Catalyst 3

A framework for success

Teacher Resource CD-ROM

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Introduction to the Catalyst course

Catalyst is designed to help you teach the key stage 3 QCA scheme of work and meet the Framework yearly teaching objectives by giving top priority to the success of all your pupils, whatever their ability.

Pupil books

There are two pupil books for each year at different levels (Red and Green) which match each other spread by spread so they can be used in mixed ability classes.

Teacher Resource CD-ROM

This Teacher Resource CD-ROM contains a wealth of resources to support your teaching and your pupils’ learning. It is intended to be used alongside the Catalyst pupil books 3 (Red and Green).

It offers the following support for teaching and learning:

- **Unit guides** – providing an overview of each unit
- **Lesson planning guides** – to plan three-part lessons
- **Starters** – with a choice of activities
- **Plenaries** – with a choice of activities
- **Main lesson activities** – with a choice of activities, many differentiated to 3 levels
- **Booster lessons** – to help pupils move from level 4 to 5 for green and level 6 to 7 for red.
- **Homework** – one for each double-page spread in the pupil book, differentiated to 3 levels
- **Specials** – for the less able, one for each double-page spread in the pupil book.
- **End of unit tests** – differentiated to two levels
- **Unit maps** – to summarise each unit
- **Pupil checklists** – to help pupils check their own strengths and weaknesses
- **Skill sheets** – 9 new sheets to support many Sc1 skills, especially Skill sheet 40 and Skill sheet 41
- **Booster skill sheets** – 3 sheets to help with learning and revision skills
- **Key words** – a list of all key words used throughout the course
- **Glossary** – can also be used for revision exercises. They can be cut up and used in a number of ways:
  - Pupils can be given the words and definitions to match up
  - Pupils can be given the definitions and asked to give the words
  - Pupils can be given the words and asked to give the definitions.

On Key words, Glossary and Unit map sheets **R** denotes the word only appears in the Red pupil book.
Introduction to the Catalyst course
(continued)

Also included on this CD-ROM

- Charts matching the course to the National Curriculum and to the Framework yearly teaching objectives.
- The spreadsheets used in some activities.
- The answers to all the questions from the relevant spread in both the Red and Green books.
- Test calculator to calculate NC levels with sublevels from the end of unit tests.

Other electronic resources to support Catalyst

Catalyst also has two other interactive CD-ROMs that can be used to support the course:

- **Catalyst Interactive Assessment** is designed to allow you to diagnose your pupil's progress at individual, whole class or year group level.

- **Catalyst Interactive Presentations** has over 350 video clips, photos, animations and presentations for each year to enable you to reduce planning time and enhance each lesson.
Catalyst has been designed for schools with three one-hour lessons per week over 35 weeks, totalling 105 hours per year.

Timing
In order to complete all the QCA Scheme of Work units in time for National Tests in year 9, it is necessary to do some year 8 units in year 7 and some year 9 units in year 8. Suggestions about which units to move forward are shown in the table below.

Each unit guide shows a direct route through the unit, with extra lessons, such as investigations, included for those schools with three hours of lessons per week.

There are some schools who only have two lessons per week over 35 weeks, totalling 70 hours per year. To complete the course, it is recommended that Think about spreads are used selectively and some lessons are combined.

For each lesson, approximate timings are given for each activity to allow flexibility so that you can design the lesson to match the time available.

Unit order
Where units are quite short or obviously go together they have been grouped together.

<table>
<thead>
<tr>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>J Energy resources</td>
<td>E Atoms and elements</td>
<td>F Patterns of reactivity</td>
</tr>
<tr>
<td>J Electrical circuits</td>
<td>F Compounds and mixtures</td>
<td>I Energy and electricity</td>
</tr>
<tr>
<td>A Cells</td>
<td>I Heating and cooling</td>
<td>A Inheritance and selection</td>
</tr>
<tr>
<td>B Reproduction</td>
<td>B Respiration</td>
<td>G Environmental chemistry</td>
</tr>
<tr>
<td>G Particle model of solids, liquids and gases</td>
<td>G Rocks and weathering</td>
<td>H Using chemistry</td>
</tr>
<tr>
<td>H Solutions</td>
<td>H Rock cycle</td>
<td>L Pressure and moments</td>
</tr>
<tr>
<td>K Forces</td>
<td>K Light</td>
<td></td>
</tr>
<tr>
<td>L The Solar System and beyond</td>
<td>L Sound</td>
<td></td>
</tr>
<tr>
<td>C Environment and feeding relationships</td>
<td>C Microbes and disease</td>
<td>C Plants and photosynthesis</td>
</tr>
<tr>
<td>D Variation and classification</td>
<td>D Ecology</td>
<td>D Plants for food</td>
</tr>
<tr>
<td>F Acids and alkalis</td>
<td>9E Reactions of metals</td>
<td></td>
</tr>
<tr>
<td>F Chemical reactions</td>
<td>9J Gravity</td>
<td></td>
</tr>
<tr>
<td>8J Magnets</td>
<td>9K Speed</td>
<td></td>
</tr>
<tr>
<td>9A Food and digestion</td>
<td>9B Fit and healthy</td>
<td></td>
</tr>
</tbody>
</table>
Using the Red and Green pupil books

Catalyst follows the QCA Scheme of Work order, so the unit headings match the units of the Scheme of Work.

