

ACE SCIENCE KS3 SCIENCE TASKS BIOLOGY

CONTENTS

1. Making a Model Cell
2. Observing Cells Under a Microscope
3. The Race to Make a Baby
4. The Journey of a Cheese Sandwich
5. How do we Breathe?
6. Investigating Variation in Beans
7. What Happens When We Exercise?
8. Investigating Yeast
9. How do Plants Grow?
10. Investigating Photosynthesis
11. Metals in Food Chains
12. Healthy Lifestyles
13. Seed Banks
14. Jackals' Social Behaviour



1

TEACHER NOTES:

MAKING A MODEL CELL

NATIONAL CURRICULUM LINKS

CELLS AND ORGANISATION

- cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope
- the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts
- the similarities and differences between plant and animal cells
- the role of diffusion in the movement of materials in and between cells
- the structural adaptations of some unicellular organisms.

TASK:

Make a model of a plant or animal cell.

SUGGESTED APPROACH:

Please read the introduction to this book to get the most out of this task. It is unusual in its format as it requires learners to make a 3D model. Set homework to make a cell, then label it and make a legend in class, using the ACE Learning Ladder as a guide. Ask learners to do a short presentation about their model cell.

To ensure that the assessment is formative, learners could either make improvements (after teacher, self or peer assessment) to their exhibit or the teacher could set specific tasks to aid progression. For example: a worksheet to label a diagram of a plant or animal cell, or match cell parts to their jobs. These types of task are available in most published schemes.

RESOURCES:

None if set as a homework. For class activity, a variety of materials for making model cells, for example: plastic and cardboard cartons, cling film, dried peas, golf balls or ping pong balls, wallpaper paste (optional: make appropriate risk assessment), plastic bags, scissors, glue.

PRIOR LEARNING EXPERIENCE:

Before students attempt this task, they must be familiar with:

- observing cells under a microscope
- simple structures of animal and plant cells
- adaptations in specialised cells.

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TASK SHEET:

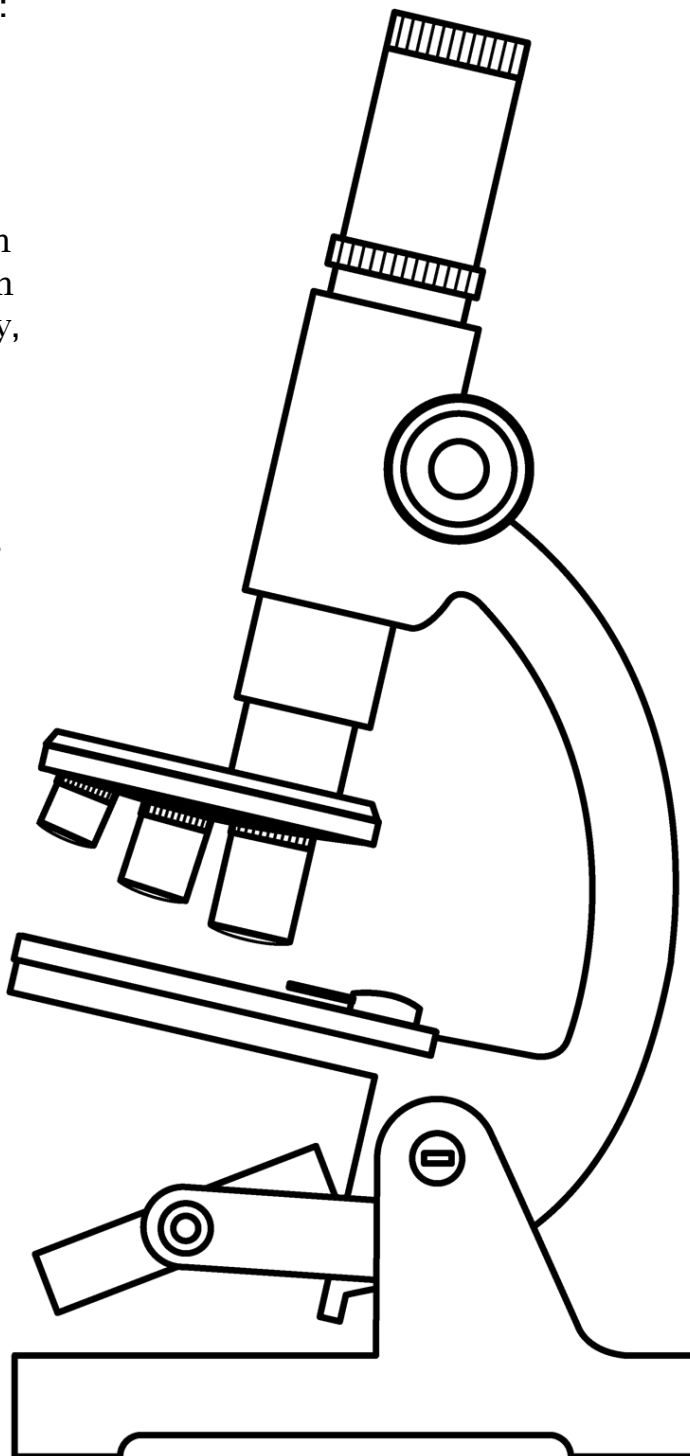
MAKING A MODEL CELL

Imagine the Science Museum has asked you to make a model cell for a display. Make a model of one of the following:

- an animal cell
- a plant cell
- a specialised cell.

Use the key words below to label each part of the model cell clearly. Make an information card, perhaps using a key, to describe what cells are and the structures they contain.

Your teacher may ask you to give a short presentation about your model.



KEY WORDS

cell, cell membrane, cell wall, chloroplast, cytoplasm, nucleus, mitochondria , vacuole

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ACE LEARNING LADDER: MAKING A MODEL CELL

ACE LEARNING LADDER

Assessment check	What you could include:
Advanced	<p>You will have made a detailed model cell, drawing on detailed scientific knowledge and understanding. You might:</p> <ul style="list-style-type: none"> • Represent the structures found within the cell of your choice approximately to scale or relative size. • Explain the role of each part of the cell shown in detail. • Discuss how different cells are specialised for different roles, and what stem cells are and their potential uses. • Explain the different types of microscopes available and the cell organelles these allow you to observe. • Use a range of appropriate scientific words, symbols and units accurately.
Confident	<p>You will have made a model cell, drawing on scientific knowledge and understanding. You might:</p> <ul style="list-style-type: none"> • Show the structures found within the cell of your choice paying attention to accuracy of shape and location within the cell. • Explain the role of each part of the cell shown. • Discuss how the cell your model shows is similar or different to other cells. • Explain how to use a microscope to observe cells. • Use a range of appropriate scientific words, symbols and units.
Establishing	<p>You will have made a simple model cell, drawing on some scientific knowledge and understanding. You might:</p> <ul style="list-style-type: none"> • Show the structures found within the cell of your choice. • State the name and role for each structure in your model. • List one or two differences between animal and plant cells. • Give a simple description of how to use a microscope. • Use some appropriate scientific words, symbols and units.

SUPPORT SHEET 1: ESTABLISHING TO CONFIDENT

MAKING A MODEL CELL

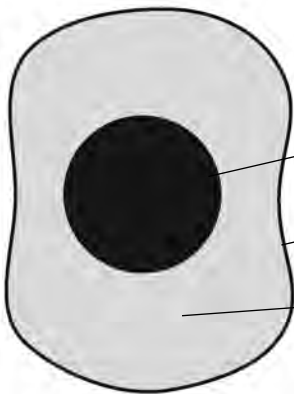
CELLS TO SYSTEMS

Key words

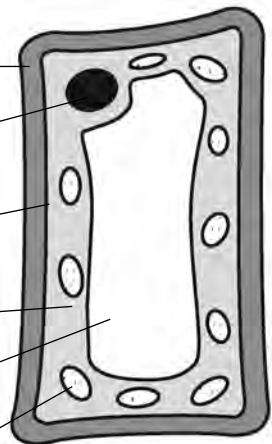
Link the correct job to each cell part.

Parts of cell	Jobs
Cell	controls the cell
Cell membrane	lets some substances in and out of the cell
Cytoplasm	place where respiration (and energy production) occurs
Nucleus	stores cell sap
Mitochondria	place where chemical reactions take place

Animal cell



Plant cell



C W

N

C M

C

V

C

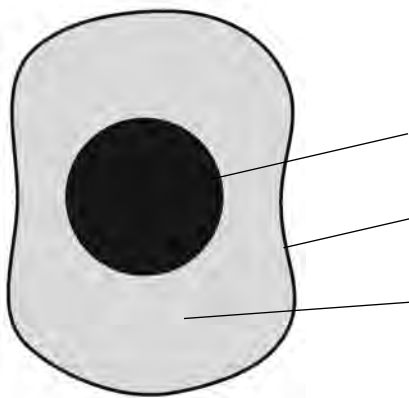
SUPPORT SHEET 2: CONFIDENT TO ADVANCED

MAKING A MODEL CELL

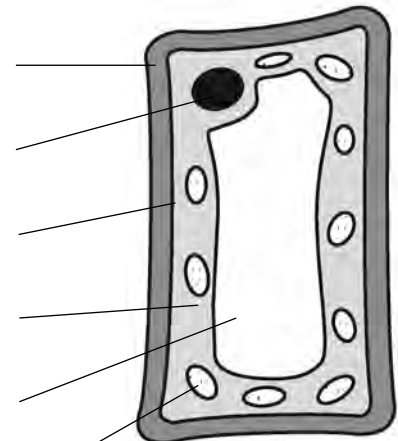
To help you think about some of the cell parts your model should include, fill in the missing cell parts to the table below.

