GCSE Science

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# Learning Gaps in GCSE Science: A National Picture

## Outlining the most common knowledge gaps across Y10-11 Science

# A Letter from our Founder

Dear teachers,

## We understand (some of) the challenges teachers are facing at the moment, and we know that it's a tricky time to be working in schools. We want to help you support your students to succeed.

"Learning Gaps in GCSE Science – a national picture" has been put together using loads of data points that we've gathered on Educake during the past couple of years. You'll find information on notoriously tricky subjects that students have to contend with in GCSE Science. It covers topics from biology, chemistry, physics and mathematical science. I hope you'll find it useful.

Whether you've been teaching for decades or are just getting started in your career (or somewhere in between), this guide provides handy insight on the most challenging topics. We've also considered learning gaps more generally, with examples of what can cause them. Potential issues around motivation, communication and environmental influences are all factors when addressing classroom progress.

We've highlighted the top three tricky topics in each subject and given you some sample questions. If you want to review the full picture across GCSE Science, we've also included the complete results, collated from millions of student responses.

I hope you'll agree that this is more than just a data dump. You're getting up-to-date information on the national understanding of GCSE Science, an explanation of learning gaps, and ideas for how to tackle the challenges.

Thanks for reading and I hope you'll share your feedback with me.

**Charley Darbishire**
Founder, Educake

> **"It's wonderful. One of our vital tools for keeping pupils engaged, motivated and learning."**
>
> **Second in science, Archbishop Temple Church of England High School**

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## Contents



> "Educake simply has to be one of the easiest interfaces for teachers to use, making it easy to gauge student effort and progression."
>
> **Marco**
> Teacher of Science

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# What types of learning gaps could your classroom (or teachers) be facing?

Learning gaps can stem from a variety of places and reasons–and they are not just limited to students. Teachers can often feel overwhelmed with the number of modules and focused time required within the science subjects.

Before we breakdown the national picture of science understanding, we wanted to explore the six key learning gaps that can impact confidence, comprehension, and results. Helping us understand these gaps is vitally important and can help teachers with focused support, lesson plans, and homework tasks.

1. **Knowledge Gaps:** the most common learning challenge for any student is a knowledge gap in the subject or topic. Students need to learn or be exposed to the correct information.

2. **Teaching Gaps:** it's easy for teachers to feel imposter syndrome, especially those newly qualified or new to their teaching careers, or those where science just isn't their strength. The science curriculum covers a lot of subjects and modules, so it's not unusual for teachers to have some of their own knowledge gaps on specific topics. Finding the right resources and evaluation tools is crucial to bridge these gaps so students can flourish.

3. **Skills Gaps:** these gaps may not relate to the actual subject, but a wider learning gap across all education. Students must have the practice necessary to develop the everyday skills required to complete tasks. The most common skills gaps include critical thinking, problem-solving, and communication skills.

4. **Motivation Gaps:** students may need motivation to apply themselves to learning. This could be a need for more understanding of how learning skills in a particular subject could enhance their lives or future careers. Students may need more motivation to advance their knowledge or skills in a school environment due to low self-esteem.

5. **Environmental Gaps:** students need an environment conducive to learning. These learning gaps are related to the external system, namely the school, peer pressure, the family, the community, and the media. They are the social systems in which other people influence students daily.

6. **Communication Gaps:** this relates to language issues and learners' verbal and non-verbal communication gaps. Students can experience breakdowns in communication with teachers, the learning material, and peers. An example could be a lack of listening or hearing skills to understand tasks or new information.

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# Revealing the national student learning gaps across science subjects

Bespoke year 10 pupil data collected by Educake over the past two academic years reveals the key learning gaps across all science modules.

After collating and examining UK-wide data collected through Educake's online learning and assessment platform, we've built a national picture of science knowledge across biology, chemistry, physics and maths for science. Through this, we have been able to identify the most common learning gaps within each science unit across the board at a national level.

Identifying learning gaps within schools can be a real challenge. Understand and automatically tackle your students' misunderstandings of science, with Educake.

## Key findings from National Year 10 Data from academic year 2022/23 (See full summary-page 9)

First, let's look at the top three units across each subject with the lowest average performance.

### Biology

**Biology Practicals / Homeostasis & Response / Inheritance & Evolution**

Example quiz question: **Which unit is most suitable for measuring the length of a cell?**

### Chemistry

**Chemistry Practicals / Energy Changes / Quantitative Chemistry**

Example quiz question: **What colour flame do sodium ions give?**

### Physics

**Physics Practicals / Forces / Electricity**

Example quiz question: **Describe how the resistance of a filament lamp changes as the current through it increases.**

### Maths for Science

**Physics Equations / Graphs / Arithmetic and Numerical Computations**

Example quiz question: **What is the total magnification of a light microscope with an eyepiece lens of ×10 & objective lens of ×40?**

