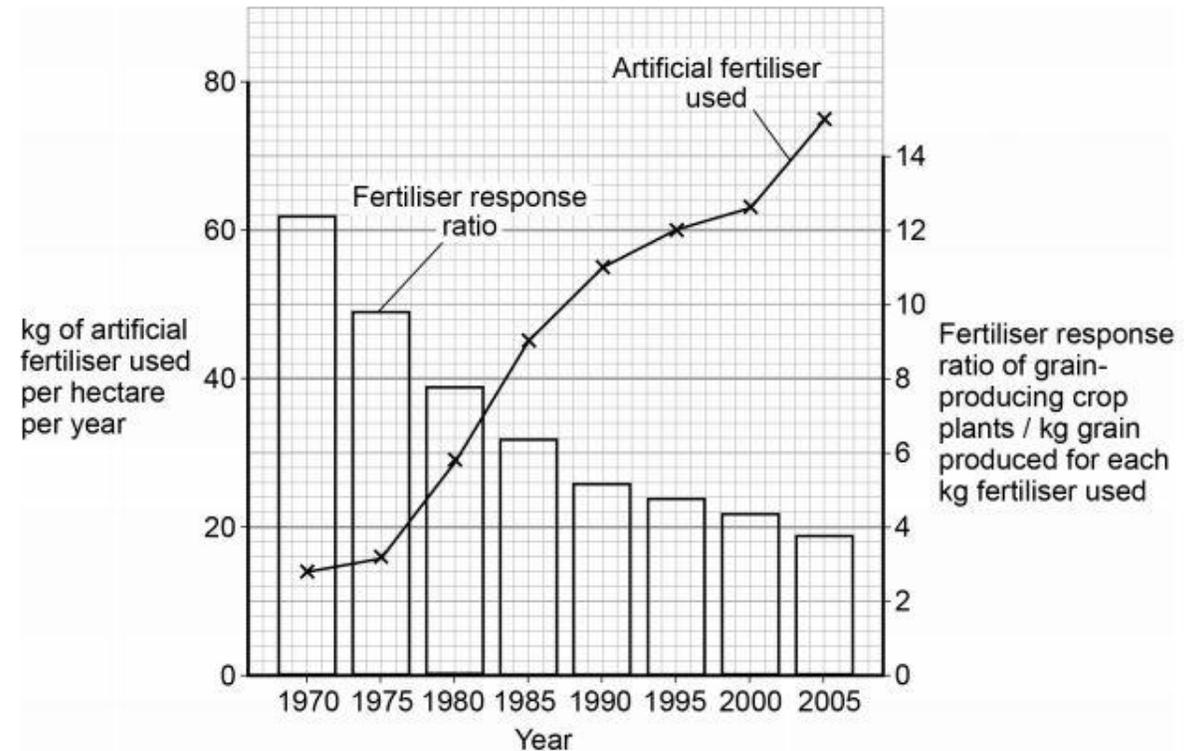
[2 marks]

0 3 . 3 Use the data in **Figure 4** to evaluate the use of artificial fertilisers on grain-producing crops in India.

[2 marks]

The graph shows that more fertilizer has been used

over time but the response to artificial fertilizers has

decreased. This suggests that fertilizers may become

less effective or less cost efficient with time.

Devise/Design: Clearly describe and explain how to **conduct an experiment**. Discuss any **uncertainty** in your method.

- Use **experimental terminology**, (**e.g:** the names of **apparatus**).
- You may need to draw a **diagram** to illustrate your answer or **plot** a **graph** and **line of best fit** to determine a **variable** from **data**.

*(b) The changes in the compost heaps are due to the activity of decomposers and other organisms.

Devise an investigation to determine the effect of the carbon to nitrogen ratio on the succession of species in these compost heaps.

(6)

*"Describe the **independent variable** and how it will be applied, the **dependent variable** and how it will be **measured**. Then try to describe valid variables that will need to be **controlled**. **Repeats on its own is not worthy of a mark** – link to specific situations "*
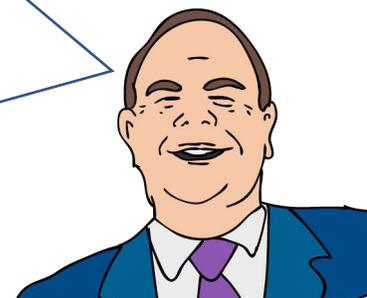
*(b) The changes in the compost heaps are due to the activity of decomposers and other organisms.

Devise an investigation to determine the effect of the carbon to nitrogen ratio on the succession of species in these compost heaps.

(6)

Firstly, compost heaps with differing C:N ratios are set up. The compost heaps are controlled for water, gases, humidity, temperature, aeration and mass using heaps in the same locations with scales used to find their masses. Subsequently, the different species and their abundance within the compost heaps are identified and counted. The samples are taken from different areas of the compost to increase the representation of the sample. In addition, at least 5 samples are taken from each compost.