The two pupil books (Red and Green) match each other spread by spread so they can be used in mixed ability classes. The Red pupil book is designed to stretch the more able. The Green pupil book supports the less able. Both books have the following features.

- Each double-page spread starts with the learning objectives in the Learn about box which clearly tells the pupil what they are going to be covering in the lesson.
- Where appropriate spreads have Do you remember? boxes which link back to what pupils studied at KS2.
- Did you know? boxes have interesting facts to inspire pupils to learn more.
- In-text questions help pupils to consolidate their knowledge and understanding as they go along.
- For your notes: boxes summarise the content of the spread and help to reinforce learning.
- End-of-spread questions review and test what pupils have learnt.
- The Think about spread in each unit provides an opportunity to develop thinking skills and scientific enquiry within the context of science. For more details on how to use these spreads, see page 5.
- The six Booster spreads highlight the five key ideas in the Framework (cells, interdependence, particles (1 and 2), energy and forces). For more details on how to use these spreads, see page 6.
- The Revision spread suggests some of the best ways to revise.
- The four double page spreads of sample SAT style questions (including SC1 questions) have notes from an examiner about how to get the best possible marks.

The Green pupil book also has:

- A larger print size and a carefully controlled language level, which make the pages more accessible for lower achievers.
- More in-text questions, to break up the text and get pupils to think about what they are reading as they go through the spread.
- End-of-spread questions which are more accessible to less able pupils – e.g. cloze questions and ‘fill in the gap’ exercises.

NC levels

The table below summarises the national curriculum levels for the Red and Green pupil books in each of years 7, 8 and 9.

<table>
<thead>
<tr>
<th></th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red pupil book</td>
<td>4–6</td>
<td>5–7</td>
<td>6–7*</td>
</tr>
<tr>
<td>Green pupil book</td>
<td>2–5</td>
<td>3–5</td>
<td>3–6</td>
</tr>
</tbody>
</table>

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Using the Think about spreads

Thinking skills
These spreads are designed to encourage pupils to develop the skills they will need to be successful in science. They help pupils move towards higher order thinking which enables them to develop skills in application, analysis, synthesis and evaluation. These skills will help pupils to be successful in:

- completing science investigations
- working like scientists and using scientific models
- problem-solving using group work and discussion.

CASE
Many schools have incorporated CASE (Cognitive Acceleration in Science Education) into their science teaching. CASE was developed in response to research that indicated that pupils struggled with science because they could not cope with the demanding scientific concepts such as variables, probability and correlation. CASE activities encourage pupils to think scientifically, so that they develop the skills they need.

Think about spreads bridge to CASE
The Think about spreads develop similar skills to CASE and do this in the context of one or more of the main Learn about spreads of the unit. They do not take the place of CASE but bridge to it. CASE activities can still be used as intervention lessons running parallel with the school's science course.

Getting discussion going
The Think about spreads are designed to stimulate discussion in pairs, small groups, or as a whole class. The pupils are encouraged to discuss the questions rather than write down individual answers. The Think about spreads lead pupils to question their thinking in a structured way. Many of the questions are open-ended and do not have right or wrong answers. Almost any answer can be met with a further question that moves the pupil’s thinking forward.

Think about spreads have five stages
A lesson using the Think about spread will usually fall into five parts:

1. A context is given which pupils are familiar with and they are introduced to any new terminology or apparatus that will be used.
2. The pupils are then lead to make an observation which may surprise them because it conflicts with their current understanding or way of thinking.
3. Pupils work in groups to find a way to resolve the conflict and thus develop new thinking patterns.
4. Pupils are encouraged to reflect on how they thought through the problem and compare their way of thinking with others in the group. They then feed back their ideas to the class to reinforce the new thinking patterns. This can be encouraged by asking open questions such as:
   - What did you do?
   - How do you explain…?
   - What would happen if…?
   - What does … tell you?
   - What did you do next?
   - What do you think they should do next?
   - Explain why/how…
   - Why do you think that…?
5. There may be opportunities to remind pupils of similar occasions where they can use their new thinking skills.

A number of the pupils using the Green pupil book will be working at NC level 4 or below so these spreads will allow fewer opportunities to develop higher order thinking patterns than the Red pupil book. But its structured approach will help these pupils to access these opportunities more easily, if they meet them either in the Red pupil book or in CASE lessons.
Boosting the five key ideas

Pupil books

The pupil books each contain six booster spreads linked to the five key ideas (cells, interdependence, particles (1 and 2), energy and forces).

