

Applied approaches to Science 14–19
an OCR perspective



SCIENCE

We provide a number of alternative specifications in applied science which offer different vocational weightings and a choice of course structure. These give great flexibility to meet local circumstances; and your feedback has told us that you have noticed a marked improvement in the motivation and engagement of your learners following such courses and there has been a steady increase in uptake and interest since their introduction.

GCSE Applied Science (Double Award) J649

This GCSE course offers an integrated, project-based approach encompassing the requirements of the Key Stage 4 Programme of Study. It encourages participation in vocationally related learning and provides experience of science in workplace environments, for example using work experience, links with local employers, case studies and research, to develop your learners' ownership of learning.

GCSE Additional Applied Science (Twenty First Century Science suite) J632

The requirements for the Key Stage 4 Programme of Study are covered by GCSE Science; Additional Applied Science can be taken in parallel with or following GCSE Science and offers a choice of three content units from the six offered. While this specification is part of the Twenty First Century Science suite, it can be taken independently and combined with any other GCSE Science qualification. The course explores scientific content through its application in authentic, work-related contexts: it focuses on the practical competencies and technical knowledge underpinning the work of scientific practitioners.

GCSE Environmental and Land-based Science J650

This specification is constructed as an Additional Applied Science, but with a particular focus on the land-based and environmental sectors. While it is a very practical course, a choice of units (three out of five) means that it can be used by both urban and rural schools. It encourages learners to relate their experiences in the classroom, laboratory and in the field to a variety of vocational opportunities.

OCR Level 2 Nationals in Science 05644, 05645

OCR Nationals are flexible, vocationally related qualifications which can be used in a full-time or part-time programme of study. They are more vocational, practical and job-related than applied GCSEs, and they provide opportunities for individuals to gain underpinning knowledge and skills to support entry into work or further studies. The units are practically based and can be certified individually or combined to gain a full qualification; thus individual units can be offered alongside other programmes of learning and learners have the option of achieving as many or as few units as are appropriate for their needs.

Assessment Models

GCSE Applied Science (Double Award)

The assessment comprises three units: a written paper unit and internal assessment in the form of two unit portfolios. Portfolio moderation and the written paper are available in each January and June session. The content of the externally assessed unit may be taught through activities used in the portfolio units. Two GCSE grades are generated by this assessment.

Unit	Type of Assessment	Details	Proportion of total GCSE marks
Developing Scientific	Portfolio	Assessed by teachers; internally standardised; externally moderated.	33.3%
Science For The Needs of Society B482	1 hr written paper	Externally assessed and offered in Foundation and Higher Tiers; uses structured questions throughout (no choice of questions)	33.3%
Science at Work B483	Portfolio	Assessed by teachers; internally standardised; externally moderated.	33.3%

GCSE Additional Applied Science

The assessment comprises three unit examinations, from a choice of six, and a work-related portfolio of coursework. The mark allocation is evenly divided between the examinations and the work-related portfolio. The unit examinations are available every January and June session. Moderation for the coursework assessment is available in June.

Unit	Type of Assessment	Details	Proportion of total GCSE marks
Life Care A324 Agriculture and Food A334 Scientific Detection A325 Harnessing Chemicals A335 Communications A326 Materials and Performance A336	45 min written examinations (three chosen from six)	Externally assessed and offered in Foundation and Higher tiers; uses structured questions throughout (no choice of questions)	3x 16.7% each
Work-related Portfolio A337	Portfolio of assignments	Internally assessed, externally moderated: 6 Standard Procedures (12%); 1 Suitability Test (21%); 1 Work-related Report (17%)	50%

GCSE Environmental and Land-based Science

This specification is wholly e-assessed. The assessment comprises unit tests taken on- screen and a portfolio saved and submitted electronically. The structure is similar to that for Additional Applied Science: learners must take the unit Management of the Natural Environment, two further units chosen from four and produce a portfolio of coursework; the mark allocation is evenly divided between the tests and the portfolio. The tests are available every January and June session. Moderation of the portfolio is available in June.

