OCR
RECOGNISING ACHIEVEMENT

Entry Level

Science

(Science Plus)

OCR Entry Level Certificate in Science R482

QAN 100/5930/1

Contents

1 About this Qualification

1.1 About this Science Specification

This booklet contains OCR's Entry Level Certificate specification in Science for teaching from September 2006 and first certification in June 2007.

This specification has been specifically designed to meet the need of those candidates in Key Stage 4 of the revised National Curriculum for whom courses leading to a GCSE examination do not represent a realistic or appropriate goal.

The specification has been approved by QCDA [but since it does not lead to a GCSE qualification, there is no requirement for it to conform either to the general GCSE criteria or to the science-specific criteria for GCSE. It does, however, meet the requirements of the QCDA common criteria and criteria for Entry Level qualifications.] The course will lead to final certification by OCR at three levels. It is possible for certification to be achieved by candidates at stages during the course. These 'interim' certificates will be awarded by the centre at Bronze, Silver and Gold levels.

The specification can be used as the basis of an independent course for those candidates identified at the start of Year 10 as unlikely to be entered for GCSE, and as a source of material to support the teaching of lower-attaining candidates in teaching groups where the majority will be entered for Foundation Tier of a GCSE examination.

The specification consists of 39 Items, equally divided between biology, chemistry and physics, with each 'Item' requiring approximately five hours of curriculum time, and candidates will not necessarily need to have been taught all of the 'Items' in order to achieve certification.

The absence of the requirement to conform to GCSE criteria enables a significantly more flexible approach to be used and this is reflected in an increased emphasis on positive achievement through the realisation of short-term goals, together with a much greater amount of direct teacher involvement in the assessment of their own candidates.

There is no terminal examination, and assessment will be by means of a combination of short End-of-Item tests, a simple study of a Science Topic, 'Can-Do' tasks and a simple Data Analysis. All assessments are centre based, are supervised by the candidate's own teacher (who should attend a training course), and are carried out at times determined by the centre. All assessments will be subject to normal moderation procedures by OCR.

Although the specification is designed to be used as an alternative to GCSE, part of the inherent flexibility built in to the specification has been the deliberate linking of the assessment of activities to the mark descriptions of similar skills assessment in OCR GCSE Twenty First Century Science suite and OCR GCSE Gateway Science suite. This allows the possibility of some candidates being entered, as late as February of Year 11, for the Foundation Tier of an OCR GCSE science course.

This specification will assess achievement at Entry Level of the National Qualifications Framework (NQF).

It is approved by QCDA as a national Entry Level award and is also approved by ACCAC for use in maintained schools in Wales and, by CCEA, in Northern Ireland.

1.2 Qualification Titles and Levels

This qualification is shown on a certificate as OCR Entry Level Certificate in Science.

All Entry Level Certificate specifications are intended to cater for those candidates unlikely to achieve a grade, in the same subject, at GCSE Level. The requirements of the **three** pass grades available (Entry 1, Entry 2 and Entry 3) are broadly equivalent to the requirements for the revised National Curriculum Levels 1, 2 and 3 and are intended to recognise a level of achievement below that of a grade G at GCSE.

Entry Level Certificate specifications utilise appropriate short term goals and manageable elements and are closely related to the GCSE specifications of the same name, in order to provide a stepping stone for possible progression to GCSE or equivalent.

1.3 Prior Learning/Attainment

Candidates who are taking courses leading to this qualification at Key Stage 4 should normally have followed the corresponding Key Stage 3 Programme of Study within the revised National Curriculum.

There is, however, no prior learning required for this qualification.

2 Summary of Content

The course consists of 39 ‘Items’, 13 for each of Biology, Chemistry and Physics. The ‘Items’ are related to those aspects of science representing important features in the life of candidates at the start of the twenty-first century.

Each ‘Item’ can be delivered in approximately two and a half hours of teaching time, and each is linked to the revised Key Stage 4 programme of study for GCSE Science.

Biology Items	Title	GCSE Suite Match to
B.1	Dead or Alive	B
B.2	Babies	B (minimum)
B.3	Extinction	A and B
B.4	Casualty	A and B
B.5	Building Bodies	B
B.6	Control Systems	A and B
B.7	Gasping for Breath	A and B
B.8	Creepy Crawlies	A and B
B.9	Fooling your Senses	A and B
B.10	Green and Growing	A
B.11	From Field to Plate	A
B.12	My Genes	A and B
B.13	Body Wars	A and B

Chemistry Items	Title	GCSE Suite Match to
C.1	Acids and Alkalis	B (minimum)
C.2	Cooking and Cleaning	B
C.3	Colours and Smells	B
C.4	Heavy Metal?	B
C.5	Fibres and Fabrics	A and B
C.6	Clean Air?	A and B
C.7	Strong Stuff	A and B
C.8	Restless Earth	A and B
C.9	How Fast? How Slow?	B
C.10	Sorting Out	B
C.11	Rubbish!	A and B
C.12	Fuels	A and B
C.13	Food Chemicals	A and B

Physics Items	Title	GCSE Suite Match to
P.1	The Digital Age	A and B
P.2	Power On!	A and B
P.3	Feel the Force	B
P.4	G-Force	
P.5	Let there be Light!	B (minimum)
P.6	Watch this Space	A and B
P.7	The Burning Question	A and B
P.8	Deep Impacts	A and B
P.9	Sound Effects	B (minimum)
P.10	Hot Stuff!	B
P.11	Nuclear Power	A and B
P.12	Full Spectrum	A and B
P.13	Medical Rays	A and B

3 Content

3.1 Layout of Module Content

The specification content is displayed as 39 ‘Items’. For each ‘Item’ the cells in the left hand column list suggested activities which teachers could use in developing the content.

Each of the cells in the central column lists the content statements which are open to assessment in the End-of-Item tests.

The right hand column lists, in each cell, the references to the OCR GCSE Science which can be linked directly with the relevant content statements.

- A links to OCR GCSE Science (Twenty First Century Science; specification J630)
- B links to OCR GCSE Science (Gateway; specification J640)

Opportunities for illustrating ‘How Science Works’ are marked by the letter H within the content statements e.g. in Item C9, H1C refers to paragraph 1c of ‘How Science Works’ in Key Stage 4 science program of study.

Can-Do tasks that are common to those found in the GCSE Science B (Gateway) specification are marked with an *.

The use of ICT is integral to the study of science and every opportunity should be taken to use ICT as part of the learning process, e.g. using digital photography to record variation in animals and plants in Item B3 Extinction.

B1 DEAD OR ALIVE

This 'Item' covers the main body organs and life processes. Exercise is used as a link to muscle fatigue and breathing rate. Organ donation and preservation complete the item.

Suggested Activities and Experiences	Content Statements	GCSE link
• Discuss the processes of life and how we know that someone is still alive. • Make up a mnemonic (e.g. MrsGren) to remember this. • Build up systems to show organisation using diagrams of cells, tissues, organs, and systems. • Build simple 3D models to show and label an animal cell. • http://www.ibiblio.org/virtualcell/index.htm (The cell.)	• Know the life processes: growth, digestion, reproduction, movement, sensitivity, excretion, and breathing. • Be able to name the body systems involved with these life processes: circulatory, respiratory and digestive. • Be able to label the nucleus, cytoplasm and cell membrane of an animal cell. • Know that the nucleus controls the cell; the membrane allows some chemicals to pass in and out, and the cytoplasm is where useful chemical reactions take place.	
• Carry out a simple exercise to show muscle fatigue (finger stretching an elastic band, or fist clenches with arm raises). • Find out how exercise affects breathing rate and pulse rate. • Discuss the link between recovery time and fitness.	• Recall that exercise requires energy, and lack of energy causes tiredness or muscle cramp. • Recall that cells use oxygen to release energy from glucose (sugar), and this is called respiration. • Interpret simple data on breathing and pulse rates during exercise [no recall expected]. • Recall that general fitness can be indicated by recovery times in pulse and breathing rates. • Know that warming up and down can help reduce muscle damage during exercise.	B B1a
• Look at the position of organs within the body. Stick cut-out organs into position on a body outline. • http://www.lessontutor.com/jm_digestive.html (Outline of body.) • Design a Donor card/organ carrying box. • Discuss why you should not accept an organ from anyone.	• Be able to name and locate: lungs, heart, kidneys, liver, brain, stomach. • Know that some healthy organs can be removed from dead people and transplanted into hosts. • Know that transplants can be rejected. • Know that people can opt to donate their organs and can carry donor cards.	
• Discuss the possibility of freezing dead humans and in the future of restoring life. Write a story about how you would be frozen and return to life. • Look at the effects of freezing and thawing on various tissues, with reference to frozen foods.	• Know that freezing slows down decay. • Know that damage occurs when cells are frozen.	

Related 'Can-Do' Tasks	(1)	I can measure a person's breathing rate or pulse.
	(42)	I can measure how fast a person recovers from exercise.
Possible Data Analysis	Effect of exercise on breathing rate.	
Possible Science Topic	Should people have to carry a card if they **don't** want to be an organ donor? **H46**	

B2 BABIES

This 'item' develops an awareness of the human reproductive system, by looking at the role of midwives during pregnancy, labour and aftercare.

Suggested Activities and Experiences	Content Statements	GCSE link
• Label simple diagrams of male/female reproductive systems. • Discuss the role of male and female in sexual intercourse. • Add arrows to a diagram of female reproductive system to show direction of sperm movement towards the egg. • Discuss what fertilisation involves, and how the egg can separate to form twins.	• Know the names of the main organs of the male and female reproductive system: penis, testis, sperm duct, ovary, oviduct, womb, vagina. • Know the functions of testes (make sperm), ovary (make eggs). • Know that fertilisation occurs by fusion of sperm and egg cells. • Know that identical twins occur when a fertilised egg divides.	
• Discuss the changes that take place in the female body after fertilisation. • Visit to clinic/midwife. • Test fake urine for protein. • http://www.med.unc.edu/embryo_images/ ; (Development of the embryo.)	• Be aware of some of the changes which occur in the female body after fertilisation: stopping periods and weight gain. • Know that tests are carried out to monitor progress of mother and foetus during pregnancy: blood pressure, height, weight.	
• Cut and stick work sheets to show positions of placenta, cord, foetus, bag of water. • Complete a table to show the basic role of these structures. • Demo to show need for bag of water – shake jar containing egg with/without water.	• Be able to name and locate the placenta, cord, foetus and bag of water. • Know the basic role of these structures.	
• Sequence statements of events of labour leading up to birth. • Make a checklist of what the mother needs to take to hospital. • Discuss how the hospital can aid the birth process (painkillers, epidural, breathing exercises). • Discussion of how the parents' lifestyle will change after the birth of the baby and list the jobs the father could do to help. • Discuss post-natal care (visit by community nurse).	• Know the early stages of labour; water breaking, labour pain. • Know the placenta is lost as the afterbirth. • Be able to interpret data from babies' growth. • Know that periods start again after childbirth.	
• Discuss the affects of the increasing human population.	• Recall that the human population is increasing. • Interpret data on human population size. • Recall that increased population will put greater demand on resources: homes, food, clean water, fuel, more household waste and sewage.	B B2g

Related 'Can-Do' Tasks	(2)	I can show the position of the foetus, cord and placenta on a model.
	(43)	I can read data from a graph.
Possible Data Analysis	Compare the absorbency of different nappies.	
Possible Science Topic	Should people be allowed to use amniocentesis or CVS tests? **H46**	

B3 EXTINCTION

This 'Item' develops an awareness of organisms in their environment, by looking at fossil evidence.

Suggested Activities and Experiences	Content Statements	GCSE link
• Look at display/pictures of fossils. • Discuss how fossils were formed. • Compare a dustbin and compost heap – oldest material at the bottom. • Make plaster casts of 'fossils'.	• Recall that fossils provide evidence for living organisms from long ago. • Know that some rocks are formed in layers. • Know that the soft part of bodies rot but teeth and bones are preserved. • Be able to sequence the main stages of fossil formation.	A B3.1.3 B B2e
• Put in sequence a timeline for the evolution of major animal groups. • http://wsrv.clas.virginia.edu/~rjh9u/hdevsum.html (The Jurassic Period.) • http://www.enchantedlearning.com/subjects/dinosaurs/index.html (Dinosaurs)	• State that life on Earth began about 3500 million years ago. • Know that these were very simple living things. • Know that living things have been changing ever since because of evolution.	A B3.1.2
• Spot variation in animals and plants of the same species (photographs/living things). • Grow seeds with different numbers of seeds per small pot (egg boxes).	• Be able to identify variations in animals or plants of the same species [no recall expected]. • Recall that living things compete for shelter, food and mates, in order to survive. • Know that the survivors can breed and pass on their features to the next generation.	A B3.1.6 A B3.4.2 B B2c
• Use the internet to find names of some animals/plants that are endangered species. • Match species to the reasons for them becoming endangered/extinct. • Produce a poster on how to protect a chosen species. • Make a plasticine dinosaur body with straw legs and cardboard feet to support the dinosaur on a swamp (wall paper paste).	• Recall the terms 'habitat' and 'species'. • Know that a species may become extinct if their habitat changes, or another species is better adapted to survive there. • Be able to suggest how human beings have caused some species to become endangered or extinct (habitat destruction, hunting, pollution). • Interpret data on population sizes of endangered species. • Recall examples of endangered species (panda, gorilla, primroses). • Recall examples of extinct species (dinosaurs, sabre-toothed tiger, dodo).	A B3.4.1 A B3.4.4 A B3.4.5 A B3.4.6 B B2c B B2d B B2f
• Watch video material of discussion of evolution. • Show newspaper headlines about the debate on the origins of the human 'hobbit' skeletons, found in 2004.	• Know that scientists do not always agree about an explanation. • Know that debate about an explanation is a good thing, and that it goes on until people are convinced by the evidence. **H4C**	A B3.2.1 A B3.3.11

Related 'Can-Do' Tasks	(21)	I can collect (scientific) information about an endangered or extinct species.
	(3)	Given information of when things lived, I can place them onto a timeline.
Possible Data Analysis	Effect of competition on plant growth.	
Possible Science Topic	How can (a named) endangered species be protected? Why did (a named) species/dinosaurs become extinct?	

B4 CASUALTY

This 'Item' develops understanding of circulation, and how some factors increase a person's risk of developing heart disease.

Suggested Activities and Experiences	Content Statements	GCSE link
• Learn basic first aid for an emergency – video/St John Ambulance etc. • Practise simple First Aid techniques. • Discuss how and when to call for help: making a 999 call.	• Know the importance of maintaining the circulation of oxygen in the body. • Know the steps to take in an emergency situation. • Know how and when to call for help. • Know the ABC code (airway, breathing, circulation).	A B2.4.1
• Look at the structure of the heart (dissection or model). • http://www.smm.org/heart/heart/top.html (The structure of the heart.) • Use a stethoscope to listen to the heart beat.	• Know that the heart is made of muscle. • Know that the heart pumps to force blood out to the lungs or around the body. • Know why the heart muscles need a good blood supply.	A B2.4.1 B B1b
• Discuss differences between arteries and veins and capillaries. • http://wsrv.clas.virginia.edu/~rjh9u/hdevsum.html (Blood circulation.) • Observe/identify differences from video/slides, or Visking tubing and Bunsen tubing.	• Know that arteries carry blood away from the heart, and veins to the heart. • Be able to recognise the difference between an artery and a vein.	A B2.4.2 B B1b
• Different ways of measuring pulse rate. • Measuring the effect of exercise on pulse rate.	• Recall that during exercise muscles need to be supplied with more blood. • Be able to relate this to an increase in heart rate. • Interpret data on heart rate before and during exercise.	
• Look at health education leaflets and identify factors that increase the risk of heart disease. • Explore heart disease risk factors for different individuals. • Consider patterns in evidence that smoking increases the risk of heart disease. • Look at video material reporting studies of risk factors for heart disease.	• Know that heart disease often happens when arteries supplying the heart with blood become blocked. • Recall that the risk of heart disease is increased by some factors including high-fat diet and smoking. • Know that these factors increase the risk of heart disease, but won't cause it in everyone. **H1D** • Understand that one case is not enough evidence to show a pattern between one change and another. • Recall that regular exercise reduces the risk of heart disease.	A B2.4.3 A B2.4.4 A B2.4.5 A B2.4.6 A B2.4.7 A B2.4.8

Related 'Can-Do' Tasks	(1) I can measure a person's breathing rate or pulse. (44) I can devise a 10 minutes a day fitness programme.
Possible Data Analysis	Effect of exercise on pulse.
Possible Science Topic	Does smoking increase your risk of heart disease?

B5 BUILDING BODIES

This 'Item' explores digestion, and the relationship between the food we eat and how it affects our bodies.