- The first section of each spread (Do you know the basics?) reminds pupils about the key idea.
- The middle section (Are you ready for the next step?) tests their basic knowledge.
- The third section (Do you really understand?) gives pupils a chance to apply the key idea in new contexts, to help with SATs questions and boost their levels from 4 to 5 in the Green book and 6 to 7 in the Red book.

The booster spreads come near the end of the pupil books, though they can be used at any appropriate point in the course. These special icons throughout the books indicate possible links to the booster spreads.

The booster spreads are treated as one lesson each and so have a lesson plan and booster activities on the Teacher Resource CD-ROM.

CD-ROM

Booster lesson starters look at any misconceptions pupils may have and give pupils the chance to reactivate their knowledge using a key ideas map.

There are three Booster lesson activities:

- An activity covering the basic ideas in an active way to go with the “Do you know the basics?” section.
- A key facts activity which teaches pupils revision strategies using key fact cards. This goes with “Are you ready for the next step?”.
- A challenge activity in which pupils use their knowledge and understanding to explain new contexts. This goes with “Do you really understand?”.

Booster lesson plenaries make sure misconceptions have been dispelled and look at how well pupils are able to apply their knowledge to new contexts.

Booster skill sheets help pupils develop their learning and revision skills.
Brief guide to how the CD-ROM is organised

Navigating the resources

There are over 1400 pages on the CD-ROM which is designed so that it's easy to navigate. There are three ways to view the resources: by unit, or by resource type, or by bookmarks.

**Resources by unit**

From the Main Menu, choose Resources by unit and the unit you want to view.

The Unit guide for that unit appears. You can:

- Click on hyperlinks to take you to the Lesson planning guides
- Click on buttons to take you to the Red and Green end of unit test, Test yourself, Pupil checklist, Glossary and Key words.

If you click on the Lesson planning guide you can then:

- Click on hyperlinks to take you to Starter activities, Main activities, Specials, Plenary activities and Homework. (The hyperlinks from the top of the starter and plenary tables on the lesson planning guide are yellow so that they can be seen against the black background.) Then you can:
- Click on Starters to see the Starter teacher notes with hyperlinks to other Starter resources.
- Click on Activities to see the Teacher activity notes, then click on the TC button for any Technician activity notes. Click on the hyperlinks to Core, Help and Extension activity sheets and Resources.

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Brief guide to how the CD-ROM is organised (continued)

- Click on Specials to see the Specials sheets and answers.
- Click on Plenaries to see the Plenary teacher notes with hyperlinks to other Plenary resources.
- Click on Homework to see the Homework sheets and Mark schemes.

Resources by type
From the Main Menu, choose Resource by type and the type of sheet you want to view. Then choose the unit for which you want to view the type of sheet. For example, choose Starter activities and then Unit B.

- You can then navigate using the arrow buttons for Previous screen, Next screen, Resource type menu and Main Menu.

- There are also buttons to take you direct to the Unit guide and Lesson planning guide.

Bookmarks
Down the left side of the screen is a panel for Bookmarks. This shows the 12 units on the CD-ROM.

- By clicking on the + boxes you can expand each menu.
- By clicking on the – boxes you can collapse each menu.
For each unit all the types of resource available are listed.

- Click on the page icons to view the resources.

Customising resources
To save you time, we already supply most resources at several levels. Using this CD-ROM you will be able to easily customise the resources to meet the needs of your department and your pupils. If you need to differentiate the resources further, you can customise the resources in two ways: using ready-made Word files or customising from PDF files yourself.

Ready-made Word files
The following resources are supplied on the CD-ROM in Word format so that you can easily adapt them as you wish.

- Unit guides
- Lesson planning guides
- Pupil Activity sheets at Core, Help and Extension level
- Specials for the less able
- Homeworks

If you are viewing any of these pages, click on the button next to the Main Menu button which will take you to the Word file for that page. Save the Word file to your computer and then make any amendments to it. For full instructions, go to the Main Menu and click on How to use this CD-ROM: Customising Word files.

Customising from PDF files
All the resources are supplied on the CD-ROM in PDF format which can be customised using the tools available within Acrobat Reader. For full instructions, go to the Main Menu and click on How to use this CD-ROM: Customising PDF pages.
Brief guide to how the CD-ROM is organised (continued)

Printing resources
You can choose to print out all the resources on this CD-ROM in a number of different ways.

Print options screen

From the Main Menu, choose Print options. Then select:
- Print by unit – this gives you all the resources for one unit.
- Print by lesson – this gives you all the resources for one lesson.
- Print by resource type – this gives you all the resources of one type.

Print menu
When you are viewing any resources, there is a Print drop-down menu at the top of every page which allows you to print the resources for that unit in many different ways. Make a selection from the menu and then click on the blue Print button to the right of the menu.

