GCSE
SCIENCE A, SCIENCE B, BIOLOGY
UNIT B1 – Example 1
4461, 4462, 4411

Scheme of Work

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Introduction

This Outline Scheme of Work is one of a number of schemes prepared by practising teachers for the new AQA GCSE Sciences suite. It is hoped that other teachers will find them helpful as the basis for the fully detailed schemes prepared for teaching from September 2006. Each outline scheme covers one unit (B1, B2, B3, C1, C2, C3, P1, P2, P3) and for some units more than one outline scheme is available. This is because there are different, equally valid ways of approaching the teaching of the specifications and a single scheme would not show the range of possible approaches.

The AQA specifications are designed to be used with a wide range of resources, so this scheme does not assume the availability of any particular printed or electronic publications, or any special equipment. Teachers are enabled to use existing resources, including their own, together with resources specially purchased for the new specifications.

The outline scheme is arranged under the section headings of the relevant specification, for example, *11.1 How do human bodies respond to changes inside them and to their environment?* The content in the section is further subdivided with a brief statement given of the coverage of each subdivision, together with activities that relate to that content and an indication of the number of hours it is suggested are needed to deliver that part of the content.

Opportunities to deliver 'How Science Works' and to use ICT are highlighted using the same icons as used in the specifications.

This identifies parts of the content which lend themselves to extended investigative work of the type needed to explore Sections 10.3–10.7 of the specifications. These sections are about obtaining valid and reliable scientific evidence.

This identifies parts of the content which lend themselves to activities which allow Sections 10.2 and 10.8–10.9 to be considered. These sections are about using scientific evidence, for example, how scientific evidence can contribute to decision making and how scientific evidence is limited.

This identifies where there are opportunities to use ICT sources and tools in teaching the specifications.

UNIT BIOLOGY 1			
Total hours: 7	**11.1 How do human bodies respond to changes inside them and to their environment?**		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Introduce nervous system		• Brainstorm previous knowledge re structure and function of nervous system including five senses. • Circus of activities to do with five senses or investigation on reaction times.	Use data loggers, sensors to test reaction times.
Reflexes		• Notes on structure of cells, synapses and tissues in a reflex. • Circus of activities to do with simple reflex actions.	

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Internal conditions		• Brainstorm internal conditions that need to be controlled: water content, ion content, temperature and blood sugar level. How well do sports drinks help you to control these conditions after exercise? • Investigate skin temperature changes down arm/leg.	
Nervous cf Hormonal control Menstrual cycle		• Draw up table of similarities and differences between nervous and hormonal control. • Brief description of menstrual cycle. • Name and locate pituitary, ovaries, womb on model torso and head. • Role of FSH, oestrogen, LH.	
Controlling fertility		• Draw up table of how hormones are used to control fertility. • Use NHS websites to find out about the pros and cons of using hormones to control fertility including IVF treatment. • Compare use of 'the pill' to other kinds of contraception.	Use the internet to find out more about use of hormones to control fertility – www.nih.gov/health

Total hours: 7	11.2 What can we do to keep our bodies healthy?		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Balanced diet	 	• Brainstorm what a healthy diet is • Definition of malnourished: too fat, too thin, deficiency diseases. • Compare volumes of fruit juice required to decolourise DCPAP (dichlorophenol-indophenol) DCPAP is an indicator of Vitamin C. • Using food wrappers, add up kilojoules of a soft drink, a bag of crisps and a large chocolate bar. What are the percentages of nutrients? How many bananas do you need to eat to obtain the same number of kJ?	
Metabolic rate and exercise		• Define metabolic rate and how it is influenced by various factors. • Effect of exercise on metabolic rate and fitness. • Investigate change in heart beat rate and blood pressure before and after three weeks of walking 20 minutes per day.	Sensors and data loggers to look at the effect of exercise on the human body.