# Top Three Trickiest Topics Per Subject- Year 10 National Average Results/ Academic Year 2022-2023

| SCIENCE SUBJECT | Topic | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|
| **BIOLOGY** | 1. Field Investigations | 60% | 55.7% | -4.3% |
| | 2. Reflex Arcs | 59.8% | 59.9% | +0.1% |
| | 3. Cloning | 67.2% | 61.2% | -6.0% |

| SCIENCE SUBJECT | Topic | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|
| **CHEMISTRY** | 1. Identifying Ions Practical | 55.0% | 43.2% | -11.8% |
| | 2. Energy Change of Reactions | 53.3% | 51.4% | -1.9% |
| | 3. Amounts of Substances 1 | 55.0% | 55.9% | +0.9% |

| SCIENCE SUBJECT | Topic | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|
| **PHYSICS** | 1. Acceleration | 54.6% | 51.8% | -2.8% |
| | 2. Specific Heat Capacity | 54.6% | 53.7% | -1.0% |
| | 3. Acceleration 1 | 58.1% | 54.9% | -3.2% |

| SCIENCE SUBJECT | Topic | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|
| **MATHS FOR SCIENCE** | 1. Selecting Equations | 32.6% | 34.1% | +1.5% |
| | 2. Slope of a Tangent Curve | 44.4% | 44.7% | +0.3% |
| | 3. Forces Equations | 49.3% | 47.3% | -2.1% |

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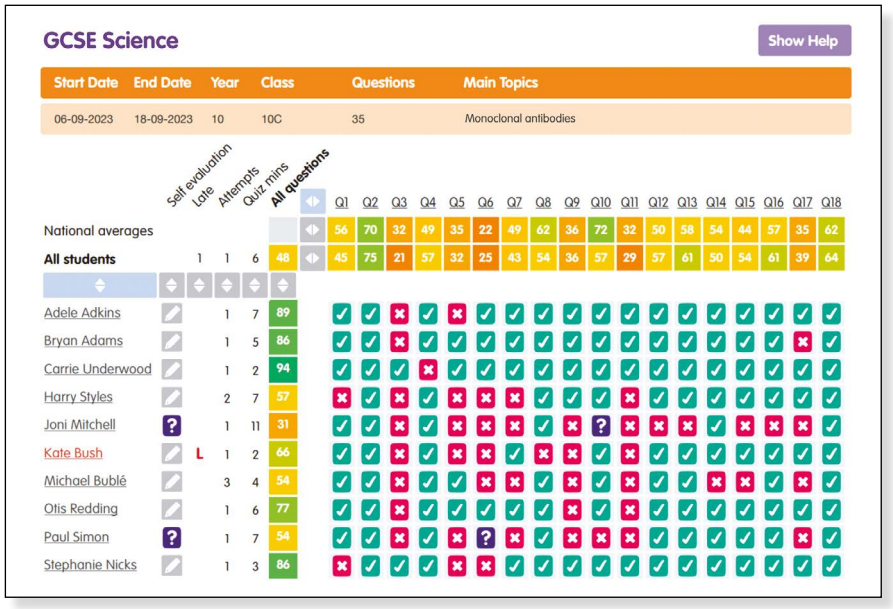
# Reduce your students' learning gaps and make the knowledge stick, with Educake

What if you could pinpoint the understanding and misconceptions for every student in your class, mapped against the national averages? And what if you could automatically provide customised, low-stakes quizzes targeted at the knowledge gaps of each individual student? Welcome to Educake.




## How can Educake reduce the knowledge gaps in your classroom?

**KNOWLEDGE GAPS: Retrieval Practice** Students can read the same revision guide repeatedly, but the learning will only stick if they actively engage with the material.

**COMMUNICATION GAPS: Feedback** Answer explanations help students understand why an answer is correct and provide added context. This saves time for the teacher and promotes independent study and revision from the student.

**SKILLS GAPS: Spaced Repetition** Repetition is a known teaching practice to ensure understanding of a topic is more firmly embedded in their long-term memory. Create spaced repetition routines easily by scheduling quizzes in advance or have students revisit earlier tests.

**MOTIVATIONAL GAPS: Interleaving** Switching between science topics while learning allows students to create links in their own understanding and distinguish between concepts.

**Plug learning gaps with online homework and revision. Educake saves time for teachers and builds student confidence. Try it with your class for free, today.**

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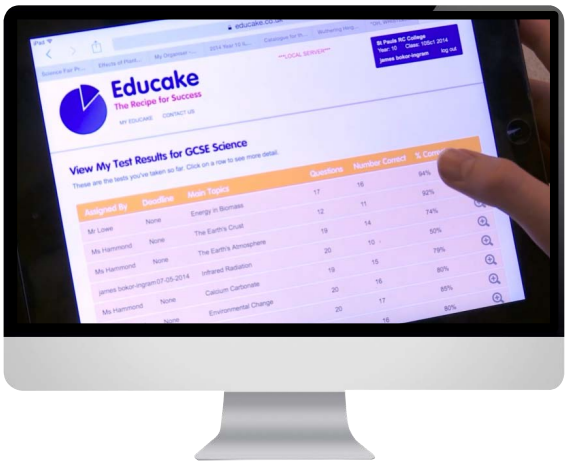