Under this Print menu, you can choose Print current page to print just the single page you are viewing.

For every print selection you make, the number of pages you print will be displayed so that you can see how many pages you are going to print.

Please note that if you press the Acrobat Reader Print button you may end up sending all the pages from the file you are in to the printer. Some of the files contain a lot of pages so take care! It is advisable to use the Print drop-down menus on the pages to select the exact pages you want to print – or you can use the various print options accessible from the Main Menu.

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Using the Unit guides and Lesson planning guides

Unit guides
The course follows the QCA Scheme of Work order and each unit guide gives an overview of that unit, the lessons in the unit and how the pupil books tie in with the resources on this CD-ROM.

The unit guides include:
- Description of where the unit fits into the QCA Scheme of Work
- Prior learning required
- Framework yearly teaching objectives
- QCA Scheme of Work differentiated expectations
- Direct route through the lessons
- Misconceptions

The unit guides show the lesson allocation with a direct route of lessons through the unit. Each lesson includes the book spread and its associated activities. Think about spreads are included in the direct route. For many units, there is an optional investigation. A variety of resources is available for informal and formal assessment for learning.

Clicking on a lesson will take you to the lesson planning guide. Clicking on the ET, TY, PC, G, and K buttons will take you to the Red and Green end of unit tests, the Test yourself quiz, the Pupil checklist, the Glossary and the Key words, respectively, for that unit.

Lesson planning guides
Each lesson planning guide presents a three-part lesson structure.

The lesson planning guides include:
- Learning objectives
- Textbook and Specials sheet references
- Starter activities
- Main activities
- Plenary activities
- Learning outcomes
- Out-of-lesson learning including Homework sheets
- Key words

Starter activities
There is a choice of starter activities for every lesson. These activities provide opportunities to remind pupils of the content of a previous lesson, or to find out what they already know about a new topic. There are suggestions for brainstorming, using unit maps and word games, ways to capture interest, and learning objectives in pupil-friendly language.

In addition, there are references to photos, video clips and animations available on the Catalyst Interactive Presentations 3 CD-ROM.

Hyperlinks take you to the teacher sheets with further links to any pupil sheets or further teacher sheets.

Main activities
Suggested alternative main activities are provided to enrich and extend the pupil books. Many of these are provided at Core, Help and Extension level. These are indicated by ‘C’, ‘H’ or ‘E’ on the lesson planning guides. There are four different types of activity: Practical, ICT, Paper and Discussion.

Clicking on the ‘S’ in the target group column on the lesson planning guides will take you to the Specials (learning support) sheet for that lesson.

Hyperlinks take you to the pupil, teacher, and technician activity sheets.

Approximate timings are given for each alternative activity so that you can construct a lesson to fit the time available.

Plenary activities
There is a choice of plenary activities for each lesson. These are designed to end the lesson by recapitulating outcomes, providing opportunities for feedback, sharing results from activities, or looking forward to the next lesson.

Hyperlinks take you to the teacher sheets with further links to any pupil sheets or further teacher sheets.

Clicking on the Homework in the Out-of-lesson learning box will take you to the homework and homework mark scheme for that lesson.
Using the Starter, Main and Plenary activities

Starter activities
Every lesson has a choice of starter activities summarised in a table at the top of the teacher sheet. Further suggestions for running the activities are provided on the same sheet. For some starters there are also pupil or additional teacher sheets that can be handed out or used as OHTs.

Clicking on the ‘Suggested alternative starter activities’ on the lesson planning guide will take you to the Starter Teacher notes, with hyperlinks to the pupil or additional teacher sheets or technician sheets.

Main activities
These worksheets lead pupils through the activities. Many are differentiated to two or three levels (Core, Help, Extension) so that you can choose the most suitable level of support for each pupil.

The activities are linked to specific lesson/pages in the pupil books. There are four types of activity:

- **Practical activities** reinforce the main concepts illustrated in the pupil books. Each activity has been tried in the classroom and checked for safety.
- **ICT activities** include datalogging, spreadsheet activities, web searches, and presentation activities. Each activity has suggestions for software and equipment that may be used.
- **Paper activities** reinforce concepts and provide opportunities for reading and writing. Some include writing frames.
- **Discussion activities** encourage pupils to talk around or debate some of the key ideas.

On the activity worksheets, bold numbers indicate steps for pupils to follow and numbers in circles indicate questions.

Teacher activity notes provide guidance for using the activities by:
- indicating the purpose of the activity
- suggesting possible ways of running and differentiating the activity
- flagging the expected outcomes
- pointing out the pitfalls
- having safety notes to aid with COSHH assessment
- giving the answers to the questions on the activity sheets
- including references to relevant skill sheets.

Technician activity notes give complete guidance for technicians on the equipment needed and set-ups for practicals and datalogging.

