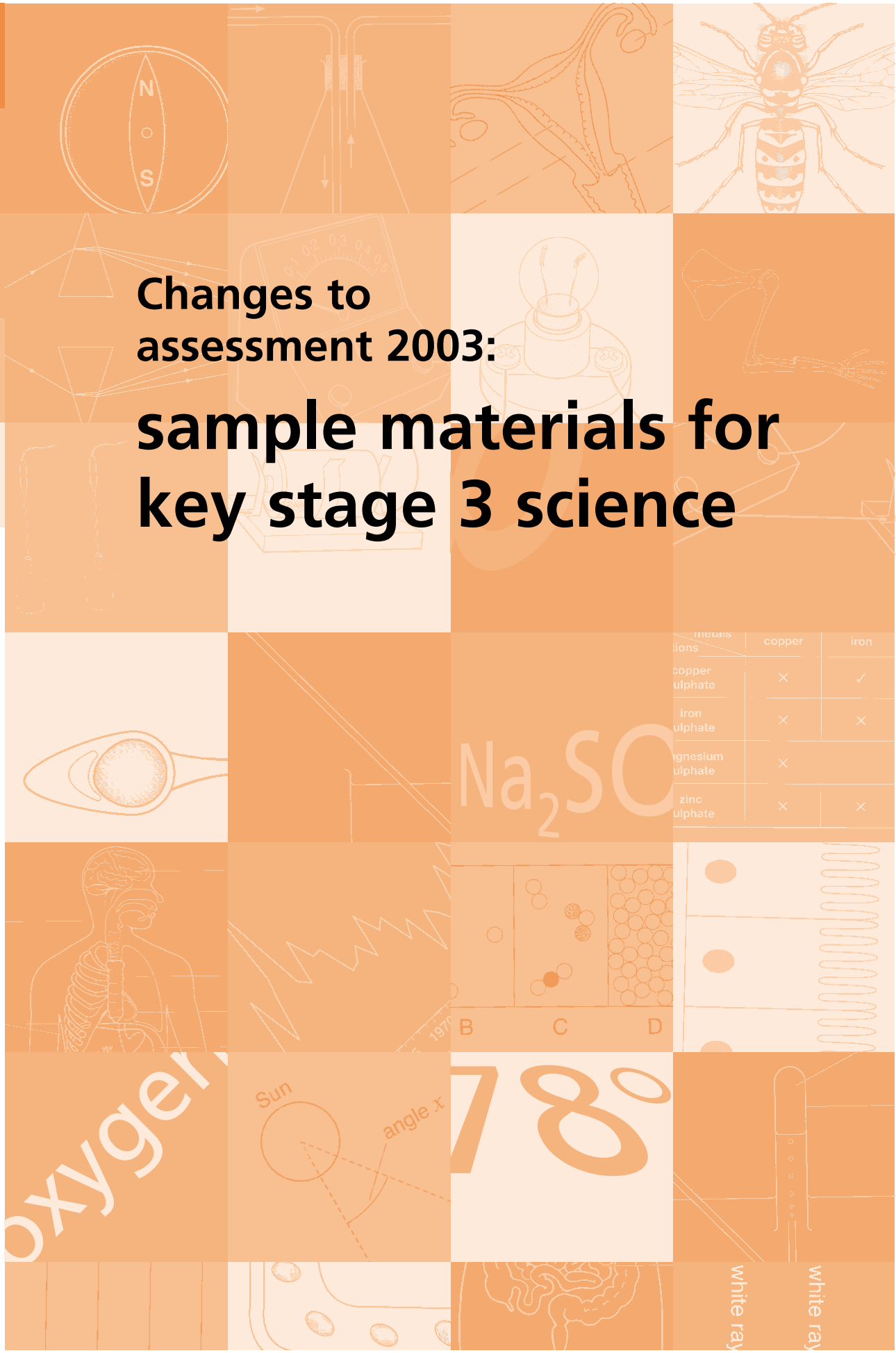
Sc

KEY STAGE 3

2003

Changes to assessment 2003:

sample materials for key stage 3 science



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Introduction

In February 2000, the Secretary of State for Education asked QCA to carry out a review of national curriculum assessment, which would identify areas for strengthening the tests in English, mathematics and science, bearing in mind curricular innovation and change.

