Brainscape

A-LEVEL BIOLOGY

A-Level Biology Practical Skills Cheat Sheet

At this stage of your A-level Biology revision, it's not just about what you know; it's about how clearly and precisely you can use that knowledge in the exam. That's why we've created this practical skills cheat sheet: to bring together the key terminology, methods, data skills, and exam phrasing that consistently show up across A-level Biology papers.

Think of this as your exam technique companion. Your core revision (especially using tools like Brainscape's digital flashcards) helps you lock in the content. This guide helps you apply it effectively, whether you're describing an experiment, analysing a graph, or evaluating a method, so you can approach practical questions with clarity and confidence.

Use This Cheat Sheet To Revise:

- How to describe common biology practical methods
- How to identify variables, controls, risks, errors, and improvements
- How to answer “suggest,” “explain,” “evaluate,” and “calculate” practical questions
- How to handle graphs, tables, uncertainty, and statistical tests
- How to connect practical work to biological theory

Additional A-level Biology Guides & Resources:

- The Most Common A-Level Biology Mistakes (And How To Avoid Them)
- Revision Planner Template & Exam Countdown Sheets
- Library of A-level Flashcards for Other Subjects & Boards
- Free Revision Timer App (Pomodoro Style)

1. The Universal Practical Skills Checklist

1.1. Before Any Biology Practical, Know These Terms

These are the core terms that sit behind almost every practical question you'll face in A-level Biology. You should recognise them **and** use them accurately and confidently in your answers. Examiners expect you to think like a scientist: to describe variables clearly, explain how a method works, and evaluate results using the right language. Getting fluent with these terms makes a huge difference, because it helps you understand exactly what the question is asking and respond in a way that earns marks.

Key Practical Skills Terminology

Core terms behind every A-level Biology practical question

Term	What It Means	Exam-Friendly Phrase
Independent variable	The factor deliberately changed	"The independent variable was..."
Dependent variable	The factor measured	"The dependent variable was measured by..."
Control variables	Factors kept the same	"This was controlled so that only the independent variable affected the result."
Validity	Whether the method tests what it is supposed to test	"The method is valid because..."
Reliability	Whether repeats give consistent results	"Reliability can be improved by repeating the experiment and calculating a mean."
Accuracy	How close the result is to the true value	"Accuracy could be improved by using apparatus with smaller divisions."
Precision	How close repeated readings are to each other	"Precision is shown by closely grouped repeat readings."
Uncertainty	The possible range of error in a measurement	"The percentage uncertainty is high because the measured value is small."
Anomaly	A result that does not fit the pattern	"This anomalous result should be investigated, not automatically ignored."

1.2. The “Practical Question” Answer Formula

When an exam question asks you to **describe** or **design a practical method**, don't just write down everything you remember. Use this checklist to build a clear, logical answer that covers the main details examiners usually look for:

1. What you changed
2. What you measured
3. What you controlled
4. How you repeated it
5. How you processed the results
6. How you stayed safe

Model sentence frame

Model sentence frame

Change **independent variable** over a suitable range. Measure **dependent variable** using **apparatus** . Keep **control variables** constant. Repeat each measurement at least three times, identify anomalies, calculate a mean, and plot a graph of **dependent variable** against **independent variable** .

Notes on graphing data

- Dependent variable goes on the Y-axis (the vertical axis)
- Independent variable goes on the X-axis (the horizontal axis)

1.3. Common Practical Command Words

Practical questions often use **command words** that tell you exactly what kind of answer to give. Learning the difference between words like describe, explain, suggest, and evaluate helps you avoid vague answers and aim your response at the marks available.

Common Practical Command Words

What students get wrong, and what to do instead

Command Word	What Students Often Do Wrong	What To Do Instead
Describe	Give vague waffle	Give clear steps in order
Explain	State what happens but not why	Link the result to biological theory
Suggest	Panic because it feels unfamiliar	Apply known practical principles to a new context
Evaluate	List pros and cons randomly	Judge validity, limitations, errors, and improvements
Calculate	Skip units or working	Show equation, substitution, answer, units
Compare	Write two separate descriptions	Use direct comparative language: “whereas,” “higher than,” “lower than”

2. High-Yield A-Level Biology Practical Themes

This section covers the practical themes that appear repeatedly across A-level Biology specifications, practical handbooks, and exam-style questions. Use it to make sure you can recognise the type of practical being tested, recall the key method and variables, and explain the biology behind the results. That way, even if the exam presents an unfamiliar scenario, you'll have the **core practical thinking** needed to respond confidently.