Clicking on the individual Main activities on the lesson planning guide will take you to the teacher sheet for that activity. This has hyperlinks to the differentiated pupil sheets and a button to take you to the Technician notes, if supplied separately.

Plenary activities
Every lesson has a choice of plenary activities summarised in a table at the top of the teacher sheet. Further suggestions for running the activities are provided on the same sheet. For some plenaries there are also pupil or additional teacher sheets that can be handed out or used as OHTs.

Clicking on the ‘Suggested alternative plenary activities’ on the lesson planning guide will take you to the Plenary Teacher notes, with hyperlinks to the pupil or additional teacher sheets.
Using the comprehensive assessment for learning

**Catalyst** provides many resources to help you to track the progress of your pupils.

**In-text and end-of-spread questions**
These are in the pupil books and help you and your pupils check their understanding.

**Homeworks**
These provide an opportunity for pupils to work alone on activities focused on reinforcing and applying their knowledge. For a 20-minute homework based on a pupil book spread, pupils can be given the Help and Core sections or the Core and Extension sections. Many of the Main paper activities could be used for homework too.

**Unit maps**
These can be used at the beginning of a unit to reactivate pupils’ knowledge, or at the end of the unit to consolidate pupils’ learning. The word lists could be withheld from more able pupils.

**Pupil checklists**
These can be used throughout the unit and at the end to help pupils check their strengths and weaknesses.

**Key words**
These can be used throughout the unit. R denotes the word only appears in the Red pupil book.

**Glossaries**
These can be cut up and used in a number of ways. Pupils can be given the words and definitions to match up. Pupils can be given the definitions and asked to give the words. Pupils can be given the words and asked to give their own definitions.

**Test yourself quizzes**
These help pupils consolidate their learning and diagnose their own misconceptions at the end of each unit. They can mark their own work from the answer sheet which you can read out or photocopy on to an OHT.

**End of unit tests**
These are provided at two levels: tier 3-6 and tier 5-7. Each end of unit test tests the required National Curriculum points, and gives a summative assessment of the pupil’s current NC level. Sc-I questions are included in most end of unit tests to offer pupils practice in answering this type of question. There are a number of questions on both papers which are common to help with comparison of pupils’ performance.

There are 35 buttons on the end of the unit tests to take you to the mark scheme for that test. Mark schemes with answers include a level for each mark. Mark ranges are provided so that a level can be given to each pupil. The combined scores from a number of tests give a more reliable measure of performance. These can be entered in the Test calculator spreadsheet on the CD-ROM. A button on each mark scheme will take you to the Test calculator.

There are two versions of the Test calculator on the CD-ROM, one for 250 pupils and one for 500 pupils. There is a link at the bottom of the Help sheet on each calculator that will take you to the other version.

**Catalyst Interactive Assessment 3**
This CD-ROM is available separately for Catalyst 3. This interactive assessment package has been designed to save you time with testing, marking and analysing data. It allows you to gather reliable, detailed data on all your pupils’ performance. You will be able to test pupils across the whole ability range and all data can be analysed instantly.
Safety information

The following symbols are used in the pupil activity sheets to help pupils work safely:

- ! Wear eye protection.

We have attempted to identify any activities that might present some hazard, and suggest the appropriate strategies to reduce the risk to acceptable levels (See Safety notes sections in both the Teacher activity notes and Technician activity notes). Most educational employers have adapted various national publications such as:

- Safety in Science Education (DFEE 1996)
- Topics in Safety (ASE, 2nd edition 1988)
- Hazcards (CLEAPSS School Science Service 1997), or SSERC Hazardous Chemicals Manual 1997 (Scotland)
- Safeguards in the School Laboratory (ASE, 10th edition 1996)

Laboratory policy and practice

It is assumed that a good laboratory policy and practice is observed throughout, for example:

- Eye protection is worn by both pupils and teacher whenever the risk assessment requires it. (This is indicated on the pupil activity sheets and in the Safety notes sections of the Teacher activity notes and Technician activity notes.)
- Other protective control equipment (e.g. safety screens, efficient fume cupboards) is similarly used when the risk assessment requires it.
- Long hair is tied back, pupils do not wear 'wet-look' hair preparations, and ties, scarves, and cardigans are not allowed to hang freely.
- Pupils are trained in how to heat chemicals safely, and reminded frequently of the technique.
- Pupils are taught how to smell gases safely.
- Containers of chemicals are clearly labelled with an appropriate name and any hazards.
- Eating, drinking, and chewing are not permitted.
- Electrical and other equipment is well maintained and subject to regular checks.
- Pupils at particular risk (e.g. asthmatics, those with allergies and those with known disabilities) are identified and catered for.
- The size of the class and behaviour of pupils within it may be considered inappropriate for certain activities.
- Science staff have received appropriate training in the activities, including hazard identification and risk assessment.

as the basis for their general risk assessments, and proposed activities should be compatible with advice contained in these publications. In all cases, however, teachers must follow the guidance or local rules produced by their employer.