Essay-style Questions (AQA only)

- Tests **understanding** and **application** – holistic approach

- **Structured** - select **five** or **six** examples (four is the minimum) and **write a paragraph** about each, **linking** it back to the key theme or idea

- You don't need to write an **introduction** or a **conclusion**

- Use **A-Level terminology** throughout

Command Words:
- **Evaluate/Contrast**
- **Explain/Discuss**
- **Describe**
- **Devise**

7.1 The importance of nitrogen-containing substances in biological systems

Question	Marking Guidance	Mark
07.1	3.1.4 and 3.1.4.2 proteins and enzymes 3.1.5 nucleic acids 3.1.5.2 DNA replication 3.1.6 ATP 3.2.1.1 ribosomes 3.2.2 cell division 3.2.3 transport across membranes 3.2.4 immune response 3.3.3 digestion and absorption 3.3.4.1 haemoglobin 3.4.1 genes and chromosomes 3.4.2 protein synthesis 3.4.3 mutation 3.4.7 investigating diversity 3..5.1 photosynthesis 3.5.2 respiration 3.5.4 nitrogen cycle 3.6.2 nervous coordination 3.6.3 muscles 3.6.4.2 control of blood glucose (and peptide/protein hormones) 3.7.1 inheritance 3.8.1 alteration of DNA sequences 3.8.2.2 regulation of transcription and translation	25

Top Tip - Prefixes

Pay attention to common prefixes in biology to help remember vocab.

E.g. inter- vs intra-
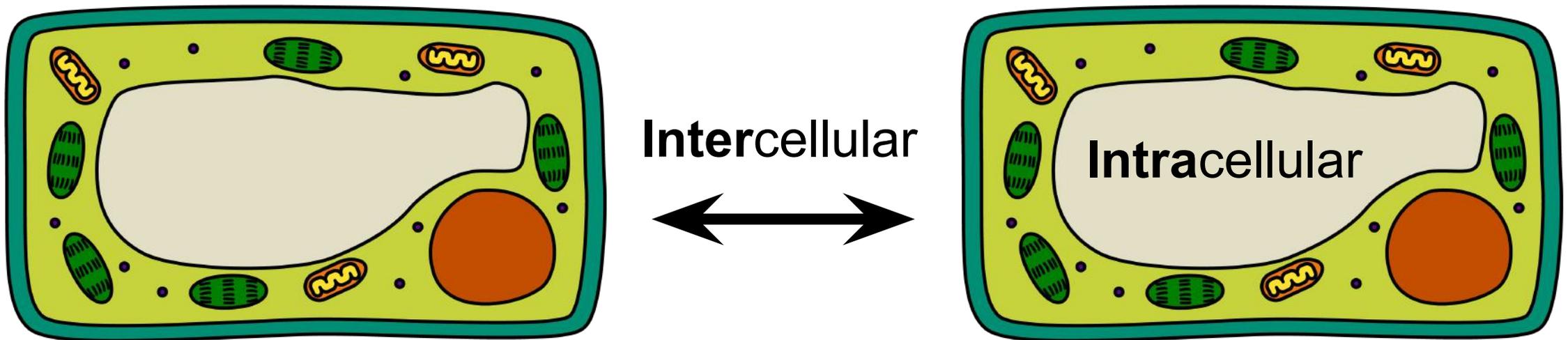
Intercellular ←→ **Intra**cellular

Top Tip - Prefixes

Pay attention to common prefixes in biology to help remember vocab.

How many of these do you know?

Prefix	Meaning	Example
cyto- or cyte-	relating to a cell	cytoplasm, cytokinesis
pulmo-	relating to lungs	pulmonary
ren-	kidney	adrenal
hem-, haem-, -hemo	blood	hemorrhage
herb-	grass, plants	herbicide, herbivore
hist-	tissue	histology
inter-	between	intercostal

Top Tip - Prefixes

Pay attention to common prefixes in biology to help remember vocab.

How many of these do you know?

Prefix	Meaning	Example
intra-	inside	intracellular
karyo-	nucleus	prokaryote, karyotype
amphi-, ampho-	both	amphipathic, amphibians
ana-	away, up, back, again	anabolism
a-, an-	not, without, lacking, deficient	anaerobic
epi-	above or on	epigenetics
erythro-	red or reddish in colour	erythrocyte

Top Tip - Prefixes

Pay attention to common prefixes in biology to help remember vocab.

How many of these do you know?

Prefix	Meaning	Example
eu-	true, good	eukaryote (true-nucleus)
pro-	first, before, forward,	Prokaryote (before-nucleus)
agglutin/o	clumping; sticking together	agglutination
hetero-	different	heterozygous
Homo-	The same	homozygous
zoo-	related to animals	zoonotic disease

Top Tip - Suffixes

Pay attention to common **suffixes** in biology to help remember vocab.

How many of these do you know?

Suffix	Meaning	Example
-ase	Denoting an enzyme	ATP synthase
-vasc	relating to vessels or tubes	Vascular tissue
-genic	giving rise to	mutagenic
-lysis	break down, burst	hydrolysis
-phage	the act of eating or consuming	macrophage
-philic	having a strong attraction	hydrophilic

Top Tips

Keep in mind the forgetting curve – information enters long term memory through repetition.