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Changes in Science & Mathematics at Key Stage 4 and Post-16

March 2007

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Key Stage 4 Changes

- New GCSEs in 2001
- New Vocational GCSEs in 2002
- 21st century science pilot 2003
- Work related learning 2004
- Entitlements: MFL, D&T arts and humanities 2004

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Post-16 Changes

- Introduction of AS/A2 in 2000
- Revised AS timetable in 2002
- Grading advice in 2003
- QCA website case studies 2005
- AEA psychology summer 2005
- Vocational GCEs in AS/A2 format September 2005

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14-19 Changes

- 'Opportunity and Excellence' (DfES January 2003 – www.dfes.gov.uk/14-19/summary.shtml)
- Tomlinson 14-19 review (www.14.19reform.gov.uk)
- QCA work on KS4 NC for implementation in 2004 and 2006 (science) (www.qca.org.uk/science)
- '14-19 Education and Skills' (DfES February 2005 (www.dfes.gov.uk/publications/14-19educationandskills/)

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KS4 Science Changes for 2006

- Revised PoS suitable for all (no disapplication)
- Brief, broad and balanced and provide progression
- Based on ‘how science works’ – relevant and motivating
- Criteria for wider range of GCSEs
- Majority will still study 2 GCSEs – re-emphasised in White Paper
- Entry levels will be revised too

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How science works

- data, evidence, theories and explanations
- practical and enquiry skills
- communication skills
- application and implications of science.

Breadth of study:

- organisms and health
- chemical and material behaviour
- energy, electricity and radiations
- environment, Earth and universe

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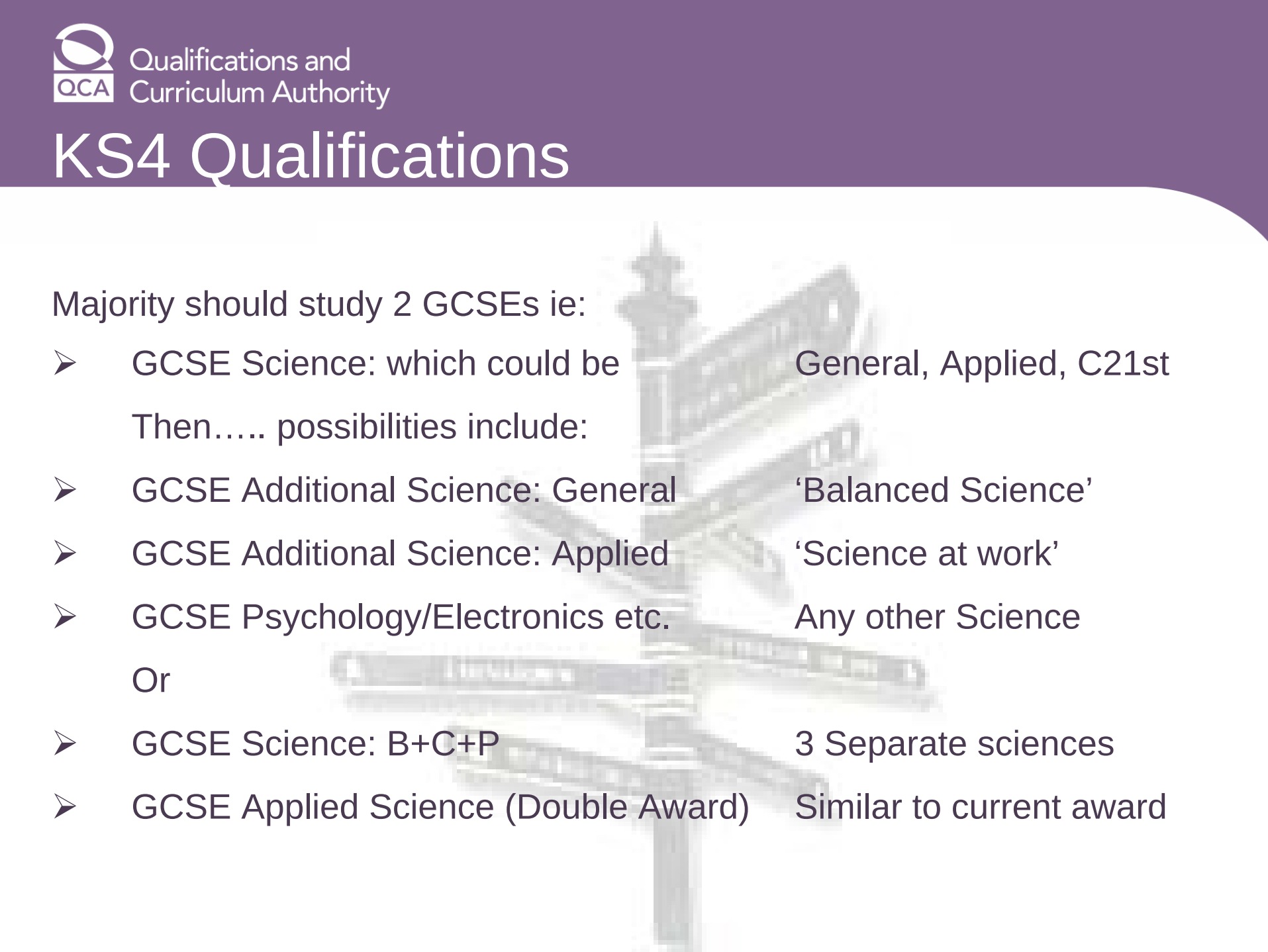
KS4 Qualifications



Majority should study 2 GCSEs ie:

- GCSE Science: which could be — General, Applied, C21st

  Then….. possibilities include:

- GCSE Additional Science: General — ‘Balanced Science’
- GCSE Additional Science: Applied — ‘Science at work’
- GCSE Psychology/Electronics etc. — Any other Science

  Or

- GCSE Science: B+C+P — 3 Separate sciences
- GCSE Applied Science (Double Award) — Similar to current award

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GCSE emphases

One or more of:

- evaluating evidence and the implications of science for society
- explaining, theorising and modelling in science
- procedural and technical knowledge of science practice

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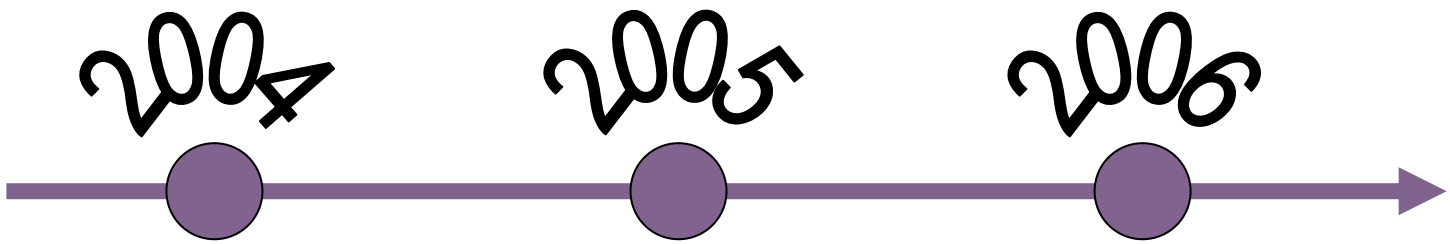
KS4 Development Timetable

- 2004-6 Evaluation of pilot
- 2004-5 Awarding bodies develop specifications
- 2005 September Details of changes in schools
- 2006 September New courses start
- 2007 June First Awards



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21st Century Science GCSE Pilot

- Originated from QCA research on scientific literacy, assessment and curriculum models
- Outcome: three GCSEs
  - Common-to-all (single) and
    - Additional science (general); or
    - Additional science (applied)
- 2-cohorts of about 80 centres from 2003 to 2006

www.21stcenturyscience.org

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Evaluation of 21st Century Science Pilot

Headlines after one year:

- More up-to-date science and a flexible structure;
- As demanding as previous GCSE science;
- Welcome reduced content and factual recall;
- Limited practical work in core and general courses diminished student engagement.

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Evaluation of 21st Century Science (cont..)

- Requires changes to teaching approaches, especially in ‘Ideas about Science’;
- Met intended outcomes, though less well for lower ability (new materials being produced);
- Scheme of assessment appropriate, though some papers had high literacy and mathematical demands;
- Core and general course combination is a good basis for progression as AS (some said Core and Applied).

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Innovation in GCSE Science for 2006

Opportunity to address issues of:

- assessment of ‘how science works’ (coursework);
- e-assessment, oral assessment, group work assessment;
- nature and purpose of practical work;
- distinctiveness of scientific enquiry;
- attitudes of students;
- range of progression routes.

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Beyond 2006: Key stage 3

The White Paper proposes:

KS3

- Review KS3 to ensure excitement and relevance (ref to KS4)
- Continue with core tests and tasks in English, Maths, Science and ICT

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Beyond 2006: Key stage 4

KS4

- Review of coursework and e-assessment in all subjects
- New entitlement to study at least 2 science GCSEs

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Beyond 2006: A level

Post-16

- Most A levels to have 4 units
- Introduce AEA-standard questions to A levels
- Students can study HE modules while at school

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Beyond 2006: Diplomas

Diplomas 'employer-designed'

- Level 2 general diploma including functional skills
- 14 lines to be available by 2015
- Combinations of academic achievement and vocational experience

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Mathematics

Reforms must…

- enthuse, motivate and encourage learners
- to engage with mathematics
- to increase the number of students going further

In order to…

- increase uptake
- demonstrate application of mathematics
- better prepare learners for employment and higher education

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Reform programme

- Secondary Curriculum Review; KS3 and post 14
- Functional Skills (mathematics, English and ICT)
- Foundation tier learning
- Specialised diplomas
- GCSE and GCE
- Extended project
- Modernising the exam system

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In the 3 years since Making Mathematics Count

- recommended strategies on pathways for 14-19
- pilots underway
- 14-19 Education and Skills White Paper
- flexible approach to develop skills and aptitudes
- KS4 now sees schools offering option choices as pathways
- more students will select a broad programme leading to a general qualification to give emphasis to languages, science, business… or mathematics

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Coursework

- recent QCA review showed coursework to be of value in many subjects

- however, concerns existed in some subjects… including mathematics
  - candidate's effort
  - levels of support
  - consistency of rules between Advisory Boards
  - the use of the internet
  - very, very small incidence of deliberate malpractice

- from 2007 students will sit only written papers… no coursework

- future specification and revision may allow 'controlled coursework'

- opportunities to develop assessment methods and principles

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From 2010…

- Functional Skills… grade C or above

  … function mathematically as citizens or in the workplace

- GCSE mathematics for higher achievers and motivated mathematics students

  - more reasoning and problem solving
  - application of mathematics in familiar and unfamiliar contexts
  - more open-ended challenges

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Functional Skills Mathematics

- Developed by QCA in Consultation
- Incorporated into:
  - GCSE Mathematics
  - Diploma
  - Qualification for Adults
- Lead Consultant SEMTA

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Functional Skills Mathematics

- Consultation Process
  - Sector Bodies
  - Employers
  - CBI
  - HE Providers
- Mathematics Reference Group

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Functional Skills Mathematics

- Timetable
  - September 2006 Trial and Test Phase
  - 3 Year Pilot GCSE
  - September 2008 Available Nationally