For detailed information on IT safety an article in School Science Review may be useful: "Safety aspects of IT" by Joe Jeffries, SSR, December 1997, 79(287).

Whenever an activity is changed in any way a new safety assessment will be needed. It will be solely the responsibility of the teacher who undertakes the modification to ensure that an appropriate assessment has been undertaken.

Heinemann Educational Publishers can take no responsibility for the safety of any activity that has been altered from the original printed version.
Yearly teaching objectives: Scientific enquiry

In the lesson plans, the full investigations have been matched to the Framework yearly teaching objectives for Scientific enquiry using the letter codes below.

<table>
<thead>
<tr>
<th>Year 9 pupils should be taught to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>9a Explain how scientific ideas have changed over time; describe some of the positive and negative effects of scientific and technological developments.</td>
</tr>
<tr>
<td>9b Select and use a suitable strategy for solving a problem; identify strategies appropriate to different questions, including those in which variables cannot be easily controlled.</td>
</tr>
<tr>
<td>9c Carry out preliminary work such as trial runs to help refine predictions and to suggest improvements to the method.</td>
</tr>
<tr>
<td>9d Make sufficient systematic and repeated observations and measurements with precision, using an appropriate technique.</td>
</tr>
<tr>
<td>9e Select and use appropriate methods for communicating qualitative and quantitative data.</td>
</tr>
<tr>
<td>9f Describe patterns in data; use scientific knowledge and understanding to interpret the patterns, make predictions and check reliability.</td>
</tr>
<tr>
<td>9g Describe how evidence or the quality of the product supports or does not support a conclusion in their own and others' enquiries; identify the limitations of data in conclusions.</td>
</tr>
</tbody>
</table>

### Scientific enquiry

<table>
<thead>
<tr>
<th>Investigation</th>
<th>Framework yearly teaching objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>E5 Investigate: Making a salt</td>
<td>9a</td>
</tr>
<tr>
<td>G2 Investigate: What makes rain acidic?</td>
<td>9b</td>
</tr>
<tr>
<td>I2 Investigate: How to increase the voltage in a fruit cell?</td>
<td>9c</td>
</tr>
<tr>
<td>K5 Investigate: How did faster vehicles develop?</td>
<td>9d</td>
</tr>
<tr>
<td>J2 Investigate: How do living things change?</td>
<td>9e</td>
</tr>
<tr>
<td>J3 Investigate: How does a planet form?</td>
<td>9f</td>
</tr>
<tr>
<td>J4 Investigate: How do stars form?</td>
<td>9g</td>
</tr>
<tr>
<td>J5 Investigate: How do galaxies form?</td>
<td>9h</td>
</tr>
</tbody>
</table>

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### Framework yearly teaching objectives

#### Cells

<table>
<thead>
<tr>
<th>Catalyst Pupil Books 3 (units A, B, C and D)</th>
<th>Framework yearly teaching objectives</th>
<th>QCA SoW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B1 Are you fit?</strong></td>
<td>Use a word and/or symbol equation to describe respiration and explain similarities with burning of fuels.</td>
<td>9B</td>
</tr>
<tr>
<td><strong>B2 Breathing and smoking</strong></td>
<td>Explain that multi-celled organisms survive well only if all their parts work well together; use this to explain how smoking, alcohol, some drugs and exercise affect parts of the human body.</td>
<td>9B</td>
</tr>
<tr>
<td><strong>B3 Drugs and alcohol</strong></td>
<td>Explain that the nucleus in a cell contains genes that control all the characteristics of the organism; use this to explain:</td>
<td>9A</td>
</tr>
<tr>
<td><strong>A1 The way we are</strong></td>
<td>- fertilisation, where genes from one parent join with genes from the other to produce a new set of genes;</td>
<td>9A</td>
</tr>
<tr>
<td><strong>A2 Selective breeding</strong></td>
<td>- how selective breeding, either by nature or by humans, can increase the chance of certain genes passing from parent to offspring;</td>
<td>9A</td>
</tr>
<tr>
<td><strong>A3 Choice vegetables</strong></td>
<td>Describe photosynthesis and the requirement of chlorophyll, light, carbon dioxide and water, know that plant nutrition involves photosynthesis and other nutrients obtained from the soil; use this to explain:</td>
<td>9C</td>
</tr>
<tr>
<td><strong>C1 Hungry plants</strong></td>
<td>- photosynthesis as a source of biomass;</td>
<td>9C</td>
</tr>
<tr>
<td><strong>C2 A food factory</strong></td>
<td>- how leaves and roots are adapted to their functions;</td>
<td>9C</td>
</tr>
<tr>
<td><strong>C3 Don’t dry up!</strong></td>
<td>- conditions in which plants grow well;</td>
<td>9D</td>
</tr>
<tr>
<td><strong>C4 Using plant biomass</strong></td>
<td>Distinguish between photosynthesis and respiration in plants, including the use of word equations.</td>
<td>9C</td>
</tr>
<tr>
<td><strong>C5 Spot the difference</strong></td>
<td>Describe relationships of organisms in a food web and use this to explain:</td>
<td></td>
</tr>
<tr>
<td><strong>D1 Storing food</strong></td>
<td>- why photosynthesis is important to humans;</td>
<td>9D</td>
</tr>
<tr>
<td><strong>D2 Making them grow</strong></td>
<td>- why maximising human food production can significantly affect other animals and plants;</td>
<td>9D</td>
</tr>
<tr>
<td><strong>D3 Competing plants</strong></td>
<td>- how the abundance and distribution of organisms may be affected by pesticides, weedkillers and the accumulation of toxins;</td>
<td>9D</td>
</tr>
<tr>
<td><strong>D4 What a pest!</strong></td>
<td>- how pyramids of numbers represent feeding relationships in a habitat;</td>
<td>9D</td>
</tr>
<tr>
<td><strong>D5 Spot the difference</strong></td>
<td>Explain that habitats change in response to changes in physical, chemical and biological factors.</td>
<td>9D</td>
</tr>
<tr>
<td><strong>D6 Making them grow</strong></td>
<td>Explain that habitats change in response to changes in physical, chemical and biological factors.</td>
<td>9C</td>
</tr>
<tr>
<td><strong>D7 What a pest!</strong></td>
<td>Begin to describe a model for the whole environment that recognises how the materials that make up all living organisms are recycled, and that energy from sunlight flows through the system; use this to explain the need for sustainable development.</td>
<td>9D</td>
</tr>
<tr>
<td><strong>D8 Spot the difference</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Framework yearly teaching objectives
match against Catalyst 3 (continued)

