

KEY STAGE 3

# HOW SCIENCE WORKS

*INTERACTIVE*

# BIOLOGY V1.0

## Getting Started

RISING  STARS

[www.risingstars-uk.com](http://www.risingstars-uk.com)

# Contents

Introduction 3

**Strand**                      **Investigation title**                      **Page**

**2.1 Life Processes**                      *Investigating heart rates and breathing rates*                      4  
*Biceps forces*                      5  
*Growing tomatoes*                      6

**2.2 Variation and Interdependence**                      *Plants need water and nutrients*                      7  
*Improving cattle breeding*                      8  
*Does radiation create better plants?*                      9

**2.3 Behaviour**                      *Reaction times*                      10  
*Squirrels learn and remember*                      11  
*Honey bee dances*                      12

**5.1 Changing Environment and Sustainability**                      *How the Earth's atmosphere has changed*                      13  
*Destroying the rainforests*                      14  
*Stocks of fish in the North Sea*                      15

### Introduction

This booklet provides the on-screen Getting Started instructions (in the 'investigation' section of each unit) from the *How Science Works Interactive Biology* CD-ROM in printed form. It should be used alongside the CD-ROM to facilitate discussion and planning of the investigations particularly if they are to be carried out by students with minimal teacher support.

*How Science Works Interactive* has been developed to support, complement and reinforce practical and investigational work at Key Stage 3. The programme consists of three CD-ROMs – Biology, Chemistry and Physics – and provides coverage of the *Framework for secondary science* 'How science works' strands as well as of the science content strands.

Each CD-ROM includes fully interactive investigations, each supported by information on science in a real-life context. Learning is reinforced and extended through follow-up questions, discussion points and extension work. These can be used for individual and group work in the classroom and as homework. More detailed information on structure and functionality is given in the 'How to use' document, accessible from the main menu screen on each CD-ROM.

Each investigation supports the teaching of the 'How science works' strand within the *Framework* generally although specific sub-strands have been identified as key to each investigation. The investigations have also been matched to the three most appropriate criteria within the Assessment Focuses (AFs) as described in *Assessing pupils' progress in science at Key Stage 3*. The investigations can provide evidence against these criteria to enable students to monitor their own learning and for teachers to make judgements about levels of attainment and progress. However, the follow-up discussion points and extension work develop the topic further to cover a much wider range of AFs. You will find the specific 'How science works' sub-strands and the three associated assessment criteria listed within each investigation's context screen.

## 2.1 Life Processes:

### *Investigating heart rates and breathing rates*

Click on the **e** button to find the subjects you need to begin your investigation.

Start with subjects 1 and 2 by dragging and dropping the clipboard of information about them onto the workbench. They each do three sessions on the treadmill and can spend up to 16 minutes on it every session. The angle of the treadmill's slope increases every few minutes. Each session must be completed before moving on to the next.

Click the 'start' button to start the first treadmill session. It will stop so that you can measure and record data. Clicking on the 'next' button moves you to the next stage of the activity. Go on to investigate subjects 1 and 2's other sessions.

Investigate subjects 3–6 (one session only) in the same way. For subjects 3–6, when they have finished their sessions, click the 'next' button to show their heart rate after one minute's rest.

The display screen will show the person's heart rate and breathing along with information regarding the treadmill activity.

Go to the follow-up screen and work through the questions and challenges in each section to extend your thinking and learning.

## 2.1 Life Processes:

### *Biceps forces*

Click on the **e** button to find the equipment you need to begin your investigation.

Choose an arm to investigate and drag and drop it onto the workbench. Drag and drop the weights and the ruler to the workbench. Start by measuring the distance of the biceps tendon attachment to the turning point of the elbow (centre of the end of the humerus) and record your results.

Put a weight on the hand. Decide the point where the downwards force of the weight is acting on the hand. Measure this distance from the turning point of the elbow. Record the weights and distances. Find the biceps force using the calculator and record this data.

Go to the follow-up screen and work through the questions and challenges in each section to extend your thinking and learning.

## 2.1 Life Processes:

### *Growing tomatoes*

Click on the **e** button to find the equipment you need to begin your investigation. Drag all the meters onto the workbench.

One seed has been sown in the pot and is automatically watered regularly. Decide which variables you are investigating and which you are fixing. Vary the light, temperature and carbon dioxide levels by clicking on the appropriate + or – buttons on the equipment at the top of the screen.

Drag the ruler to the workbench. Use it to measure the height of the plant and the quality chart to record its health at frequent intervals.

Use the week counter to start the investigation. Record and graph your results as appropriate.

Go to the follow-up screen and work through the questions and challenges in each section to extend your thinking and learning.

## 2.2 Variation and Interdependence:

### *Plants need water and nutrients*

Click on the **e** button to find the plant material you need to begin your investigation.

There are three pairs of rice varieties grown in different density soil. Drag one of the varieties to the workbench. The left hand ones are the control plants harvested after 30 days; the right hand ones are the experimental plants harvested after 40 days. All plants were watered regularly for the first 30 days but no water was given to the experimental plants for the last 10 days before harvesting.

Plant growth has been recorded for you. Click on the data tool to see these results.

Once both the control and experimental plants have been harvested, they automatically have their roots separated from their shoots and are dried in an oven for 2 days. Find and record the masses of the shoots and roots.