Unit	Type of Assessment	Details	Proportion of total GCSE marks
Plant Cultivation B491 Amenity Horticulture B492 Management of the Natural Environment B493 Care of Animals B494 Livestock Husbandry B495	45 min tests, taken on-screen (B493 and two others)	Externally assessed and offered in Foundation and Higher tiers; uses structured questions throughout (no choice of questions)	3x 16.7% each
Portfolio B496	Portfolio of assignments	Internally assessed, externally moderated: 9 Practical Skills (12.4%), 1 Work Related Report (14.7%), 1 Investigative Project (22.9%)	50%

OCR Level 2 Nationals in Science

All the units are assessed by the centre using a portfolio of evidence to show that the assessment objectives have been met. The evidence can be built up through assignments or by collecting evidence from activities including practical activities; and a variety of approaches, including the use of ICT and multimedia, can be used for recording. Learners can progress at their own pace because there are no timetabled examinations; therefore, the work for the units can be planned and completed at a time that suits the centre. Entry is made when each portfolio is complete, and all achievement is graded as Pass, Merit or Distinction. The assessment is then externally moderated by a visiting OCR moderator.

Learners can be entered for an individual unit or for several units to form a full qualification. Two types of qualification can be obtained:

- OCR Level 2 National Award in Science, which is the same size and level as two GCSEs
- OCR Level 2 National Certificate in Science, which is the same size and level as four GCSEs.

Certification

Individual Units

Unit achievement is certificated

OCR Level 2 National Award requires:

3 units

OCR Level 2 National Certificate requires:

6 units

Units of Assessment

Unit 1: Best practice in science

Unit 2: Materials science

Unit 3: Forensic science

Unit 4: Food science

Unit 5: Science of health and bodycare products

Unit 6: Science of construction

Unit 7: Science and the environment

Unit 8: Science in sport

Unit 9: Investigating energy sources

Unit 10: Industrial science

Unit 11: The science of the universe and humanity

Unit 12: Career planning for science

Unit 13: Work experience in science

Mandatory Units

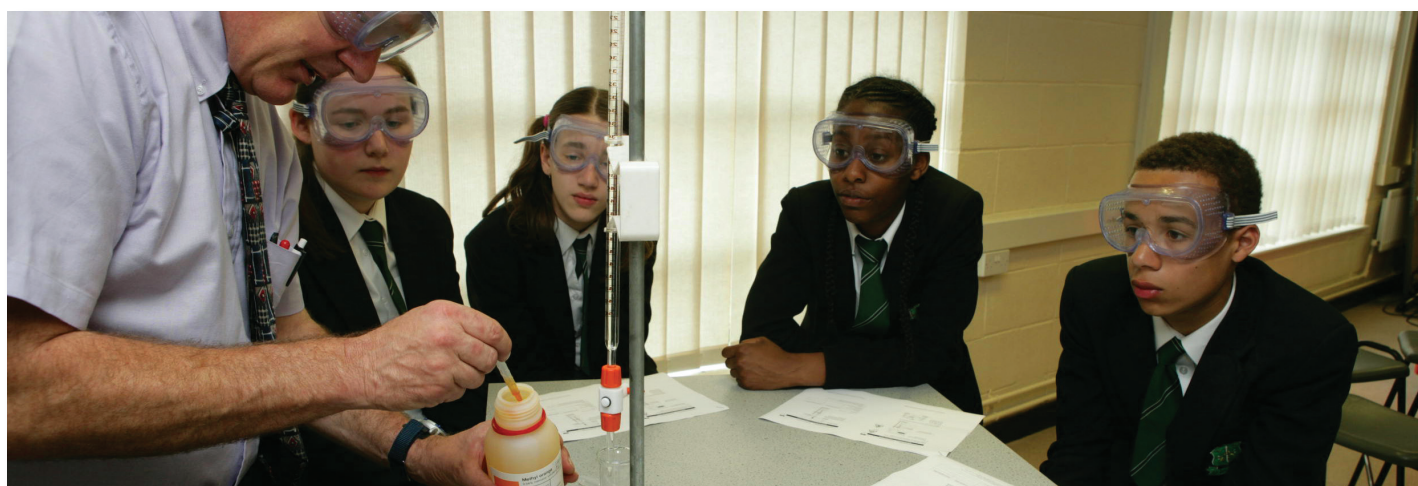
The mandatory units are:

For learners below the age of 16: **Units 1, 2 and 11** (to cover the Key Stage 4 Programme of Study).