Suggested Activities and Experiences	Content Statements	GCSE link
• Discuss how different people with different lifestyles need different diets. • Look at the main food groups and which foods contain them. • Look at their own diets. • http://www.lessontutor.com/jm_digestive.html (The digestive system.)	• Be aware that different people have different lifestyles and therefore dietary requirements. • Know that the diet in many parts of the world is deficient in protein. • Know that a high protein diet is needed by teenagers for growth. • Know that the body is mainly water, with carbohydrates, protein, fats, vitamins, minerals, and that food and drink provide these. • Interpret data on nutrient content of different foods. • Know the main food groups and examples of foods that contain them.	B B1e B B2h
• Looking at food labels. • Visit shops/kitchen cupboards. • Discuss how the diet should be balanced. • Discuss dietary excesses, deficiencies and allergies.	• Know that almost all foods are mixtures of different food groups. • Know that carbohydrates and fats provide energy, and protein is needed for growth and repair. • Know that food labels give nutritional information. • Recognise the need for a balanced diet and adequate exercise and rest. **H3C**	B B1e
• Testing foods for starch, glucose, protein and fat. • Plan to test different sweets for glucose.	• Interpret simple data on food tests [no recall expected].	
• Produce a full size model body with labelled cut-outs of the organs. • Discuss / watch a video about how we digest food. • Discuss the role of enzymes in digestion. • Show that large molecules (e.g. starch) cannot pass through Visking tubing, while smaller molecules (e.g. simple sugars) can. • Show that only particular types of enzyme can digest certain foods, e.g. protease cannot digest starch.	• Know the names and positions of main organs of the human digestive system: mouth, stomach, small intestine, large intestine. • Know, in simple terms, the processes of digestion and absorption and where these events occur. • Know that enzymes speed up reactions in humans. • Know that enzymes speed up digestion to produce smaller soluble chemicals (which can pass into the blood). • Know that there are different enzymes in the mouth, stomach and intestines, each of which digests a different type of food.	A C3.4.1 B B1e

Related 'Can-Do' Tasks	(45)	I can plan my daily protein intake.
	(22)	I can safely carry out a food test for starch
Possible Data Analysis	Use nutritional information from food labels to compare food types in different foods.	
Possible Science Topic	Is eating a 'junk-food' diet a problem?	

B6 CONTROL SYSTEMS

This 'Item' considers the effect of changes on the human body and considers the importance of control mechanisms.

Suggested Activities and Experiences	Content Statements	GCSE link
• Introduce the idea that things need controlling. • Discuss changes in our surrounding environment which can affect our body's internal environment.	• Be aware that changes in our surroundings can affect our body's internal environment. • Know that the body's internal environment can change and that the body tries to control this change.	B B1g
• Discuss what factors can affect our body temperature. • Place cards under headings: 'Keeping our body warm' and 'Keeping our body cool'. • Use thermometers / 'fever scans' to take external body temperature. • Find out about hypothermia and frostbite. • Investigate insulation / huddling.	• Know that the body's temperature is about 37ºC. • Know that the body loses heat in cold air. • Know that working muscles generate heat. • Understand that shivering and moving produce heat. • Know that raised hair, stored fat and clothing reduce heat loss. • Recall that temperature extremes are dangerous to your body.	B B1g
• Discuss what happens to our bodies when we get too hot. • Secondary sources including ICT to find out about cooling mechanisms. • Investigate the temperature drop of warm water with wet, dry or with no covering.	• Know that sweating and 'red face' help to keep the body cool. • Be able to interpret the results of simple cooling experiments.	B B1g
• Label a simple diagram of a kidney and a bladder. • Survey the amount of liquid drunk in summer and winter. • Discussion of the use off isotonic liquids by athletes.	• Know the ways the body gains or loses water. • Be able to name and locate kidneys and bladder. • Know that kidneys remove excess water.	
• Read a story about a diabetic. • Discuss how being a diabetic affects your life. • Design a logo for a diabetic to wear.	• Know that sugar levels need to be controlled. • Know that the body controls sugar levels with insulin. • Know that diabetes can be controlled by sugar levels in diet and insulin.	A B3.3.7 A C3.4.8 A C3.4.9 A C3.4.10 B B1f

Related 'Can-Do' Tasks	(17)	I can produce a poster to warn old people about the risks of hypothermia.
	(46)	I can use a thermometer to accurately measure temperature.*
Possible Data Analysis	Experiment to show rate of cooling.	
Possible Science Topic	Does your lifestyle increase your risk of diabetes? **H3C**	

B7 GASPING FOR BREATH

This 'Item' explores the lung and cell respiration. It leads onto consideration of health problems caused by asthma and smoking.

Suggested Activities and Experiences	Content Statements	GCSE link
• Measure chest movement during breathing. • Make a model thorax.	• Know how the movement of the ribs brings about breathing. • Be able to name and locate the windpipe, lungs and ribs on a diagram of the thorax.	
• Design a health education poster about asthma. • Talk to asthma sufferers about the symptoms. • Measure lung volumes. • Use a peak flow meter.	• Recall that air pollution may cause asthma and that asthma causes the airways to narrow. • Know that it is difficult to prove that air pollution causes asthma**. H2D** • Be able to spot patterns in data about asthma [no recall expected]. • Be aware than an inhaler can relieve and prevent the symptoms of asthma. • Know that lung volumes vary and may be affected by smoking and asthma. • Know that the speed of exhalation varies and may be affected by smoking and asthma.	A C1.3.1
• Demonstrate a model smoking machine. • Debate smoking in public places. • Use websites / books to find out about smoking.	• Know that smoking can cause heart disease and cancer. • Interpret data relating to health studies on smoking. • Be aware that other people may be affected by passive smoking.	A B2.4.8 B B1c
• Look at microscope slides or diagrams of muscle cells. • Watch a video/simulation (e.g. www.bbc.co.uk/bitesize) to show respiration in cells. • Test exhaled air to show it contains carbon dioxide and water vapour. • Link exercise to respiration rate.	• Recall that in all cells, glucose from food and oxygen breathed in, combine to release energy, and that this process is called respiration. • Recall that carbon dioxide and water are the waste products of respiration. • Know how to test for carbon dioxide using limewater, and water vapour (mirror or cobalt chloride paper). • Recall carbon dioxide is removed from our bodies via the lungs. • Know that during exercise, more oxygen and glucose is needed by muscles, and water and carbon dioxide are removed quicker.	B B1g B B1a

Related 'Can-Do' Tasks	(4)	I can show the position of the lungs, windpipe and ribs on a model of the thorax.
	(23)	I can test exhaled air for carbon dioxide.*
Possible Data Analysis	Compare lung volumes to size of different people.	
Possible Science Topic	Does pollution from cars increase the risk of asthma?	

B8 CREEPY CRAWLIES

The Item focuses on finding organisms using sampling techniques: naming them, and matching them to their habitats.

Suggested Activities and Experiences	Content Statements	GCSE link
• Growing plants in different conditions of light and water. • Identifying adaptations of prey and predators.	• Know that plants make their own food from carbon dioxide in the air and water. • Know that plants also need light to make their own food. • Know that animals get their food from eating plants or other animals. • Know that some animals are adapted to survive being caught as prey. • Recall how some animals are adapted as successful predators.	B B2a
• Constructing a food chain using well-known examples. • Using simple food webs to predict affects of changes on different members of the food web.	• Know the meaning of the terms 'herbivore' and 'carnivore'. • Be able to construct a simple food chain with a plant, a herbivore and a carnivore. • Be able to interpret a simple food web (limited to 3 organisms at any level). • Be able to explain how a change affecting one species in a food web can affect another species in the same food web.	A B3.4.1 A B3.4.3
• Collecting data using a variety of sampling techniques. • Collecting pond or leaf-litter organisms. • Using a key to identify collected organisms. • Matching plants and animals to their habitats.	• Be able to describe and carry out simple sampling methods (limited to pooters, nets, pitfall traps and quadrat surveys). • Be able to use simple keys to name plants and animals. • Recall the meaning of the term 'habitat'. • Match pictures of animals and plants to the habitats they live in.	A B3.4.1 B B2a B B2b
• Estimating the number of weeds in a field.	• Recall that a variety of plants live in a 1m quadrat area. • Be able to estimate the number of plants in an area using a quadrat survey. **H1g**	B B2a B B2b

Related 'Can-Do' Tasks	(3)	Given information I can match an animal to the place in which it lives.
	(47)	I can carry out a simple survey.
Possible Data Analysis	Population sizes in different conditions using a quadrat survey, e.g. pleurococci on trees, distribution of weeds.	
Possible Science Topic	Is it harmful to get rid of hedgerows?	

B9 FOOLING YOUR SENSES

This 'Item' develops an understanding of how we sense our environment, in the context of fooling our senses.

Suggested Activities and Experiences	Content Statements	GCSE link
• Look at a model / video / website of the structure of the eye. • Build a cut and stick model of the eye.http://www.macula.org/anatomy/eyeframe.html • Demonstrate binocular vision by bringing two pencil points together at arms length using one eye and two eyes. • Look at pictures of predators (binocular) and prey (monocular).	• Be able to label a diagram of the eye (limited to cornea, iris, pupil, lens, retina, optic nerve). • Recall that humans have good binocular vision, but a limited field of view. • Know the differences between monocular and binocular vision. • Be able to use the position of eyes to state if an animal is a predator, or prey. • Know that 3D vision enables distances to be judged.	B B1f
• Taste food when the sense of smell is impaired, e.g. apple and onion. • Investigation of the four taste areas on the tongue. • Identifying substances by smell, e.g. different types of crisps.	• Know that the nose is lined with nerves sensitive to chemicals in the air. • Know that taste buds are located on the tongue and are sensitive to four tastes: salt, sweet, sour, bitter. • Know that different areas of the tongue are more sensitive to different tastes. • Be aware that the flavour of food diminishes when we have a cold because we cannot smell.	B B1f
• Watch a video / website simulation of how nerve impulses work. • Investigate reflex reactions, e.g. knee jerk, pupil dilation and blinking. • Measure reaction times by catching a dropped ruler. • http://www.neurophys.wisc.edu/animations/ (The structure of the ear.)	• Recall that sensor (receptor) cells detect stimuli, and effector cells (muscles) produce a response. • Recognise the need for simple reflex actions, i.e. for protection. • Interpret simple data on reaction times.	A B3.3.3 B B1f
• Use 'feelie' boxes to test skin sensitivity. • Test water temperature with the hands. • Test different areas of skin for sensitivity.	• Know that the skin contains sensory nerves for touch, temperature, pain and pressure. • Know that pressure sensors are deeper than pain sensors. • Know that some areas of skin contain more nerve endings than others.	A B3.3.3 A B3.3.7
Related 'Can-Do' Tasks	(5) I can measure reaction time. (6) I can carry out a tasting test safely.	
Possible Data Analysis	Compare reaction times / discuss if the data is valid.	
Possible Science Topic	Should we have a total ban on drinking and driving? **H4b**	

B10 GREEN AND GROWING

This 'Item' develops an understanding of some simple plant biology and considers how we produce food.

Suggested Activities and Experiences	Content Statements	GCSE link
• Classify plants we eat into roots, stems, leaves, flowers and buds (use of real plants or photos). • Consider the pros and cons of vegetarianism.	• Be able to label a diagram of a generalised plant and be able to show roots, stems, leaves, flowers and buds. • Be aware that we eat different parts of plants.	
• Investigate conditions needed for germination. • Cut open a soaked seed and look for root, shoot, food store and test it for starch.	• Know that plants make seeds to produce the next generation. • Know that seeds grow into adult plants. • Know the conditions necessary for germination: warmth, air and water. • Be able to state the function of roots: anchorage, uptake of minerals and water. • Know that leaves make food, and some is stored as starch.	
• Look at data from selectively bred plants or animals, e.g. milk yield from cows, over a time period.	• Know that selective breeding can result in increased size, yield, and disease resistance. • Interpret data on selectively bred plants or animals.	A B3.1.9
• Grow plants from cuttings, and/or compare cuttings grown with or without rooting powder. • Discuss the advantages and disadvantages to garden centres of cloning plants.	• Know that plants can regrow damaged parts, but most cloned animals cannot. • Know that cloning leads to identical offspring. • Recall that differences between clones are likely to be due to environmental factors. • Know advantages and disadvantage of cloning plants: – advantages (all identical/quicker) – disadvantages (prone to same infections or disease). • Recall some different views that people may have about human cloning. **H4b**	A B1.4.1 A B1.4.2 A B1.4.7

Related 'Can-Do' Tasks	(22)	I can safely carry out a food test for starch.
	(48)	I can grow plants from seeds or cuttings.
Possible Data Analysis	Effect of different conditions on seed germination.	
Possible Science Topic	Should human cloning be allowed to look for cures for diseases?	

B11 FROM FIELD TO PLATE

This 'Item' follows the 'food chain' from farm to home.

Suggested Activities and Experiences	Content Statements	GCSE link
• Watching a presentation or using a web site (such as the photo section of http://www.face-online.org.uk/) to follow milk from field to fridge. • Comparing the taste of milks processed in different ways. • Carrying out a milk quality test on samples of milk.	• Know that milk comes from cows (or sheep or goats) but is processed before being supplied to customers. • Be able to sequence a series of images showing the stages in providing milk to people's homes. • Match the words 'pasteurised' and 'sterilised' to descriptions of milk processing. • Be able to give a reason why it is important to test samples of milk.	
• Testing soil samples for materials present, humus content and drainage. • Testing the pH of soil samples.	• Know that there are different types of soil and that this can affect the type of plants that grow there. • Know that some soils dry out easily and others get waterlogged. • Know how to test the pH of soil. • Interpret data to determine pH preferences of different plant species.	
• Germinating grass seeds and growing grass. • Comparing grass growing with and without fertiliser. • Watching a presentation to compare intensive and organic farming. • Sorting arguments for and against types of farming and matching them with organic and intensive methods.	• Know that fertilisers supply the chemicals that plants need for growth. • Know that fertilisers include nitrogen for improved growth, phosphorus for good root growth and potassium for flowers and fruit growth. • Know that organic farmers use manure and crop rotation to improve soil fertility. • Be able to distinguish between facts and opinions about organically grown food. **H4g**	A C3.1.4 A C3.1.6 A C3.1.7 A C3.1.12
• Making cheese and yogurt. • Carrying out a consumer preference test on varieties of cheese or yoghurt.	• Recognise the importance of hygiene in making cheese and yoghurt. • Know the conditions that bacteria need to grow: warmth, moisture and food supply. • Know that special bacteria are needed to make cheese and yoghurt. • Be able to sequence a series of images or descriptions for the stages in turning milk into yogurt or cheese.	

Related 'Can-Do' Tasks	(24)	I can use Universal Indicator solution to find pH.
	(49)	I can follow a recipe to make yoghurt or cheese.
Possible Data Analysis	Present and interpret the results of a consumer preference test.	
Possible Science Topic	Organic food: is it worth the money?	

B12 MY GENES

This 'Item' introduces simple aspects of genetics, starting from the idea that chromosomes and genes are inside cells, and extending this into sex determination, possible genotype combination and variation. Ideas about genetic diseases and possible cures, selective breading and cloning are also covered.

Suggested Activities and Experiences	Content Statements	GCSE link
• Make models, use books, use the internet or multi-media to show that the nucleus contains chromosomes. • Use pipe cleaners or coloured sweets to make models of genes and chromosomes.	• Know that all human cells contain a nucleus. • Know that the nucleus contains chromosomes. • Know that the chromosomes contain genes. • Recall that genes carry our unique genetic code.	A B1.1.1 A B1.1.3 B B1h
• Record and present data on variation in human features. • Identify human features which are inherited, environmental or both. • Look at photographs of families, and identify similar features.	• Know that most human features are determined by a person's genes. • Know that environment also affects many features. • Know that most features are affected by several genes, e.g. height. • Classify a range of human features as genetic (e.g. tongue rolling, ear lobes), environmental (e.g. scars, accent), and both (e.g. hair colour, good at sport). • Collect and Interpret data on human variation. **H2C**	A B1.3.1 A B1.3.2 B B1h
• Use a gene pairing game to show males have an odd set of chromosomes (XY) while females have (XX). • Vary the game to pair genes and decide the outcome of a baby. • Use simple punnett squares to show possible genotypes and the ratio of each. • http://www.accessexcellence.org/RC/VL/GG/recessive.html (Dominance.)	• Know that normal body cells have 46 chromosomes: – females have 23 pairs (including XX) – males have 22 pairs and **one** odd pair (XY). • Know that some genes are dominant and some are recessive. • Know how to use simple punnett squares to show genotype ratios.	A B1.3.3 A B1.3.6 B B1h
• Watch video material describing genetic diseases. • Discuss viewpoints people may have about testing embryos for certain genes.	• Recall that a few diseases are caused by faulty genes. • Know that embryos can be tested for certain genes. • Recall different viewpoints that people may have about such testing.	A B1.3.7 A B1.3.11

Related 'Can-Do' Tasks	(50)	I can measure body features accurately, e.g. length of fingers.
	(7)	I can use a picture of chromosome pairs to say what sex a person is.
Possible Data Analysis	Comparing height and foot size.	
Possible Science Topic	Should people be allowed to test embryos for certain genes?	