SECTION 2.1

Microscopy, Magnification & Biological Drawings

You Need To Know How To

- Prepare a temporary slide
- Use a light microscope
- Use an eyepiece graticule and stage micrometer
- Calculate magnification, image size, or actual size
- Produce a clear biological drawing

Common Exam Focus

- Why stains are used
- Why thin sections are needed
- How to calibrate an eyepiece graticule
- How to calculate actual size and magnification
- How to improve resolution or contrast
- How to draw cells accurately without shading

Exam-Safe Phrases

The following list provides short, reliable wording you can adapt in practical questions to make your answers more precise and mark-worthy. Don't memorise them as full scripts; use them as building blocks to help you explain the biology clearly, avoid common traps, and show examiners exactly what you mean:

- “A thin section allows light to pass through the specimen.”
- “The stain increases contrast so structures are easier to distinguish.”
- “The eyepiece graticule must be calibrated using a stage micrometer at the same magnification.”
- “A biological drawing should use clear, continuous lines and should not include sketchy shading.”

OCR provides this biological drawing skills handbook for GCE Biology A and Biology B, reflecting how important drawings, scale, and observation skills are in A-level Biology practical work.

2.2. Enzymes & Rates of Reaction

SECTION 2.2

Enzymes & Rates of Reaction

Typical Practical Focus

Investigating how temperature, pH, substrate concentration, or enzyme concentration affects the rate of an enzyme-controlled reaction.

AQA's required practical list includes an investigation into the effect of a named variable on the rate of an enzyme-controlled reaction.

Key Variables

- Independent: temperature, pH, substrate concentration, enzyme concentration
- Dependent: rate of reaction
- Controls: enzyme concentration, substrate concentration, pH, temperature, volume, reaction time

Common Errors

- Temperature fluctuates during the reaction
- Timing starts inconsistently
- Colour-change endpoint is subjective
- Volumes are measured imprecisely
- pH is not properly controlled

Improvements

- Use a thermostatically controlled water bath
- Use a colorimeter where appropriate
- Use buffer solutions to control pH
- Repeat and calculate a mean
- Use a wider range of values near the optimum

Exam-Safe Phrases

- “The rate increases as temperature rises because enzyme and substrate molecules have more kinetic energy, causing more frequent successful collisions.”
- “Above the optimum temperature, the enzyme denatures because bonds maintaining the tertiary structure are disrupted.”
- “The active site changes shape, so fewer enzyme-substrate complexes form.”

2.3. Membranes, Permeability & Beetroot

SECTION 2.3

Membranes, Permeability & Beetroot

Typical Practical Focus

Investigating the effect of temperature or solvent concentration on membrane permeability.

Key Biological Principle

Beetroot cells contain a red pigment called betalain inside the vacuole. The cell surface membrane and tonoplast (vacuolar membrane) normally prevent the pigment from escaping.

When membranes are damaged:

- Membrane proteins denature
- Phospholipid bilayer becomes disrupted and more fluid
- Membrane permeability increases
- Pigment leaks out into the surrounding solution
- Greater leakage = higher absorbance / colour intensity

Key Variables

- Independent: temperature or alcohol concentration
- Dependent: pigment leakage, often measured using colour intensity or absorbance
- Controls: size of beetroot pieces, volume of solution, time, pH, rinsing method

Common Errors

- Beetroot pieces are not the same size
- Surface pigment is not rinsed off
- Temperature is not kept constant
- Colour judgement is subjective
- Cuvettes are not wiped before the colorimeter reading

Improvements

- Use a cork borer to cut equal-sized cylinders
- Rinse beetroot pieces before the experiment
- Use a colorimeter to measure absorbance
- Use thermostatically controlled water baths
- Repeat and calculate a mean

Exam-Safe Phrases

- "Higher temperature increases membrane permeability because phospholipids gain kinetic energy, making the membrane more fluid and disrupted."
- "As the membrane becomes more permeable, more pigment diffuses out of the beetroot cells into the surrounding solution."
- "A colorimeter can be used to measure absorbance, giving a more objective measure of pigment leakage than judging colour by eye."
- "The beetroot pieces should be cut to the same size to control surface area and volume."
- "The beetroot pieces should be rinsed first to remove pigment released from damaged cells during cutting."