For a National Award, Units **1 and 2**.

For a National Certificate, Units **1, 2, 3 and 4**.

Otherwise there is a free choice of units.



The Assessment Portfolio

A characteristic of applied science courses is the high allocation of marks for an internally assessed portfolio. The portfolio comprises work from a variety of tasks which allow the development and assessment of a wide range of skills. These skills can best be assessed by you in the relevant context: for example, the skills of producing a risk assessment and of working safely on a practical task. Work-related learning is enhanced by contact with local employers and the portfolio assessment allows local opportunities to be used to best advantage.

Producing work for a portfolio can help learners develop self-evaluation skills and raise their motivation and attainment. We are developing more creative uses of portfolio assessment.

Using Assessment Criteria

The portfolios for GCSE Applied Science (Double Award), for GCSE Additional Applied Science and for GCSE Environmental and Land-based Science are assessed by criterion referencing.

Descriptions of the work required, and the definitive assessment criteria, are provided in our specifications. The wording of the assessment criteria is precise with detailed guidance on scoring the level of response to each criterion. We provide amplification of this qualitative marking method by exemplar material in coursework guidance booklets and on the website www.ocr.org.uk/science/gcse, as well as at INSET training.

Internal Standardisation

Standardisation within a centre is essential for the accurate ranking of the learners, especially if tasks are different for different groups; once a task has been set and completed, cross-marking should be used to check comparability between different teachers.

External Moderation

The portfolios for the Nationals are moderated by a visiting moderator. The centre initiates the process by requesting a visit when the portfolios are ready. GCSE qualifications are moderated by post: the moderator sends a request for a sample and scrutinises the portfolios in order to confirm the marks awarded. The moderator's report commends the good practice which has been seen and offers suggestions for improvements, indicating where these are necessary in order to be in line with the national standards.



Managing an Applied Science Course

Offering an applied science course at Key Stage 4 provides opportunities for departmental development with respect to a number of whole-school issues. The courses assessed by us cover the statutory requirements for Work-Related Learning. The high internally assessed weighting sets a natural context for developing formative assessment and self-evaluation, and the flexibility of the assessment gives scope for progress in personalised learning. Some aspects of the assessment can be linked with Citizenship. All the applied science specifications include mapping to ICT, Citizenship and Key Skills; to spiritual, moral, ethical, legislative, economic, social and cultural issues; and to environmental issues, health and safety considerations and European developments. Nationals include mapping to National Occupational Standards and to the crossover with our GCSE Applied Science (Double Award).

Curriculum Models

We provide advice on possible curriculum models in teacher guidance booklets and at training events.

CPD Planning for Teaching Applied Science

Teaching applied science will require a novel approach for many of you, together with a broadening of general experience as the applications of science in the workplace are explored. This opens up opportunities for professional development in order to optimise the benefits of work-related activities.

Science technicians too will be exposed to challenges to support new practical activities and because of the importance of these activities for assessment. It is useful if technicians attend INSET courses and are given time to develop good-quality resources for the assessed activities. Technicians need to develop a clear understanding of the requirements of the practical assessments and to appreciate the high proportion of marks which depend on them. Where learners show initiative in designing practical work, technicians must be prepared to deal with non-standard equipment requests.

Support

The methods of assessment have been chosen to achieve a valid assessment of skills which are relevant to the workplace, but these may be unfamiliar to teachers whose experience has chiefly been that of the National Curriculum Sc1.

We support assessment through published materials, training courses and supportive links including the teachers' forum on the website www.ocr.org.uk/science/gcse. Guidance booklets and centre handbooks are produced by us and we endorse other published materials to support our courses and assessments. Suggestions for help in establishing workplace contacts are included.