Parts of cell	Jobs
	controls the cell
	lets some substances in and out of the cell
	place where respiration (and energy production) occurs
	stores cell sap
	place where chemical reactions take place

Animal cell



Plant cell



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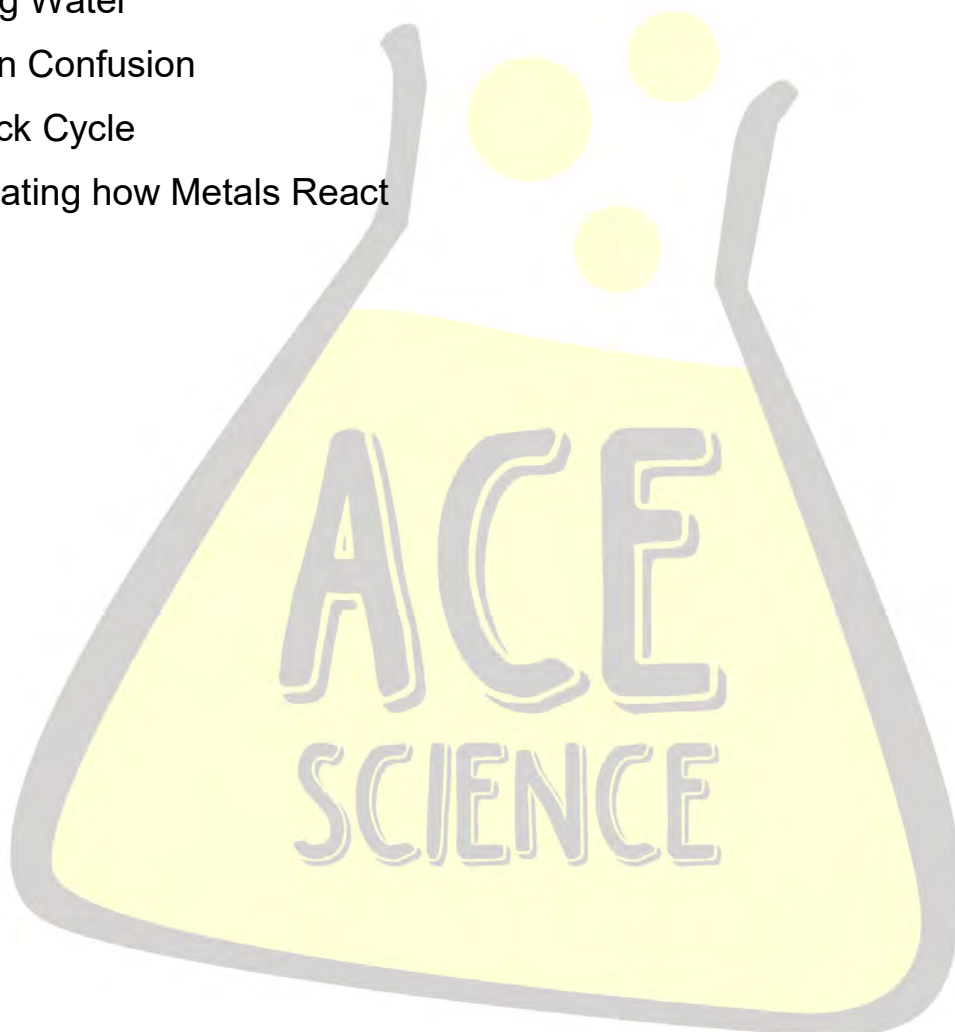
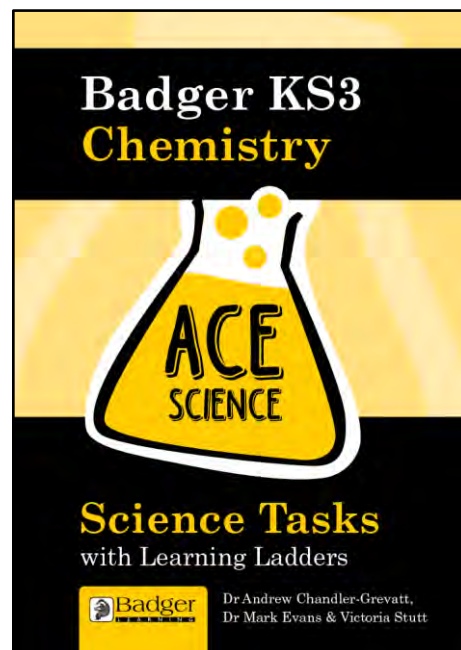
SUPPORT SHEET 3: ADVANCED EXTEND AND STRETCH **MAKING A MODEL CELL**

- Make a *scale* model of a *specialised* plant or animal cell.
- Label all parts of the cell correctly, including unusual characteristics, explaining their function.
- Explain in detail the importance of understanding cell structure and function.
- Explain how the cell's shape is related to its function.

ACE SCIENCE KS3 SCIENCE TASKS CHEMISTRY

CONTENTS

1. Ice Cube Poster
2. Indigestion Remedies
3. The Iron and Sulfur Reaction
4. When a Candle is Alight
5. Cooling Compounds
6. Investigating Sedimentation
7. Making Magnesium Oxide
8. Displacement Disco
9. Atmosphere in Balance
10. What Happens to Sugar in Tea?
11. Acid Fizz
12. Cleaning Water
13. Diffusion Confusion
14. The Rock Cycle
15. Investigating how Metals React



NATIONAL CURRICULUM LINKS**THE PARTICULATE NATURE OF MATTER**

- the properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure
- changes of state in terms of the particle model.

TASK:

Draw a poster that explains why an ice cube melts (and evaporates) when left out of the freezer.

SUGGESTED APPROACH:

Please read the introduction to this book to get the most out of this task. It is suitable for a homework task or class activity.

In class, use a starter activity as the stimulus to the task; introduce the task and ACE Learning Ladder, and allow 30–40 minutes to complete it. Starter suggestions: matching key words – melting, evaporating, condensing, solidification, freezing – to pictures of these events, e.g. melting ice cube. Match words and phrases describing the behaviour of solids, liquids and gases to the correct state. Allow learners to use secondary resources such as class notes, textbooks and library books to develop their poster. In the plenary, peer or self assess using the ACE Learning Ladder.

RESOURCES:

A4 plain paper, pencils, pens, rulers.

PRIOR LEARNING EXPERIENCE:

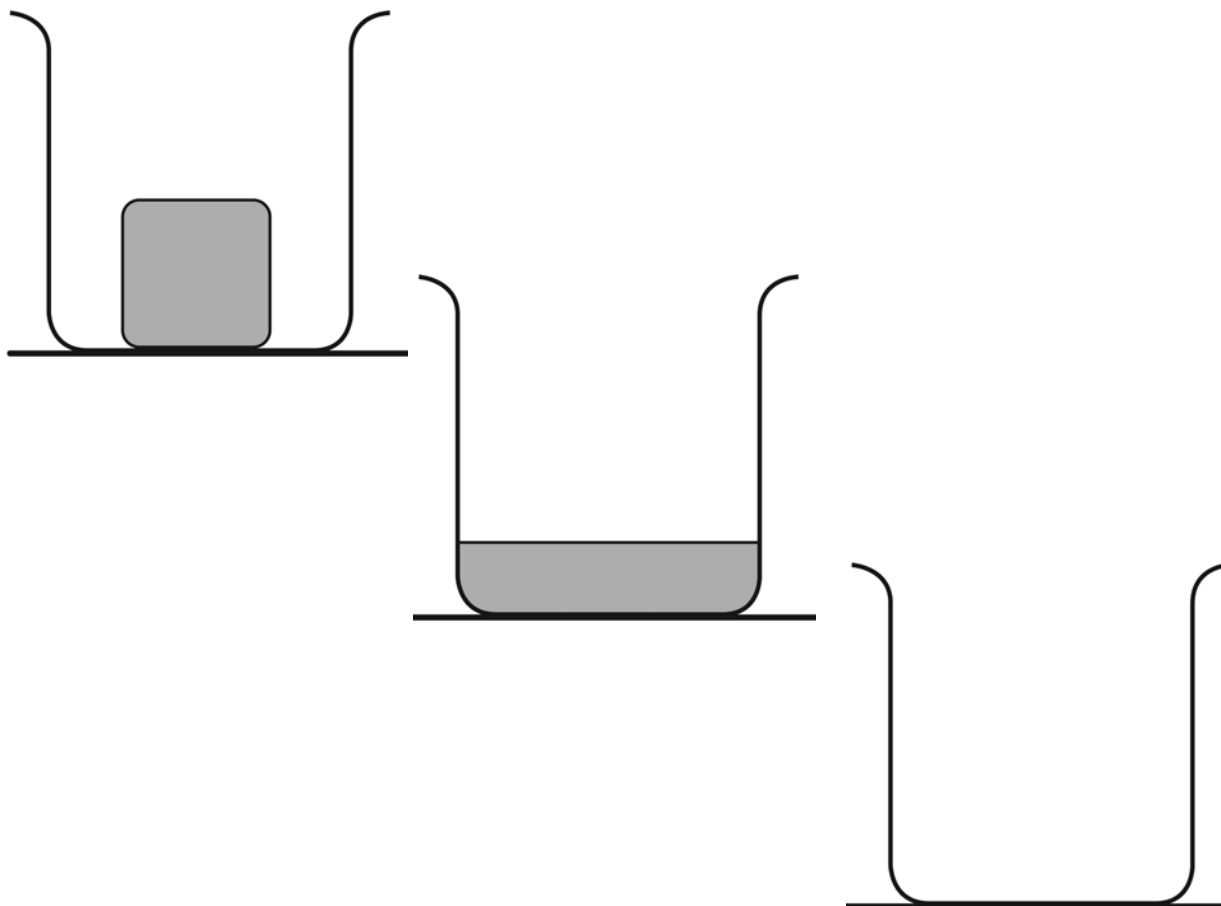
Before students attempt this task, they must be familiar with:

- properties of solids, liquids and gases
- changes of state between the three states of matter
- particle theory, arrangement and behaviour of particles in the three states of matter.

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TASK SHEET: ICE CUBE POSTER

Some students were watching an ice cube in a beaker as it slowly melted. They were wondering why it melts. When they inspected the beaker the next lesson, the water was gone.



Draw a poster that explains why an ice cube melts when left out of the freezer and what happens to the water when it is left in a beaker for a while. Use a particle model to help explain your ideas.

KEY WORDS

boiling, compressible, conservation of mass, density, energy, evaporating, fixed, forces between particles, freezing, gas, liquid, melting, moving randomly, particles, solid, solidification, states of matter, temperature, vibrating

ACE LEARNING LADDER: ICE CUBE POSTER

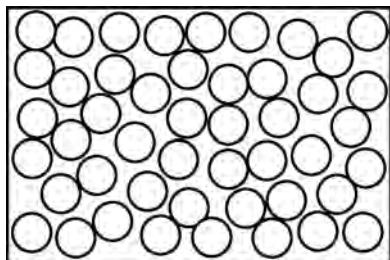
ACE LEARNING LADDER

Assessment check	What you could include:
Advanced	<p>You will have drawn a detailed poster explaining why an ice cube melts, drawing on detailed scientific knowledge and understanding. You might:</p> <ul style="list-style-type: none"> • Draw a detailed particle diagram for the water particles in each state, showing that water particles are molecules. • Explain why energy is required for the ice to melt or evaporate and where this comes from. • Use the idea of melting points and boiling points to describe the changes. • Compare the melting and evaporating of an ice cube to observations that would be expected from other substances undergoing the same processes. • Use a range of appropriate scientific words, symbols and units accurately.
Confident	<p>You will have drawn a poster explaining why an ice cube melts, drawing on scientific knowledge and understanding. You might:</p> <ul style="list-style-type: none"> • Draw a particle diagram for the water particles in each state. • Explain the differences in movement and energy of the particles at each state. • Explain what has to happen to the particles to be able to melt or evaporate. • Describe whether the melting and evaporating of an ice cube is a physical or chemical change. • Use a range of appropriate scientific words, symbols and units.
Establishing	<p>You will have drawn a simple poster explaining why an ice cube melts, drawing on some scientific knowledge and understanding. You might:</p> <ul style="list-style-type: none"> • Draw a simple particle diagram for the water particles in each state, with help. • State how the particles are arranged in each state, what their movement is like and how much energy they have. • Describe what happens when the ice cube melts and when it evaporates, in terms of what would be observed. • State if melting and evaporating are a physical or chemical change. • Use some appropriate scientific words, symbols and units.