B13 BODY WARS

This 'Item' introduces how our bodies can become infected, and how we prevent and deal with infections.

Suggested Activities and Experiences	Content Statements	GCSE link
• Look at magnified white blood cells. • http://science.howstuffworks.com/blood.htm (Blood.) • Look at pictures (internet) of different microbes.	• Know that microbes are bacteria, fungi and viruses. • Recall that our bodies provide good conditions for microbes to reproduce rapidly. • Interpret data on microbial population size. • Know that white blood cells are part of the immune system. • Recall that the immune system fights infections.	A B2.1.2 A B2.1.4 B B1d
• Test the effect of acidic pH (stomach acid) or protease (tears) on growth of bacterial agar plates.	• Know that a few types of microbes can make people ill. • Know that the skin, chemicals in tears, sweat, and stomach acid stop microbes getting in. • Know that microbes can still enter the body through natural openings, or cuts in the skin.	A B2.1.1 B B1b
• Identify good hygiene rules by looking at health education leaflets. • Arrange some common foodstuffs safely in a cut and stick fridge.	• Recall ways of reducing the risk of catching infections, e.g. washing hands after going to the toilet, before preparing or eating food. • Know that food should be stored carefully in a fridge, e.g. salad covered, raw meat below cooked meat. • Know that knives and chopping boards should be washed thoroughly after preparing meat, and that the food should be cooked thoroughly, in order to kill any microbes.	
• Test the effect of antiseptics and / or antibiotic discs on growth of bacterial agar plate.	• Recall that antibiotics are chemicals that kill bacteria and fungi, but not viruses. • Know that some bacteria have developed which are not killed by some antibiotics. • Know that there are some ways that people can reduce the risk of 'superbugs' developing: – only use antibiotics when needed – always finish a course of antibiotics.	A B2.3.1 A B2.3.2 A B2.3.4
• Find out what vaccinations they have had. • Discuss why vaccines are given – to protect the majority against a possible deadly disease. • Discuss why some parents don't have their children vaccinated (risk of side effects). • Match changing media headlines about the MMR vaccine over time to different pieces of evidence (source from the web).	• Know that vaccines can make people immune to a disease. • Know that once you are immune you are protected from a particular disease. • Know that no action can ever be completely safe, including medical treatments such as vaccines. • Recall different viewpoints that parents may have about giving their child a vaccination. • Know that media reports of health studies are not always accurate.	A B2.2.1 A B2.2.2 A B2.2.4 A B2.2.9 B B1d

Related 'Can-Do' Tasks	(8)	I can focus a slide of a cell on a microscope. *
	(25)	I can search the internet to find information fit for purpose.
Possible Data Analysis	Be able to compare bacterial growth by estimating percentage cover of different types. **H46**	
Possible Science Topic	Should it be compulsory to have the MMR vaccine?	

C1 ACIDS AND ALKALIS

This 'Item' explores the importance of acidity/alkalinity and investigates the process of neutralisation in everyday life.

Suggested Activities and Experiences	Content Statements	GCSE link
• Extract plant dyes from flowers, beetroot or red cabbage and use the solution to identify acids and alkalis. • Use litmus to identify solutions that are acidic, alkaline or neutral.	• Be able to label simple laboratory apparatus used to obtain a dye from a plant (limited to beaker, stirring rod, heating apparatus, filter funnel, filter paper and mortar and pestle). • Know that acids or alkalis change the colour of some dyes. • Describe one safety precaution when using acids or alkalis. • Interpret simple information about the use of indicators to classify solutions as acid, neutral or alkali [no recall expected].	
• Use Universal Indicator to measure the pH of common substances. • Create a 'rainbow' of colours using Universal Indicator.	• Know how to use the pH scale.	
• Use dilute hydrochloric acid to investigate properties of acids. • Find out if vinegar (ethanoic acid) and fruit acid (citric acid) show the same properties as dilute hydrochloric acid.	• Know that acids have an effect on indicators and turn Universal Indicator red, orange or yellow. • Know that acids fizz with carbonates to make carbon dioxide gas. • Know that acids react with some metals (limited to magnesium) to make hydrogen gas. • Know the tests for hydrogen and carbon dioxide.	B C1a
• Investigate the reactions between acid drops and bicarbonate of soda or soda toothpaste and fruit juice. • Investigate the change in pH when acid and alkali are mixed. • http://www.chem4kids.com/files/react_acidbase.html	• Know that neutralisation occurs when acids and alkalis are mixed. • Know that a neutral solution has a pH of 7. • Know that Universal Indicator is green at pH 7.	
• Find out about the contents of different types of indigestion remedies. • Compare different indigestion remedies by finding out how much acid they neutralise. • Test soils for pH using Universal Indicator. • Carry out a survey of different plants growing in different types of soil.	• Be able to explain uses of neutralisation, limited to curing indigestion and reducing the acidity of soils. • Interpret simple information comparing the effectiveness of different indigestion remedies [no recall expected]. **H3b**	

Related 'Can-Do' Tasks	(24)	I can find the pH of three solutions using Universal Indicator.
	(26)	I can test a gas to see if it is hydrogen.
Possible Data Analysis	Making sense of a chart showing which plants grow well in soils at different pH values.	
Possible Science Topic	Comparing indigestion remedies by looking at the ingredients, and the advice to the public supplied by the makers.	

C2 COOKING AND CLEANING

This 'Item' considers some of the ways in which food is cooked and prepared and ways to clean up afterwards.

Suggested Activities and Experiences	Content Statements	GCSE link
• Survey of the different types of food. • Look at different ways to cook food (e.g. boiling, frying, grilling, steaming, oven, microwave). • Heat water, contained in a block of ice shaped as a beaker, in a microwave and watch the water boil. • Reverse baked alaska (ice cream on outside, meringue on inside).	• Know two examples of foods that can be eaten raw and two that must be cooked. • Know examples of different ways to cook food (limited to boiling, frying, grilling, steaming, microwave and use of conventional oven). • Know reasons why food is cooked (limited to improving texture, taste, flavour, making it easier to digest and killing microbes).	B C1a
• Investigate the effect of heat on potatoes or meat. • Discussion: can you turn cooked meat back into raw meat, can you turn ice back into water?	• Know that the cooking food is an example of a chemical change. • Know that a chemical change takes place if a new substance is formed and the process is not reversible. • Know that the texture and taste of a potato changes when it is heated.	B C1a
• Investigate the effect of heat on baking powder. • Find out how baking powder is used in making cakes and making dough rise. • Making carbon dioxide using baking powder and vinegar, by fermentation and in pizza dough.	• Know that carbon dioxide is made when baking powder is heated and that it is used in making cakes. • Know that carbon dioxide is made by fermentation and from adding carbonate to acid. • Plan to compare different types of baking powder. **H2d**	B C1a
• Making soap. • Cleaning things with detergents and soap.	• Know that soap is made from animal fat or plant oils. • Know that synthetic detergents are made from chemicals found in crude oil. • Interpret simple diagrammatic representations showing how detergents can aid the removal of grease from a surface. • Interpret simple data relating to the effect of different cleaning agents [no recall expected].	
• Investigate the effectiveness of biological washing powders. • Finding out about wash labels on fabrics. • Find out about the contents of different washing powders. • http://home.howstuffworks.com/washer.htm (Washing machines)	• Know why enzymes are added to washing powders. • Be able to recognise simple wash labels.	

Related 'Can-Do' Tasks	(23)	I can carry out a test to show the presence of carbon dioxide.*
	(27)	I can heat a solid substance safely. *
Possible Data Analysis	Comparing temperature data from heating the same food for the same time by different methods.	
Possible Science Topic	The appliance of science to cooking in magazines or cookery books.	

C3 COLOURS AND SMELLS

This 'Item' investigates paints, pigments and perfumes.

Suggested Activities and Experiences	Content Statements	GCSE link
• Making coloured substances by mixing together solutions. • Data search using the internet to find out about paints and the ingredients in paints. • Investigate thermochromic pigments (Middlesex University Teaching Resources) and people who use them in their jobs.	• Know that a pigment is a coloured substance used in paint. • Know that paints contain a solvent, binding medium and pigment. • Know that paints are used to decorate or protect surfaces. • Know that some paints can change colour when heated or cooled. • Describe one use of a paint that changes colour with temperature.	B C2a
• Making water based paints using pigments and pva glue, and using them to paint with. • Survey some advertisement leaflets about different types of paints. • http://en.wikipedia.org/wiki/Paint	• Know that oil paint has a pigment dispersed in an oil and a solvent to dissolve the oil. • Know that water paint has a pigment dissolved in a mixture of water and a binder such as glue. • Interpret simple information on the content of paints [no recall expected].	B C2a
• Investigate the action of some solvents to remove stains such as paints or nail varnish.	• Understand the terms solvent, soluble and insoluble. • Know that different solids need different solvents. • Know that when a solid dissolves a solution is formed. • Interpret simple information on the effectiveness of solvents [no recall expected].	B C1c
• Find out about the range of cosmetics obtained from natural sources (e.g. Norfolk lavender). • Demonstration of extracting lavender oil by steam distillation. • Microscale preparation of an ester (e.g. ethyl ethanoate).	• Know that many perfumes are made from natural sources. • Recall one example of a perfume made from a natural source. • Know that some perfumes are made synthetically (made by human action) using weak acids.	B C1c
• Discuss the properties needed by perfumes (e.g. evaporates easily, non-toxic, does not irritate skin). • Debate about 'is the testing of cosmetics on animals justified?' Compare this with testing of lifesaving drugs.	• Know that perfumes have a pleasant smell. • Know that perfumes must evaporate easily. • Know that all perfumes must be tested to ensure they are safe to use but not everyone agrees with how they should be tested. **H2d**	B C1c

Related 'Can-Do' Tasks	(51)	I can make an artificial perfume.
	(28)	I can make a paint sample and prove that it works.
Possible Data Analysis	Examine images or samples of decorated surfaces to compare the 'covering power' of different paints.	
Possible Science Topic	The benefits to health and the environment of using water-based paints instead of oil-based paints.	

C4 HEAVY METAL?

This 'Item' considers the physical and chemical properties of metals which make them suitable for specific uses.

Suggested Activities and Experiences	Content Statements	GCSE link
• Extraction of unreactive metals from the Earth by panning, e.g. copper from a mixture of copper turnings and sand. • Consider the uses of gold and silver. • Discussion of the use of hallmarks. • Find out about allergies some people have to metals. **H26**	• Know that unreactive metals can be found unreacted in the Earth. • Know that panning is used to separate gold from rock. • Know that gold, silver and platinum are expensive, shiny and are heavy metals. • Know that their lack of reactivity makes them suitable for jewellery. • Know that some jewellery is coated in gold to avoid allergic reaction to the metal that is coated.	
• Extraction of copper by heating malachite and carbon. • Find data about the amounts of metal ores remaining in the Earth's crust.	• Know that copper can be extracted by heating its ore with carbon. • Know that recycling copper is cheaper than making copper and that it saves resources.	B C2d
• Copper plate a nail. • Looking at examples of electroplated metals. • http://www.finishing.com/faqs/howworks.html	• Know that electroplating cheap metals with silver, gold or platinum enables cheaper jewellery to be made. • Know uses of electroplating (limited to silver plated cutlery and chromium plated steel).	
• Compare the physical properties of iron and aluminium by data search and/or by experiment.	• Describe similarities and differences between the properties of iron and aluminium, limited to: – iron is more dense than aluminium – iron is magnetic, aluminium is not – iron corrodes (rusts) easily and aluminium does not.	B C2e
• Investigate the corrosion of aluminium and iron using different conditions (e.g. salt water, acid rain and moist air). • Find out about corrosion prevention on large structures such as the Eiffel tower. • 'Paint and paint again', corrosion resistance on the Forth rail bridge. • http://science.howstuffworks.com/question445.htm (Rusting)	• Know that rusting needs iron, water and oxygen. • Know that rusting is speeded up by salt water. • Know one advantage and one disadvantage of making cars from aluminium. • Interpret simple in formation about metals used to make cars [no recall expected].	B C2e

Related 'Can-Do' Tasks	(52)	I can extract a sample of copper from its ore.*
	(9)	I can use a magnet to separate a mixture of iron and aluminium.
Possible Data Analysis	Making sense of tables or charts comparing the properties of iron and aluminium.	
Possible Science Topic	Personal adornment: the use of metals in body decoration and jewellery.	

C5 FIBRES AND FABRICS

This 'Item' explores the wide range of uses that polymers have, with emphasis on clothing and health care.

Suggested Activities and Experiences	Content Statements	GCSE link
• Examining fibres and fabrics using eye and microscope. • Surveying garment labels to find the fibres used in clothes and where they come from. • Solving a mock crime from clues on fibre samples.	• Know that some fibres are natural (cotton from cotton plants and wool from sheep) and others are artificial (nylon, polythene and polyester are made by chemical reactions). • Recall one example of a natural fibre and an artificial fibre. • Be able to take information from garment labels and add it to a table or chart [no recall expected]. • Be able to match an image of a fibre to its description.	A C2.1
• Discussion; what do people look for when they buy clothing? • Testing the strength of fibres. • Testing the stretchiness of fibres. • Find out about the best material to use in the design of a hammock. • http://science.howstuffworks.com/question211.htm	• Be able to relate given properties of fibres or fabrics to their uses in clothing [no recall expected]. • Recall a reason why fibres or fabrics are tested. • Interpret simple data on testing the stretchiness of fibres or fabrics.	A C2.1
• Testing different materials for waterproofing (e.g. cotton, waxed cotton, nylon and Gore-Tex®). • Presenting results as bar charts.	• Know one advantage and one disadvantage of waterproof clothing. • Be able to spot differences in data about waterproof fabrics [no recall expected].	A C2.1 A IAS 1.6 B C1d
• Investigating flameproofing. • Matching fabrics to uses based on information about their resistance to catching fire. • Find out about people who use waterproof or flameproof clothing. • http://science.howstuffworks.com/space-suit1.htm	• Know that certain chemicals can help make clothes more fireproof. • Recall, or recognise, an example of the use of flameproof fabrics. • Interpret simple data relating the properties of materials to their use as waterproof or fireproof clothing [no recall expected].	B C1d
• Watching a presentation or video about the uses of fibres or fabrics in health care (such as stitching wounds, wound dressing, spare parts for surgery). • Comparing the advice to patients on a range of wound dressings from pharmacy stores.	• Know that a fibre or fabric used in, or on, a patient must not harm the body. • Match images of health care fibres or fabrics to simple descriptions of their properties. • Interpret simple data about the use of fibres or fabrics in heath care [no recall expected]. **H1g**	A C2.1 B C1d

Related 'Can-Do' Tasks	(29)	I can make measurements to test a property of a fibre or fabric.
	(10)	I can add results to a bar chart.
Possible Data Analysis	Interpreting data from an investigation of the strength or stretchiness of fibres.	
Possible Science Topic	Fibres and fabrics used in sport.	

C6 CLEAN AIR?

This 'Item' considers some of the environmental and health consequences of certain air pollutants.

Suggested Activities and Experiences	Content Statements	GCSE link
• Compare charts showing the composition of polluted and unpolluted air. • Watch a demonstration to show that not all of the air is reactive. • http://earthguide.ucsd.edu/earthguide/diagrams/atmosphere/index.html (The atmosphere.)	• Know that the Earth is surrounded by air in the atmosphere. • Know that air contains about 80% nitrogen and 20% oxygen. • Know that there are smaller amounts of water vapour, carbon dioxide and other gases in the air.	A C1.1 B C2f
• Collect particles from the air in various sites with a simple home-made dust collector (double-sided sticky tape on a slide). • Burn small samples of fuels and compare the quantities of soot (carbon particles). • Find out about the current levels of air pollution locally and what this means for people - www.airquality.co.uk • Design a poster describing the main causes and effects of air pollution in the UK.	• Know that burning fuels adds harmful chemicals into the atmosphere and that these are called pollutants because they are harmful to humans or the environment. • Be able to make sense of simple public information about air quality [no recall expected]. • Know some of the problems these pollutants cause limited to nitrogen oxides (breathing problems and acid rain) and carbon particles (lung damage).	A C1.2 B C2f
• Watch a demonstration to show that carbon dioxide and water form when fuels burn. • http://science.howstuffworks.com/fire.htm (Fire).	• Know that fuels contain carbon, which turns to carbon dioxide when the fuel burns. • Know how to test for the presence of carbon dioxide.	A C1.2
• Looking at maps showing levels of nitrogen oxides across a region. • Look at the results from an MOT test on a car and work out why it has failed the test. • Research ways in which atmospheric pollution from motor vehicles can be reduced (use more efficient engines, use low sulfur fuels, use catalytic converters, and have laws and tests on cars). • http://auto.howstuffworks.com/question66.htm (Catalytic converters.)	• Know that nitrogen and oxygen from the air can make nitrogen oxides in an engine. • Recall that a catalytic converter gets rid of pollutants like nitrogen oxides. • Interpret simple data on removal of pollutants from car exhausts. • Be able to state the benefits and drawbacks of using catalytic converters. **H49**	A C1.4 B C2f
• Find out about the use of ventilation, extractor fans and air-conditioning systems (e.g. clean rooms for electronic silicon wafer manufacture, operating theatres).	• Know one example where unpolluted air is essential.	A C1.2 B C2f

Related 'Can-Do' Tasks	(25)	I can use the internet to find out information about air pollution and display this on a chart.
	(23)	I can carry out a test to show the presence of carbon dioxide.*
Possible Data Analysis	Making sense of data from a survey of particle pollution.	
Possible Science Topic	Local air pollution and its effects.	