A schedule of INSET training days for each specification is published on our website, www.ocr.org.uk/training. Training days for portfolio assessment include marking exercises and discussion of exemplar material, guidance on selecting and managing suitable tasks, and advance planning. A coursework consultancy service is available by contacting the subject officer for the specification. We encourage schools to form cluster groups with other schools who are teaching the same specification, and our website provides details of this. Clusters and individual schools can request customised in-house training.

It is helpful if your school/college Senior Management Team is aware of the benefits and demands of teaching applied science, in order to aid successful development. In addition to one-off costs of new resources, there needs to be investment in training for both you and your technicians, and in releasing time for preparation and internal standardisation. A supportive system for planning visits and trips helps enormously with vocational aspects. Many schools will already have made such links and if clusters are set up others can benefit.



A Level Applied Science

A Level Applied Science offers a wide range of interesting and accessible AS Level and A2 units. These are flexibly structured to give learners plenty of choice to form qualifications which can be highly individual to their personal aptitudes, interests and ambitions. The assessment allows learners the opportunity to work on internally assessed portfolio units as well as taking externally assessed examinations.

At AS Level, single (three unit) and double (six unit) awards are available, and at A2 Level, single (six unit) and double (twelve unit) awards are available. Grades are awarded from A to E for single awards and A*A* to EE for double awards. The A2 externally examined provide the opportunity for stretch and challenge.

They are designed to give a 'vocational' alternative to the more 'traditional' A Levels in the sciences and may be used to give an applied/vocational introduction to science. Units may also be selected to provide an introduction to more specialised areas. They provide a suitable progression route to support young people who have studied applied science options at Key Stage 4 (such as GCSE Additional Applied Science or OCR Nationals in Science).

There are many opportunities for learners to actively experience the scientific environment through work experience, links with local employers, case studies and research. The AS course may be used to complement other vocational courses or provide a more applied experience for learners taking non-vocational subjects.

Using work-related contexts and innovative teaching and assessment methods, these courses offer the opportunity to gain a high-quality qualification in applied science. They are designed to provide a progression route to higher education or further training for employment.

As with other A Levels, AS units and A2 units are equally weighted and, in the A Level awards, AS forms 50% of the total assessment. Each unit requires 60 guided-learning hours. Assessment is 33% externally examined and 67% by portfolio evidence.

These A Level Applied Science specifications are available for teaching from September 2009. All units will be available for assessment in January 2010 and June 2010.

Units of Assessment

AS

Unit 1

G620 – Science at work *portfolio*

Unit 2

G621 – Analysis at work *portfolio*

Unit 3

G622 – Monitoring the activity of the human body *external assessment 90 mins*

Unit 4

G623 – Cells and molecules *external assessment 45 mins*

Unit 5

G624 – Chemicals for a purpose *portfolio*

Unit 6

G625 – Forensic Science *portfolio*

Unit 7

G626 – The physics of sport *portfolio*

A2

Unit 8

G627 – Investigating the scientist's work *portfolio*

Unit 9

G628 – Sampling, testing and processing *external assessment 90 mins*

Unit 10

G629 – Synthesising organic chemicals *portfolio*

Unit 11

G630 – Materials for a purpose *portfolio*

Unit 12

G631 – Electrons in action *portfolio*

Unit 13

G632 – The mind and the brain *portfolio*

Unit 14

G633 – Ecology and managing the environment *portfolio*

Unit 15

G634 – Applications of biotechnology *portfolio*

Unit 16

G635 – Working waves *external assessment 90 mins*

Internal assessment forms 67% of each qualification.

Three unit AS A Level	Learners take units 1, 2 and 3
Six unit AS A Level (Double Award)	Learners take units 1, 2, 3 and 4 plus two of units 5, 6 and 7
Six unit Advanced A Level	Learners take units 1, 2, 3 and 8 Plus one of units 9 and 16 Plus one of units 10, 11, 12, 13, 14 and 15
Twelve unit Advanced A Level (Double Award)	Learners take units 1, 2, 3, 4, 8, 9 and 16 Plus two of units 5, 6 and 7 Plus three of units 10, 11, 12, 13, 14 and 15

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