SUPPORT SHEET 1: ESTABLISHING TO CONFIDENT

ICE CUBE POSTER

Correctly identify the state of matter shown in the diagrams below. Complete the sentences about each before starting the task, by choosing which sentence finishers correctly describe the state shown in each diagram.



This represents a

The particles have

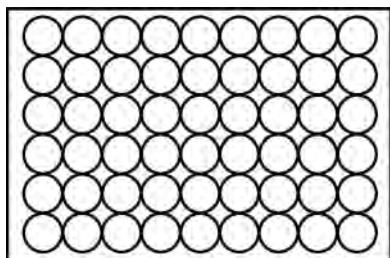
- high levels of energy
- medium levels of energy
- low levels of energy.

They

- can move about past one another
- cannot move about
- can move about completely freely.

The particles are arranged

- in a regular pattern
- randomly and apart from one another
- randomly but in contact with one another.



This represents a

The particles have

- high levels of energy
- medium levels of energy
- low levels of energy.

They

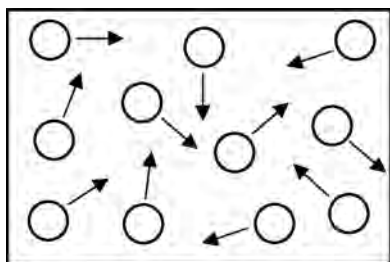
- can move about past one another
- cannot move about
- can move about completely freely.

The particles are arranged

- in a regular pattern
- randomly and apart from one another
- randomly but in contact with one another.

SUPPORT SHEET 1: ESTABLISHING TO CONFIDENT

ICE CUBE POSTER



This represents a

The particles have

- high levels of energy
- medium levels of energy
- low levels of energy.

They

- can move about past one another
- cannot move about
- can move about completely freely.

The particles are arranged

- in a regular pattern
- randomly and apart from one another
- randomly but in contact with one another.

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SUPPORT SHEET 2: CONFIDENT TO ADVANCED ICE CUBE POSTER

Use the spaces below to plan particle diagrams for each state of matter.

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- What explanations will you need to include to describe what each state is like?

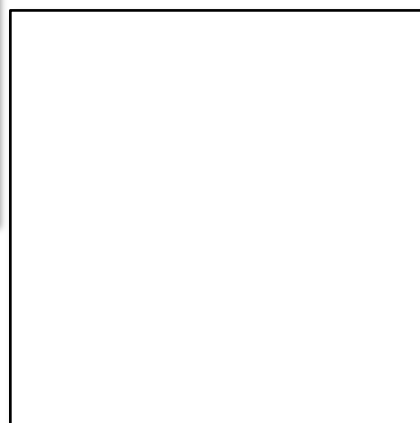
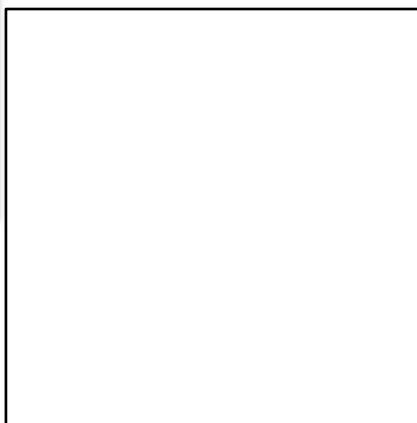
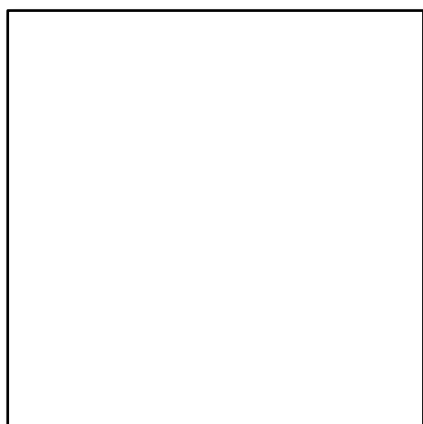
- How could you describe what happens to particles within substances moving between each of the states shown?

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SUPPORT SHEET 3: ADVANCED EXTEND AND STRETCH ICE CUBE POSTER

Water has the chemical formula H_2O . It exists as molecules.

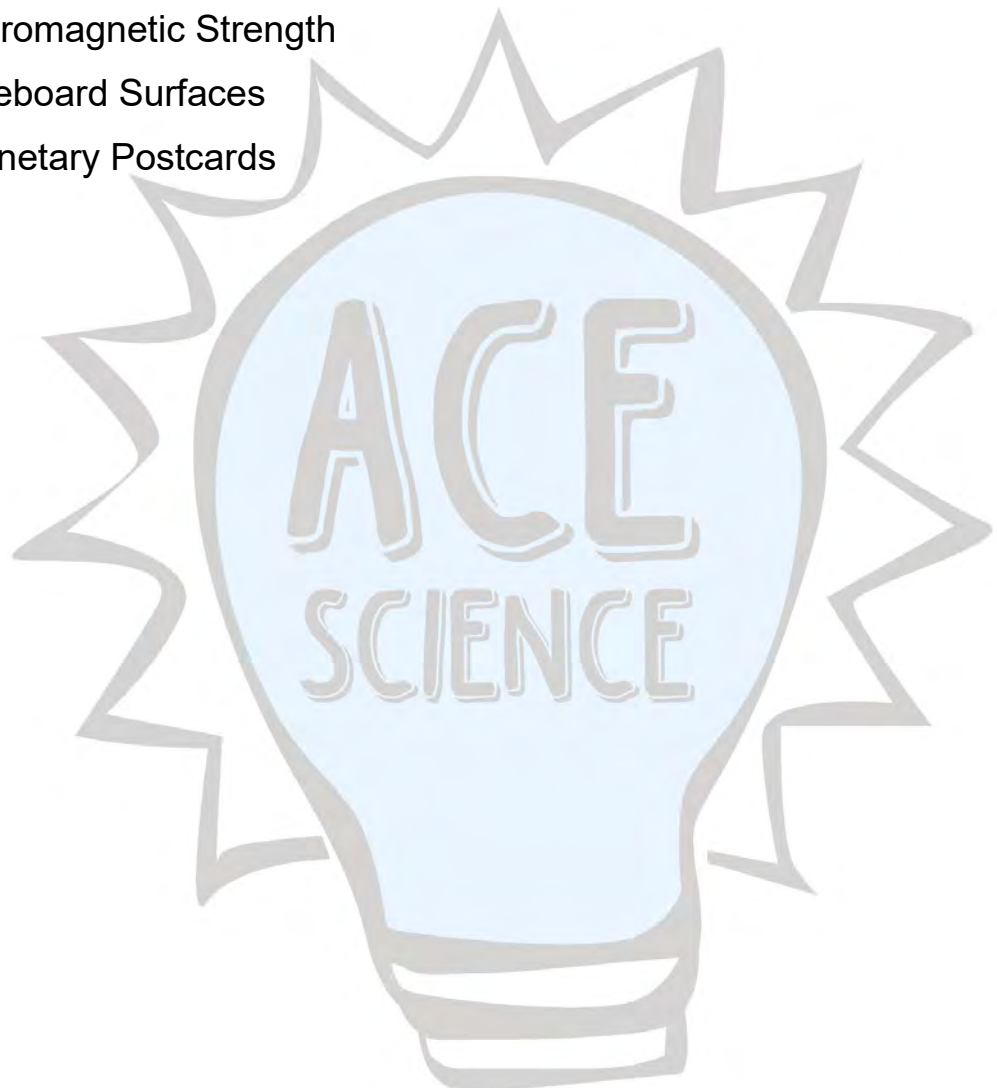
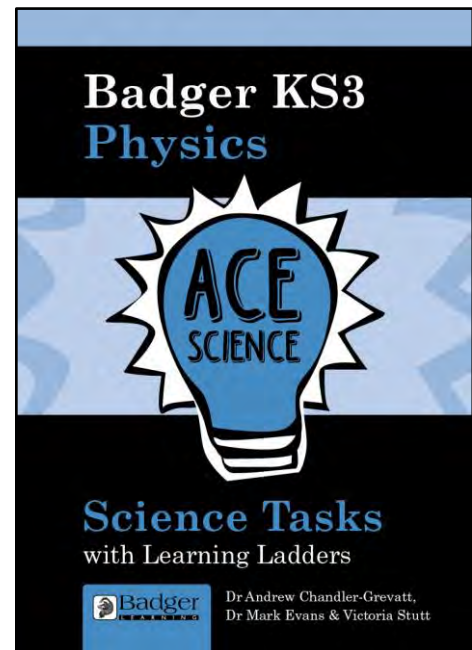
- What does this formula tell us about what water is made from?
- Use the spaces below to plan particle diagrams for each state of matter, which clearly show water is a molecule.



ACE SCIENCE KS3 SCIENCE TASKS PHYSICS

CONTENTS

1. Investigating Insulation
2. Heat in the Kitchen
3. What are Forces?
4. Journey of Pram, Car or Submarine
5. Investigating Turning Forces
6. Bungee Testing
7. Designing Ear Defenders
8. Investigating Hearing with Age
9. Light Effects
10. How does a Torch work?
11. Wiring a House
12. Electromagnetic Strength
13. Skateboard Surfaces
14. Interplanetary Postcards



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TEACHER NOTES:

INVESTIGATING INSULATION

NATIONAL CURRICULUM LINKS

WORKING SCIENTIFICALLY

Experimental skills and investigations

CALCULATION OF FUEL USES AND COSTS IN THE DOMESTIC CONTEXT

- domestic fuel bills, fuel use and costs
- fuels and energy resources.

ENERGY CHANGES AND TRANSFERS

- heating and thermal equilibrium: temperature difference between two objects leading to energy transfer from the hotter one to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference; use of insulators.

CHANGES IN SYSTEMS

- energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change.

TASK:

Plan an investigation, collect evidence safely and present the data appropriately.

This task is designed to encourage students to develop their planning and data collection skills. It draws on their knowledge and understanding of energy transfers and insulation.

SUGGESTED APPROACH:

Please read the introduction to this book to get the most out of this task.

In class, use a starter activity as the stimulus to the task; introduce the task and ACE Learning Ladder, and allow 30–40 minutes to complete it. Allow students to use secondary resources such as class notes, textbooks and library books to develop their ideas. In the plenary, peer or self assess using the ACE Learning Ladder.

You may wish to show examples of different types of insulation and recap how insulation works and why it is necessary.

RESOURCES:

Lined and plain A4 paper. Possibly examples of insulation.