2.4. Chromatography & Biological Molecules

SECTION 2.4

Chromatography & Biological Molecules

Typical Practical Focus

Separating pigments, amino acids, or other biological molecules.

Key Biological Principles

- The stationary phase is the paper or chromatography medium
- The mobile phase is the solvent
- Substances separate because they have different solubilities in the solvent and different affinities for the stationary phase
- Rf values can be calculated and compared

Exam-Safe Phrases

- "Chromatography separates substances because they have different solubilities in the solvent and different affinities for the stationary phase."
- "The solvent level must be below the pencil line so the sample does not dissolve directly into the solvent reservoir."
- "A pencil line is used because pencil graphite is insoluble and will not run with the solvent."
- "The chromatogram should be removed before the solvent reaches the top so the solvent front can be marked and used to calculate Rf values."
- "Rf values can be compared with known standards to help identify the substance, but this is only valid if the chromatography was carried out under the same conditions."

2.5. Microbiology & Aseptic Technique

SECTION 2.5

Microbiology & Aseptic Technique

Typical Practical Focus

Investigating bacterial growth, antimicrobial substances, or inhibition zones.

Pearson Edexcel resources include core practical material on investigating the effect of antibiotics, and OCR examiner material references practical activity involving aseptic technique and microbial investigations.

Key Safety Points

- Sterilise equipment before use
- Work near a Bunsen flame where appropriate
- Minimise exposure of agar plates to air
- Tape plates securely but not completely sealed
- Incubate at a safe school-lab temperature (around 25°C)
- Dispose of cultures safely

Common Exam Focus

- Why aseptic technique is used
- Why plates are not fully sealed
- Why low incubation temperatures are used
- How to identify and measure zones of inhibition (measure diameter, not radius)
- Why repeats are needed
- Distinguish between sterilisation and disinfection as aseptic techniques

Common Errors

- Contamination from air
- Measuring radius instead of diameter causes inaccurate results
- Use of wrong growth media
- Different agar depth, which may affect diffusion rate

Exam-Safe Phrases

- “Aseptic technique reduces contamination by unwanted microorganisms.”
- “The plate should not be fully sealed because anaerobic pathogenic bacteria may grow.”
- “The larger the zone of inhibition, the more effective the antimicrobial substance.”
- “Sterilisation removes all microorganisms completely, whereas disinfection only reduces harmful microorganisms to safe levels.”

3. More High-Yield Practical Themes

3.6. Photosynthesis & Respiration

SECTION 3.6

Photosynthesis & Respiration

Typical Practical Focus

- Measuring photosynthesis using oxygen production, carbon dioxide uptake, or pH change
- Measuring respiration using oxygen uptake or carbon dioxide production

Photosynthesis Variables

- Independent: light intensity, wavelength, carbon dioxide concentration, temperature
- Dependent: rate of photosynthesis
- Controls: species, mass/length of plant, temperature, carbon dioxide concentration, light distance

Respiration Variables

- Independent: temperature, substrate, organism type, activity level
- Dependent: oxygen uptake or carbon dioxide production
- Controls: mass of organism, temperature, time, volume, species

Common Errors

- Counting bubbles is imprecise
- Temperature changes due to lamp heat
- Organisms differ in mass or activity
- Gas volume readings are small, increasing percentage uncertainty
- Leaks occur in respirometer apparatus

Improvements

- Measure oxygen volume rather than bubble count
- Use an LED lamp or heat filter
- Use a water bath to maintain temperature
- Use organisms of similar mass, or calculate rate per gram
- Check apparatus for leaks

Common Exam Focus

- Why potassium hydroxide / soda lime is used
- Why coloured fluid moves
- Why germinating seeds are used
- Calculation of respiratory quotient (RQ)

Exam-Safe Phrases

- “Light intensity becomes limiting at low light levels.”
- “At high light intensity, another factor such as carbon dioxide concentration or temperature may become limiting.”
- “Respiration rate can be calculated as oxygen uptake per unit time, and may be standardised per gram of tissue.”
- “Light intensity decreases with distance (the inverse square law).”

3.7. Transpiration & Potometers

SECTION 3.7

Transpiration & Potometers

Typical Practical Focus

Investigating how light intensity, temperature, humidity, or wind speed affects transpiration.