C7 STRONG STUFF

This 'Item' describes various materials and relates their uses to particular properties.

Suggested Activities and Experiences	Content Statements	GCSE link
• Discuss the materials needed to make a mountain bike and divide these into metallic and non-metallic materials. • Consider the simple properties of these materials.	• Know the physical properties which distinguish metals from non-metals, limited to conductivity (heat and electricity) and strength.	B C2b
• Compare the ease of melting solder and pure lead or pure tin. • Discuss the use of alloys in everyday life, e.g. bike frames, coins and window frames. • Data search on the properties and uses of alloys. • Investigate nitinol (Middlesex University Teaching Resources).	• Know that an alloy is a mixture of two or more elements, at least one of which is a metal. • Know the names and one use of the alloys: steel, solder, aluminium alloy and brass. • Recognise the term 'smart' alloy.	B C2d
• Compare the bending of pure aluminium and aluminium alloy. • Compare the thermal conductivity of different metals. • Find out about alloy wheels for cars. Are they just 'cool' or are there other advantages? • http://people.howstuffworks.com/sword-making.htm (Sword making.)	• Know that the properties of alloys are different from the properties of the metals from which they are made. • Be able to match properties of alloys to their uses limited to changes in strength and hardness. • Relate properties to the uses of materials [no recall expected].	A C2.1 B C2d
• Comparing the hardness of different rocks and minerals. • Looking at a range of minerals and jewellery. • Discussing the use of rocks as raw materials, e.g. building houses, road construction. • Making mortar and concrete: using cement.	• Be able to use a key to rank materials in order of hardness. • Know that some hard minerals are used for making jewellery. • Know that bricks are made from clay. • Be able to link the properties of a building material to suitable uses. • Know that concrete is made from cement, sand and small stones.	A C2.1 B C2b
• Compare tennis rackets made from carbon fibre, metals and wooden frames. • Study data of different materials and make predictions about the suitability of particular materials for different uses.	• Know the advantages of using wood, metals and carbon fibre for making pieces of sports equipment. • Know one use for each of the composite materials: GRP, reinforced concrete and plywood. • Be able to analyse simple data comparing the properties of different materials [no recall expected].	A C2.1 B C2d

Related 'Can-Do' Tasks	(11)	I can identify some common metals: iron (using a magnet), copper, aluminium and lead (by sight and touch).
	(53)	I can make and then test a sample of concrete for its strength.
Possible Data Analysis	Interpret data compare the ease of bending tubes of paper with different diameters and different paper thickness.	
Possible Science Topic	Find out about the advantages and disadvantages of using 'modern' materials in sport.	

C8 RESTLESS EARTH

This 'Item' considers the restless nature of the Earth's crust, and how the damaging effects of natural disasters can be reduced.

Suggested Activities and Experiences	Content Statements	GCSE link
• Watch a PowerPoint presentation or video clips showing a range of natural disasters caused by movement of the Earth's crust. • Learn from a case study about people affected by a volcano, earthquake or tsunami.	• Recall that movement of the Earth's crust causes earthquakes, volcanoes, and tsunamis. • Describe possible effects of volcanoes and earthquakes on people and wildlife. • Know some actions that public authorities can take to reduce damage caused by natural disasters.	A P1.2
• Create a model of the Earth's structure. • Use ICT and/or other information sources to construct a global map showing where volcanoes and earthquakes happen. • Look at examples of people who live near volcanoes / earthquake zones and those who study them.	• Know that the Earth is a sphere with a core, mantle and thin rocky crust. • Know that the rocky crust is split into sections called tectonic plates. • Know that volcanic activity and earthquakes are linked to the movement of tectonic plates. • Interpret simple data linking the position of earthquakes and volcanoes to the edges of tectonic plates.	A P1.1 A P1.2 B C2c
• Consider evidence for Wegener's theory of continental drift. • Discuss some of the reasons why Wegener's theory was rejected at the time (movement not detectable; Wegener not a geologist; there were already simpler explanations).	• Recognise some of the evidence for plate tectonic theory (limited to jigsaw fit of continents, matching rocks and fossils). • Know that the idea of moving continents was not immediately accepted by scientists when Wegener first thought it up. **H4C** • Recall that lots of new evidence later showed Wegener had been thinking on the right lines.	A P1.2
• Model an earthquake with bricks and a heavy elastic cord.	• Know that large amounts of energy can be released in an earthquake. • Know that it is not possible to predict when earthquakes might happen or exactly when volcanoes might erupt.	A P1.2 B C2c
• Model a volcano using wax, sand and water www.chemsoc.org/networks/learnnet/jesei/ • Growing crystals (salol experiment).	• Know that molten rock under the surface of the Earth is called magma. • Know that molten rock erupts from volcanoes and is called lava. • Know that igneous rocks form when molten rock cools down. • Know that igneous rocks, which have formed slowly, have large crystals (and vice-versa).	B C2c

Related 'Can-Do' Tasks	(30)	I can grow crystals to show what happens when molten chemicals cool down.
	(54)	I can mark on a map of the world the locations of ten earthquakes or volcanoes.*
Possible Data Analysis	Add the positions of volcanoes and earthquakes onto a map of the Earth showing tectonic plates boundaries.	
Possible Science Topic	Find out about the most recent natural disaster.	

C9 HOW FAST? HOW SLOW?

This 'Item' investigates the factors which affect reaction rate in the context of reactions which take place in the home and In industry.

Suggested Activities and Experiences	Content Statements	GCSE link
• Video clips of fires (including chip pan fires), rusting and explosions to illustrate different rates of chemical reactions. • Video clip (or demonstration) of flour/lycopodium explosions. • Looking at reactions and separating them into fast and slow reactions. • Look at the application of rate of reaction in everyday life (e.g. speed of cooking with a pressure cooker, slowing up rusting, rate of dissolving tablets for medicinal use).	• Know that the rates of chemical reactions can vary greatly. • Interpret simple visual images showing different rates of chemical reactions. • Know that a reaction stops when one of the reacting substances is used up. • Interpret and use bar charts showing information about rates of reaction (limited to: adding results, reading off values, recognising fastest and shortest times, recognising fastest and slowest reactions).	B C2g B C2e
• Investigate the effect of temperature on the speed of dissolving indigestion tablets. • Investigate the effect of temperature when baking powder is added to vinegar.	• Know that increasing temperature usually speeds up chemical reactions. • Know that lowering the temperature (in refrigerator or freezers) slows down the changes that make food go bad.	B C2g
• Investigating the effect of concentration on reaction time, e.g. magnesium ribbon and hydrochloric acid, resin and hardener in car body filler.	• Know that increasing the concentration increases the speed of a chemical reaction. • Be able to label simple laboratory apparatus used to find out about rates of reaction (limited to beaker, flask, measuring cylinder, thermometer, stirring rod, test tube, gas syringe, top pan balance, stop clock/digital watch).	B C2g
• Investigating the effect of particle size on reaction time, e.g. magnesium and hydrochloric acid.	• Know that the rate of reaction is increased when small particles are used rather than large lumps. • Understand that a difference in the rate of reaction can be explained by a change in the surface area.	B C2h
• Investigate the effect of metal oxides as catalysts on a solution of hydrogen peroxide and washing up liquid. • http://auto.howstuffworks.com/question66.htm (catalytic converters.)	• Know that catalysts can alter the rate of a reaction but are not used up in the reaction. • Interpret simple information on the use of different catalysts [no recall expected]. • Know that particle collisions can be used to explain reaction rates. **H1C**	B C2h

Related 'Can-Do' Tasks	(31)	I can measure the volume of a liquid using a measuring cylinder.
	(55)	I can measure time accurately (e.g. to time a chemical reaction).
Possible Data Analysis	Any analysis of rate of reaction data.	
Possible Science Topic	Fires and explosions.	

C10 SORTING OUT

This 'Item' develops an awareness and understanding of how and when we use different separation techniques, at home and in industry.

Suggested Activities and Experiences	Content Statements	GCSE link
• Looking at the various ways to separate mixtures in everyday life (e.g. sieves, vacuum cleaner filters, car air-intake filters). • Choosing how to separate a mixture (by dissolving), e.g. salt and sand. • http://www.chemsoc.org/networks/learnnet/jesei/index2.htm (Materials sorting.)	• Know that a mixture contains two or more uncombined substances. • Know that mixtures contain substances that can be separated from each other. • Plan how to separate a soluble substance (e.g. salt, copper sulfate or sugar) from an insoluble substance (e.g. sand) by dissolving and filtration. **H19**	
• Using chromatography to solve a simple forensic problem or to investigate food colours. • Using and making chromatograms.	• Know how chromatography is able to separate mixtures into their constituents. • Be able to interpret simple chromatograms.	B C1b
• Using filters to separate different types of mixtures, e.g. air filters, extracting poison from air, tea bags and coffee filters. • Investigate the best paper for tea bags or coffee filters. • Choosing the best technique for separation, e.g. magnetism for separating iron from rubbish, decanting for tea from a teapot.	• Know that magnetism can be used to separate iron from a mixture of iron and aluminium. • Know that filtering can be used to separate a solid from a solution. • Know that decanting can be used to separate a solid in a suspension.	B C2e
• Demonstration of the use of a centrifuge. • Watching a presentation about the separation techniques used in hospitals: – dialysis uses thin membrane to separate the waste in blood – centrifuging used to separate a suspended solid from a liquid.	• Know how to use centrifuging to separate mixtures. • Know one medical application of each of centrifuging and dialysis.	
• Watching a video about the use of distillation in industry. • Distilling pure water from salt water.	• Know that distillation can be used to obtain fresh water from sea water. • Know that distillation is used to separate liquids with different boiling points. • Understand that distillation is used to produce some alcoholic drinks, e.g. whisky.	B C1e

Related 'Can-Do' Tasks	(9)	I can separate a simple mixture (e.g. salt from sand).
	(32)	I can make a chromatogram.
Possible Data Analysis	Analysing the data from a chromatogram.	
Possible Science Topic	Use of chromatography or other separation methods in crime detection.	

C11 RUBBISH!

The 'Item' describes the ways of dealing with rubbish from homes and school.

Suggested Activities and Experiences	Content Statements	GCSE link
• Surveying the types and amounts of waste produced at home or at school. • Using the local council web site to find out what happens to waste locally. • Watching a presentation or video about ways of getting rid of waste.	• Know some of the ways that waste can be disposed of (limited to landfill, burning, recycling and composting). • Know that burning rubbish produces ash, waste gases and energy. • Know that some rubbish can be made into fuel pellets.	A C2.4 B C1d
• Looking a consumer information or newspaper articles that illustrate ways of cutting down on waste (the four Rs: reduce, reuse, recycle, recover). • Suggest ways of reducing the amount of packaging materials used.	• Know one example each to illustrate the four Rs (reduce, reuse, recycle, recover). • Be able to match simple short descriptions of ways of reducing waste to the four Rs.	A C2.4 B C1d
• Sorting clean plastic containers into the different types of polymer by looking at the codes printed on the products. • Mapping recycling facilities in the local area. • Surveying the extent of recycling in the local community. • Use RSC resources by Dorothy Warren.	• Be able to give a reason why metals (such as iron) and glass are easier to recycle than plastics. • Be able to recognise advantages of recycling materials (saves natural resources, reduces disposal problems). • Interpret information on recycling of materials [no recall expected].	A C2.4 B C1d
• Digging up and examining samples of materials buried in soil for various lengths of time. • Watching a presentation or video about the use and hazards of gas from a landfill site.	• Know which materials in rubbish will rot away (paper, wood, cotton, vegetable matter) and which will not (most plastics and glass). • Be able to match the words biodegradable and non-biodegradable to descriptions of what happens to materials in rubbish. • Know that the methane gas from landfill sites can be used as a fuel but can also be an explosion hazard.	A C2.4 B C1d
• Matching a series of images with titles, then sequencing the images to tell the 'life' of a product from 'cradle' to grave'. • Playing the Science Museum T-shirt game to find the best way of making, cleaning and disposing of a T-shirt.	• Be able to sequence images or statements describing stages in the life of a familiar product. • Be able to make sense of simple information about different materials or objects about their use of materials, energy or formation of waste.	A C2.4

Related 'Can-Do' Tasks	(12)	I can use a key to sort plastic containers into the different types of polymer by looking at the codes printed on the products.
	(33)	I can sort a mixture of rubbish into biodegradable and non-biodegradable parts.
Possible Data Analysis	Making sense of data from a survey of rubbish from home or school.	
Possible Science Topic	Is recycling a waste of effort? **H3C**	

C12 FUELS

This 'Item' introduces the idea that most of our fuels and much of our energy requirements are met from the substances that we get from crude oil.

Suggested Activities and Experiences	Content Statements	GCSE link
• Watching a demonstration of distillation of artificial crude oil in the laboratory. • Watching a demonstration that some fuels catch fire more easily than others. • Making a virtual visit to an oil refinery on the internet or watch a video about refining.	• Know that crude oil is a toxic, dark sticky liquid. • Know that crude oil is a mixture that is separated into more useful parts at an oil refinery. • Know that petroleum gases, petrol, kerosene and diesel come from crude oil. • Know that some fuels ignite more easily than others do and that this is important for their uses.	A C2.2 B C1f
• Constructing a presentation or display matching each of the fractions to their uses.	• Know the uses of these fuels: – petroleum gases, such as propane, in portable gas cylinders – petrol in cars – kerosene in airplanes – diesel in lorries, buses, trains and cars.	A C2.2 B C1f B C1g
• Comparing the advantages of different fuels – solids, liquids and gases. • Burning a fuel and using the energy to heat water. • Comparing the energy values of various fuels.	• Know that burning fuels produces energy for heating, transport and making electricity in power stations. • Be able to label the apparatus used to find out how much energy a flame gives out. • Be able to use given data to decide which of two fuels gives out more energy when the same amount burns.	A C1.2 B C1g
• Looking at advice to the public about carbon monoxide poisoning and how to avoid the accidents that it can cause. • Examining a carbon monoxide detector and the instructions for its use.	• Know that carbon monoxide forms when fuels from crude oil burn in a limited supply of air. • Know that carbon monoxide is a poisonous, colourless gas with no smell. • Be able to make sense of given public information about carbon monoxide poisoning. **H1B**	A C1.2 B C1g
• Comparing information for customers about diesel cars and petrol cars (such as fuel consumption, 0-60 mph time, pollution and cost). • Watching or reading news reports about a way of lowering pollution from burning fuels.	• For each of petrol and diesel, recall one advantage and one disadvantage of the two fuels in motor vehicles. • Interpret simple information about the use of different fuels [no recall expected]. • Recognise that people can make choices about which fuels to use.	A C1.4 B C1g

Related 'Can-Do' Tasks	(13) I can make a poster to warn about the dangers of carbon monoxide poisoning.
Possible Data Analysis	Using data to compare the heating effect of different fuels when they burn.
Possible Science Topic	Which is better: a petrol car or a diesel car?

C13 FOOD CHEMICALS

This 'Item' explores food additives and vitamin supplements.

Suggested Activities and Experiences	Content Statements	GCSE link
• Looking at food labels to see what additives they contain. • Discussion about the advantages and disadvantages of using food additives.	• Know that some foods contain chemicals put there by people and that these are called additives. • Know that there are different types of food additives (limited to antioxidants, flavour enhancers and food colours). • Explain why flavour enhancers and food colours are put into foods. • Know that some additives can be harmful to certain individuals.	A C3.2 B C1b
• Comparing methods of stopping apple slices going brown in the air. • Looking at food labels to see which types of food contain antioxidants.	• Know that oxygen from the air can make food go off. • Know that antioxidants preserve food by stopping the effects of oxygen in the air. • Interpret information on simple experiments to show the effect of oxygen (or its absence) on foods.	A C3.2 B C1b
• Making oil and water emulsions to compare emulsifying agents. • Looking at food labels to find the additives that help to make stable emulsions. • Use the internet to give advice to the public about food additives from the Food Standards Agency.	• Know that chemicals used to make food products such as salad dressing help to make a mixture with one part spread in fine specks or droplets through another. • Know that food additives have an E number if they that have been tested and found to be safe. • Be able to take meaning from public information about food additives [no recall expected].	A C3.2 A C3.3 B C1b
• Use dcpip solution to compare the vitamin C content of fruit drinks. • Looking at the information for users in packs of vitamin C tablets. • Checking the vitamin C content of a typical diet to see if a vitamin supplement is needed.	• Know that a healthy diet must include small amount of vitamins. • Be able to compare information about a person's diet with the recommended daily intake of a vitamin.	A C3.4
• Comparing the energy values of portions of food or drink with sugars or artificial sweeteners. • Looking at information about changes in the energy in the diet and patterns of obesity.	• Know that sugar is a sweetener. • Know that diet drinks and some slimming foods contain artificial sweeteners. • Know that too much sugar in the diet can be harmful to health.	A C3.4

Related 'Can-Do' Tasks (56) I can do a test to compare the quantities of vitamin C in fruit juices.
(34) I can make an emulsion.

