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# **GCSE subject criteria for additional science**

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## Introduction

1. GCSE subject criteria set out the knowledge, understanding, skills and assessment objectives common to all GCSE specifications in additional science<sup>1</sup>. They provide the framework within which an awarding organisation creates the detail of the specification.
2. Specifications must also meet the regulators' general requirements, including the common and GCSE criteria as defined in *The statutory regulation of external qualifications* (QCA/04/1293).
3. Subject criteria are intended to:
  - help ensure consistent and comparable standards in the same subject across the awarding organisations
  - ensure that the rigour of GCSEs is maintained
  - ensure that specifications build on the knowledge, understanding and skills established by the national curriculums for England, Northern Ireland and Wales, and facilitate progression to higher level qualifications in science
  - help higher education institutions, employers and other stakeholders, such as learners and parents/guardians, know what has been studied and assessed.
4. Any GCSE specification that contains significant elements of additional science must be consistent with the relevant parts of these subject criteria.
5. Specifications must contain sufficient additional appropriate content to merit 120-140 guided learning hours.

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<sup>1</sup> Specifications leading to the certificate title Double Award Science, where the content is that set out in the Science and Additional Science criteria combined, will be accredited by the regulators but will be for use only in centres in Northern Ireland.

## Aims and learning outcomes

6. GCSE specifications in additional science should encourage learners to be inspired, motivated and challenged by following a broad, coherent, practical, satisfying and worthwhile course of study. They should encourage learners to develop their curiosity about the living, material and physical worlds and provide insight into and experience of how science works. They should enable learners to engage with science and to make informed decisions about further study in science and related subjects and about career choices.
7. GCSE specifications in additional science must enable learners to:
  - develop their knowledge and understanding of the material, physical and living worlds
  - develop their understanding of the effects of science on society
  - develop an understanding of the importance of scale in science
  - develop and apply their knowledge and understanding of the nature of science and of the scientific process
  - develop their understanding of the relationships between hypotheses, evidence, theories and explanations
  - develop their awareness of risk and the ability to assess potential risk in the context of potential benefits
  - develop and apply their observational, practical, modelling, enquiry and problem-solving skills and understanding in laboratory, field and other learning environments
  - develop their ability to evaluate claims based on science through critical analysis of the methodology, evidence and conclusions both qualitatively and quantitatively
  - develop their skills in communication, mathematics and the use of technology in scientific contexts.

## Subject content

8. The content of GCSE specifications in additional science must reflect the learning outcomes.
9. GCSE specifications in additional science must build on the programmes of study at key stage 4.
10. GCSE specifications in additional science must require learners to develop the knowledge, skills and understanding specified below.
11. GCSE specifications in additional science must ensure the qualification is comparable in content and range with other GCSE science qualifications.
12. GCSE specifications in additional science must require learners to demonstrate knowledge and understanding of:
  - science as an evidence-based discipline
  - the collaborative nature of science as a subject discipline, the way new scientific knowledge is validated and the limitations of science
  - the importance of working accurately and safely
  - hazard identification and the nature of risk
  - risk factors and risk assessment in the context of potential benefit
  - the importance of scale in terms of time, size and space in science
  - the uses of modelling, including mathematical modelling to explain aspects of science.
  - the chemical properties of elements and compounds in terms of structure and bonding, including metallic, ionic and covalent bonds and forces between molecules
  - the chemical properties of elements related to their atomic structure and their position in the periodic table
  - how conditions and quantities can be used to control the rate of chemical reactions
  - chemical analysis using detection and separation techniques
  - the quantitative interpretation of chemical formulae and equations, including percentage yield

- the energy changes that take place during chemical reactions
- the relationship between work and energy, and changes in gravitational potential energy and kinetic energy
- electrical circuits, including the relationships between power, current and voltage and resistance, current and voltage
- Newton's laws of motion and their theoretical and practical uses
- calculating changes in the velocity and acceleration of bodies acted on by forces, including momentum
- radioactivity, sources of background radiation
- effects of ionising radiations
- radioactive decay, half-life, fission and fusion
- the structure of cells, including plant, animal and microbial cells
- mitosis and meiosis
- fieldwork techniques to explore the relationships between communities of organisms and their environments
- the structure and function of DNA and its role in protein synthesis
- structure and functions of proteins including enzyme action
- how chemical reactions essential for life take place inside and outside cells
- photosynthesis and respiration
- the different patterns of growth and development in plants and animals
- the need for and development and functions of specialised organ systems
- how organisms have changed through time.

13. GCSE specifications in additional science must require learners to develop the ability to:
- develop hypotheses and plan practical ways to test them including risk assessment; manage risks when carrying out practical work; collect, process, analyse and interpret primary and secondary data including the use of appropriate technology to draw evidence-based conclusions; review methodology to assess fitness for purpose, and review hypotheses in light of outcomes
  - use scientific theories, models and evidence to develop hypotheses, arguments and explanations; develop and use models to explain systems, processes and abstract ideas
  - communicate scientific information using scientific, technical and mathematical language, conventions, and symbols

## Assessment objectives

14. All specifications in additional science must require candidates to demonstrate their ability to:

| Assessment objectives |  | Weighting (%) |
|-----------------------|--|---------------|
| <b>AO1</b>            | Recall, select and communicate their knowledge and understanding of science                    | 30–40         |
| <b>AO2</b>            | Apply skills, knowledge and understanding of science in practical and other contexts           | 30–40         |
| <b>AO3</b>            | Analyse and evaluate evidence, make reasoned judgements and draw conclusions based on evidence | 25–35         |

## Scheme of assessment

15. GCSE specifications in additional science must allocate a weighting of 75 per cent to external assessment and a weighting of 25 per cent to controlled assessment in the overall scheme of assessment.
16. Question papers in science must be targeted at either foundation or higher tier.

## Grade descriptions

17. Grade descriptions are provided to give a general indication of the standards of achievement likely to have been shown by candidates awarded particular grades. The descriptions must be interpreted in relation to the content in the specification; they are not designed to define that content.
18. The grade awarded will depend in practice upon the extent to which the candidate has met the assessment objectives overall. Shortcomings in some aspects of candidates' performance in the assessment may be balanced by better performances in others.

| Grade | Description |
|-------|-------------|
| A     |             |
| C     |             |
| F     |             |

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