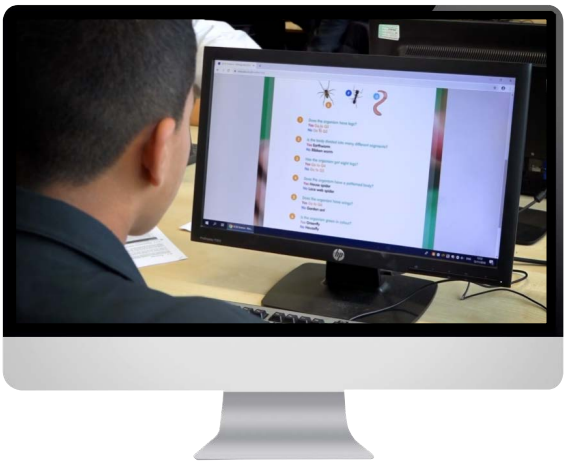

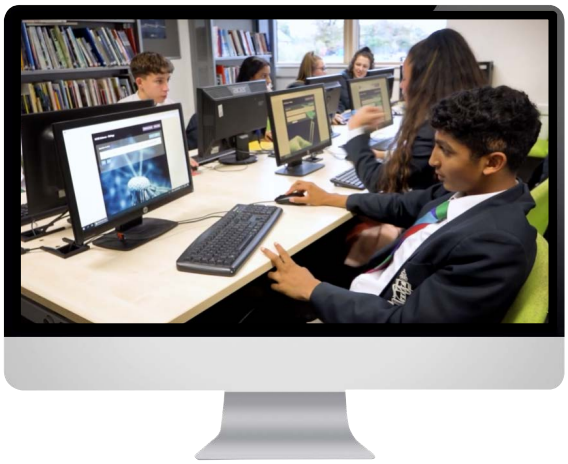

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www.educake.co.uk

# Science/Biology National Performance Data Year 10 Avg Results/Academic Year 2021-2023

| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Biology | Biology Practicals | Field investigations | 60.0 | 55.7 | -4.3 |
| Biology | 4.5 Homeostasis and Response (Paper 2) | Reflex arcs | 59.8 | 59.9 | +0.1 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | Cloning (separate biology only) | 67.2 | 61.2 | -6.0 |
| Biology | 4.2 Organisation (Paper 1) | Structure of plants | 62.8 | 62.6 | -0.2 |
| Biology | Biology Practicals | Osmosis | 65.3 | 62.7 | -2.5 |
| Biology | 4.1 Cell Biology (Paper 1) | Cell specialisation | 62.8 | 62.8 | -0.0 |
| Biology | 4.1 Cell Biology (Paper 1) | Diffusion and osmosis | 63.5 | 63.3 | -0.2 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | Gene technology | 65.0 | 63.5 | -1.5 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | DNA and genetics (separate biology only) | 65.2 | 63.8 | -1.4 |
| Biology | 4.5 Homeostasis and Response (Paper 2) | The eye (separate biology only) | 64.6 | 64.4 | -0.1 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | DNA basics | 64.9 | 64.8 | -0.1 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | The theory of evolution | 64.5 | 65.1 | +0.6 |
| Biology | 4.7 Ecology (Paper 2) | Distribution of organisms | 65.5 | 65.3 | -0.2 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | Reproduction 2 | 65.1 | 65.7 | +0.6 |
| Biology | 4.3 Infection and Response (Paper 1) | Monoclonal antibodies (separate biology only) | 65.3 | 65.7 | +0.4 |
| Biology | 4.5 Homeostasis and Response (Paper 2) | The human endocrine system: urinary system (separate biology only) | 67.2 | 65.9 | -1.3 |
| Biology | 4.1 Cell Biology (Paper 1) | Active transport | 65.4 | 65.9 | +0.5 |
| Biology | 4.5 Homeostasis and Response (Paper 2) | Homeostasis and the nervous system | 64.7 | 66.0 | +1.3 |

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| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Biology | 4.3 Infection and Response (Paper 1) | Antibiotics, painkillers and drugs | 65.3 | 66.0 | +0.8 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | Genetics and inheritance | 66.1 | 66.0 | -0.0 |
| Biology | 4.2 Organisation (Paper 1) | Blood | 65.4 | 66.5 | +1.1 |
| Biology | 4.4 Bioenergetics (Paper 1) | Aerobic and anaerobic respiration | 66.1 | 66.5 | +0.5 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | Species and classification | 61.1 | 67.0 | +5.9 |
| Biology | 4.7 Ecology (Paper 2) | Food production (separate biology only) | 64.7 | 67.3 | +2.6 |
| Biology | 4.5 Homeostasis and Response (Paper 2) | The human endocrine system: blood glucose levels | 66.4 | 67.5 | +1.1 |
| Biology | 4.2 Organisation (Paper 1) | Human digestive enzymes | 67.5 | 67.6 | +0.1 |
| Biology | 4.4 Bioenergetics (Paper 1) | Exercise and metabolism | 66.2 | 67.6 | +1.4 |
| Biology | 4.5 Homeostasis and Response (Paper 2) | Human reproduction | 67.6 | 67.6 | +0.0 |
| Biology | 4.4 Bioenergetics (Paper 1) | Photosynthesis | 67.5 | 68.0 | +0.6 |
| Biology | 4.5 Homeostasis and Response (Paper 2) | The brain, central nervous system and thermoregulation (separate biology only) | 68.9 | 68.4 | -0.5 |
| Biology | 4.2 Organisation (Paper 1) | Human circulatory system | 69.4 | 68.7 | -0.8 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | Theory of evolution (separate biology only) | 71.5 | 69.4 | -2.0 |
| Biology | Biology Practicals | Photosynthesis | 71.6 | 69.6 | -1.9 |
| Biology | Biology Practicals | Food tests | 68.6 | 69.7 | +1.0 |
| Biology | 4.1 Cell Biology (Paper 1) | Cell division | 69.2 | 69.9 | +0.7 |
| Biology | 4.2 Organisation (Paper 1) | Principles of organisation | 70.5 | 70.0 | -0.5 |
| Biology | 4.3 Infection and Response (Paper 1) | Plant disease (separate biology only) | 70.1 | 70.2 | +0.1 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | Variation | 70.5 | 70.6 | +0.1 |
| Biology | 4.1 Cell Biology (Paper 1) | Cells, tissues and organs | 69.0 | 70.7 | +1.7 |