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TEACHER NOTES:

INVESTIGATING INSULATION

PRIOR LEARNING EXPERIENCE:

Before students attempt this task, they must be familiar with:

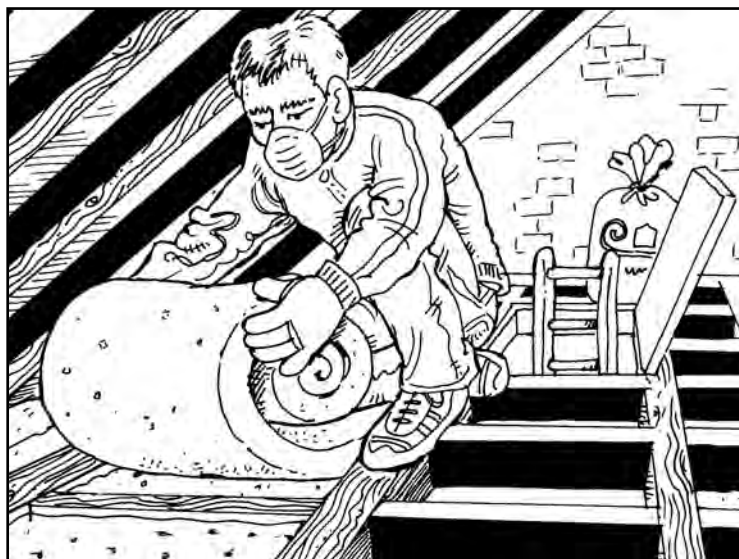
- insulating materials
- energy transfers
- planning investigations
- planning how to collect valid results.

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TASK SHEET:

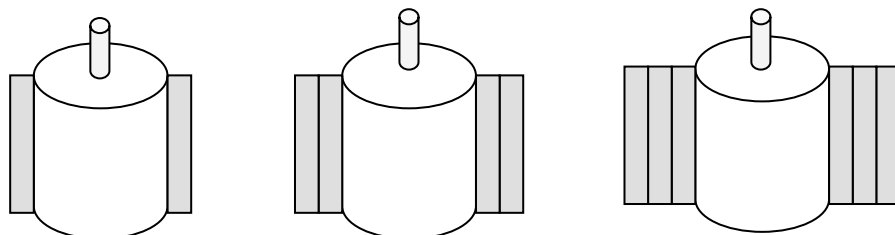
INVESTIGATING INSULATION

According to the Energy Saving Trust, if everyone in the UK installed 270mm loft insulation, we could save around £520 million and nearly three million tonnes of carbon dioxide every year.



TASK

Which is the best thickness of insulation to use in a loft?



IN YOUR PLAN INCLUDE:

- equipment list
- variables - the ones you will keep the same (control) the one you will change (independent) and the one you will measure (dependent)
- a description of what you will do
- include a suitable range and intervals for your observations
- safety precautions.

COLLECTING RESULTS:

- draw a table for your results.
- plan to collect a sufficient number of results

KEY WORDS

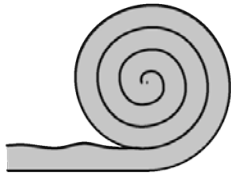


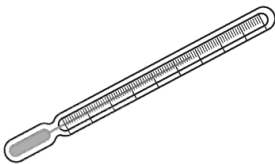


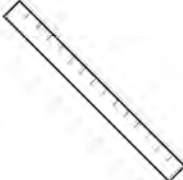

conduction, control variable, convection, dependent variable, energy transfer, independent intervals, insulation, radiation, range, temperature, thermal, variable

ACE LEARNING LADDER


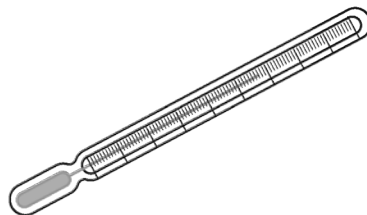
Assessment check	What you could include:
Advanced	<p>You will have planned an in-depth investigation into insulation, drawing on scientific knowledge and understanding. You might:</p> <ul style="list-style-type: none"> • Write a detailed method that clearly shows all variables you will control, change and measure. • Give a detailed justification for your method and the number of repeats you plan to make, explaining how you will ensure accuracy and precision. • Explain, in detail, your method in terms of your scientific knowledge and understanding of insulation and energy transfers. • Consult secondary sources of information when writing a risk assessment for your investigation. • Use a range of appropriate scientific words, symbols and units accurately.
Confident	<p>You will have planned an investigation into insulation, drawing on scientific knowledge and understanding. You might:</p> <ul style="list-style-type: none"> • Write a method that clearly shows all variables you will control, change and measure. • Justify your method and the number of repeats you plan to make. • Explain your method in terms of your scientific knowledge and understanding of insulation and energy transfers. • Recognise familiar risks within your investigation and describe how you will control these. • Use a range of appropriate scientific words, symbols and units.
Establishing	<p>You will have planned a simple investigation into insulation, drawing on scientific knowledge and understanding. You might:</p> <ul style="list-style-type: none"> • With help, write a method. • Identify factors you will keep the same and change. • Select appropriate equipment for your investigation. • Describe how many repeats you will use. • Identify possible risks to yourself and others. • Use some appropriate scientific words, symbols and units.

SUPPORT SHEET 1: ESTABLISHING TO CONFIDENT

INVESTIGATING INSULATION

Equipment options			
			
Insulating material	Large beaker with cover	Stopwatch	Thermometer
			?
String, sticky tape, or elastic bands	Kettle	Ruler	Other?
Variables Control, dependent, independent <input type="checkbox"/> thickness of insulation <input type="checkbox"/> type of insulation <input type="checkbox"/> starting temperature of water <input type="checkbox"/> time intervals <input type="checkbox"/> temperature decrease <input type="checkbox"/> others?		Safety for yourself and others Risks <input type="checkbox"/> insulating material <input type="checkbox"/> glass <input type="checkbox"/> thermometer <input type="checkbox"/> hot water How will you control them?	
Range and intervals How many thicknesses of insulation will you compare? How many times will you repeat each measurement?		About insulation Insulating material traps warm air. This slows down convection (warm air rising) and heat loss from the house. 	

<p style="text-align: center;">Equipment</p> <p>Possible equipment.</p> <ul style="list-style-type: none"> <input type="checkbox"/> insulating material <input type="checkbox"/> large beaker with a cover <input type="checkbox"/> thermometer or data logger <input type="checkbox"/> stopwatch <input type="checkbox"/> string, rubber bands or sticky tape <input type="checkbox"/> kettle <input type="checkbox"/> other? 	<p style="text-align: center;">Techniques</p> <p>Measuring temperature What is the advantage of using a data logger over a thermometer?</p> <p>Starting temperature How will you decide the starting temperature? Does it matter?</p>
<p style="text-align: center;">Variables</p> <p>Consider the variables that you can control, measure and change.</p> <p>What will you do to control the variables?</p>	<p style="text-align: center;">Safety</p> <p>What risks are there when using:</p> <ul style="list-style-type: none"> <input type="checkbox"/> insulating material? <input type="checkbox"/> a kettle? <input type="checkbox"/> glass? <p>How will you control them for yourself and for others?</p>
<p style="text-align: center;">Range, intervals and reliability</p> <p>Range: How many thicknesses of insulation will you investigate?</p> <p>Intervals: What intervals of measurements are you using?</p> <p>Reliability: How many times will you do each test? How will you ensure that your investigation is reliable?</p>	<p style="text-align: center;">About insulation</p> <p>Insulating materials usually trap air and slow down thermal energy transfers.</p> <p>Heat energy is usually lost from the roof by convection. Roof insulation does reduce this.</p> <p>The thicker the insulation, the more expensive it is to install. Is it worth putting very thick insulation in the roof?</p>

<p style="text-align: center;">Techniques</p> <p>What makes insulation effective?</p> <p>What's the best way to measure the effectiveness of insulation?</p> <p>When would you start the measurement and finish it? What effect may this have?</p> <p>How will you ensure the water starts at the same temperature? Does it matter?</p> <p>What is it exactly that you want to investigate?</p>	<p style="text-align: center;">Controlling risk</p> <p>Safety – research guidance from:</p> <ul style="list-style-type: none"> • CLEAPSS • Using hot water • Other? 
<p style="text-align: center;">Variables</p> <p>Identify the variables that are not easy to control and consider how to reduce errors from them.</p> 	<p style="text-align: center;">Controlling errors</p> <p>What possible errors could happen in your measurements?</p> <p>Consider each stage of the investigation.</p> <p>How can you ensure that you measure accurately?</p> <p>Consider the errors that may occur when you carry out the investigation.</p> <p>How will you control them?</p>
<p style="text-align: center;">Precision and reliability</p> <p>Which measurements will need to be precise?</p> <p>How will you ensure precision?</p> <p>How are reliability and error control linked?</p> <p>How will you ensure the results are reliable?</p>	<p style="text-align: center;">About insulation</p> <p>Thick insulation is more expensive. Is it worth having very thick insulation?</p> <p>What else could you do to reduce thermal energy loss from your home?</p>

ACE SCIENCE HOMEWORK TASKS WITH LEARNING LADDERS

Below is a brief introduction to the three Science Homework Task books in the series plus their contents.

It is often hard to set 'meaningful' homework tasks as it usually takes a lot of planning. These tasks have been developed to do just that: provide a range of extended homework projects from which students can get a much wider experience. We have found that many students relish the chance to 'do a project' and have a real feeling of pride with their work when they hand it in.

The key features of the ACE Science Homework Tasks:

- Extend learning outside the classroom.
- Encourage the use of science in 'real life' situations.
- Encourage independent learning.
- Encourage improvements in literacy, numeracy and ICT.
- Fit with the new 2014 KS3 Science Curriculum.
- Develop skills in working scientifically.
- Excellent preparation for Key Stage 4 assessment tasks.
- Allow parents to see not only how their children are being assessed but also the improvements in their work.

Cross-curricular opportunities

We feel that these projects could be easily adapted for such ventures and so have added some suggested links in the Teacher Notes. These tasks can be a starting point for this and we would be interested to know how people adapt and use these tasks for this part of the new Key Stage 3.

How to use these tasks

Each task is a simple open-ended task that assesses knowledge and understanding of a significant concept from the new Science National Curriculum. The tasks should be photocopied with the task sheet and the ACE Learning Ladder back-to-back or side-to-side. Teachers and learners can use the ACE Learning Ladder to guide their response to the task.

Each task is available in three level ranges: Establishing, Confident and Advanced. This allows you to differentiate appropriately.

This book contains four types of task:

- Projects
- Making and Presenting
- Mini Investigations
- Critical Thinking.

General information on how to use each task is given on 'General Guide' sheets and specific information relating to each task is given in each task's 'Teacher Notes'.

ACE SCIENCE KS3 SCIENCE

HOMEWORK TASKS BIOLOGY

CONTENTS

1 Projects

Tasks

- 1 Baby booklet
- 2 Double trouble
- 3 British mammal project
- 4 Endangered animals
- 5 Profitable plants
- 6 Staying scientific
- 7 Profession portfolio
- 8 Living scientists

Topic Links

- Reproduction
Reproduction
Relationships in an ecosystem
Relationships in an ecosystem
Relationships in an ecosystem
Any
Any
Any

2 Making and Presenting

- 1 Marvellous microscopes
- 2 Picturing plants
- 3 Creature cartoons
- 4 Science timeline
- 5 Scientific scriptwriting
- 6 Scintillating science!