Possible Data Analysis Checking the vitamin C content of a typical diet to see if a vitamin supplement is needed.

Possible Science Topic Is organic food worth the money?

P1 THE DIGITAL AGE

This 'Item' uses simple circuits to show how electricity can be used to transfer and process information.

Suggested Activities and Experiences	Content Statements	GCSE link
• Playing a game of Chinese Whispers. • Sending a coded message by hand signals. • Investigating mobile phone 'texting'. • Investigate the range of spoken messages in the playground.	• Know that coding a message increases its security. • Know errors can happen when messages are sent. • Know that noise carries no useful information and can cause errors. • Understand that noise limits the range of a message transfer system.	
• Sending a Morse code message by turning a lamp on and off. • Find out about historical uses of using light or sound for communication (semaphore, ASDIC). • Investigating making smoke signals. • Investigating binary code. • Contrast vinyl analogue music with digital MP3/iPod music.	• Know that Morse code uses a digital code. • Understand how using light allows messages to be transmitted quickly. • Know that analogue signals have a continuously variable value and that digital signals are either on or off. • Know MP3 players use digital technology.	B P1e B P1g
• Compare mobile and fixed phones. • Find out how the mobile phone system works. • Discuss the advantages and disadvantages of wireless links for computers. • Write a letter to the Head to protest at the mobile phone mast he wants to install at school.	• Know that household remote control devices use infrared radiation. • Know that wireless communication devices use radio waves. • Understand the advantages of wireless technology for radio, mobile telephones and laptop computers. • Know that there is some concern amongst scientists about children using mobile phones. • Suggest ways of reducing the risk of using mobile phones (limited to shorter time of use, hands free kit, texting). • Recall reasons for and against the siting of mobile phone masts. **H4b** • Interpret information about siting of mobile phone masts [no recall expected].	A P2.5 B P1d B P1f

Related 'Can-Do' Tasks	(14)	I can send a text message on a mobile phone.
	(57)	I can send and receive a message in Morse code.
Possible Data Analysis	Interpret simple data about the use of mobile phones.	
Possible Science Topic	Is it safe to use mobile phones?	

P2 POWER ON!

This 'Item' considers how electricity is generated and transmitted.

Suggested Activities and Experiences	Content Statements	GCSE link
• Making a fruit battery and investigating its properties. • Making a chemical battery. • Discussion of appropriate uses for different batteries.	• Know that electricity is 'made' by chemical reactions in a battery. • Know that **two** different metals are needed for the terminals of a battery. • Be able to choose suitable batteries for different situations.	B P2b
• Watch an animation showing how a power station works. • Find out about the parts of a power station. • Model a power station with a bicycle dynamo or steam engine.	• Recall that crude oil, coal and natural gas are fossil fuels used in power stations. • Recall that every power station needs an energy source. • Know the main stages in the production of electricity: – that heat from the energy source changes water into steam – that the steam is used to rotate turbines – that turbines turn a generator – that the generator produces electricity. • Understand that energy is wasted at each stage. • Interpret simple energy transfer diagrams (no recall required).	B P2c B P2b A P3.3
• Assemble and test transformers with AC supplies and oscilloscopes. • Demonstrate a model transmission line system. • Design a leaflet to warn of the dangers of transformers or overhead power lines.	• Know electricity is transferred from a power station through a grid of high voltage transmission lines. • Understand that transformers are required at either end of the transmission lines to increase or decrease voltage. • Describe a transformer as two coils of wire wound onto a core of iron.	A P3.3 B P2b
• Discussion of electricity bills and meters and economy – e.g. TV on 'standby'. • Demonstration of electricity meter. • Worksheet related to paying for electricity and how long each item will run for one unit.	• Know that we pay for electricity by the unit. • Know that some appliances use more electricity than others. • Be able to read a digital electricity meter. • Be able to check an electricity bill. • Be able to work out how many units have been used. • Be able to calculate the amount of electricity used.	B P2c

Related 'Can-Do' Tasks	(35)	I can read a domestic electricity meter.*
	(58)	I can use a domestic electricity meter to find the cost of using electricity.
Possible Data Analysis	Using data to compare the cost of electricity suppliers. **H2b**	
Possible Science Topic	Are fossil fuels running out?	

P3 FEEL THE FORCE

This 'Item' explores everyday applications of magnets and magnetism.

Suggested Activities and Experiences	Content Statements	GCSE link
• Testing materials to see if they are magnetic. • Investigate games using magnets (fishing, theatre). • Using iron filings to see magnetic fields. • Finding where magnetic fields are strongest and weakest on a bar magnet. • Finding the magnetic field of a magnet by using iron filings.	• Know that iron and steel are magnetic. • Know that magnets attract magnetic materials (limited to iron and steel). • Know that like poles repel and unlike poles attract. • Understand how iron filings or a compass can show up a magnetic field.	B P2e
• Making a compass. • Using a compass to plan a route around a school. • Following a route using a compass. • Find out about the Earth's magnetic field. • Use the internet to find out about the 'Northern Lights'.	• Know that a freely swinging magnet comes to rest in a N-S direction. • Understand why a compass works and why it is so useful. • Recall the Earth has a magnetic field around it. • Know that the Earth's magnetic field protects us from cosmic rays. • Know that the 'Northern Lights' are caused by the interaction between cosmic rays onto the Earth's magnetic field.	B P2e
• Making a pin magnetic using (i) a permanent magnet (ii) a current-carrying wire. • Making an electromagnet and use it to pick up paper clips. • Devising ways of improving the electromagnet.	• Know how to induce magnetism in a pin. • Know that a current-carrying wire behaves like a magnet. • Know that increasing the current or number of turns wrapped onto a coil increases the strength of a magnet.	B P2e
• Making and using a loudspeaker.	• Be able to label the magnet, core and cone in a loudspeaker. • Plan to compare how the number of turns on the coil (or strength of magnet) affects how well a loudspeaker works. **H2a**	

Related 'Can-Do' Tasks	(36)	I can use a compass to find the direction of a magnetic field.*
	(59)	I can use a plotting compass to map the magnetic field around a coil.
Possible Data Analysis	Enter experimental results into a spreadsheet, and generate a graph.	
Possible Science Topic	What are the Northern Lights?	

P4 G-FORCE

This 'Item' explores forces in a variety of contexts.

Suggested Activities and Experiences	Content Statements	GCSE link
• Explore the size and feel of a range of forces. • Investigate types and operation of screwdrivers, spanners, levers etc. • Making and testing a spring forcemeter (balance). • Measure gravity force using a newtonmeter. • Testing the breaking strain of a fishing line.	• Recall that forces can be pulls, pushes, twists or bends. • Recall that forces are measured in newtons. • Know that gravity is a force pulling things towards the Earth. • Understand that weight is due to the force of gravity.	
• Measure the speed of falling objects. • Making parachutes. • Investigating gliders and airplanes.	• Know that falling objects are acted on by gravity and drag. • Know that unbalanced forces make things move. • Understand the effect of air resistance on falling objects. • Recall falling objects reach a maximum speed.	
• Making model bungee ropes and testing them. • Look at the design of cushioned trainers.	• Know that an increased force increases the length of an elastic material. • Know that a stretched elastic band exerts a force. • Understand that elastic materials return to their original shape unless the force becomes too big.	
• Watch a road safety video. • Talk about the links between traffic speed and injury. • Build crumple zones on model cars and test them.	• Know that crumple zones in vehicles reduce the impact force. • Know that air bags and seatbelts reduce impact forces for occupants. • Be able state ways traffic speed can be reduced (speed humps, chicanes, speed cameras). • Recall and be able to use speed = distance ÷ time.	
• Discuss how gravity needs to be overcome to put objects into space. • Testing a compressed air and water rocket. • Find out about chemically-fuelled rockets used in firework displays.	• Know that large rockets are needed to put things in space. • Know that some parts of some rockets/shuttles return to Earth and can be reused. • Understand that many objects burn up in the atmosphere.	
Related 'Can-Do' Tasks	(37) I can use a newtonmeter to measure force. (60) I can measure the speed of a moving object.	
Possible Data Analysis	Analyse data on road traffic injuries.	
Possible Science Topic	Should we have speed limits on motorways?	

P5 LET THERE BE LIGHT!

This 'Item' develops an understanding of the basic properties of light.

Suggested Activities and Experiences	Content Statements	GCSE link
• Draw (or make a paper collage of) a cross section of the human eye. • Recognise the difference between luminous and non-luminous objects. • Investigate the operation of 'cats' eyes.	• Recall that some things are luminous and that others are only seen because they reflect light from other sources. • Know that you can see things when light from them reaches the eye. • Be able to label the retina, lens, pupil and optic nerve. • Understand the job of the retina, lens, pupil and optic nerve.	
• Look in a mirror and recognise the orientation of the image. • Make mirror writing and symmetrical drawings. • Count the number of images in **two** mirrors held at different angles to each other.	• Know that smooth shiny surfaces reflect light to give a clear reflection. • Know that the image in a mirror is the same way up and the same size as the object but is the other way around.	
• Draw diagrams of parallel rays of light passing through lenses and/or being reflected by mirrors.	• Know that rays of light travel in straight lines. • Be able to complete a diagram to show how light reflects from a mirror. • Be able to complete a diagram to show how a convex (converging) lens forms an image on a screen.	
• Find out about total internal reflection with Perspex blocks and ray boxes. • Discuss the uses of optical fibres for communication. • Use optical fibres to send messages in code.	• Understand that light can be totally reflected from a transparent surface. • Describe how light travels along an optical fibre from one end to the other by reflection. • Know that optical fibres transmit data very quickly. • Know that using light for communication requires the use of digital code. **H4a**	B P1e

Related 'Can-Do' Tasks
(15) I can write a message in mirror writing.
(61) I can draw a ray diagram to show the path of a ray of light along an optical fibre.

Possible Data Analysis

Possible Science Topic What are the advantages and disadvantages of optical fibres for telephone communication?

P6 WATCH THIS SPACE!

This 'Item' considers our place in the Solar System in the context of space exploration.

Suggested Activities and Experiences	Content Statements	GCSE link
• Make a simple model of the Solar System. • Devise a mnemonic to remember the names of the planets in our solar system.	• Know the order of the planets in the Solar System. • Understand that the Earth orbits the Sun and that other planets take longer/shorter to do so if they are further/nearer to the Sun. • Recall that the Earth moves in its orbit through space at an enormous speed.	A P1.1 B P2f
• Find out about our Sun. • Find out the name of the nearest stars to our Solar System.	• Know that the Sun is at the centre of our Solar System. • Know that the Sun is a source of light. • Know that it is dangerous to look at the Sun. • Understand that Space contains many stars of which the Sun is one.	B P2f
• Find out about the Moon. • Discuss the uses of artificial satellites. • What causes an eclipse of the Sun?	• Know that the Moon orbits the Earth. • Understand that other (artificial) satellites orbit the Earth and are used for communication, mapping, spying and tracking. **H4b** • Know that planets and moons reflect light which enable them to be seen. • Know that some planets have moons.	B P2e
• Use the internet to find out about planets around stars other than the Sun. • Discuss the chances of life on other planets.	• Recall that the Sun is a star in the Milky Way galaxy. • Recall that there are billions of stars in the Milky Way. • Recall that there are billions of galaxies in the Universe. • Compare the sizes of the Moon, the Earth, the Sun, the Milky Way and the Universe. • Recall that astronomers have discovered planets around other stars.	A P1.1 A P1.3 B P2f

Related 'Can-Do' Tasks	(16)	I can list the things that an astronaut needs to stay alive.
	(62)	I can draw a labelled model of our Solar System.*
Possible Data Analysis	Describe patterns in Solar System data.	
Possible Science Topic	What are artificial satellites used for?	

P7 THE BURNING QUESTION

This 'Item' develops an understanding of energy sources in the context of energy changes.

Suggested Activities and Experiences	Content Statements	GCSE link
• Research to find different energy sources. • Discussion on energy needs and wants. • Making a poster on energy sources they have used today.	• Recall that energy is needed to do useful things. • Recall that we get energy from a variety of sources. • Recall that the Sun is a stable source of energy.	A P3.3 B P2a
• Research to find out how the sources were made and how long they will last. • Burning different fuels and evaluate their effectiveness in terms of how easy it is to burn and control, how much heat is produced and how 'clean' it is. • Make a poster to promote 'the 'best' fuel'.	• Know that some energy sources are non-renewable, i.e. coal, oil, gas and uranium. • Interpret simple information on the effectiveness of various fuels in terms of heat produced, ease of burning, pollution and how easy they are to control [no recall expected]. • Know that biomass can be a renewable energy source, producing heat when burned.	A P3.3 B P2c
• Discussion on renewable energy resources. • Making a model windmill and investigate the angle of the blades and the use of a rudder. • Investigate a hydro-electric installation.	• Know that some energy sources are renewable, i.e. wind, sunlight, waves and hydro-electricity. • Know that a wind turbine uses energy from the wind to generate electricity. • Be able to evaluate windmill design in terms of blade size and use of a rudder. **H2d**	B P2a
• Use a photocell to make electricity. • Discuss appropriate uses of photocells. • Find out how the photocells can be connected to increase their voltage. • Find out how the voltage of a photocell depends on distance from a lamp.	• Know that a photocell transforms light into electrical energy. • Recognise that photocells are useful sources of electricity for remote locations. • Describe some advantages and disadvantages of using photocells to generate electricity.	B P2a
• Mix and match ways of putting out fires and suggest how they work. • Know how to treat a burn and how to phone for the emergency services. • Write a newspaper article on a fictitious fire.	• Know and understand the fire triangle. • Be able to use the fire triangle to suggest methods of fire prevention and fire fighting. • Understand the advantages and disadvantages of different methods of putting out fires.	

Related 'Can-Do' Tasks
(17) I can draw a poster to show the fire triangle.
(38) I can tell others what the school fire drill is.

Possible Data Analysis Comparing wind turbines.

Possible Science Topic Fire fighting: how is it done?

P8 DEEP IMPACTS

This 'Item' considers our place in the Solar System and what may happen in the future.

Suggested Activities and Experiences	Content Statements	GCSE link
• Use different shape/sizes of balls to investigate craters in sand. • Drop marbles from different heights onto sand to investigate impact damage.	• Understand that speed and 'weight' affect the damage caused by objects. • Understand that other bodies, i.e. comets and meteorites, move through space and may hit the Earth/Moon or other planets. • Understand that bombardment causes craters.	A P1.1 B P2g
• Study craters on the Moon for evidence of the early history of the Solar System. • Find out about the NASA Moon landings. • Discuss the evidence for the creation of the Moon. • Find out about the craters on Mars.	• Know that the Moon orbits the Earth. • Know that the planets (and moons) reflect light that enables them to be seen. • Know that the Moon may be the remains of a planet which collided with Earth.	A P1.1 B P2e
• Survey the internet for photographs of asteroids. • Discuss what we can tell from the elements in meteorites. • Investigate claims that comets might carry bacteria.	• Know that asteroids are rocks left over from the formation of the Solar System. • Know that comets are lumps of dust and ice.	A P1.1 B P2f B P2g
• Survey the evidence for the destruction of the dinosaurs by an asteroid. • Discuss what happens when a Near Earth Object (NEO) hits the Earth.	• Know that a Near Earth Object (NEO) is an asteroid or comet on a possible collision course with Earth. • Understand the consequences of a collision between Earth and a large NEO.	A P1.1 A P2.5 B P2g
• Find out about recent NEOs. • Discuss what we should do about NEOs.	• Be able to make sense of simple data showing the risk associated with possible NEO collisions. • Describe how scientists know that an object may be on a collision course with the Earth, and why uncertainty gets smaller as the object gets closer. **H3c**	A P1.1 B P2g

Related 'Can-Do' Tasks	(50)	I can measure distance accurately.
	(63)	I can find out how the size of an object affects the size of a crater.
Possible Data Analysis	I can analyse and evaluate class results from crater experiments.	
Possible Science Topic	Comets and asteroids. Should we fear them?	