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National Performance Data

| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Biology | 4.5 Homeostasis and Response (Paper 2) | Plant hormones (separate biology only) | 70.1 | 70.7 | +0.5 |
| Biology | 4.7 Ecology (Paper 2) | Waste management and recycling | 70.1 | 70.9 | +0.7 |
| Biology | 4.5 Homeostasis and Response (Paper 2) | Kidney failure (separate biology only) | 71.2 | 71.1 | -0.1 |
| Biology | 4.1 Cell Biology (Paper 1) | Microscopy | 68.8 | 71.1 | +2.3 |
| Biology | 4.3 Infection and Response (Paper 1) | Preventing diseases | 71.5 | 71.3 | -0.2 |
| Biology | 4.7 Ecology (Paper 2) | Ecosystems (separate biology only) | 65.6 | 71.7 | +6.1 |
| Biology | 4.3 Infection and Response (Paper 1) | Communicable diseases | 72.2 | 71.8 | -0.4 |
| Biology | Biology Practicals | Enzymes | 71.2 | 72.1 | +0.8 |
| Biology | 4.7 Ecology (Paper 2) | Communities | 73.7 | 73.6 | -0.1 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | Reproduction 1 | 73.6 | 73.6 | -0.0 |
| Biology | Biology Practicals | Microbiology | 76.2 | 73.9 | -2.3 |
| Biology | 4.2 Organisation (Paper 1) | Non-communicable diseases | 74.5 | 74.1 | -0.4 |
| Biology | 4.1 Cell Biology (Paper 1) | Culturing microorganisms (separate biology only) | 76.0 | 74.6 | -1.4 |
| Biology | Biology Practicals | Reaction time | 75.7 | 74.9 | -0.9 |
| Biology | Biology Practicals | Decay | 80.4 | 75.2 | -5.2 |
| Biology | 4.7 Ecology (Paper 2) | Biodiversity | 74.2 | 75.2 | +1.1 |
| Biology | 4.7 Ecology (Paper 2) | Decomposition (separate biology only) | 75.8 | 76.0 | +0.2 |
| Biology | 4.7 Ecology (Paper 2) | Land use and deforestation | 75.3 | 77.3 | +2.0 |
| Biology | Biology Practicals | Germination | 72.2 | 77.5 | +5.2 |
| Biology | 4.6 Inheritance, Variance and Evolution (Paper 2) | Natural selection | 75.8 | 77.9 | +2.1 |
| Biology | Biology Practicals | Microscopy | 78.2 | 77.9 | -0.2 |
| Biology | 4.7 Ecology (Paper 2) | Environmental change | 78.6 | 78.7 | +0.0 |

# Science/Chemistry National Performance Data Year 10 Avg Results/Academic Year 2021-2023

| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Chemistry | Chemistry Practicals | Identifying ions | 55.0 | 43.2 | -11.8 |
| Chemistry | 4.5 Energy Changes (Paper 1) | Energy change of reactions | 53.3 | 51.4 | -1.9 |
| Chemistry | 4.3 Quantitative Chemistry (Paper 1) | Amounts of substances 1 | 55.0 | 55.9 | +0.9 |
| Chemistry | 4.3 Quantitative Chemistry (Paper 1) | Amounts of substances 2 | 56.7 | 56.1 | -0.6 |
| Chemistry | 4.3 Quantitative Chemistry (Paper 1) | Relative formula mass | 56.8 | 57.3 | +0.6 |
| Chemistry | 4.3 Quantitative Chemistry (Paper 1) | Concentration and volume (separate chemistry only) | 57.0 | 57.6 | +0.6 |
| Chemistry | Chemistry Practicals | Making salts | 59.0 | 57.9 | -1.1 |
| Chemistry | 4.4 Chemical Changes (Paper 1) | Electrolysis 2 | 58.5 | 58.1 | -0.4 |
| Chemistry | 4.8 Chemical Analysis (Paper 2) | Identifying carbonates, halides and sulfates (separate chemistry only) | 60.5 | 59.2 | -1.3 |
| Chemistry | Chemistry Practicals | Electrolysis | 59.4 | 60.3 | +0.9 |
| Chemistry | 4.7 Organic Chemistry (Paper 2) | Polymers 2 (separate chemistry only) | 62.6 | 61.0 | -1.6 |
| Chemistry | 4.9 Chemistry of the Atmosphere (Paper 2) | Atmospheric pollutants | 62.0 | 61.4 | -0.6 |
| Chemistry | 4.7 Organic Chemistry (Paper 2) | Carboxylic acids (separate chemistry only) | 64.4 | 61.5 | -2.9 |
| Chemistry | Chemistry Practicals | Chromatography | 61.7 | 61.6 | -0.1 |
| Chemistry | 4.4 Chemical Changes (Paper 1) | Reactions of acids with metals | 61.2 | 62.1 | +0.9 |
| Chemistry | 4.8 Chemical Analysis (Paper 2) | Identifying metal ions (separate chemistry only) | 63.9 | 62.1 | -1.8 |
| Chemistry | 4.4 Chemical Changes (Paper 1) | Soluble salts | 62.2 | 62.2 | -0.1 |