- Cells and organisation
Relationships in an ecosystem
Relationships in an ecosystem
Any
Any
Any

3 Mini Investigations

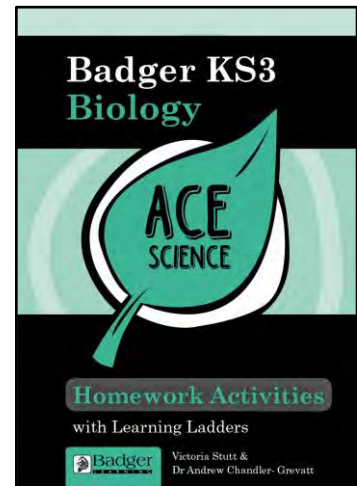
- 1 Counting creatures
- 2 My scientific investigation
- 3 My peer review
- 4 Perceptions of science
- 5 Screen scientists

- Relationships in an ecosystem
Any
Any
Any
Any

4 Critical Thinking

- 1 Stem cells – yes or no?
- 2 Tissue issues
- 3 Views on vitamins
- 4 Behaviour bother
- 5 Are zoos for keepers?
- 6 Fishing follies
- 7 The future of science
- 8 Scientific spending
- 9 Science in newspapers
- 10 Science on TV
- 11 Shampoo statistics

- Cells and organisation
Cells and organisation
Cells and organisation, Nutrition and digestion
Nutrition and digestion
Inheritance, chromosomes, DNA and genes
Relationships in an ecosystem
Any
Any
Any
Any
Any



1

PROJECT 1: TEACHER NOTES BABY BOOKLET

NATIONAL CURRICULUM LINKS

REPRODUCTION

- reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the fetus through the placenta.

INHERITANCE, CHROMOSOMES, DNA AND GENES

- heredity as the process by which genetic information is transmitted from one generation to the next
- differences between species.

CROSS-CURRICULAR OPPORTUNITIES INCLUDE:

- English – genres of writing and creative writing
- ICT – internet searching, word processing, use of PowerPoint
- mathematics – scale.

TIME

Three homework sessions of between 30 and 60 minutes each.

ASSESSMENT, FEEDBACK AND IMPROVEMENT

Assessing these tasks should not be arduous. Rather than assigning an absolute grade, you should focus on how each student can improve. To ensure that this task is formative, students should be given the opportunity to improve their work based on the teacher's targets or through peer and self-assessment.

GUIDANCE FOR CONFIDENT (C)

Students working with confidence will demonstrate an understanding of the relationship between the structure and function of organs and cells. The role of hormones should be included in the changes at puberty and birth (naming them and recognising that they influence the changes).

We find that reading through the project using these additional prompts helps to assess the task.

BABY BOOKLET

Young people have a lot of questions about the changes that occur as they grow up and need good scientific information to reassure them and help them make decisions.

Write an information booklet about the science of human reproduction and development.

Use websites, magazines and books to get information to answer each section below. Use the ACE Learning Ladder to help you do your best.

Use your own words throughout the project.

SECTION 1: GROWING UP

- Include information about the physical changes as boys and girls go through puberty.
- Describe some of the emotional changes that happen at puberty.
- Label a diagram of the reproductive system and describe the job of each part.

SECTION 2: MAKING A BABY

- Describe how humans reproduce.
- Suggest what couples should think about before deciding to have a baby.
- Draw diagrams and explain the terms 'fertilisation' and 'conception'.

SECTION 3: DEVELOPING AND BEING BORN

- Show and explain how a fetus develops in the uterus.
- Explain, simply, the role of the placenta.
- Describe how alcohol and smoking tobacco can affect the development of the fetus.
- Describe what happens at birth.



Use the Good Project Guide sheet for tips on internet safety, research and literacy.

BABY BOOKLET

Young people have a lot of questions about the changes that occur as they grow up and need good scientific information to reassure them and help them make decisions.

Write an information booklet about the science of human reproduction and development.

Use websites, magazines and books to get information to answer each section below. Use the ACE Learning Ladder to help you do your best.

Use your own words throughout the project.

SECTION 1: GROWING UP

- Compare the physical changes that take place at puberty in both boys and girls.
- Describe some of the emotional changes that happen at puberty.
- Draw, label and explain diagrams of the male and female reproductive system.

SECTION 2: MAKING A BABY

- Describe how humans reproduce.
- Consider the issues involved with deciding to have a baby.
- Draw diagrams and explain the terms fertilisation and conception.

SECTION 3: DEVELOPING AND BEING BORN

- Show and explain how a fetus develops in the uterus.
- Explain, simply, the role of the placenta.
- Describe how alcohol and smoking tobacco can affect the development of the fetus.
- Describe what happens at birth.



Use the Good Project Guide sheet for tips on internet safety, research and literacy.

BABY BOOKLET

Young people have a lot of questions about the changes that occur as they grow up and need good scientific information to reassure them and help them make decisions.

Write an information booklet about the science of human reproduction and development.

Use websites, magazines and books to get information to answer each section below. Use the ACE Learning Ladder to help you do your best.

Use your own words throughout the project.

SECTION 1: GROWING UP

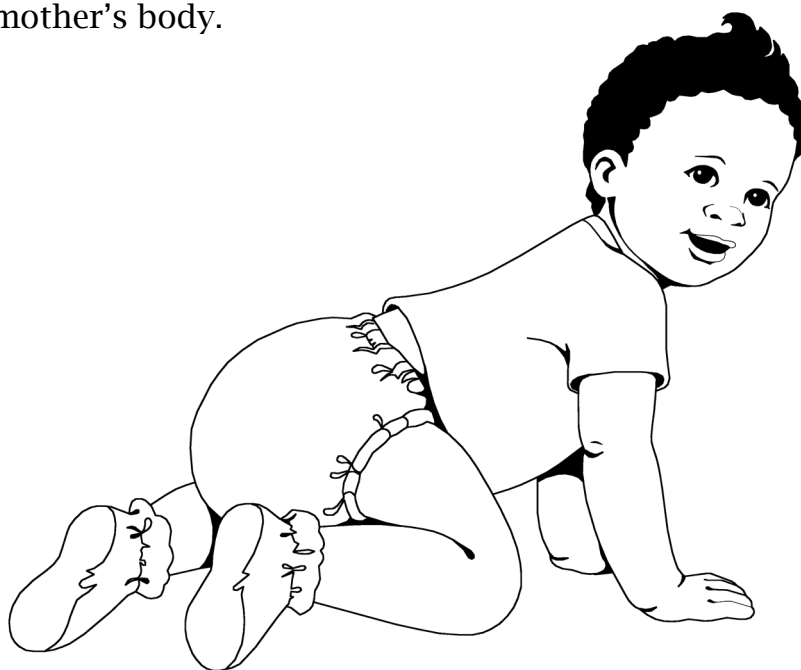
- Explain, in detail, the physical and emotional changes that take place at puberty in both boys and girls.
- Use labelled diagrams to explain the differences between the male and female reproductive systems.

SECTION 2: MAKING A BABY

- Describe how humans reproduce, explaining the terms fertilisation and conception.
- Consider the issues involved with deciding to have a baby.

SECTION 3: DEVELOPING AND BEING BORN

- Explain, in detail, the stages of pregnancy and birth, including how the unborn baby is supported by the mother's body.



Use the Good Project Guide sheet for tips on internet safety, research and literacy.

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PROJECT 1: ACE LEARNING LADDER

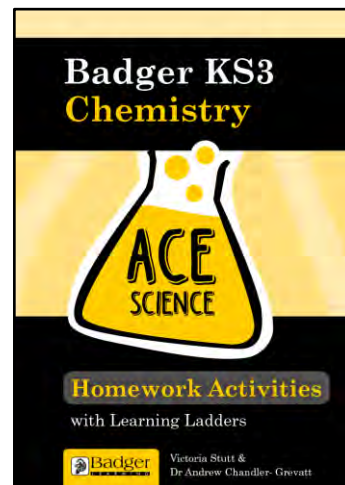
BABY BOOKLET

ACE LEARNING LADDER

Assessment Check	The types of things you can do:
Advanced	<ul style="list-style-type: none"> • Make an information booklet on human reproduction and development, drawing on detailed scientific knowledge and understanding. • Explain the stages of reproduction in the correct order, considering relative time scales. • Use detailed explanations and diagrams to show how the fetus develops. • Explain how unborn babies can be harmed while in the uterus, using data to support what you discuss, e.g. the risk to babies whose mothers smoke. • Use a range of appropriate scientific words, symbols and units accurately.
Confident	<ul style="list-style-type: none"> • Make an information booklet on human reproduction and development, drawing on scientific knowledge and understanding. • Explain how humans reproduce, using more than one step. • Explain how the fetus develops in the uterus. • Draw accurate diagrams to help explain the differences between the male and female reproductive system, in several sentences. • Explain the job of the placenta, the major stages of fetal development and birth using a range of keywords correctly. • Use a range of appropriate scientific words, symbols and units.
Establishing	<ul style="list-style-type: none"> • Make a simple information booklet about human reproduction and development, drawing on some scientific knowledge and understanding. • Give a simple description of how reproduction occurs. • Label the main parts of the female and male reproductive system. • Describe one or two changes boys and girls go through during puberty. • Name one or two substances that may harm an unborn baby. • Use some appropriate scientific words, symbols and units.

ACE SCIENCE KS3 SCIENCE

HOMEWORK TASKS CHEMISTRY



CONTENTS

1 Projects

Tasks

- 1 Who made the periodic table?
- 2 Chemical care
- 3 Extracting salt
- 4 Considering ceramics, polymers and composites
- 5 Great geologists
- 6 Living scientists
- 7 Staying scientific
- 8 Profession portfolio

Topic Links

The periodic table
Chemical reactions
Pure and impure substances, Chemical reactions

Materials
Earth and atmosphere
Any
Any
Any

2 Making and Presenting

- 1 Pocket particles
- 2 Marketing metals
- 3 Acids and alkalis
- 4 Equation education
- 5 Garden geology
- 6 Science timeline
- 7 Scientific scriptwriting
- 8 Scintillating science!

The particulate nature of matter
The particulate nature of matter, The periodic table
Chemical reactions
Chemical reactions
Earth and atmosphere
Any
Any
Any

3 Mini Investigations

- 1 Caring for cress
- 2 Innovative indicators
- 3 Soil sampling
- 4 Screen scientists
- 5 My scientific investigation
- 6 My peer review

Chemical reactions
Chemical reactions
Earth and atmosphere
Any
Any
Any

4 Critical Thinking

- 1 Mercury madness
- 2 Detecting disasters
- 3 Terrible trials
- 4 Wasting water
- 5 Scientific spending
- 6 Shampoo statistics
- 7 Science on TV
- 8 Science in newspapers

Atoms, elements and compounds,
The periodic table, Materials
Earth and atmosphere
Pure and impure substances, The periodic table
Earth and atmosphere
Any
Any
Any
Any

1

PROJECT 1: TEACHER NOTES

WHO MADE THE PERIODIC TABLE?

NATIONAL CURRICULUM LINKS

The topic covered will depend on the practical examples students focus on.