P9 SOUND EFFECTS

This 'Item' develops an understanding of how we sense sound and how sound is made and travels.

Suggested Activities and Experiences	Content Statements	GCSE link
• Looking at a range of musical instruments to suggest what makes sound. • Making musical instruments from bits and pieces – students state how the sound is made. • Look at waves along a slinky spring.	• Recall that sound carries energy. • Know that sound is made by vibrations and transfers energy from one place to another. • Know that sound travels as a longitudinal wave in solids, liquids and gases. • Be able to explain how sound is produced by a stringed instrument.	
• Investigating length of string/pitch of note. Three strings of different thickness but the same tension/length. • Investigation to find the length of the thickest string that produces the same note as the thinnest string.	• Know the relationship between pitch and frequency. • Understand that the pitch of a note depends on the length, thickness, tension and material of the string. **H2a**	
• Use an oscilloscope and a signal generator to 'see' sound waves. • Investigate what happens to sound waves when sounds are high/low, quiet/loud. Measuring volume of sound, discussion of sound pollution and damage to hearing. • How volume of sound diminishes with distance, ripple on pond demonstration.	• Understand that sound can be represented by transverse wave diagrams. • Be able to label a wave pattern with its wavelength and its amplitude. • Know the meaning of the words amplitude, frequency and wavelength. • Know that very loud sounds can damage the ear. • Interpret simple data on the use of sound level meters [no recall expected].	
• How sounds travel in water. How do dolphins hear? Sound and a vacuum. Echoes. • Making more musical instruments – vibrating reeds and vibrating columns of water.	• Know that sound waves can be reflected. • Be able to measure distance by timing an echo. • Know that sound does not travel in a vacuum, but travels at different speeds through solids, liquids and gases. • Interpret simple data on the speed of sound in different materials [no recall expected].	
• Examine seismograph traces of recent earthquakes. • Make a simple working seismometer.	• Understand that earthquakes produce shock waves which can be detected by seismometers.	B P1h

Related 'Can-Do' Tasks
(18) I can make a high sound and a low sound with a single string.
(39) I can match sound levels onto a decibel chart.

Possible Data Analysis Sound levels in everyday life.

Possible Science Topic How is electronic music made?

P10 HOT STUFF!

This 'Item' develops an understanding of heat transfers.

Suggested Activities and Experiences	Content Statements	GCSE link
• Circus of energy experiments. • Record energy transfers as block flow charts.	• Recall that energy exists in different forms. • Recall that energy can be transformed from one form to another. • Know the main uses of heat: generating electricity, heating and cooking.	
• Discuss why a lump of ice held in the hand melts and why the hand feels cold. • Examine thermograms to see where hot spots occur. • Carry out experiments to measure the energy required to change the temperature of objects.	• Know that heat energy flows from a hot to a cooler body. • Know that temperature is measured in ºC and that heat is measured in J. • Know that the energy to change the temperature of a body depends on its mass, the material it is made from, and the temperature change. • Interpret simple data on heating/cooling experiments [no recall expected]. • Recall and use the words: melting, boiling, freezing, condensing, evaporating.	B P1a
• Build a solar collector from aluminium foil and an umbrella.	• Know that light from the Sun is reflected to a focus by a curved mirror. • Know that when light is absorbed by a surface, its energy is transformed to heat.	B P2a
• Applying the terms conductor and insulator to different materials. • Investigating the insulating properties of packaging for takeaway foods. • Compare temperature changes in insulated and non-insulated model houses. • Find optimum thickness for loft insulation.	• Know that hot air rises and is replaced by colder air. • Know that metals are good conductors of heat and that trapped air and plastics are good insulators. • Understand that insulation reduces heat loss. • Use the terms insulator and conductor correctly for heat. • Be able to design and carry out a test to evaluate the effectiveness of food packaging from a takeaway. **H2b** • Interpret simple data on home insulation [no recall expected].	B P1c B P1b

Related 'Can-Do' Tasks	(46)	I can use a thermometer to accurately measure temperature.*
	(64)	I can plot a temperature / time graph.
Possible Data Analysis	Interrogate a database containing data about thermal properties of materials used to make take away food containers.	
Possible Science Topic	Is home insulation worth the money?	

P11 NUCLEAR POWER

This 'Item' introduces some of the issues raised by our use of uranium to generate electricity.

Suggested Activities and Experiences	Content Statements	GCSE link
• Making and improving a generator.	• Understand that electricity is made by changing the magnetism of a coil of wire. • Know that the amount of electricity can be increased by spinning the magnet faster, using a stronger magnet, using more coils of wire. • Be able to label a diagram of a generator to show magnet, coil and meter. • Know that generators in power stations use electromagnets.	A P3.4 B P2b
• Watch an animation of a nuclear reactor to see how fission boils water in the steam generator. • Simulate the fission of a large atom into smaller radioactive atoms.	• Know that uranium is a non-renewable resource. • Know that in a nuclear power station, the uranium provides the source of energy. • Know where radioactive materials are produced in a power station and how they are contained. • Know that a lot of energy is released by the splitting of uranium atoms.	A P3.3 A P3.4 B P2c
• Watch a demonstration showing the penetration of radioactivity through different materials. • Design a radiation-proof suit. • Investigate different types of nuclear waste and how they are stored. • Consider the need for security of nuclear installations.	• Understand that a nuclear power station produces harmful radioactive waste. • Know that plutonium is a waste product from the nuclear power industry. • Know that plutonium can be used to make nuclear bombs. • Know why there is a government agency responsible for nuclear safety.	A P3.2 A P3.3 A P3.4 B P2c
• Discuss the government's plans for disposing of nuclear waste. • Discuss the safe siting of nuclear power stations. • Find out about commissioning, operating and decommissioning nuclear power stations.	• In the context of nuclear power, understand that people can make choices about the best use of science and technology. **H4b** • Describe one risk and one benefit of nuclear power. • Know that there is a national government agency (Health Protection Agency) responsible for nuclear safety.	A P3.4 B P2c

Related 'Can-Do' Tasks
(19) I can recognise the nuclear hazard warning symbol.
(40) I can build a model generator.

Possible Data Analysis What proportion of European power is nuclear?

Possible Science Topic Should we use nuclear power?

P12 FULL SPECTRUM

This 'Item' introduces the electromagnetic spectrum and the uses of the different parts.

Suggested Activities and Experiences	Content Statements	GCSE link
• Use a mnemonic such as Roll Out Your Guinness Boys In Vats or Rural Old Yokels Guzzle Beer In Volumes. • Make a rainbow using water from a garden hose. • Research uses for lasers.	• Know that visible light is part of a group of waves called the electromagnetic spectrum. • Be able to list the colours of the visible spectrum in order from red to violet. • Know that a rainbow is a naturally occurring example of the visible spectrum. • Know that a laser produces a narrow, intense beam of light. • Recall that lasers are used to read CDs, for light shows, as pointers and as cutting tools.	A P2.1 B P1d B P1g
• Use an infrared detector to show there is radiation beyond red. • Look at examples of photographs taken at night, e.g. from surveillance cameras. • Identify household objects, which work by using infrared radiation	• Know that infrared is useful for: – remote control for TV etc. – night photography – burglar alarms – heating things, e.g. fire, toaster, grill. • Recall two examples of household devices that use infrared radiation.	A P2.1 B P1d B P1e
• Listen to the quality of reception from different radio frequency bands. • Invite local police to demonstrate a radar gun.	• Understand that microwaves can heat materials containing particles that the microwave radiation can cause to vibrate. • Recall two examples of uses of microwave radiation (cooking, mobile phones, radar telephone links). • Understand that radio waves produce electrical signals in metal aerials. • Recall two examples of radio waves (radio, mobile telephones and wireless links for laptop computers).	A P2.2 B P1d B P1f
• Discuss the advantages and disadvantages of wireless links for communication. • Compare mobile and fixed phones. • Find out how the mobile phone system works.	• Understand the advantages of wireless technology for global communications. • Know that there is some concern that microwave radiation used for mobile phones could have long term harmful effects not yet identified. **H4c**	A P2.1 B P1d B P1e B P1f

Related 'Can-Do' Tasks	(14)	I can send a text message on a mobile phone.
	(20)	I can produce a poster on the safe use of mobile phones.
Possible Data Analysis	Analyse mobile phones tariffs to find which is best for me.	
Possible Science Topic	Is it safe to use mobile phones? (as in P.1)	

P13 MEDICAL RAYS

This 'Item' explores how radiation are used in medical imaging and treatment.

Suggested Activities and Experiences	Content Statements	GCSE link
• Consider why a doctor may need to see inside a patient's body to confirm a diagnosis. • Discuss the risks of exploratory surgery.	• Understand the difference between diagnosis of an illness, and its treatment. • Recall some benefits of a doctor being able to see inside a patient's body. • Know that all surgical procedures have risks.	
• Use case studies to learn about medical uses of UV radiation (treating eczema and jaundice, revealing the presence of bacteria, setting dental fillings).	• Recall some medical uses of UV radiation. • Know that exposure to UV radiation can cause suntan, sunburn and skin cancer. • Understand that the use of UV radiation involves balancing benefits against risk. **H4a** • Describe some ways of reducing the risk. • Interpret data on the use of sunscreens [no recall expected].	A P2.5 B P1h
• Look at X-rays of normal and broken bones. • Discuss advantages and disadvantages of X-rays in medicine.	• Understand that bone absorbs X-rays and so produces shadow pictures. • Know that too much exposure to X-rays is dangerous. • Understand that the use of X-rays involves balancing benefits against risk. **H4a**	A P2.1 A P2.2
• Look at gamma camera images of the thyroid. • Watch a demonstration / simulation of the penetrating power of gamma radiation. • Discuss how radioactive chemicals can produce an image outside the patient's body.	• Know that gamma radiation is very penetrating. • Know that a gamma camera detects gamma radiation and that a computer linked to it can make pictures. • Understand that exposure to gamma rays is dangerous.	A P3.1 B P2d
• Watch a video showing procedures in the radiology department in a hospital to see how staff and patients are protected from unnecessary doses of X-rays. • Find out how gamma rays are used in nuclear medicine.	• Recall that UV radiation, X-rays and gamma rays are part of a family called the electromagnetic spectrum. • Recall that UV radiation, X-rays and gamma rays can damage living cells. • Know some radiation is natural, and this is called background radiation. • Interpret simple data on radiation doses and possible harmful effects [no recall expected].	A P2.1 A P2.2 A P3.2 B P2d

Related 'Can-Do' Tasks	(41) I can use a Geiger counter.
Possible Data Analysis	Collect and use data on radiation linked to illnesses e.g. leukemia.
Possible Science Topic	Is sunbathing dangerous?

4 Scheme of Assessment

4.1 Elements of Assessment

There are four elements to the assessment and marks for each element are aggregated by the centre to produce one final points total for each candidate.

Entry Level Science (Science Plus) (R482)	
Element 1: Study of Science Topic	
16% of the total max. 16 points	This aspect of the assessment is linked to the Case Study in GCSE Science (Twenty First Century Suite) and the 'Science in the News' report in GCSE Science (Gateway Suite). The Case study assesses the **four** separate Skill Areas: • Skill Area A collecting evidence • Skill Area B looking for patterns • Skill Area C developing conclusions • Skill Area D presenting the evidence
Element 2: 'Can-Do' Tasks	
12% of the total max. 12 points	These tasks, many of which involve simple manipulative skills, are designed to provide, at frequent intervals, additional positive reinforcement of candidates' attainment and allow progression in development of these skills. Many are linked to tasks in the Gateway Suite. Each task is marked out of 1 mark, 2 marks or 3 marks. A maximum of 8 tasks are assessed giving a maximum of 24 marks. This mark is divided by 2 to give a maximum of 12 points.
Element 3: Data Analysis	
12% of the total max. 12 points	In these tasks, candidates analyse either given data or data they have obtained through their own practical activity. They look for patterns and evaluate the method of data collection.

Element 4: End-of-Item Tests	
60% of the total 60 points	An End-of-Item test is an integral part of each of the 39 'Items' forming the specification. Candidates may submit a maximum of 30 of these tests. This number should consist of a minimum of eight Items from each of Biology, Chemistry and Physics Items to provide an appropriate overall balance. The tests are supervised by teachers in normal lesson time and will be taken at times convenient to the centre. Teachers are required to ensure that normal 'examination conditions' for supervision and invigilation are maintained. All tests contain 15 marks and are constructed to a common format. The breakdown of marks will approximate to: Recall and understanding of content 12/13 marks Communication of scientific ideas 2/3 marks. There is no formal time limit to these tests. It is expected that most candidates will be able to complete a test within 10 minutes, but a time of 15 minutes is permitted to allow for candidates who have special requirements. The marks for each test are converted into points. Each test yields a maximum of two points.

All centres entering candidates are subject to quality control via moderation of a sample of candidates' work towards the end of the course. This means that marked End-of-Item tests and all other elements must be retained for all candidates in case it is required for moderation. Moderation is by post.

4.2 Assessment Availability

Assessment is available in the June session each year.

The first session that candidates may be awarded this qualification is June 2007.

4.3 Assessment Objectives

These Assessment Objectives describe the intellectual and practical skills which candidates should be able to demonstrate.

Study of a Science Topic

Candidates must be able to produce a short report on a topic of interest in which they collect, record and analyse the evidence they have collected, and develop conclusions from what they have found. Credit will be given for presentation of the work.

Candidates are free to use any suitable method of producing and presenting their report. It may be hand-written, or word processed, or as a video presentation, or as a PowerPoint presentation or presented in audio format.

‘Can-Do’ Tasks

Candidates must be able to demonstrate their ability to undertake simple tasks which may involve the manipulation of scientific equipment.

Data Analysis

Candidates must be able to analyse and evaluate data from primary or secondary sources.

Knowledge and Understanding of Science

Candidates must be able to:

(i) recall, understand and apply the defined specification content;

(ii) communicate scientific observations and ideas using the appropriate scientific vocabulary.

Weighting of Assessment Objectives

Assessment Objectives	Weighting
Science Topic and Data Analysis	28%
‘Can-Do’ Tasks	12%
Knowledge and Understanding of Science	60%

5 Internal Assessment

5.1 Nature of Assessment

Principles of Assessment

- Teachers record the raw marks generated from their candidates' work for the four elements of assessment (Study of a Science Topic, 'Can-Do' Tasks, Data Analysis and End-of-Item Tests).
- These raw marks are converted into points for each element (using separate conversion scales in order to preserve the overall weightings of the assessment).
- The aggregation of these points leads to the award of Bronze, Silver and Gold interim certificates by the centre. Following final entry, OCR will certificate a candidate's overall level of achievement at three levels following moderation.

Introduction to Skills Assessment

Study of a Science Topic (16%)

This encourages candidates to undertake simple research, using a variety of approaches, as a method of developing their ability to understand the place of science as part of life in the 21st century.

This element gives candidates the opportunity to produce a short report on a topic of interest either as a 'Science in the News' activity which is linked to a current matter of media interest or as a simple 'Case Study' linked to a relevant part of the Entry Level course.

Candidates should be encouraged in ways of:

- collecting evidence from a variety of sources;
- discovering patterns in the evidence they have collected;
- developing conclusions from what they have found;
- deciding the best way of presenting their work.

Centres can use the list of titles provided by OCR to support Gateway Science and then to use the defined performance descriptors to assess their candidates' work under these four headings.

Alternatively, a centre has the freedom to choose suitable topics linked specifically to their own Schemes of Work but are always advised to use the Coursework Consultancy Service offered by OCR to obtain further guidance as to the suitability of these topics.

Format of the report

Candidates are free to use any suitable method of producing and presenting their report. It may be hand-written, or word-processed, or as a video presentation, or as a PowerPoint Presentation, or presented orally.

If a written report is presented it should be no longer than 400 words. If as an audio-visual report it should last no longer than ten minutes.

If presented orally then some residual evidence, in the form of prompt notes or contemporaneous notes taken by the teacher should be available for eventual moderation.

Candidates are free to produce more than one report, but only the best one may be used for assessment.

Assessment

Performance Descriptors are provided for four aspects of the report (see Appendix B):

- collecting evidence ('What am I going to choose and use ?')
- discovering patterns ('What patterns have I spotted?')
- developing conclusions (' What can I write about these patterns ?')
- presenting my information ('What's the best way of showing what I have found out?')

Each of the four aspects will be marked on a 0 – 4 mark scale. The final mark will therefore have a maximum of 16 marks and which will count as 16 points towards a candidate's final credit.

Links with GCSE

This study of a science topic represents a part of a 'free-standing' Entry Level qualification, but it is recognised that many candidates, initially of low attainment at the start of the Entry Level course, will make sufficient progress to warrant an entry to GCSE Science.

It is stressed that a suitably designed Entry Level report can also be used as a basis for part of the coursework requirement for an entry to GCSE Science (Suite A) – 21st Century Science or for an entry to the GCSE Science (Suite B) - Gateway.