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| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Chemistry | 4.1 Atomic Structure and the Periodic Table (Paper 1) | Group 7 | 62.6 | 62.6 | -0.0 |
| Chemistry | Chemistry Practicals | Hazard Symbols | 61.5 | 62.7 | +1.2 |
| Chemistry | 4.2 Bonding, Structure and the Properties of Matter (Paper 1) | Giant covalent structures | 63.1 | 62.8 | -0.3 |
| Chemistry | Chemistry Practicals | Neutralisation (separate chemistry only) | 60.7 | 62.9 | +2.3 |
| Chemistry | Chemistry Practicals | Temperature changes | 62.2 | 63.2 | +1.0 |
| Chemistry | Chemistry Practicals | Water purification | 57.5 | 64.1 | +6.6 |
| Chemistry | 4.7 Organic Chemistry (Paper 2) | Hydrocarbons and cracking | 63.8 | 64.2 | +0.4 |
| Chemistry | 4.4 Chemical Changes (Paper 1) | Reactivity of metals | 64.7 | 64.3 | -0.4 |
| Chemistry | 4.5 Energy Changes (Paper 1) | Exothermic and endothermic reactions | 65.0 | 64.3 | -0.6 |
| Chemistry | 4.8 Chemical Analysis (Paper 2) | Instrumental methods of identifying ions (separate chemistry only) | 69.1 | 64.4 | -4.7 |
| Chemistry | 4.6 The Rate and Extent of Chemical Change (Paper 2) | Changing conditions at equilibrium | 63.9 | 64.7 | +0.8 |
| Chemistry | 4.3 Quantitative Chemistry (Paper 1) | Yield and atom economy (separate chemistry only) | 67.5 | 64.8 | -2.8 |
| Chemistry | 4.3 Quantitative Chemistry (Paper 1) | Conservation of mass | 67.6 | 65.1 | -2.5 |
| Chemistry | 4.7 Organic Chemistry (Paper 2) | Polymers 1 (separate chemistry only) | 67.0 | 65.1 | -1.8 |
| Chemistry | 4.2 Bonding, Structure and the Properties of Matter (Paper 1) | Chemical bonds | 65.7 | 65.4 | -0.3 |
| Chemistry | 4.4 Chemical Changes (Paper 1) | Reactions of acids with bases or carbonates | 65.1 | 65.7 | +0.5 |
| Chemistry | 4.4 Chemical Changes (Paper 1) | Electrolysis 1 | 66.2 | 66.0 | -0.2 |
| Chemistry | 4.1 Atomic Structure and the Periodic Table (Paper 1) | Group 1 | 65.3 | 66.1 | +0.7 |
| Chemistry | 4.2 Bonding, Structure and the Properties of Matter (Paper 1) | Types of compounds | 65.4 | 66.3 | +0.9 |

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| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Chemistry | 4.10 Using Resources (Paper 2) | Life cycle assessments and recycling | 69.0 | 66.7 | -2.3 |
| Chemistry | 4.6 The Rate and Extent of Chemical Change (Paper 2) | Calculating rates of reaction | 65.9 | 66.7 | +0.8 |
| Chemistry | 4.10 Using Resources (Paper 2) | Useful materials (separate chemistry only) | 69.9 | 66.8 | -3.1 |
| Chemistry | 4.10 Using Resources (Paper 2) | Water treatment | 68.8 | 66.9 | -1.9 |
| Chemistry | 4.8 Chemical Analysis (Paper 2) | Purity, formulations and chromatography | 65.8 | 67.0 | +1.2 |
| Chemistry | 4.5 Energy Changes (Paper 1) | Chemical cells and fuel cells (separate chemistry only) | 68.5 | 67.0 | -1.5 |
| Chemistry | 4.1 Atomic Structure and the Periodic Table (Paper 1) | Mixtures | 67.1 | 67.3 | +0.2 |
| Chemistry | 4.4 Chemical Changes (Paper 1) | The pH scale and neutralisation | 66.6 | 67.4 | +0.7 |
| Chemistry | 4.1 Atomic Structure and the Periodic Table (Paper 1) | Atomic models | 67.8 | 67.4 | -0.4 |
| Chemistry | 4.2 Bonding, Structure and the Properties of Matter (Paper 1) | Metals and alloys | 69.2 | 68.5 | -0.7 |
| Chemistry | 4.6 The Rate and Extent of Chemical Change (Paper 2) | Increasing the rate of reaction | 68.1 | 68.6 | +0.5 |
| Chemistry | 4.2 Bonding, Structure and the Properties of Matter (Paper 1) | Nanoscience (separate chemistry only) | 67.7 | 69.2 | +1.5 |
| Chemistry | 4.7 Organic Chemistry (Paper 2) | Structure and reactions of alkenes (separate chemistry only) | 69.0 | 69.3 | +0.2 |
| Chemistry | 4.1 Atomic Structure and the Periodic Table (Paper 1) | The periodic table | 68.8 | 69.3 | +0.5 |
| Chemistry | 4.9 Chemistry of the Atmosphere (Paper 2) | Composition of Earth's atmosphere | 69.5 | 69.9 | +0.3 |
| Chemistry | 4.10 Using Resources (Paper 2) | Earth's resources | 71.3 | 70.3 | -1.0 |
| Chemistry | 4.6 The Rate and Extent of Chemical Change (Paper 2) | Reversible reactions | 70.7 | 70.4 | -0.3 |
| Chemistry | Chemistry Practicals | Rates of reaction | 70.3 | 71.1 | +0.8 |
| Chemistry | 4.1 Atomic Structure and the Periodic Table (Paper 1) | Group 0 | 71.9 | 71.8 | -0.1 |
| Chemistry | 4.7 Organic Chemistry (Paper 2) | Alcohols (separate chemistry only) | 71.5 | 71.9 | +0.4 |