THE PERIODIC TABLE

- the varying physical and chemical properties of different elements
- the principles underpinning the Mendeleev periodic table
- the periodic table: periods and groups; metals and non-metals
- how patterns in reactions can be predicted with reference to the periodic table.

WORKING SCIENTIFICALLY

Scientific attitudes

Analysis and evaluation

CROSS-CURRICULAR OPPORTUNITIES INCLUDE:

- history – using sources.

TIME

Three homework sessions of between 30 and 60 minutes each.

ADDITIONAL GUIDANCE

Students will find the names of several influential scientists given on the task sheet, which will help them guide their research into who developed the periodic table.

It has been suggested that they draw a timeline to help them discuss the developments of the periodic table. Higher ability students may like to consider if any other scientists had a role in the development of the periodic table, or if there may have been scientists who haven't made it into the history books, perhaps due to bad timing with their results etc!

ASSESSMENT, FEEDBACK AND IMPROVEMENT

Assessing these tasks should not be arduous. Rather than assigning an absolute grade, you should focus on how each student can improve. To ensure that this task is formative, students should be given the opportunity to improve their work based on the teacher's targets or through peer and self-assessment.

GUIDANCE FOR CONFIDENT (C)

Students working with confidence will make a coherent and detailed timeline.

We find that reading through the project using these additional prompts helps to assess the task.

1

PROJECT 1: TASK SHEET (ESTABLISHING)

WHO MADE THE PERIODIC TABLE?

Chemists all around the world use the periodic table to help them in their work. It is an invaluable tool for telling chemists about every element we know about.

So who came up with the periodic table? And how did they decide on its layout? And what exactly can we use it for?

Research the following scientists to help you complete your project:

Johann Döbereiner

Stanislao Cannizzaro

John Newlands

Dimitri Mendeleev

Include other scientists you feel have played an important role, and produce a timeline of the periodic table's development.

SECTION 1: RESEARCH THE DEVELOPMENT OF THE PERIODIC TABLE

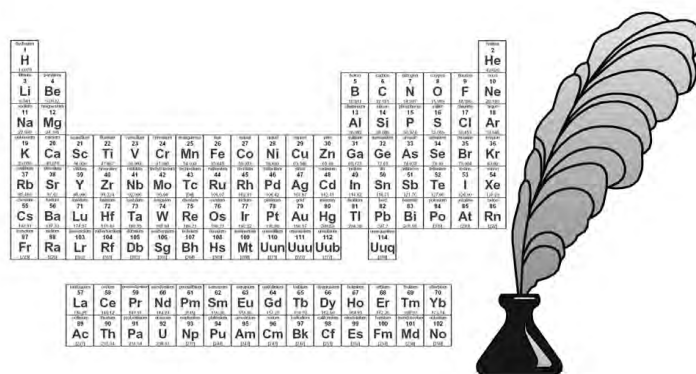
- Use the internet or books to find out about the scientists listed above.
- Describe the main findings each scientist made.
- Draw a timeline to show the developments that took place.

SECTION 2: WHY DOES THE PERIODIC TABLE LOOK THE WAY IT DOES?

- Find out why the periodic table has been set out the way it has, e.g. in groups (columns) and periods (rows).
- What information can the periodic table give us?
- Has the periodic table always looked this way?

SECTION 3: THE FUTURE OF THE PERIODIC TABLE

- Do you think the periodic table will always look the same way?
- What changes may come about which would change the periodic table as we know it?



Use websites, magazines and books to get information to answer each section above. Use the ACE Learning Ladder to help you do your best.

Use your own words throughout the project.

Use the Good Project Guide sheet for tips on internet safety, research and literacy.

PROJECT 1: TASK SHEET (CONFIDENT)

WHO MADE THE PERIODIC TABLE?

Chemists all around the world use the periodic table to help them in their work. It is an invaluable tool for telling chemists about every element we know about.

So who came up with the periodic table? And how did they decide on its layout? And what exactly can we use it for?

Research the following scientists to help you complete your project:

Johann Döbereiner

Stanislao Cannizzaro

John Newlands

Dimitri Mendeleev

Include other scientists you feel have played an important role, and produce a timeline of the periodic table's development.

SECTION 1: RESEARCH THE DEVELOPMENT OF THE PERIODIC TABLE

- Use the internet or books to find out about the scientists listed above.
- Describe the role each scientist played.
- Draw a timeline to show the developments that took place.

SECTION 2: WHY DOES THE PERIODIC TABLE LOOK THE WAY IT DOES?

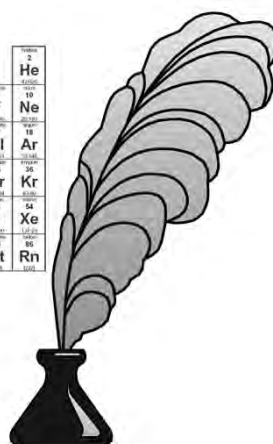
- Find out why the periodic table has been set out the way it has.
- What information can the periodic table give us?
- Has the periodic table always looked this way?

SECTION 3: THE FUTURE OF THE PERIODIC TABLE

- Do you think the periodic table will always look the same way?
- What changes may come about which would change the periodic table as we know it?

	H 1																	He 2
	Li 3	Be 4											B 5	C 6	N 7	O 8	F 9	Ne 10
	Na 11	Mg 12											Al 13	Si 14	P 15	S 16	Cl 17	Ar 18
K 19	Ca 20	Sc 21	Ti 22	V 23	Cr 24	Mn 25	Fe 26	Co 27	Ni 28	Cu 29	Zn 30	Ga 31	Ge 32	As 33	Se 34	Br 35	Kr 36	
Rb 37	Sr 38	Y 39	Zr 40	Nb 41	Mo 42	Tc 43	Ru 44	Rh 45	Pd 46	Ag 47	Cd 48	In 49	Sn 50	Sb 51	Te 52	I 53	Xe 54	
Cs 55	Ba 56	La 57	Hf 72	Ta 73	W 74	Re 75	Os 76	Ir 77	Pt 78	Au 79	Hg 80	Tl 81	Pb 82	Bi 83	Po 84	At 85	Rn 86	
Fr 87	Ra 88	Ac 89	Rf 103	Db 105	Sg 106	Bh 107	Hs 108	Mt 109	Uun 110	Uuu 111	Uub 112	Uuq 114						

La 57	Ce 58	Pr 59	Nd 60	Pm 61	Sm 62	Eu 63	Gd 64	Tb 65	Dy 66	Ho 67	Er 68	Tm 69	Yb 70
Ac 89	Th 90	Pa 91	U 92	Np 93	Pu 94	Am 95	Cm 96	Bk 97	Cf 98	Es 99	Fm 100	Md 101	No 102



Use websites, magazines and books to get information to answer each section above. Use the ACE Learning Ladder to help you do your best.

Use your own words throughout the project.

Use the Good Project Guide sheet for tips on internet safety, research and literacy.

WHO MADE THE PERIODIC TABLE?

So who came up with the periodic table? And how did they decide on its layout? And what exactly can we use it for?

Dimitri Mendeleev

Include the following sections:

Section 3: The future of the periodic table - will it always look this way?

2	He
10	Ne
18	Ar
36	Kr
54	Xe
86	Rn

Use the Good Project Guide sheet for tips on internet safety, research and literacy.

1

PROJECT 1: ACE LEARNING LADDER

WHO MADE THE PERIODIC TABLE?

ACE LEARNING LADDER

Assessment Check	The types of things you can do:
Advanced	<ul style="list-style-type: none">• Make a detailed timeline, drawing on detailed scientific knowledge and understanding.• Explain why scientists were trying to find an order for the elements and how other findings may have influenced the scientists' work.• Explain, in detail, the contribution each scientist made.• Explain why the periodic table is ordered the way it is and what it can tell us, including discussions on reactivity.• Suggest some changes that could happen to the periodic table, using evidence to justify your suggestions.• Use a range of appropriate scientific words, symbols and units accurately.
Confident	<ul style="list-style-type: none">• Make a timeline, drawing on scientific knowledge and understanding.• Explain why scientists were trying to find an order for the elements.• Explain the contribution each scientist made.• Explain why the periodic table is ordered the way it is and what it can tell us.• Suggest some changes that could happen to the periodic table.• Use a range of appropriate scientific words, symbols and units.
Establishing	<ul style="list-style-type: none">• Make a simple timeline, drawing on some scientific knowledge and understanding.• State what each scientist found out.• Give a simple reason why scientists were trying to place elements in an order.• State one or two pieces of information the periodic table contains about elements.• State whether the periodic table is likely to stay the same forever, giving a reason.• Use some appropriate scientific words, symbols and units.

ACE SCIENCE KS3 SCIENCE HOMEWORK TASKS PHYSICS

CONTENTS

1 Projects

Tasks

- 1 History of electricity
- 2 Energy escape!
- 3 Static and sparks!
- 4 Faces in forces
- 5 Genius glasses
- 6 Seeing through space
- 7 Working with waves
- 8 Staying scientific

Topic Links

Current electricity
Energy
Static electricity
Forces
Light waves
Light waves, Space physics
Energy and waves
Any

2 Making and Presenting

- 1 Seeing the seasons
- 2 Solar shoeboxes
- 3 Electrical storyboards
- 4 Heated houses
- 5 Barmy birdmen
- 6 Science timeline
- 7 Scientific scriptwriting
- 8 Scintillating science!

Space physics
Space physics
Calculation of fuel uses and costs in the domestic context, Current electricity, Energy in matter
Energy
Motion and forces
Any
Any
Any

3 Mini Investigations

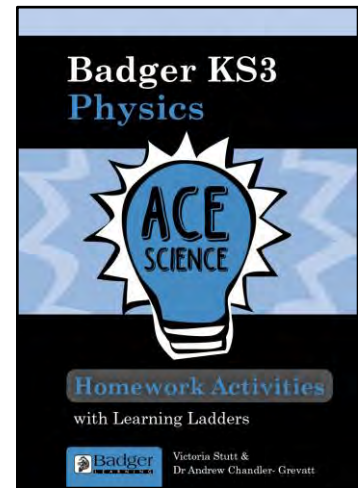
- 1 Fruit batteries
- 2 Frictional forces
- 3 Looking at light
- 4 Solar energy
- 5 Space from earth
- 6 Shifting stars
- 7 My scientific investigation
- 8 My peer review

Current electricity
Motion and forces
Light waves
Energy
Space physics
Space physics
Any
Any

4 Critical Thinking

- 1 Power politics
- 2 Scientific spending
- 3 Shampoo statistics
- 4 The future of science
- 5 Science on TV
- 6 Science in newspapers

Calculation of fuel uses and costs in the domestic context, Current electricity, Energy in matter
Any
Any
Any
Any
Any



1

PROJECT 1: TEACHER NOTES

HISTORY OF ELECTRICITY

NATIONAL CURRICULUM LINKS

CURRENT ELECTRICITY

- electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge
- potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current
- differences in resistance between conducting and insulating components (quantitative).