What A Potometer Actually Measures

- A potometer estimates water uptake, not transpiration directly. This is a classic exam trap.

Key Variables

- Independent: environmental factor (light, temperature, humidity, wind speed)
- Dependent: distance moved by air bubble per unit time, or volume of water uptake per unit time
- Controls: leaf area, species, temperature, humidity, light intensity, wind speed

Common Errors

- Air leaks in the apparatus
- Water uptake is assumed to equal water loss
- Leaf area differs between samples
- Environmental factors are not isolated

Exam-Safe Phrases

- “The potometer measures water uptake, which is used as an estimate of transpiration rate.”
- “The apparatus must be airtight so that bubble movement is due to water uptake only.”
- “Increased wind speed removes humid air from around the stomata, maintaining a steep water potential gradient.”

3.8. Ecology, Sampling, Quadrats & Transects

SECTION 3.8

Ecology, Sampling, Quadrats & Transects

Typical Practical Focus

Investigating distribution, abundance, biodiversity, or the effect of abiotic factors.

Pearson Edexcel resources include a core practical on carrying out an ecological study using quadrats and transects to determine distribution and abundance, and AQA includes required practical work on field investigations into species distribution and environmental factors.

Sampling Methods

- Random quadrats — estimate abundance without bias
- Belt transect — study changes across an environmental gradient
- Line transect — record species touching a line
- Systematic sampling — sample at regular intervals

Common Exam Focus

- Why random sampling reduces bias
- Why a large sample size improves reliability
- How abiotic factors affect distribution
- How to calculate mean, percentage cover, species frequency, or diversity index
- How to evaluate sampling limitations
- Difference between population and community

Exam-Safe Phrases

- “Random sampling reduces selection bias.”
- “A larger number of quadrats gives a more representative estimate.”
- “A transect is suitable when investigating distribution across an environmental gradient.”
- “A population contains organisms of one species, whereas a community contains populations of different species living together.”
- “Population density is the number of individuals of a species per unit area or volume, usually estimated using quadrats and transects.”

SECTION 3.9

Dissection & Organ Systems

Typical Practical Focus

Examining the structure of organs such as the heart, lungs, kidneys, or plant transport tissue.

Common Exam Focus

- Identifying structures (organ identification)
- Linking structure to function
- Explaining limitations of dissection
- Drawing or labelling biological structures
- Using safe dissection technique

Exam-Safe Phrases

- “Dissection allows the gross structure of an organ to be observed directly, including the arrangement of tissues and major vessels.”
- “The structure of the organ can be linked to its function, such as thicker muscular walls where higher pressure is needed.”
- “Fine cellular detail cannot usually be seen by dissection alone, so microscopy may be needed to observe tissues or cells in more detail.”

SECTION 3.10

DNA, Genetics & Molecular Biology Techniques

Typical Practical Focus

- DNA extraction
- Gel electrophoresis
- Genetic crosses or statistical testing
- Investigating variation

Common Exam Focus

- Why detergent is used in DNA extraction
- Why salt may be used
- Why DNA precipitates in cold ethanol
- How electrophoresis separates fragments
- How to interpret banding patterns

Exam-Safe Phrases

- “Detergent breaks down the cell and nuclear membranes.”
- “Cold ethanol causes DNA to precipitate because DNA is insoluble in ethanol.”
- “Smaller DNA fragments move further through the gel.”

4. Data, Graphs, Statistics & Last-Minute Exam Phrases

This final section brings together the data-handling and exam-technique skills that often make the difference between a decent answer and a stronger, more precise one. Use it to check that you can choose the right graph, present results clearly, understand uncertainty and error, and use practical vocabulary confidently when explaining or evaluating experimental data.

4.1. Choosing The Right Graph

Choosing The Right Graph

Pick the right display for the data you have

Data Type	Best Display	Example
Continuous independent variable	Line graph or scatter graph	Temperature vs enzyme rate
Categoric independent variable	Bar chart	Species A vs Species B
Relationship between two continuous variables	Scatter graph	Light intensity vs photosynthesis rate
Percentage composition	Bar chart or pie chart	Percentage cover of species

Graph Checklist

- Label both axes with units
- Use a sensible scale
- Plot points accurately
- Draw a line of best fit when appropriate
- Do not force the line through the origin unless biologically justified
- Include error bars if asked
- Refer to the graph using data, not vague claims

OCR provides student checklists for graphs, tables, and drawings as part of its A-level Biology practical support materials, reinforcing that data presentation is an assessed practical skill.