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| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Chemistry | 4.7 Organic Chemistry (Paper 2) | Crude oil, hydrocarbons and alkanes | 72.4 | 71.9 | -0.4 |
| Chemistry | 4.10 Using Resources (Paper 2) | Corrosion (separate chemistry only) | 73.1 | 71.9 | -1.1 |
| Chemistry | 4.9 Chemistry of the Atmosphere (Paper 2) | Carbon footprints and climate change | 72.4 | 72.0 | -0.5 |
| Chemistry | 4.10 Using Resources (Paper 2) | The Haber process (separate chemistry only) | 70.6 | 72.2 | +1.6 |
| Chemistry | 4.10 Using Resources (Paper 2) | NPK fertilisers (separate chemistry only) | 65.7 | 72.3 | +6.6 |
| Chemistry | 4.8 Chemical Analysis (Paper 2) | Identifying common gases | 76.5 | 74.3 | -2.2 |
| Chemistry | 4.6 The Rate and Extent of Chemical Change (Paper 2) | Rates of reaction and collision theory | 75.0 | 74.9 | -0.1 |
| Chemistry | 4.9 Chemistry of the Atmosphere (Paper 2) | The greenhouse effect | 76.7 | 75.9 | -0.8 |
| Chemistry | 4.1 Atomic Structure and the Periodic Table (Paper 1) | Atoms, elements, and compounds: the basics | 77.8 | 78.3 | +0.5 |
| Chemistry | 4.1 Atomic Structure and the Periodic Table (Paper 1) | The transition metals (separate chemistry only) | 78.2 | 78.6 | +0.4 |
| Chemistry | 4.2 Bonding, Structure and the Properties of Matter (Paper 1) | States of matter | 81.2 | 80.6 | -0.7 |

# Maths for Science National Performance Data Year 10 Avg Results/Academic Year 2021-2023

| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Maths for Science | Physics Equations | Selecting equations | 32.6 | 34.1 | +1.5 |
| Maths for Science | Graphs | Draw and use the slope of a tangent to a curve as a measure of rate of change (not needed for Separate Biology or Physics) | 44.4 | 44.7 | +0.3 |
| Maths for Science | Physics Equations | Forces equations 2 | 49.3 | 47.3 | -2.1 |
| Maths for Science | Physics Equations | Rearranging equations | 40.6 | 47.8 | +7.2 |
| Maths for Science | Physics Equations | Equations for motion along a line | 57.4 | 51.3 | -6.2 |
| Maths for Science | Physics Equations | Density equation | 47.4 | 52.3 | +4.8 |
| Maths for Science | Graphs | Understand the physical significance of area between a curve and the x-axis and measure it by counting squares as appropri-ate (not needed for Separate Biology or Chemistry) | 57.9 | 52.6 | -5.3 |
| Maths for Science | Arithmetic and Numerical Computation | Make estimates of the results of simple calculations | 52.7 | 56.9 | +4.2 |
| Maths for Science | Physics Equations | Wave speed equation | 54.7 | 52.8 | -1.9 |
| Maths for Science | Physics Equations | Forces equations 1 | 55.6 | 53.9 | -1.7 |
| Maths for Science | Physics Equations | Equations for changes in energy | 56.5 | 54.4 | -2.1 |
| Maths for Science | Physics Equations | Equations for power in circuits | 59.5 | 55.0 | -4.5 |

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| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Maths for Science | Physics Equations | Forces and momentum equations | 61.9 | 56.1 | -5.8 |
| Maths for Science | Physics Equations | Efficiency equations | 52.4 | 57.1 | +4.7 |
| Maths for Science | Physics Equations | Equations for energy transfers in everyday appliances | 55.7 | 58.1 | +2.4 |
| Maths for Science | Graphs | Translate information between graphical and numeric form | 63.7 | 58.8 | -4.8 |
| Maths for Science | Handling Data | Make order of magnitude calculations | 60.0 | 59.3 | -0.7 |
| Maths for Science | Physics Equations | Power equations | 55.3 | 59.6 | +4.3 |
| Maths for Science | Handling Data | Find arithmetic means | 61.3 | 60.8 | -0.4 |
| Maths for Science | Graphs | Understand that y = mx + c represents a linear relationship and determine the slope and intercept of a linear graph | 68.5 | 61.2 | -7.3 |
| Maths for Science | Physics Equations | Current, potential difference, and resistance equations | 58.8 | 62.0 | +3.3 |
| Maths for Science | Handling Data | Understand the terms mean, mode and median (not needed for Separate Chemistry) | 68.5 | 63.1 | -5.4 |
| Maths for Science | Arithmetic and Numerical Computation | Use ratios, fractions and percentages | 63.8 | 63.8 | -0.0 |
| Maths for Science | Algebra | Understand and use the symbols: =, <, <<, >>, >, ~ | 58.4 | 64.1 | +5.7 |
| Maths for Science | Algebra | Solve simple algebraic equations (not needed for Separate Chemistry) | 63.0 | 64.9 | +1.9 |
| Maths for Science | Handling Data | Understand simple probability (needed for Separate Biology only) | 68.3 | 65.1 | -3.3 |
| Maths for Science | Geometry and Trigonometry | Calculate areas of triangles and rectangles, surface areas and volumes of cubes | 64.7 | 68.0 | +3.4 |