Over the last two years there has been extensive consultation with teachers, headteachers, teacher unions, Ofsted, local education authority advisers and colleagues from the national strategies for key stage 3. Schools have also been involved in trialling proposed changes to the tests, and pupils and teachers have contributed to discussions on the outcomes of these trials. Those involved in the review and in the development of the 2003 tests, have broadly welcomed the changes, seeing them as complementing current approaches to teaching and learning.

QCA wrote to all schools in June 2002 outlining the changes arising from the review, which are to be introduced in 2003. This leaflet provides further information on these changes in the form of sample science questions, mark schemes and commentaries. More sample materials are available on QCA's website at www.qca.uk/ca/tests/2003sample where each question is exemplified with a range of pupils' responses and a commentary.

Summary of changes to key stage 3 science tests to be introduced in 2003

There will be an increase in the number of questions assessing scientific enquiry (Sc1) in the key stage 3 tests. Questions may be set in the context of any part of the programme of study for Sc2, Sc3 or Sc4 and in contexts in which only aspects of Sc1 will be assessed. The change is intended to focus on assessing pupils' understanding of the development of scientific ideas and the use of scientific evidence. The form of questions may be:

- what question is being investigated;
- how an enquiry could be carried out;
- what factors need to be controlled and what factors need to be observed or measured;
- whether the outcome can be predicted;
- how the results are to be presented;
- what the results show and whether they match the prediction;
- to describe the outcome and interpret the evidence in relation to conclusions which might be drawn.

The time allowed for each paper in the test will be unchanged and there will be no additional questions or marks. The increase in the number of questions on scientific enquiry will therefore result in a reduction in questions addressing other parts of the programme of study.

The extension paper will cease to be available in 2003. In its place will be a range of ways of assessing pupils working above the level of the science tests, who have followed a curriculum which blends faster pace and more breadth with greater depth in science. QCA will be producing guidance early next year to help teachers decide the best approach for their more able and gifted pupils.

In addition, QCA is producing optional tasks for pupils working below the level of the tests.

Example 1: *Bones*

In this question an investigation is described and a prediction and results table given.

(a)(i) Pupils are asked to select the results from the table which support the prediction. This probes their understanding of the concept of evidence in scientific enquiry. The correct answer (from 5mm to 15mm) must be stated unambiguously for credit to be awarded.

(a)(ii) Asking for results from the table which do not support the prediction might be thought to be slightly more difficult. Again a complete answer, unambiguously stated, is required to gain credit. At tube diameters of 15mm and 20mm, the mass needed to cause collapse remains the same. Thereafter, as the diameter increases, the mass needed to cause collapse decreases. Pupils need to be able to recognise that each of these relationships is inconsistent with the prediction.

Jane and Joanne noticed that bones are hollow inside.

They wanted to find out how the diameter of a bone affects its strength.
They made model bones of different diameters from tubes of paper.
They tested the strength of the tubes by hanging a number of 50g masses on each tube until it collapsed.

They measured the mass that made each tube collapse and recorded their results in a table.

diameter of tube, in mm	mass that made tube collapse, in g
5	100
10	150
15	200
20	200
25	150
30	100
35	50

(a) Jane predicted that tubes of greater diameter are stronger.

(i) Which results in the table support Jane's prediction?

1/2l *1 mark Level 6*

(ii) Which results in the table do **not** support Jane's prediction that tubes with greater diameter are stronger?

1/2l *1 mark Level 6*

(b) To decide the two diameters between which the tubes have the greatest strength, pupils need to recognise that this is defined by the diameters where the mass of 200g is needed to cause collapse. It is important not to include ranges of diameters where the mass is still increasing or starting to fall, for example 10mm to 20mm or 15mm to 35mm.

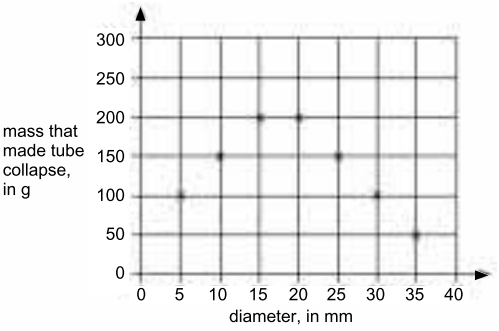
(c) To gain both marks for deciding how to improve the data collected, pupils need to identify two distinct ways of modifying the investigation. Diameters intermediate between 15mm and 20mm, and masses smaller than 50g, are needed to pinpoint the answer with precision. One mark is available for either point on its own. Suggestions which would improve the reliability of existing data, rather than improving precision, for example repeating measurements, are not creditworthy. Answers which suggest re-presenting existing data, such as drawing a curve of best fit, are not considered creditworthy as the question asks pupils to improve the data they collect, not that they have already collected.