<table>
<thead>
<tr>
<th>Particles</th>
<th>Framework yearly teaching objectives</th>
<th>QCA SoW</th>
</tr>
</thead>
<tbody>
<tr>
<td>E2 Salt on the roads</td>
<td>Identify evidence which indicates that a chemical reaction has taken place, such as the association of energy transfer with chemical change.</td>
<td>9E</td>
</tr>
<tr>
<td>E3 Acids attack metals</td>
<td>Recognise that chemical reactions can be modelled by assuming that atoms can rearrange themselves, and that this can happen in only a limited number of ways, for example. A + B → AB, AB + CD → AD + CB.</td>
<td>9E, 9F</td>
</tr>
<tr>
<td>E6 Acids and metal oxides</td>
<td>Use the particle rearrangement model to:</td>
<td>9G, 9H</td>
</tr>
<tr>
<td>F1 Losing that shine</td>
<td>– predict the names and formulae for products that might be formed from given reactants;</td>
<td>9E, 9F, 9G, 9H</td>
</tr>
<tr>
<td>F2 Corrosive liquids</td>
<td>– write word and symbol equations for some simple reactions;</td>
<td>9E, 9F, 9G</td>
</tr>
<tr>
<td>F3 Changing places</td>
<td>– explain why mass is conserved in chemical reactions;</td>
<td>9H</td>
</tr>
<tr>
<td>G2 Acid rain</td>
<td>Describe how metals react with:</td>
<td>9E</td>
</tr>
<tr>
<td>H2 Energy from reactions</td>
<td>– oxygen, water, acids and oxides;</td>
<td>9E, 9F, 9G, 9H</td>
</tr>
<tr>
<td>H3 Reactions in balance</td>
<td>– solutions of salts of other metals.</td>
<td>9F</td>
</tr>
<tr>
<td>H4 The story of burning</td>
<td>– explain how acids react with bases and neutralisation occurs.</td>
<td>9E</td>
</tr>
</tbody>
</table>

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Framework yearly teaching objectives
match against Catalyst 3 (continued)

### Energy

<table>
<thead>
<tr>
<th>Catalyst Pupil Books 3 (unit I)</th>
<th>Framework yearly teaching objectives</th>
<th>QCA SoW</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1 Make it work</td>
<td>Recognise the idea of energy conservation as a useful scientific accounting system when energy is transferred; use this to explain energy transfers in familiar situations, energy efficiency and energy dissipation.</td>
<td>H1</td>
</tr>
<tr>
<td>I2 Energy in and out</td>
<td>Develop, from a simple model of energy transfer in electrical circuits, the idea of potential difference in electrical circuits.</td>
<td>H1</td>
</tr>
<tr>
<td>I3 Using electricity</td>
<td>Use the model of energy conservation to explain how:</td>
<td>H1</td>
</tr>
<tr>
<td>I4 Power stations</td>
<td>– the potential difference measured across cells or components shows how much energy is transferred from the cells to the current and from the current to the components.</td>
<td>H1</td>
</tr>
<tr>
<td>I5 Power stations</td>
<td>– electrical energy can be generated using fuels, including the energy transfers involved; recognise possible environmental effects of this.</td>
<td>H1</td>
</tr>
</tbody>
</table>