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| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Maths for Science | Algebra | Substitute numerical values into algebraic equations using appropriate units for physical quantities (not needed for Separate Biology) | 66.5 | 69.2 | +2.7 |
| Maths for Science | Arithmetic and Numerical Computation | Recognise and use expres-sions in standard form | 69.1 | 70.9 | +1.8 |
| Maths for Science | Handling Data | Use an appropriate number of significant figures | 69.7 | 71.7 | +2.0 |
| Maths for Science | Algebra | Change the subject of an equation (not needed for Separate Biology) | 66.9 | 72.2 | +5.3 |
| Maths for Science | Graphs | Plot two variables from experimental or other data | 73.5 | 72.3 | -1.3 |
| Maths for Science | Handling Data | Use a scatter diagram to identify a correlation between two variables (not needed for Separate Chemistry) | 71.0 | 75.4 | +4.4 |
| Maths for Science | Handling Data | Understand the principles of sampling as applied to scientific data (Biology only) | 67.9 | 75.5 | +7.7 |
| Maths for Science | Handling Data | Construct and interpret frequency tables and diagrams, bar charts and histograms | 81.1 | 79.2 | -1.9 |
| Maths for Science | Geometry and Trigonometry | Visualise and represent 2D and 3D forms, including two dimensional representations of 3D objects (not needed for Separate Biology) | 79.3 | 79.3 | -0.0 |
| Maths for Science | Geometry and Trigonometry | Use angular measures in degrees (not needed for Separate Biology or Chemistry) | 82.6 | 82.0 | -0.6 |
| Maths for Science | Arithmetic and Numerical Computation | Recognise and use expressions in decimal form | 76.4 | 82.4 | +6.0 |

# Science/Physics National Performance Data Year 10 Avg Results/Academic Year 2021-2023

| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Physics | Physics Practicals | Acceleration | 54.6 | 51.8 | -2.8 |
| Physics | Physics Practicals | Specific heat capacity | 54.6 | 53.7 | -1.0 |
| Physics | 4.5 Forces (Paper 2) | Acceleration 1 | 58.1 | 54.9 | -3.2 |
| Physics | 4.2 Electricity (Paper 1) | Circuits | 57.6 | 57.0 | -0.5 |
| Physics | Physics Practicals | Waves | 60.8 | 58.2 | -2.6 |
| Physics | Physics Practicals | Force and extension | 57.5 | 58.5 | +1.1 |
| Physics | Physics Practicals | Resistance | 61.7 | 58.6 | -3.1 |
| Physics | Physics Practicals | Density | 57.1 | 58.7 | +1.7 |
| Physics | 4.1 Energy (Paper 1) | Energy changes in systems | 59.4 | 59.3 | -0.1 |
| Physics | 4.5 Forces (Paper 2) | Acceleration 2 | 58.2 | 59.3 | +1.1 |
| Physics | 4.6 Waves (Paper 2) | Refraction | 59.8 | 59.8 | +0.1 |
| Physics | Physics Practicals | Radiation and absorption | 63.6 | 59.9 | -3.7 |
| Physics | 4.2 Electricity (Paper 1) | Energy transfers | 60.6 | 60.3 | -0.3 |
| Physics | 4.2 Electricity (Paper 1) | Resistors | 61.6 | 61.2 | -0.4 |
| Physics | 4.6 Waves (Paper 2) | Lenses (separate physics only) | 60.4 | 61.9 | +1.6 |
| Physics | 4.7 Magnetism and Electromagnetism (Paper 2) | Transformers (separate physics only) | 63.5 | 62.1 | -1.4 |
| Physics | Physics Practicals | Light (separate physics only) | 63.1 | 62.2 | -0.8 |
| Physics | 4.1 Energy (Paper 1) | Energy | 61.1 | 62.3 | +1.2 |
| Physics | 4.3 Particle Model of Matter (Paper 1) | Energy transfers | 61.3 | 62.4 | +1.0 |
| Physics | 4.7 Magnetism and Electromagnetism (Paper 2) | The motor effect | 64.8 | 63.4 | -1.3 |