4.2. Tables Checklist

A good results table should:

- Have clear column headings
- Include units in headings, not repeatedly in the body
- Record raw data before processed data
- Use consistent decimal places
- Include repeats and means
- Make anomalies visible

4.3. Uncertainty & Error

Absolute Uncertainty

Usually based on the measuring instrument. For example:

- Ruler marked in 1 mm divisions: uncertainty may be ±0.5 mm
- Measuring cylinder marked every 1 cm^3: uncertainty may be ±0.5 cm^3

Percentage Uncertainty

Percentage uncertainty = absolute uncertainty ÷ measured value × 100, where absolute uncertainty = |measured value − true value|.

Exam-Safe Phrases

- "The percentage uncertainty is larger when the measured value is small."
- "Using apparatus with smaller scale divisions would reduce uncertainty."
- "Repeats reduce the effect of random error but do not remove systematic error."

4.4. Random vs Systematic Error

Random vs Systematic Error

Two types of error, two different fixes

Type of Error	What It Means	Example	Improvement
Random error	Unpredictable variation between readings	Human reaction time when using a stopwatch	Repeat and calculate a mean
Systematic error	Readings are consistently too high or too low	Balance not zeroed	Calibrate or zero the apparatus

4.5. Statistical Tests Students Should Recognise

AQA updated its AS and A-level Biology practical handbook in 2026 to clarify statistical tests in relation to practical work, a useful reminder that practical revision should include data analysis, not just methods.

Statistical Tests You Should Recognise

Match the right test to the question

Statistical Test	Used For	Typical Biology Example
Student's t-test	Comparing means between two groups	Mean plant growth in two conditions
Chi-squared test	Comparing observed and expected frequencies	Genetic inheritance ratios
Spearman's rank correlation	Testing correlation between two variables	Abiotic factor vs species abundance
Standard deviation	Spread of data around the mean	Variation in repeat measurements

Exam-Safe Phrases

- "A statistical test is used to determine whether the difference or correlation is likely to be significant rather than due to chance."
- "The null hypothesis (H) states that there is no significant difference or correlation between the variables being tested."
- "The alternative hypothesis (H or H) states that there is a significant difference or correlation between the variables being tested."
- "If the calculated value is greater than the critical value, the result is significant and the null hypothesis can be rejected." This is the decision-making rule.

4.6. "Improve This Practical" Phrase Bank

Use these when asked how to improve validity, accuracy, precision, or reliability:

- "Repeat the investigation and calculate a mean."
- "Use a wider range of values for the independent variable."
- "Use smaller intervals around the apparent optimum."
- "Control temperature using a thermostatically controlled water bath."
- "Use a colorimeter rather than judging colour by eye."
- "Use a larger sample size to make the data more representative."
- "Use random sampling to reduce bias."
- "Standardise the mass, size, age, or surface area of biological material."
- "Calibrate the measuring instrument before use."
- "Use apparatus with smaller scale divisions to reduce uncertainty."

4.7. Final 10-Minute Practical Skills Self-Test

Before the exam, can you answer these?

1. What is the independent variable?
2. What is the dependent variable?
3. What are three control variables?
4. How would you repeat the method?
5. How would you calculate a mean?
6. What graph would you draw?
7. What are the main sources of error?
8. How could the method be improved?
9. What safety issue applies?
10. What biological theory explains the result?