(b) Between which **two** diameters do tubes have the greatest strength?

1/2i *1 mark Level 5*

_____ mm and _____ mm

(c) They then plotted a graph of their results.



The precise point at which the diameter starts to reduce the strength of the tube is **not** shown on the graph.

How could the pupils improve the data they collect to find this point? Suggest **two** ways.

1/2p *2 marks Level 6*

1. _____

_____

2. _____

_____

maximum 5 marks

Example 2: *Shadows*

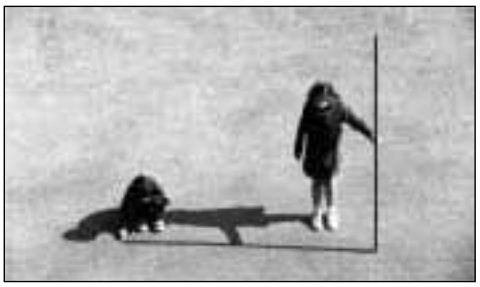
In this question pupils are asked to plan an investigation under specified conditions (outside, using a stick and sunlight). The question explores pupils' understanding of the concept of designing an investigation in such a way that the evidence collection is systematic. Although the context is one which pupils are likely to have met at an earlier key stage, it is not necessary for them to remember this in order to respond to the question successfully.

(a) It is important that pupils learn to identify the different factors in an investigation using correct scientific language. Therefore the correct terminology is given in brackets in this question, and in other types of question where different kinds of variables are involved. In this part of the question pupils must identify the independent variable to gain credit. Details of how the investigation is performed or how the independent variable might be measured are treated as neutral in the marking of this part of the question.

(b) It is important that the dependent variable relates appropriately to the independent variable suggested by the pupil in part (a). The variable itself is all that is required to gain credit but if pupils indicate how they intend to measure it in answering this part of the question, rather than, or as well as, in part (c) they will be given credit.

(c) Pupils need to be able to quantify variables as the next step in the progression of their understanding after simply observing qualitative outcomes of an investigation. In this question, markers are asked to mark part (b) and part (c) together so that if both marking points are presented in either part of the question, credit will be given. The answer in part (c) must be an appropriate way of measuring the dependent variable suggested in part (b).

You are asked to plan a science investigation to find out something about shadows. You are to work outside using sunlight and a stick any way you decide.



Think about the question you plan to investigate before you answer the following questions.

(a) What factor should you plan to change as you carry out your investigation. (This is called the independent variable.)

1/2d

1 mark
Level 4

_____

(b) What factor will you observe or measure to collect your results? (The dependent variable.)

1/2d

1 mark
Level 4

_____

(c) Say how you might measure the factor you have planned to examine.

1/2d

1 mark
Level 4

_____

(d) Write **one** factor you should keep the same to make your test fair. (This is called a control variable.)

1/2d

1 mark
Level 4

_____

maximum 4 marks

(d) This part of the question explores pupils' understanding of control variables. Responses must be directly relevant to the investigation to gain credit. Some pupils may fail to gain credit by naming independent or dependent variables, indicating confusion between the 'control' and 'management' of variables. No credit is awarded for naming factors which have no effect on the investigation.

EARLY YEARS

NATIONAL CURRICULUM 5–16

GCSE

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GCE A LEVEL

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OTHER VOCATIONAL QUALIFICATIONS

Curriculum and Standards

Audience	Headteachers, science teachers of year 9 pupils and key stage 3 assessment and special educational needs coordinators
Circulation lists	LEAs, ITT institutions, educational libraries and teacher centres
Type	Guidelines
Description	This booklet provides information on the changes to the key stage 3 national curriculum tests in science for 2003.
Cross ref	www.qca.org.uk/ca/tests/2003sample
Action required	To note changes to the key stage 3 national curriculum tests in science for 2003
Timing	By May 2003
Contact	See below
For school use:	

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