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| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Physics | 4.1 Energy (Paper 1) | Power | 62.7 | 63.6 | +0.9 |
| Physics | 4.6 Waves (Paper 2) | The electromagnetic spectrum | 64.8 | 64.7 | -0.1 |
| Physics | 4.5 Forces (Paper 2) | Distance-time graphs | 66.6 | 65.1 | -1.6 |
| Physics | 4.3 Particle Model of Matter (Paper 1) | Density of materials | 62.7 | 65.1 | +2.4 |
| Physics | 4.2 Electricity (Paper 1) | Current, resistance and potential difference | 65.8 | 66.3 | +0.5 |
| Physics | Physics Practicals | I-V characteristics | 65.1 | 66.4 | +1.3 |
| Physics | 4.1 Energy (Paper 1) | Energy resources | 65.6 | 65.4 | -0.2 |
| Physics | 4.2 Electricity (Paper 1) | Domestic uses and safety | 66.4 | 66.2 | -0.1 |
| Physics | 4.6 Waves (Paper 2) | Waves, hearing, exploration and detection (separate physics only) | 65.1 | 66.7 | +1.6 |
| Physics | 4.5 Forces (Paper 2) | Weight and gravity | 68.0 | 66.7 | -1.3 |
| Physics | 4.5 Forces (Paper 2) | Resolving forces | 65.5 | 67.0 | +1.5 |
| Physics | 4.5 Forces (Paper 2) | Moments, levers and gears (separate physics only) | 67.1 | 67.1 | -0.0 |
| Physics | 4.7 Magnetism and Electro-magnetism (Paper 2) | Induced potential (separate physics only) | 68.1 | 67.1 | -1.0 |
| Physics | 4.4 Atomic Structure (Paper 1) | Radiation | 66.4 | 67.2 | +0.7 |
| Physics | 4.2 Electricity (Paper 1) | Electrical charge and current | 66.3 | 67.2 | +0.9 |
| Physics | 4.5 Forces (Paper 2) | Forces and elasticity | 65.4 | 67.2 | +1.8 |
| Physics | 4.5 Forces (Paper 2) | Changes in momentum | 65.2 | 67.3 | +2.0 |
| Physics | 4.4 Atomic Structure (Paper 1) | Nuclear fission and fusion (separate physics only) | 69.4 | 67.4 | -2.0 |
| Physics | 4.6 Waves (Paper 2) | Types of electromagnetic waves | 67.3 | 67.6 | +0.3 |
| Physics | 4.4 Atomic Structure (Paper 1) | Hazards and uses of radia-tion (separate physics only) | 67.4 | 67.9 | +0.5 |
| Physics | 4.5 Forces (Paper 2) | Momentum: the basics | 67.2 | 67.9 | +0.7 |

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| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Physics | 4.1 Energy (Paper 1) | Energy transfer in a system | 67.3 | 68.2 | +0.9 |
| Physics | 4.5 Forces (Paper 2) | Newton's laws of motion | 68.0 | 68.4 | +0.4 |
| Physics | 4.2 Electricity (Paper 1) | Electric fields (separate physics only) | 68.8 | 68.5 | -0.3 |
| Physics | 4.4 Atomic Structure (Paper 1) | Atoms and isotopes | 69.2 | 68.6 | -0.6 |
| Physics | 4.4 Atomic Structure (Paper 1) | Radioactive contamination | 66.7 | 68.6 | +1.9 |
| Physics | 4.5 Forces (Paper 2) | Pressure in a fluid 2 (separate physics only) | 67.9 | 68.6 | +0.7 |
| Physics | 4.5 Forces (Paper 2) | Speed and velocity | 68.5 | 68.7 | +0.2 |
| Physics | 4.6 Waves (Paper 2) | Properties of waves | 70.0 | 70.1 | +0.2 |
| Physics | 4.8 Space Physics (Paper 2) | Orbital motion and satellites (separate physics only) | 68.7 | 70.4 | +1.7 |
| Physics | 4.3 Particle Model of Matter (Paper 1) | Pressure in gases (separate physics only) | 74.7 | 72.2 | -2.5 |
| Physics | 4.2 Electricity (Paper 1) | Static charge (separate physics only) | 73.6 | 72.7 | -0.9 |
| Physics | 4.7 Magnetism and Electromagnetism (Paper 2) | Electromagnetism | 72.2 | 73.0 | +0.8 |
| Physics | 4.3 Particle Model of Matter (Paper 1) | Work done on gases (separate physics only) | 74.2 | 73.0 | -1.1 |
| Physics | 4.5 Forces (Paper 2) | Forces and braking | 73.6 | 73.5 | -0.1 |
| Physics | 4.3 Particle Model of Matter (Paper 1) | Changes of states | 73.1 | 74.0 | +0.9 |
| Physics | 4.6 Waves (Paper 2) | Black body radiation (separate physics only) | 72.1 | 74.0 | +2.0 |
| Physics | 4.7 Magnetism and Electromagnetism (Paper 2) | Permanent and induced magnetism | 73.9 | 74.8 | +0.9 |
| Physics | 4.5 Forces (Paper 2) | Work | 75.4 | 75.5 | +0.1 |
| Physics | 4.3 Particle Model of Matter (Paper 1) | Particle motion in gases | 75.4 | 75.6 | +0.1 |
| Physics | 4.5 Forces (Paper 2) | Pressure in a fluid 1 (separate physics only) | 73.1 | 76.3 | +3.2 |
| Physics | 4.8 Space Physics (Paper 2) | The solar system (separate physics only) | 75.1 | 76.3 | +1.3 |

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| SUBJECT NAME | UNIT NAME | TOPIC NAME | 2021-22 Y10 Avg % Correct | 2022-23 Y10 Avg % Correct | % Change |
|---|---|---|---|---|---|
| Physics | 4.6 Waves (Paper 2) | Visible light (separate physics only) | 74.3 | 77.2 | +2.8 |
| Physics | Physics Practicals | Thermal insulation (separate physics only) | 75.8 | 80.2 | +4.4 |
| Physics | 4.5 Forces (Paper 2) | Forces: the basics | 79.2 | 80.2 | +1.0 |
| Physics | 4.8 Space Physics (Paper 2) | Red-shift (separate physics only) | 82.0 | 82.0 | -0.0 |