The ways in which the tasks have been designed and the performance descriptors have been developed allow an easy progression from the requirements for Entry Level to those in each of the separate GCSE Science suites.

It is stressed that if 'double entry' for both Entry Level and GCSE is possible then teachers need to

- ensure that the way in which the task is presented to the candidates allows access to all the performance descriptors for both Entry Level and for the chosen GCSE Suite,
- assess the piece of work by matching against the Entry Level performance descriptors and then to assess the same piece of work to match the appropriate GCSE performance descriptors.

'Can-Do' Tasks (12%)

These tasks, many of which involve simple manipulative skills, are designed to provide, at frequent intervals, additional positive reinforcement of candidates' attainment and provide progression in the attainment of science procedure and understanding.

Many tasks are available and candidates may gain credit from a maximum of 8 of them. The tasks have been grouped at **three** levels of performance which correspond to attainment at Bronze (Level 1), Silver (Level 2) and Gold (Level 3) Awards.

Frequent opportunities will arise during the course for candidates to attempt these tasks and each 'Item' contains suggested links to **one or two** of them. The variety of different practical activities undertaken by candidates will provide many other opportunities for candidates to demonstrate their attainment.

Teachers will need to select the tasks to be used, and their choice will depend on their own Schemes of Work, the resources available to them and the specific needs of their own candidates.

Tasks completed satisfactorily are awarded marks. For each Level 1 task, **1 mark** is given, for each Level 2 task, **2 marks** are given, and for each Level 3 task **3 marks** are given. The total mark (up to the maximum of 24) is divided by a factor of 2 to give the final points total out of 12.

Data Analysis (12%)

Candidates, either singly or collaboratively take part in a practical procedure in order to collect primary data. Candidates are assessed on their ability to analyse and evaluate the data collected and the limitations of the techniques used. It is not essential for candidates to collect all of the data which is to be used in this exercise. Their own first hand data may be supplemented with extra data from other candidates or classes, demonstrations or other sources.

Marks are awarded for three strands, (see Appendix C). The three marks which make up the assessment total for this element of coursework must come from the same activity.

The skills to be assessed for this element are also assessed in GCSE Additional Science A.

End-of-Item Tests (60%)

An End-of-Item test is an integral part of each of the 39 'Items' forming the specification. It is accepted that absence through illness, or other unforeseen circumstances, may affect candidates' assessment and they are therefore expected to submit a maximum of 30 of these tests. (For cases in which candidates are able to take more than 30, the best 30 marks are used for assessment.)

The tests are supervised by teachers in normal lesson time and will be taken at times convenient to the centre. Teachers are required to ensure that normal 'examination conditions' for supervision and invigilation are maintained. Candidates who **miss** a test may take it on another occasion convenient to the centre. Further details are available in the Handbook for Centres.

For each 'Item' candidates are only allowed **one** attempt at the associated End-of-Item test. Candidates are **not** allowed to retake any End-of-Item tests or take an alternative version of any End-of-Item test.

All tests contain 15 marks and are constructed to a common format. The breakdown of marks will approximate to:

Recall and understanding of content	12/13 marks
Communication of scientific ideas	2/3 marks.

There is no formal time limit to these tests, but it is expected that most candidates will be able to complete a test within 10 minutes. Extra time may be taken if required.

Marking of the tests will be carried out by teachers according to the mark scheme provided by OCR. All test papers and mark schemes should be retained securely until the end of the course and may be sampled during the moderation process. Marks will be submitted to OCR at the end of the course in accordance with OCR's procedures.

The raw **marks** obtained from these tests are converted into points according to the following scale:

Raw Mark	3-5	6-8	9-11	12-15
Points	0.5	1	1.5	2

The maximum **points** total is 60 (= 30 tests x 2).

This points total is added to the points totals of the other elements to establish the candidates' final points total (submitted to OCR).

5.2 Marking Internally Assessed Work

Element 1: Study of a Science Topic (Points submitted out of 16)

Candidates are required to carry out a personal research study and then complete a written report on their findings.

The report may be submitted as a hand written or word processed document or in other suitable forms, for example an audio or video recording.

The report should be less than 400 words in length. Reports in excess of 400 words will indicate poor structure and unselective choice of material. A written report should be illustrated by pictures, diagrams, and tables as appropriate. At the end of the report, the sources used should be listed with references made to these sources in the body of the report where appropriate.

Arrival at Marks for Study of a Science Topic

The award of marks is based on the professional judgment of the science teacher, working within a framework of descriptions of performance (see Appendix B). Within each strand, different aspects of performance are identified in the marking grid. For each of these, two descriptions of performance (for 2 and 4 marks) illustrate what might be expected for candidates working at different levels.

Marking decisions should be recorded on the candidate cover sheet. This cover sheet can be downloaded from the OCR website www.ocr.org.uk.

Candidates may not always report their work in a particular order. Evidence of achievement may be located almost anywhere in the report. Thus it is necessary to look at the whole report for evidence of each strand in turn.

Within any one strand, a tick on the grid should be used to indicate the performance statement that best matches the work. Intermediate marks 1 or 3 can be used where performance exceeds that required by one statement, but does not adequately match that required by the next higher statement. When each aspect of performance has been assessed in this way, the marks are added together to give a total mark on a scale 0-16 marks.

Element 2: 'Can – Do' Tasks (Points submitted out of 12)

These tasks enable all candidates to achieve success but still provide challenge and reward for high attainers. The tasks are set at three levels.

Basic Skills: 1 Mark Tasks	Simple practical skills, which should be within the reach of all candidates.
Intermediate Skills: 2 Mark Tasks	More complex tasks which require more than one practical skill.
Advanced Skills: 3 Mark Tasks	Extended activities which require a candidate to perform a sequence of more demanding operations.

Opportunities to demonstrate proficiency in 'Can-do' Tasks are indicated throughout the specification content and are summarised in Appendix D. Results can be submitted from **eight** tasks. Thus, candidates can gain a maximum of eight marks from eight Basic Skills tasks or 16 marks by matching eight Intermediate Skills Tasks or 24 marks by successfully completing eight Advanced Skills tasks. It is expected that during their course candidates will attempt a wide range of tasks at a variety of levels and that all candidates will be able to achieve success at appropriate levels. At the end of the course, results for the highest scoring eight tasks should be identified and

the total mark calculated out of a maximum of 24. This is then divided by two to give a final points total out of 12, which should be submitted.

Element 3: Data Analysis (Points submitted out of 12)

Candidates are required to present or process a set of data in such a manner as to bring out any 'patterns' [1] that are present and state a conclusion based on these patterns. They are expected to show what they have learned from the data and evaluate the method of data collection.

Arrival at Marks for Data Analysis

The award of marks is based on the professional judgement of the science teacher, working within a framework of descriptions of performance (see Appendix C). Within each strand, different aspects of performance are identified in the marking grid. For each of these, two descriptions of performance (for 2 and 4 marks) illustrate what might be expected for candidates working at different levels.

Marking decisions should be recorded on the candidate cover sheet. This cover sheet can be downloaded from the OCR website www.ocr.org.uk.

Within any one strand, a tick on the grid should be used to indicate the performance statement that best matches the work. Intermediate marks 1 or 3 can be used where performance exceeds that required by one statement, but does not adequately match that required by the next higher statement. When each aspect of performance has been assessed in this way, the marks are added together to give a total mark (and points total) on a scale 0-12 marks.

Recording and Submitting Marks

The sum of points given for each element (the points total) must be submitted to OCR on form MS1 by 15th May in the year of entry for Entry Level certification. These forms are produced and despatched at the relevant time based on entry information provided by the centre.

All assessed work which has contributed to candidates' final totals must be available for moderation.

[1] 'patterns' here means similarities, or differences, or the presence or absence of a relationship (e.g. a correlation between a factor and an outcome, or a trend linking two variables).

5.3 Linking of Points to Interim Awards

Awards are based on credit accumulation. **Any** combination of points gained from the assessment elements is used to reach the threshold total for each level of interim award.

Bronze Award (25%)

An example of a performance for Bronze Award would be:

End-of-Item tests - 17 points out of 60

Science Topic - 0 points out of 16

'Can-Do' tasks - 4 points out of 12

Data Analysis - 4 points out of 12

This represents an overall achievement of 25%.

Silver Award (50%)

An example of a performance for Silver Award would be:

End-of-Item tests - 30 points out of 60

Science Topic - 12 points out of 16

'Can-Do' tasks - 5 points out of 12

Data Analysis - 3 points out of 12

This represents an overall achievement of 50%.

Gold Award (75%)

An example of a performance for Gold Award would be:

End-of-Item tests - 45 points out of 60

Science Topic - 14 points out of 16

'Can-Do' tasks - 9 points out of 12

Data Analysis - 7 points out of 12

This represents an overall achievement of 75%

5.4 Regulations for Internally Assessed Work

Supervision and Authentication of Work

OCR expects teachers to supervise and guide candidates who are undertaking work that is internally assessed. The degree of teacher guidance will vary according to the kind of work being undertaken. It should be remembered, however, that candidates are required to reach their own judgments and conclusions.

When supervising internally assessed tasks, teachers are expected to:

- offer candidates advice about how best to approach such tasks;
- exercise supervision of the work in order to monitor progress and to prevent plagiarism;
- ensure that the work is completed in accordance with the specification requirements and can be assessed in accordance with the specified mark descriptions and procedures.

Work should, wherever possible, be carried out under supervision. However, it is accepted that some tasks may require candidates to undertake work outside the centre. Where this is the case, the centre must ensure that sufficient supervised work takes place to allow the teachers concerned to authenticate each candidate's work with confidence.

Production and Presentation of Internally Assessed Work

Candidates must observe certain procedures in the production of internally assessed work.

- Any copied material must be suitably acknowledged.
- Where work is based on the use of secondary data, the original sources must be clearly identified.
- Each candidate's assessed work should be stapled together at the top left hand corner and have a completed cover sheet as the first page.

Annotation of Candidates' Work

Each piece of assessed coursework should show how the marks have been awarded in relation to the mark descriptions.

The writing of comments on candidates' work provides a means of dialogue and feedback between teacher and candidate and a means of communication between teachers during internal standardisation of coursework.

However, the use of a completed cover sheet for each candidate's work provides a means of communication between teacher and moderator and might replace the need for annotation.

Moderation

All coursework is marked by the teacher and internally standardised by the centre. It is the responsibility of the centre to carry out effective internal standardisation; that is to ensure that similar standards are applied by each teacher involved in the assessment.

The purpose of external moderation is to ensure that the standard for the award of marks is the same for each centre, and that each teacher has applied the standards appropriately across the range of candidates within the centre.

External moderation is by postal sample submitted to the Moderator. It is the responsibility of the centre to select the sample of candidates' work to be sent for moderation.

The sample should represent performance across the whole attainment range from the centre and should include work assessed by each teacher involved in the assessment. The Moderator will require a written statement describing how effective internal standardisation has been carried out within a centre.

The sample should consist of the complete portfolios of six candidates (two top, two middle and two bottom of the range) together with a photocopy of their record card. A 'portfolio' should consist of all End-of-Item tests taken and the pieces of work which contribute the best marks for the Science Topic and the Data Analysis task at the time of submission.

More detailed instructions will be issued by OCR nearer to the coursework deadline date.

Minimum Requirements for Internally Assessed Work

If a candidate submits no work for this internally assessed unit, then the candidate should be indicated as being absent from that unit on the mark sheets submitted to OCR. If a candidate completes any work at all for an internally assessed unit, then the work should be assessed according to the criteria or mark scheme and the appropriate mark awarded, which may be zero.

6 Technical Information

6.1 Registration and Entries

Please note that centres must be registered with OCR in order to make any entries, including estimated entries. It is recommended that centres apply to OCR to become a registered centre well in advance of making their first entries. Centres should be aware that a minimum of ten candidates for summer examinations is normally required.

Centres wishing to register their interest in the course will need to complete the order form (Appendix E) in order to receive materials for undertaking the course. Both estimated and final entries must be made in the certification year. Estimated entries, giving estimated numbers only, are needed for the appointment of the centre Moderators and final entries provide the necessary individual candidate details.

Candidates should be entered for the qualification code R482.

Entry Deadlines

Candidate entries must be made by 21 February for the June session.

Entry to GCSE Examinations

The progress of some candidates during the course might be sufficient to allow their transfer to a science GCSE course and subsequent entry to a GCSE examination. Such changes are possible at any stage up to the final date for receipt of GCSE entries (normally February in Year 11). Changes made after this final date are likely to be subject to late entry fees.

Teachers must ensure that, if an entry to a GCSE examination is also made, the work which a candidate has undertaken is matched to the skills assessment requirements of GCSE Science.

6.2 Grading

Award of Certificates

Interim certificates for Bronze, Silver and Gold Awards can be awarded by centres at any time during the course, but final certificates will be issued by OCR when the candidates have completed the course.

Final certification is available from OCR on a three-point scale of grades: Entry 1, Entry 2 and Entry 3, where Entry 3 is the highest grade available.

6.3 Result Enquiries and Appeals

Under certain circumstances, a centre may wish to query the grade available to one or more candidates or to submit an appeal against an outcome of such an enquiry.

For procedures relating to enquires on results and appeals, centres should consult the *OCR Admin Guide* and the *JCQ Post-Results Services* booklet. Copies of the most recent editions of these papers can be obtained from the OCR website.

6.4 Re-sits

For each 'Item' candidates are only allowed one attempt at the associated End-of-Item test and are not allowed to retake any End-of-Item tests.

6.5 Guided Learning Hours

Entry Level Certificate in Science requires about 100 guided learning hours in total.

6.6 Code of Practice/Subject Criteria/Common Criteria Requirements

These specifications comply in all respects with the criteria for Entry Level qualifications and *The Statutory Regulation of External Qualifications 2004*.

6.7 Arrangements for Candidates with Particular Requirements

Special Arrangements

Arrangements for candidates with special needs for Entry Level Certificate specifications are based on the principle that the centre is best able to assess the needs of the candidate and the appropriateness of the arrangement required. Arrangements for candidates with special needs should not advantage nor disadvantage a particular candidate, nor should they reduce the reliability and validity of the assessment.

The arrangements for candidates with special needs are more flexible than those currently available at GCSE and as such it should not be assumed that any arrangements made at Entry Level Certificate Level will automatically be available at GCSE or GCE Level.

The following arrangements can be made for candidates without permission being sought:

- mechanical and technological aids may be used by candidates who are physically dependent on them;
- instructions regarding the conduct of any In-Course tests may be simplified;
- language support staff may provide linguistic help;

- bilingual and word exchange lists may be used.

For information relating to permission to use the following special arrangements, please consult the Handbook for Centres. Under certain circumstances:

- the teacher may act under the candidate's instructions to perform simple physical actions which the candidate is unable to undertake;
- mechanical and technological aids may be used by candidates who generally use them in their normal work;
- communicators or signers may be used;
- readers and amanuenses may be used;
- the tests may be modified as necessary for visually impaired candidates. It is the responsibility of the centre to Braille or enlarge the tests.

It is expected that, generally, the candidate's own teacher will act as a communicator, a signer, a reader or an amanuensis.

Further clarification of any special arrangements may be obtained by consulting the section on *'Special Arrangements for Entry Level Certificate'* (Section 6C) in the *Handbook for Centres* or by contacting OCR.

6.8 Prohibited Qualifications

Restrictions on Candidate Entries

Candidates who enter for this Entry Level specification may not also enter for any other Entry Level specification with the certification title Science in the same examination series.

They may however enter for any GCSE, GNVQ or NVQ, including GCSE Science.

7 Access arrangements for Entry Level Certificate in Science

Arrangements for candidates with special needs for Entry Level Certificate specifications are based on the principle that the centre is best able to assess the needs of the candidate and the appropriateness of the arrangement required. Arrangements for candidates with special needs should not advantage nor disadvantage a particular candidate, nor should they reduce the reliability and validity of the assessment.

The arrangements for candidates with special needs are more flexible than those currently available at GCSE and as such it should not be assumed that any arrangements made at Entry Level Certificate Level will automatically be available at GCSE or GCE Level. Please consult the JCQ booklet *Access Arrangements, Reasonable Adjustments and Special Consideration*. Entry Level Forms are available on the JCQ website (Forms 11–13).

The following arrangements can be made for candidates without permission being sought:

- mechanical and technological aids may be used by candidates who are physically dependent on them; (screen readers must not be used in reading texts)
- instructions regarding the conduct of any In–Course tests may be simplified
- language support staff may provide linguistic help; (please see regulations relating to readers and scribes, sign language and oral language modifiers)
- bilingual and word exchange lists may be used.