Go to the follow-up screen and work through the questions and challenges in each section to extend your thinking and learning.

## 2.2 Variation and Interdependence:

### *Improving cattle breeding*

DairyCo is the dairy sector organisation promoting knowledge to British dairy farmers so they can profit from a sustainable future. They publish *breeding+* providing explanations on genetic evaluations, the latest evaluation results and statistics for the major dairy breeds in the UK. They use what is called £PLI to rank the bulls genetically: the larger the £PLI value, the greater the chance of breeding cows that give high quality milk yields. Cows have their own similar ranking.

£PLI of bulls and cows is calculated from a range of 'predictions'. For example, daughters of a bull with a 'prediction' of 650 kg milk are likely to produce 650 kg more milk in a milking season than the daughters of an average bull.

The £PIN is a 'prediction' of both milk quantity and milk quality in terms of fat and protein. It is an important factor in the overall £PLI, but 'predictions' of fertility, lifespan and health of daughters matter too.

Investigate the data on bulls and cows using the questions in the follow-up section to guide your research and extend your thinking and learning. For the data on bulls, click 'show bull data'. The data on cows can be seen on screen.

## 2.2 Variation and Interdependence:

### *Does radiation create better plants?*

Click on the **e** button to find the plants you need to begin your investigation.

Each tray of seeds has received different doses of radiation. Choose a tray of seeds, which have been watered once, to investigate and drag it to the workbench. Click on the 'days' button to start the investigation and record how many seeds grow over time. All the seeds are watered automatically.

Clicking on the table reveals data from daughter plants.

Go to the follow-up screen and work through the questions and challenges in each section to extend your thinking and learning.

## 2.3 Behaviour:

### *Reaction times*

Click on the **e** button to vary the backdrops used in this investigation.

Click the 'start' button to begin. As soon as the star appears, click on it. The time taken from clicking 'start' to clicking your mouse will be automatically recorded for you with the data tool. You will be given ten attempts. Practise with this, and other backdrops, and try to improve your reaction time.

Go to the follow-up screen and work through the questions and challenges in each section to extend your thinking and learning.

## 2.3 Behaviour:

### *Squirrels learn and remember*

Click on the **e** button to find the equipment you need to begin your investigation.

Drag and drop five cups into the virtual garden, one per elliptical target. Drag the pile of nuts to one of these cups. The nuts will vanish under the cup and a yellow arrow will appear to indicate which cup the nuts have been hidden under.

Click the 'start' button to begin the squirrel's hunt for food. Follow the instructions on screen and observe the squirrel's actions. When instructed to do so, you can adjust the investigation by using different combinations of cups or by moving the nuts using the yellow arrow.

Record the time taken by the squirrel to find the nuts.

Go to the follow-up screen and work through the questions and challenges in each section to extend your thinking and learning.

## 2.3 Behaviour:

### *Honey bee dances*

Watch and listen to this film of a honey bee dance.

Record the time of each 'waggle dance' against the direction of the flower source. Repeat your timings until you are confident that you have a reliable average time for each flower source direction 'dance'.

Go to the follow-up screen and work through the questions and challenges in each section to extend your thinking and learning.

## 5.1 Changing Environment and Sustainability:

### *How the Earth's atmosphere has changed*

Use the controls to navigate forwards and backwards along the timeline. Click the 'evidence' button to read and discuss research and theories relating to the change in the Earth's atmosphere about those points in time.

Record the percentage of oxygen in the atmosphere at different times in the Earth's history.

Go to the follow-up screen and work through the questions and challenges in each section to extend your thinking and learning.

## 5.1 Changing Environment and Sustainability: *Destroying the rainforests*

In tropical Africa, wood collection for fuel and clearing ground for agriculture, combined with increasing logging operations, may be the cause of the rising levels of wood removal. In tropical Asia, vast areas were logged in the 1980s and 90s. Today, timber harvesting in natural forests is much less, while forest plantations are replacing lost production.

Use the controls to navigate forwards and backwards along the timeline to one of the pre-selected points in time. Click on the continents of South America, Africa and Asia in turn to observe and record information about wood removal.

For each continent, in terms of forest sustainability, record and plot data for countries with a) the most worrying data and b) the most hopeful data.

Go to the follow-up screen and work through the questions and challenges in each section to extend your thinking and learning.

## 5.1 Changing Environment and Sustainability: *Stocks of fish in the North Sea*

Use the controls to navigate forwards and backwards along the timeline to one of the pre-selected points in time.

Click on the boat for a chosen year to observe information about numbers of different fish in the North Sea during the 20th century. Starting at 1905, record and graph stock levels of flat fish (sole and plaice) and round fish (cod, haddock and whiting) at five year intervals.

Click on the fish in the net to investigate, record and graph how the stock, and the spawning stock, of cod and haddock has changed from 1964 to 1994.

Go to the follow-up screen and work through the questions and challenges in each section to extend your thinking and learning.

**RISING  STARS**

Rising Stars UK Ltd  
22 Grafton Street  
London W1S 4EX

For more information about the How Science Works Interactive series:  
0800 091 1602  
[www.risingstars-uk.com/hswbiology](http://www.risingstars-uk.com/hswbiology)

Published 2009 © Rising Stars UK Ltd