WORKING SCIENTIFICALLY

Scientific attitudes

Analysis and evaluation

CROSS-CURRICULAR OPPORTUNITIES INCLUDE:

- English – genres of writing and creative writing
- citizenship – knowledge and understanding of the world. Gender issues
- history – timelines, secondary evidence
- ICT – internet searching, word processing, use of PowerPoint.

TIME

Three homework sessions of between 30 and 60 minutes each.

ASSESSMENT, FEEDBACK AND IMPROVEMENT

Assessing these tasks should not be arduous. Rather than assigning an absolute grade, you should focus on how each student can improve. To ensure that this task is formative, students should be given the opportunity to improve their work based on the teacher's targets or through peer and self-assessment.

GUIDANCE FOR CONFIDENT (C)

Students working with confidence will use the key terms correctly within their project.

We find that reading through the project using these additional prompts helps to assess the task.

PROJECT 1: TASK SHEET (ESTABLISHING)

HISTORY OF ELECTRICITY

The discovery of electricity has changed the world. These are some people who tried to find out more about electricity. Use information sources to find out more about them and make a timeline about the major discoveries of electricity.

William Gilbert, Alessandro Volta, Luigi Galvani, Charles Coulomb, André-Marie Ampère, Georg Ohm, Michael Faraday, Hans Oersted

Your teacher will tell you when to do each section.
Use the ACE Learning Ladder to help reach your target.
Try to use your own words throughout the project.

SECTION 1: RESEARCH ABOUT ELECTRICAL SCIENTISTS

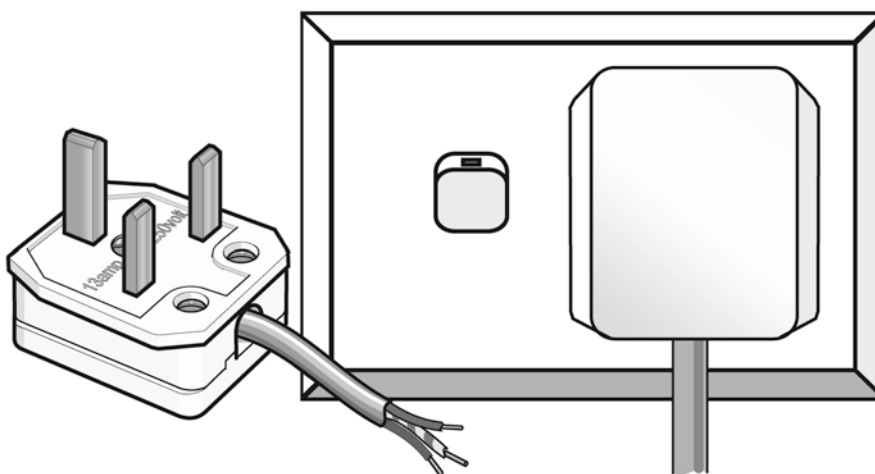
- Use the library and the internet to find out about the scientists who discovered electricity.
- Find out the main findings each scientist made and add this to a timeline.
- Select images that would help people understand the key events in your timeline.
- Describe how you went about doing your search.

SECTION 2: TIMELINE OF ELECTRICAL DISCOVERIES

- Design a timeline that includes the information and images you have found.
- Identify and describe important events.
- Select suitable images for your timeline.

SECTION 3: IMPACT OF ELECTRICITY ON CIVILIZATION

- What were the beliefs and understanding of electricity before it was discovered and used?
- What are the advantages and disadvantages of the discovery of electricity?
- Why is it that only men were involved in the discovery of electricity? How are things different now?



Use the Good Project Guide sheet for tips on internet safety, research and literacy.

HISTORY OF ELECTRICITY

The discovery of electricity has changed the world. These are some people who tried to find out more about electricity. Use information sources to find out more about them and make a timeline about the major discoveries of electricity.

William Gilbert, Alessandro Volta, Luigi Galvani, Charles Coulomb, André-Marie Ampère, Georg Ohm, Michael Faraday, Hans Oersted

Your teacher will tell you when to do each section.

Use the ACE Learning Ladder to help reach your target.

Try to use your own words throughout the project.

SECTION 1: RESEARCH ABOUT ELECTRICAL SCIENTISTS

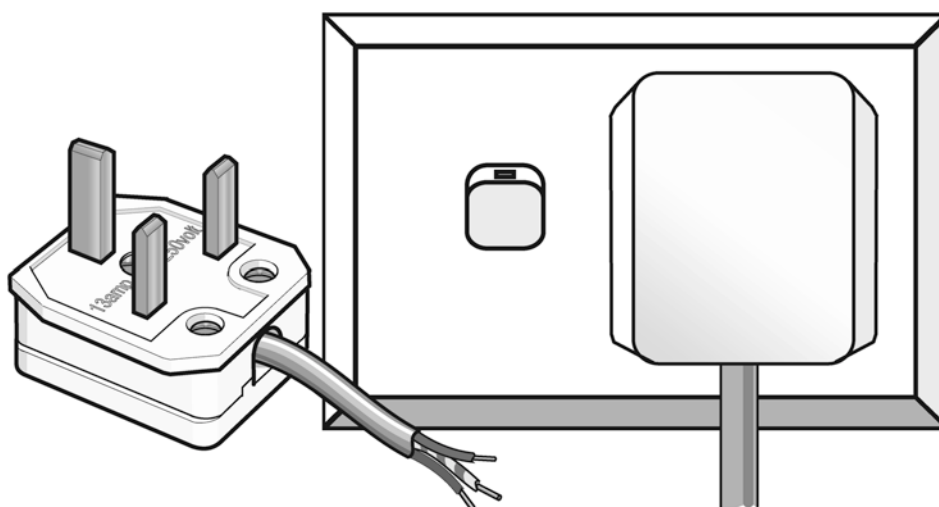
- Use the library and the internet to find out about the scientists who discovered electricity.
- Select useful information about each scientist to add to a timeline.
- Select suitable images for your timeline.
- Describe how you went about doing your search.

SECTION 2: TIMELINE OF ELECTRICAL DISCOVERIES

- Design a timeline that includes the information you have found.
- Identify and describe important events.
- Select suitable images for your timeline.

SECTION 3: IMPACT OF ELECTRICITY ON CIVILIZATION

- What were the beliefs and understanding of electricity before it was discovered and used?
- What are the advantages and disadvantages of the discovery of electricity?
- Why is it that only men were involved in the discovery of electricity? How are things different now?



Use the Good Project Guide sheet for tips on internet safety, research and literacy.

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PROJECT 1: TASK SHEET (ADVANCED)

HISTORY OF ELECTRICITY

The discovery of electricity has changed the world. These are some people who tried to find out more about electricity. Use information sources to find out more about them and make a timeline about the major discoveries of electricity.

William Gilbert, Alessandro Volta, Luigi Galvani, Charles Coulomb, André-Marie Ampère, Georg Ohm, Michael Faraday, Hans Oersted

Your teacher will tell you when to do each section.

Use the ACE Learning Ladder to help reach your target.

Try to use your own words throughout the project.

The sections for your project are as follows:

SECTION 1: RESEARCH ABOUT ELECTRICAL SCIENTISTS

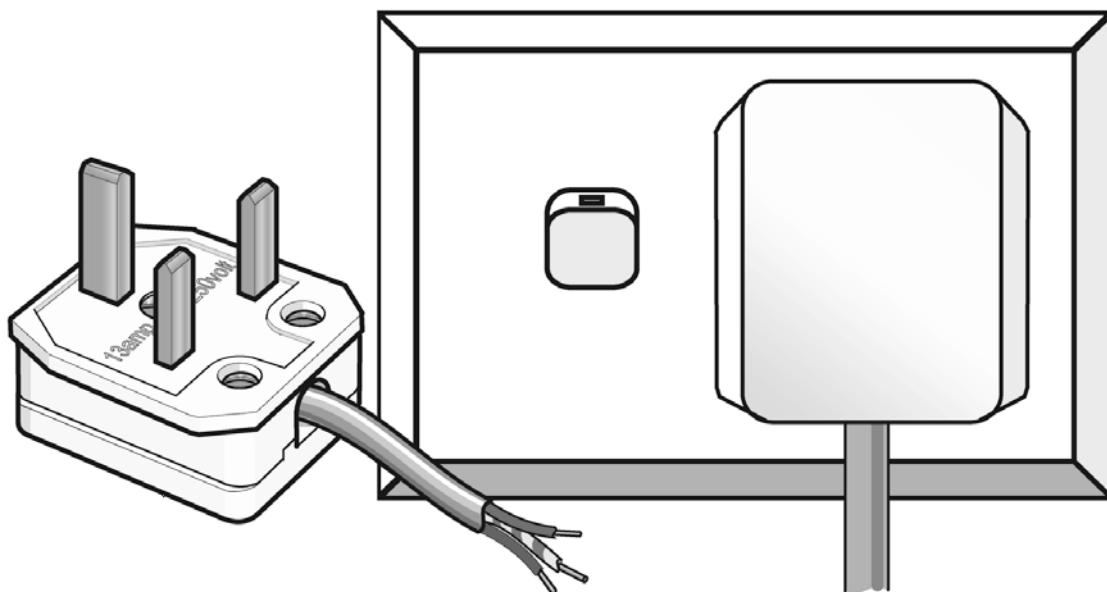
Find relevant information and images and explain how you conducted your search.

SECTION 2: TIMELINE OF ELECTRICAL DISCOVERIES

Design a timeline that explains important events and discoveries and include images.

SECTION 3: IMPACT OF ELECTRICITY ON CIVILIZATION

How has electricity changed the world – for better or worse? Has the world of science changed as understanding of electricity changed?



Use the Good Project Guide sheet for tips on internet safety, research and literacy.

1

PROJECT 1: ACE LEARNING LADDER

HISTORY OF ELECTRICITY

ACE LEARNING LADDER

Assessment Check	The types of things you can do:
Advanced	<ul style="list-style-type: none"> • Make a detailed timeline, drawing on detailed scientific knowledge and understanding. • Explain why scientists were interested in electricity and how their work built upon or challenged earlier understanding. • Explain the key discoveries made and how these came about, describing, in detail, investigations carried out. • Explain any unintended consequences that have arisen through the discovery of electricity and how our understanding may progress in the future. • Evaluate the significance of each scientist's findings. • Use a range of scientific words, symbols and units accurately.
Confident	<ul style="list-style-type: none"> • Make a timeline, drawing on scientific knowledge and understanding. • Explain why scientists were interested in electricity. • Explain the key discoveries made and how these came about. • Explain how discoveries about electricity have impacted on society as a whole, negatively or positively. • Explain how you researched the issue. • Use a range of appropriate scientific words, symbols and units.
Establishing	<ul style="list-style-type: none"> • Make a simple timeline, drawing on some scientific knowledge and understanding. • Describe the key discoveries on your timeline. • Identify the scientists responsible for each discovery. • List some advantages and disadvantages of the discovery of electricity. • State some uses of electricity. • Explain how you researched the issue. • Use some appropriate scientific words, symbols and units.

ACE SCIENCE CONSIDERING SCIENTIFIC CONCEPTS THROUGH MODELS AND ANALOGIES

Below is a brief introduction to Considering Scientific Concepts through Models and Analogies plus contents.