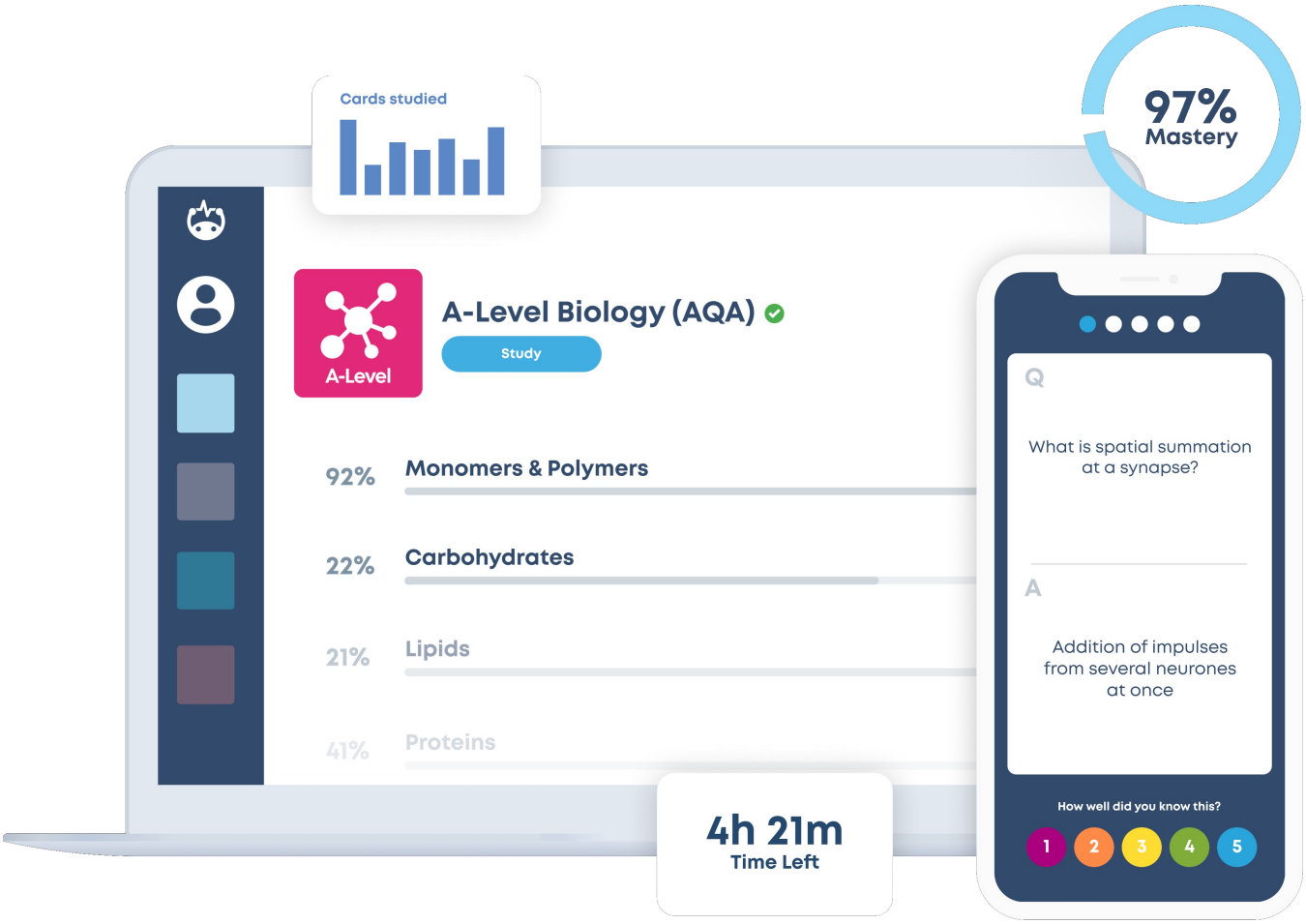
Pair Practical Technique With Rock-Solid Knowledge

Know the content. Use the skills. Practise the exam.

This cheat sheet gives you the practical skills, vocabulary, and exam technique you need to answer A-level Biology questions more clearly and confidently. But practical know-how is only half the battle. To really perform in the exam, you also need the core content knowledge deeply stored in long-term memory, so you can retrieve the right terms, processes, and explanations quickly under pressure.

That's where Brainscape's A-level Biology flashcards come in. They help you systematically ingrain the facts, definitions, mechanisms, and theory behind the practical questions, giving you the intellectual arsenal you need to explain results, analyse data, and build precise, mark-worthy answers.

Use this cheat sheet alongside Brainscape's flashcards and regular exam practice for a more complete revision strategy. And when you download the A-level Biology flashcards, you'll also get **three free A-level Biology practice papers** so you can put your knowledge, skills, and exam technique to the test.


Cards studied
97%
Mastery
A-Level
A-Level Biology (AQA)
Study
92%
Monomers & Polymers
22%
Carbohydrates
21%
Lipids
41%
Proteins
4h 21m
Time Left
Q
What is spatial summation at a synapse?
A
Addition of impulses from several neurones at once
How well did you know this?
1
2
3
4
5