For information relating to permission to use the following special arrangements, please consult the JCQ booklet *Access Arrangements, Reasonable Adjustments and Special Consideration.*

Under certain circumstances:

- the teacher may act under the candidate's instructions to perform simple physical actions which the candidate is unable to undertake; (please see regulations on the use of practical assistants)
- mechanical and technological aids may be used by candidates who generally use them in their normal work; (for screen readers, please see regulations relating to readers)
- communicators or signers may be used
- readers and amanuenses may be used
- the tests may be modified as necessary for visually impaired candidates. It is the responsibility of the centre to Braille or enlarge the tests.

It is expected that, generally, the candidate's own teacher will act as a communicator, a signer, a reader or an amanuensis.

Further clarification of any special arrangements may be obtained by consulting the JCQ booklet *Access Arrangements, Reasonable Adjustments and Special Consideration* or by contacting OCR Special Requirements Team.

8 Other Specification Issues

8.1 Overlap with other Qualifications

There is some overlap of content with the OCR GCSE in Science, although the assessment requirements will be different.

8.2 Progression from these Qualifications

This Entry Level qualification is a general qualification designed to enable candidates to progress either directly to employment or to Foundation Level courses within the National Qualifications Framework.

The progress of some candidates during the course might be sufficient to allow their transfer to a science GCSE course.

8.3 ICT

In order to play a full part in modern society, candidates need to have an awareness of the importance of ICT and its uses. Centres are therefore encouraged to present candidates with opportunities to develop their skills in ICT.

Opportunities for ICT could possibly include:

- gathering information from the world wide web;
- the use of CD-ROMs as sources of information;
- word-processing or DTP to produce reports and posters;
- monitoring experiments using sensors.

The examples listed below show some points in the specification where opportunities might more easily be found.

ICT	Opportunity	Item Ref.
Use of the world wide web	Search for data on the location and severity of earthquakes.	C.8
	Search for data on types of dinosaurs.	B.3
	Search for data about conditions on other planets.	P.6
Use of CD-ROM	These provide many opportunities to provide information and stimulus material.	Many
Word processing	Reports of practical activities.	Many
Data capture	The use of light gates to monitor movement down a slope.	P.4

8.4 Citizenship

From September 2002, the National Curriculum for England at Key Stage 4 includes a mandatory Programme of Study for Citizenship.

This section offers guidance for developing, at an appropriate level, the knowledge, skills and understanding of citizenship issues during the course.

Citizenship Programme of Study	Opportunities for Teaching the Issues in the Units of the Course
Section 1: Knowledge and understanding about becoming informed citizens	
Aspects of shaping the laws on pollution control.	B.7, C.11, P.7
The rights of consumers.	B.5, C.3, P13
Issues of sustainable development.	B.10, C.11, P.7
Section 2: Enquiry and communication	
Researching issues relating to the use and abuse of statistics.	C.6
Expressing personal opinions on environmental issues.	B.10, B.11, C.11, C.12
Contributing to group discussions.	B.1, B.5, B.7, C.8
Section 3: Developing skills of participation and responsible action	
Consider and evaluate views that are not their own.	B.10, B.12
Participating in science-based school and community activities.	C.11

8.5 Spiritual, Moral, Ethical, Social, Legislative, Economic and Cultural Issues

During the course there are opportunities to promote candidates' spiritual, moral, social and cultural development.

Issue	Opportunities for Teaching the Issues in the Units of the Course
The endeavour of science in describing the structure and functioning of the natural and modern world.	B.3, C.8, P.6
The ethical and moral implications of some of the applications of science and technology.	B.1, B.2, B.12
A sense of awe and wonder at the atomic and molecular workings of the material world.	B.2, B.12
The endeavour of scientists in the development of knowledge and understanding of the material world.	B.1, C.7
Pollution.	B.7, C.11

8.6 Sustainable Development, Health and Safety Considerations and European Developments

OCR has taken account of the 1988 Resolution of the Council of the European Community and the Report *Environmental Responsibility: An Agenda for Further and Higher Education*, 1993 in preparing this specification and associated specimen assessments.

Issue	Opportunities for Teaching the Issues in the Units of the Course
Environmental issues:	
Energy and mineral recycling.	C.4, C.11
The positive steps taken to reduce environmental pollution.	B.7, C.11
The conservation of resources.	B.11, P.7
Environmental monitoring.	B.7, B.8, C.11
Health and Safety issues:	
Safe practice in the laboratory.	C.1, C.9, P.13
Diet and malnutrition.	B.5
Diabetes and its treatment.	B.6
Smoking and related diseases.	B.7

OCR has taken account of the 1988 Resolution of the Council of the European Community in preparing this specification and associated specimen assessments. European examples should be used where appropriate in the delivery of the subject content.

Although this specification does not make specific reference to the European Dimension it may be drawn into the course of study in a number of ways. The table below provides some appropriate opportunities.

Issue	Opportunities for Teaching the Issues in the Units of the Course
Power stations in Europe	P.11

8.7 Avoidance of Bias

OCR has taken great care in preparation of these specifications and assessment materials to avoid bias of any kind.

8.8 Language

These specifications and associated assessment materials are in English only.

8.9 Support and Resources

Resources

Specific resources written to match the specification can be obtained through Collins Education and Oxford University Press.

Support and In-service Training for Teachers

In support of this specification, OCR will make the following materials and services available to teachers:

- a full service of In-Service Training (INSET) meetings (details from 01223 552950);
- consultants to advise on coursework and other aspects of OCR science specifications;
- moderation feedback to each centre;
- a support booklet available from OCR Publications, (telephone: 0870 770 6622, fax: 0870 770 6621);
- specification available on the OCR website (www.ocr.org.uk).

Teacher Training

One teacher from each centre offering the specification must take responsibility for the scheme at the centre.

One day training courses will be held in September/October at the start of the course.

Appendix A: Grade Descriptions

Grade descriptions are provided to give an indication of the standards of achievement likely to have been shown by candidates awarded particular grades. The descriptions should be interpreted in relation to the content specified in the specification: they are not designed to define the content. The grade awarded will depend in practice upon the extent to which the candidate has met the assessment objectives overall. Shortcomings in some aspects of the assessment may be balanced by better performance in others.

Entry 1

Science Topic and Data analysis

Candidates carry out simple investigative work with help. They develop questions or ideas based on everyday experience and collect at least one piece of evidence. They can state simply what they found out and, when prompted, they comment on the procedures used or evidence obtained.

'Can-Do' Tasks

Candidates show that they are able to carry out some simple tasks, some of which involve the use of scientific equipment, safely. For example: 'I can match an animal to the place it lives'; 'I can separate a simple mixture'; 'I can make a high sound and a low sound with a single string'.

Knowledge and Understanding of Science

Candidates recall, understand and apply knowledge from a limited range of the defined specification content. For example: they are able to label a diagram of a plant to show roots, stems, leaves, flowers and buds; they know that gold and silver are expensive, shiny and heavy; they know that forces can be pulls, pushes, twists or bends. They are able to communicate simple ideas using everyday language.

Entry 2

Science Topic and Data Analysis

Candidates carry out some investigative work in which they research and collect some evidence. They can process in simple terms the data that has been collected and make a relevant comment about the procedures used or the evidence obtained.

'Can-Do' Tasks

Candidates show that they are able to carry out simple tasks, some of which involve the manipulation of scientific equipment safely. For example: 'I can match sound levels into a decibel chart'; 'I can carry out a test to show the presence of carbon dioxide'.

Knowledge and Understanding of Science

Candidates recall, understand and apply knowledge from a range of the defined specification content. For example: they know that animals get their food from eating plants and other animals; know that a mixture contains two or more uncombined substances and know about using mobile phones safely. They communicate ideas making limited use of scientific and technical vocabulary.

Science Topic and Data Analysis

Candidates carry out work in which they research, collect and record evidence and present their findings in the form of simple tables or charts. They identify a straightforward trend or pattern in their results and make summarising comments on the procedures used and the evidence obtained. In a simple way they relate their investigative work to appropriate scientific knowledge and understanding.

'Can-Do' Tasks

Candidates show that they are able to carry out simple tasks, including those which involve the manipulation of scientific equipment, safely and with confidence. These may require candidates to take accurate measurements. For example: 'I can use a thermometer to accurately measure temperature'; 'I can do a test to compare quantities of Vitamin C in fruit juice'.

Knowledge and Understanding of Science

Candidates recall, understand and apply knowledge from a wide range of the defined specification content. For example: understand that different people have different lifestyles and therefore dietary requirements; know the physical differences between metals and non-metals; know that unbalanced forces make things move. Candidates obtain information from simple tables and charts and are able to link cause and effect in simple contexts. They communicate ideas well making some use of scientific and technical vocabulary.

Appendix B: Performance Descriptors for Study of Science Topic

Performances are described at the 2 mark and 4 mark standards.

Teachers are expected to use professional judgment in cases where a candidate's performance cannot be matched exactly against the defined descriptors. A mark of 0 should only be awarded where no work is attempted.

Aspect	Marks Awarded		
	0 1 2	3	4
A Collecting evidence		collects evidence from only one source	collects relevant evidence from more than one source
		the evidence is limited in quantity and of low quality	the evidence is sufficient in quantity and of sufficient quality to be used as a basis for further work
		the sources are not mentioned	the sources are identified but are incomplete
B Discovering patterns		is able to identify a single simple pattern or trend in the evidence collected	can identify patterns in the evidence collected
			is able to make a meaningful comment on the trend identified
C Developing conclusions		a single simple conclusion is stated without reference to the supporting evidence	can draw one suitable simple conclusion linked to the evidence collected and to the patterns discovered
D Presenting my information		the report has little or no structure or coherence or simply follows a procedure provided by worksheets	the report has an appropriate sequence and structure
		there is little or no visual material used in the production of the report	visual material has been appropriately included but may be simply decorative

Intermediate marks may be awarded where performance exceeds that of the lower descriptor but does not meet the level of the higher descriptor e.g. for Aspect B, discovering patterns, one mark may be awarded where there is an attempt to identify a simple pattern or trend.

Appendix C: Performance Descriptors for Data Analysis Task

Performances are described at the 2 mark and 4 mark standards.

Teachers are expected to use professional judgment in cases where a candidate's performance cannot be matched exactly against the defined descriptors. A mark of 0 should only be awarded where no work is attempted.

Aspect	Marks Awarded			
	0	1	2	3 4
A Graphical or numerical processing of data			displays limited numbers of results in tables, charts or graphs, using given axes or scales selects individual results as a basis for conclusions	constructs simple charts or graphs to display data in an appropriate way, allowing some errors in scaling or plotting carries out simple calculations e.g. correct calculation of averages from repeated readings
B Summary of evidence			notes differences between situations/cases, or compares individual results	identifies trends or general correlations in the data
C Explanation and reliability			links the outcomes to previous experience or 'common sense'	relates the conclusion to scientific ideas/explanation comments on the reliability of the data collected

Appendix D: List of 'Can-Do' Tasks

'Can-Do' tasks provide progression in the attainment of skills. Candidates will have different levels of skills at the start of the course and will progress to different levels at different rates.

The Level 1 task (1), I can measure a person's pulse, links to the Level 3 task (42), I can measure how fast a person recovers from exercise.

In the Level 3 task (52) I can extract a sample of copper from its ore, some candidates may not achieve this task but may be awarded the Level 2 task (27), I can heat a solid substance safely.

The Level 2 task (36), I can use a compass to find the direction of a magnetic field, may be extended for some candidates to allow achievement of the Level 3 task (59), I can use a plotting compass to map the magnetic field around a coil.

More details on the use of 'Can-Do' tasks to provide progression in skills development can be found in the OCR teacher support booklet and at OCR INSET sessions.

Level 1 Tasks

There are **20** tasks which represent Level 1 skills and these are suitable for candidates working towards an interim **Bronze Award** and a Final Certification at **Entry 1**.

It is anticipated that candidates working at this level will have demonstrated success in approximately **eight** of the Level 1 tasks.

Ref	Tasks	'Item(s)'
1	I can measure a person's breathing rate or pulse.	B.1, B.4
2	I can show the position of the foetus, cord and placenta on a model.	B.2
3	Given information I can match an animal to where it lives or when it lived.	B.3, B.8
4	I can show the position of the lungs, wind pipe and ribs on a model of the thorax.	B.7
5	I can measure reaction time.	B.9
6	I can carry out a tasting test safely.	B.9
7	I can use a picture of chromosome pairs to say what sex a person is.	B.12
8	I can focus a slide of a cell on a microscope. *	B.13
9	I can separate a simple mixture (e.g. iron filings and aluminium, salt from sand).	C.4, C.10
10	I can add results to a bar chart.	C.5
11	I can identify some common metals; iron (using a magnet) copper, aluminium and lead (by sight and touch).	C.7
12	I can use a key to sort plastic containers by looking at the codes printed on the products.	C.11
13	I can make a poster to warn about the dangers of carbon monoxide poisoning.	C.12
14	I can send a text message on a mobile phone.	P.1, P.12
15	I can write a message in mirror writing.	P.5

16	I can list the things that an astronaut needs to stay alive.	P.6
17	I can draw an information poster to show the fire triangle or warn of the risks of hypothermia.	B.6, P.7
18	I can make a high sound and a low sound with a single string.	P.9
19	I can recognize the nuclear hazard warning symbol.	P.11
20	I can produce a poster on the safe use of mobile phones.	P.12

Level 2 Tasks

There are **21** tasks which represent Level 2 skills and these are suitable for candidates working towards an interim **Silver Award** and a Final Certification at **Entry 2**.

Ref	Tasks	'Item(s)'
21	I can collect (scientific) information about an endangered or extinct species.	B.3
22	I can safely carry out a food test for starch.	B.5, B.10
23	I can carry out a test to show the presence of carbon dioxide.*	B.7, C.2, C.6
24	I can use Universal Indicator solution to find pH.	B.11, C.1
25	I can search the internet to find information fit for purpose.	B.13, C.6
26	I can test a gas to see if it is hydrogen.	C.1
27	I can heat a solid substance safely.*	C.2
28	I can make a paint sample and prove that it works.	C.3
29	I can make measurements to test a property of a fibre or fabric.	C.5
30	I can grow crystals to show what happens when molten chemicals cool down.	C.8
31	I can measure the volume of a liquid using a measuring cylinder.	C.9
32	I can make a chromatogram.	C.10
33	I can sort a mixture of rubbish into biodegradable and non-biodegradable parts.	C.11
34	I can make an emulsion.	C.13
35	I can read a domestic electricity meter. *	P.2
36	I can use a compass to find the direction of a magnetic field. *	P.3
37	I can use a newtonmeter to measure force.	P.4
38	I can tell others what the school fire drill is.	P.7
39	I can match sound levels onto a decibel chart.	P.9
40	I can build a model generator.	P.11
41	I can use a Geiger counter.	P.13

Level 3 Tasks

There are **23** tasks which represent Level 3 skills and these are suitable for candidates working towards an interim **Gold Award** and a Final Certification at **Entry 3.**

Ref	Tasks	'Item(s)'
42	I can measure how fast a person recovers from exercise.	B.1
43	I can plot and / or read data from a graph.	B.2
44	I can devise a 10 minutes a day fitness programme.	B.4
45	I can plan my daily protein intake.	B.5
46	I can use a thermometer to accurately measure temperature. *	B.6, P.10
47	I can carry out a simple survey.	B.8
48	I can grow plants from seeds or cuttings.	B.10
49	I can follow a recipe to make yoghurt or cheese.	B.11
50	I can measure length / distance accurately.	B.12, P.8
51	I can make an artificial perfume.	C.3
52	I can extract a sample of copper from its ore. *	C.4
53	I can make and then test a sample of concrete for its strength.	C.7
54	I can mark on a map of the world ten locations of earthquakes or volcanoes. *	C.8
55	I can measure time accurately (e.g. to time a chemical reaction).	C.9
56	I can do a test to compare the quantity of Vitamin C in fruit juices.	C.13
57	I can send and receive a message in Morse code.	P.1
58	I can use a domestic electricity meter to find the cost of using electricity.	P.2
59	I can use a plotting compass to map the magnetic field around a coil.	P.3
60	I can measure the speed of a moving object.	P.4
61	I can draw a ray diagram to show the path of a ray of light along an optical fibre.	P.5
62	I can draw a labelled model of our Solar System. *	P.6
63	I can find out how the size of an object affects the size of a crater.	P.8
64	I can plot a temperature / time graph.	P.10

Appendix E: Order Form for End-of-Module Tests

ENTRY LEVEL CERTIFICATE IN SCIENCE (R482)

Order Form for End-of-Item Tests (*photocopy* for regular use)

Please complete all boxes

Number of candidates **starting** the course this year i.e. requiring End-of-Item tests						
Number of candidates **starting their final year** this September						
Name of teacher who will prepare the moderation sample						
Centre Number						
Name of Centre						
E-mail address of Centre						

Please allow 28 days for delivery of materials

Thank you

Please post or fax this order form to:

OCR
1 Hills Road
Cambridge
CB1 2EU

Fax: 01223 553242
E-mail: general.qualifications@ocr.org.uk