### Forces

<table>
<thead>
<tr>
<th>Catalyst Pupil Books 3 (units J, K and L)</th>
<th>Framework yearly teaching objectives</th>
<th>QCA SoW</th>
</tr>
</thead>
<tbody>
<tr>
<td>K4 Faster!</td>
<td>Use friction in liquids and gases to explore how the resistance to an object moving through liquids and gases changes with the object’s speed and shape; explain how streamline reduces an object’s resistance to air and water.</td>
<td>H1</td>
</tr>
<tr>
<td>K5 Slow down</td>
<td></td>
<td>H1</td>
</tr>
<tr>
<td>L4 Where’s the pivot?</td>
<td>Recognise how the turning effect of a force (moment) is related to the size of the force and the distance the force is from the pivot; use moments to explain how a simple object can be balanced.</td>
<td>L1</td>
</tr>
<tr>
<td>L5 Balancing act</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td>L6 Moments in life</td>
<td>Recognise how the effect of a force depends upon the area to which it is applied and that the force acting per unit area is called pressure; use the relationship to explain:</td>
<td>L1</td>
</tr>
<tr>
<td>L1 Under pressure</td>
<td>– the pressure exerted by solids;</td>
<td>L1</td>
</tr>
<tr>
<td>L2 Pressure in liquids</td>
<td>– pressure within liquids and gases.</td>
<td>L1</td>
</tr>
<tr>
<td>L3 Pressure in the air</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td>J1 A massive problem</td>
<td>Recognise that gravity is a force of attraction between objects, that this force is greater for large objects like the Earth but gets less the further an object moves away from the Earth’s surface; use these ideas to explain:</td>
<td>J3</td>
</tr>
<tr>
<td>J2 A massive problem</td>
<td>– how weight is different on different planets.</td>
<td>J3</td>
</tr>
<tr>
<td>J3 Satellites</td>
<td>– how stars, planets, and natural and artificial satellites are kept in position in relation to one another.</td>
<td>J3</td>
</tr>
<tr>
<td>Unit</td>
<td>Sc1 Scientific enquiry</td>
<td>Sc2 Life processes and living things</td>
</tr>
<tr>
<td>------</td>
<td>------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>9A Inheritance and selection</td>
<td>2b, 2h, 2i, 2k, 2m, 2o</td>
<td>1c, 2a, 4c</td>
</tr>
<tr>
<td>9B Fit and healthy</td>
<td>2b, 2d, 2e, 2k, 2m</td>
<td>1c, 2a, 2d, 2e, 2i, 2m</td>
</tr>
<tr>
<td>9C Plants and photosynthesis</td>
<td>4a, 5a, 5b, 5c, 5d, 4a, 4b</td>
<td>3b, 3k, 3a, 3b, 3c, 3d, 4a, 4b</td>
</tr>
<tr>
<td>9D Plants for food</td>
<td>2c, 2d, 2e, 2f, 2g, 2i, 2j, 2k, 2m</td>
<td>2a, 2k, 3i, 3k, 3e, 5g, 5a</td>
</tr>
<tr>
<td>9E Reactions of metals and metal compounds</td>
<td>2b, 2c, 2d, 2e, 2f, 2g, 2i, 2j, 2k, 2l, 2m, 2n, 2e, 2y</td>
<td></td>
</tr>
<tr>
<td>9F Patterns of reactivity</td>
<td>2b, 2c, 2d, 2e, 2f, 2g, 2h, 2i, 2j, 2k, 2l, 2m, 2n, 2e, 2y</td>
<td>3a, 3b, 3c, 3d, 3f, 3g, 3h</td>
</tr>
<tr>
<td>9G Environmental chemistry</td>
<td>2b, 2g, 2i, 2j, 2k, 2m, 2o</td>
<td></td>
</tr>
<tr>
<td>9H Living chemistry</td>
<td>2g, 2i, 2j, 2k, 2m</td>
<td></td>
</tr>
<tr>
<td>9I Energy and electricity</td>
<td>2c, 2g, 2i, 2j, 2k, 2m</td>
<td></td>
</tr>
<tr>
<td>9J Gravity and space</td>
<td>1a, 1b, 1c, 1d, 2m</td>
<td></td>
</tr>
<tr>
<td>9K Speeding up</td>
<td>2b, 2g, 2i, 2j, 2k, 2l, 2m</td>
<td></td>
</tr>
<tr>
<td>9L Pressure and moments</td>
<td>1b, 1c, 2g, 2i, 2j, 2k, 2l, 2m</td>
<td></td>
</tr>
</tbody>
</table>