Much of the science we teach cannot be seen, it is abstract. In order to understand it, most students need to be able to visualise it. If we use a familiar scenario that can be seen or experienced, this can give a starting point, on which students can build their new knowledge. Using real life situations can also motivate some students.

Learning scientific concepts is not a passive process, students must construct their own ideas and knowledge and through using models and analogies they can do this. Each student will visualise the model or analogy differently and so will have to make their own choices about how the model is similar to, or different from, the concept being considered. Models are not perfect and will all contain flaws. It is through identifying and considering these flaws that students' learning is embedded.

THE TASKS

Are intended to be used as a qualitative summative assessment task, or as a stimulus for discussion on topics already covered in lessons. The tasks can be used to gauge the level of understanding of a topic students have achieved, or to help identify any misconceptions that have arisen. The tasks would be ideal for use as starter, main or plenary activities or homework part way into a topic.

The book contains over twenty easy to use, engaging tasks written specifically to help students embed difficult scientific concepts through considering models and analogies. The tasks use easily understood and everyday situations to encourage student engagement. The tasks will improve students' ability to consider abstract concepts and the strengths and weaknesses of analogies and models and will provide an excellent diagnostic resource to help identify misconceptions.

The tasks cover biology, chemistry and physics and each includes:

- **Teacher's Notes** This includes the National Curriculum link and an **ACE Learning Ladder** to be used as broad guidance on the understanding being demonstrated by students. Detailed guidance on how to use ACE Learning Ladders is provided.
- **Stimulus Sheet** that should be given to, or displayed for, students. The stimulus sheet is presented in a very open-ended way, so that students can have freedom to consider the model in their own way.
- **Discussion Starters** These are optional suggested sentence starters to help students consider how the model may represent the concept. If required these could be printed out and given to students. The sheet is editable, so questions can be removed or added, to suit the needs of given students or classes.

ACE SCIENCE CONSIDERING SCIENTIFIC CONCEPTS THROUGH MODELS AND ANALOGIES

CONTENTS

1 Biology

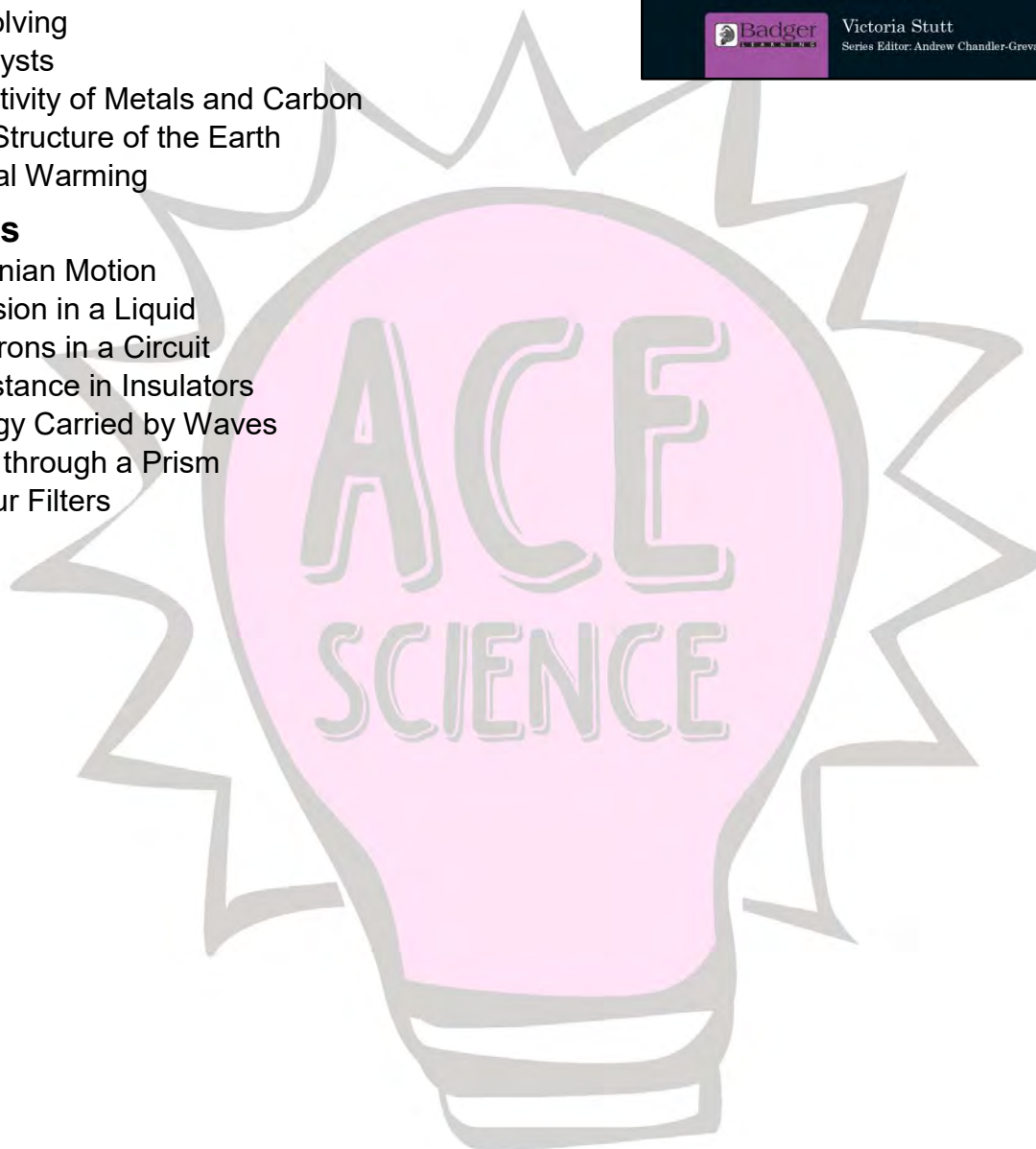
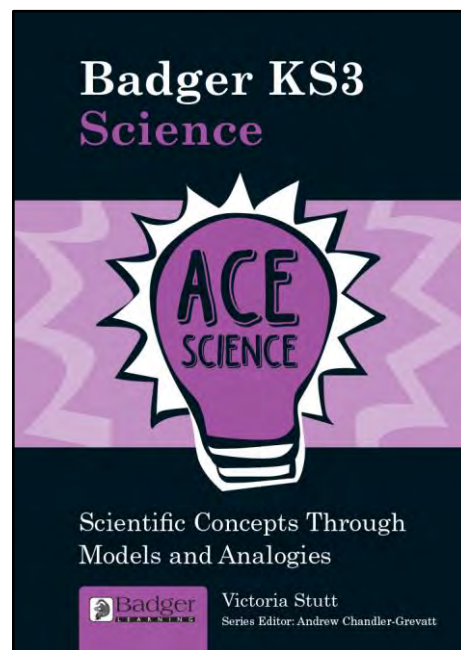
- 1 The Hierarchy of Cells
- 2 Substances Moving in and out of Cells
- 3 How the Lungs Work
- 4 Movement of Food through the Intestines
- 5 Getting Nutrients from Food
- 6 Interdependence in a Food Web
- 7 Natural Selection

2 Chemistry

- 1 Solids, Liquids and Gases
- 2 Atoms during Chemical Reactions
- 3 The Conservation of Mass
- 4 Dissolving
- 5 Catalysts
- 6 Reactivity of Metals and Carbon
- 7 The Structure of the Earth
- 8 Global Warming

3 Physics

- 1 Brownian Motion
- 2 Diffusion in a Liquid
- 3 Electrons in a Circuit
- 4 Resistance in Insulators
- 5 Energy Carried by Waves
- 6 Light through a Prism
- 7 Colour Filters



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BIOLOGY 1: TEACHER'S NOTES THE HIERARCHY OF CELLS

NATIONAL CURRICULUM LINK

CELLS AND ORGANISATION

- the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms

GUIDANCE ON THE ANALOGY

Student interpretation of the analogy can vary and still be correct. However, as a general guide, the individual police officers are representing individual cells. When they work together to carry out the same role this is representing tissues. When the units work together within a police force this is representing various tissues working together as an organ. When various police forces work together as the UK Police, this represents an organ system. The organism could be discussed as being similar to all the international police forces working together. Students should identify flaws in the analogy. For example, there not being the same number of organisation levels as within the body (which is five); the police officers are all the same in terms of their structure (ignoring differences in appearances and characteristics) whereas cells can have completely different structures to suit their roles (e.g. nerve cells and red blood cells); and the police officers within a unit may have slightly different roles, or attend different jobs, whereas all the cells in a tissue carry out the same function.

Please refer to the generic guidance on pp 7–8 on how to use the following ACE Learning Ladder.

1

BIOLOGY 1: TEACHER'S NOTES THE HIERARCHY OF CELLS

ACE LEARNING LADDER

Performance	Students may:
Advanced	<ul style="list-style-type: none"> • Explain in detail how the police force analogy explains the hierarchical organisation of cells. • Explain the limitations of the police force analogy compared to the actual hierarchical organisation of cells. • Explain how the analogy could be improved or suggest and explain your own model for hierarchical organisation of cells.
Confident	<ul style="list-style-type: none"> • Describe how the police force analogy represents the hierarchical organisation of cells. • Describe the differences between the police force analogy and the actual hierarchical organisation of cells. • Describe how the analogy could be improved.
Establishing	<ul style="list-style-type: none"> • Match the parts of the police force analogy to the key parts of the hierarchical organisation of cells. • State one problem with the analogy. • State how the analogy can be improved.

BIOLOGY 1: STIMULUS SHEET

THE HIERARCHY OF CELLS

I am a police officer.
My colleagues and I all
make up the emergency
response unit.
Our job is to answer
emergency calls.



I am a police officer too.
My colleagues and I all
work on the dog unit. We
use dogs to find people
and property.



All our units
work together for
Southtown Police
Force. We protect
the people of
Southtown.

I am a police officer
too. My colleagues
and I work for the
investigation unit
as detectives.
Our job is to solve
serious crimes.



Southtown Police Force
work alongside all the other
Police Forces in the UK to
protect the country. I think
that all together we are like
cells in the body. What do
you think?

POSSIBLE KEYWORDS TO USE:

cell, different, level, organ, organ system, organisation, role, similar, tissue

1

BIOLOGY 1: DISCUSSION STARTERS THE HIERARCHY OF CELLS

What does the analogy describe or explain?

- I think each police officer would represent...
- I think the special units (e.g. the dog unit) represent...
- All the police officers in each unit do the same job, this is important because...
- I think Southtown Police Force could represent...
- I think all the UK Police Forces together could represent...

What are the limitations of the analogy?

- The analogy has four levels of organisation. This is/is not the same as in the body because...
- Using police officers as an analogy to explain how cells are arranged in the body is good because...
- Using police officers as an analogy to explain how cells are arranged in the body is not good because...

How could the analogy be improved?

- The analogy could be improved by...
- I would adapt the analogy by ...
- A better analogy would be...
- I would improve the analogy by...