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Metabolic rate and exercise contd…	 	• Using datasheets, calculate daily kJ intake, both actual and recommended. • Investigate how much time a particular activity burns up a packet of crisps.	Calculate kJ required to walk own body mass upstairs in a given length of time.
Obesity and slimming programmes Too little food		• Short definitions of diseases caused by obesity. • Visit World Health Organisation (WHO) website re obesity "globesity". • Evaluate claims made by slimming programmes – Weight Watcher's, Atkin's, crash diets etc. • Problems linked to lack of food in developing world (link to drug addiction).	www.fda.gov – Food and Drug Administration (US) www.who.int/en/ www.WeightWatchers.co.uk www.accessexcellence.org - The National Health Museum (US)
Cholesterol		• What is it, where is it produced, why do some people have too much? What problems does too much cholesterol cause?	

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Cholesterol contd…		• Investigate the rate of water flow through clear plastic tubing before and after melted wax has been poured into it.	
LDLs, HDLs, Saturated and Unsaturated fats		• Define all of these and their effects on blood cholesterol levels. • Using datasheets, draw up tables of foods rich in saturated, monosaturated and polyunsaturated fats.	www.nutition.org.uk - British Nutrition Foundation www.eatright.org – American Dietetic Association
Salt and processed food	 	• Effect of too much salt in the diet. • Demonstration of effect of high pressure in a balloon compared to low pressure on how easily it bursts. • Visit NHS websites to find out about high blood pressure and increasing risks of heart attacks and strokes. • Compare nutrient levels of bananas to snack (as per Balanced Diet). • Demonstration: weigh salt that one needs a day (0.5 g), that one eats a day (10-12 g) and daily recommendation (6 g).	www.nhs.uk

Total hours: 5	11.3 How do we use/abuse medical and recreational drugs?		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Introduce medical drugs Focus: Statins		• Brainstorm uses, side-effects and derivation from natural substances of common drugs eg aspirin, quinine, hormones for fertility treatment. • Visit websites of pharmaceutical companies and evaluate the effect of statins on heart disease.	www.pfizer.com – Pfizer www.merck.com – Merck www.jnj.com – Johnson and Johnson www.bayer.com - Bayer
How drugs are developed		• Draw up flow diagram/timeline of research, development, testing and trialling of new drugs.	
Focus: Thalidomide		• Case studies – thalidomide – historical thalidomide – present uses	www.wikipedia.org www.fda.gov
Introduce recreational drugs		• Define recreational drugs, both legal and illegal. • Compare overall impact on health of legal to illegal drugs.	www.nida.gov – National Institute on Drug Abuse

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Introduce recreational drugs contd…		• Visit NHS websites and evaluate why some people use both legal and illegal recreational drugs. • Investigate the effect of caffeine drinks on heart beat rate, effect of decaffeinated drinks.	www.nhs.uk use sensors and data loggers
Cannabis		• Visit websites and evaluate claims about cannabis on health and the link between cannabis and addiction to hard drugs.	www.nida.gov www.dare.uk.com – Drug Abuse Resistance Education
Heroin and Cocaine Alcohol		• Dependency, addiction and withdrawal symptoms. • Effects of drinking alcohol.	
Tobacco		• Effects of nicotine, carcinogens, and carbon monoxide in tobacco smoke • Demonstration of smoking machine. Compare high, medium and low tar brands. • Explain how link between smoking and lung cancer was made (Sir Richard Doll) and eventually accepted. What are the pros and cons of the different ways to stop smoking?	www.bmjjournals.com – British Medical Journal – search archives www.nhs.uk

Total hours: 7	11.4 What causes infectious diseases and how can our bodies defend themselves against them?		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Introduce pathogens and infectious diseases		• Brainstorm how different viral and bacterial pathogens can cause disease. • The body's immune reponse. • Research contribution of Dr Ignaz Semmelweiss (1818-1865) in controlling infection to solving modern problems with the spread of infection in hospitals.	
Treatment of disease		• Painkillers • Penicillin and other antibiotics • Timeline and explanation of how treatment of disease has changed as a result of increased understanding of action of antibiotics and immunity.	
MRSA		• Antibiotic resistance • Using WHO and Centre of Disease Control, Atlanta websites, evaluate the consequences of mutations of bacteria and viruses into pathogens that cause epidemics and pandemics eg bird flu.	www.who.int/en/ www.cdc.gov

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Vaccines	 	• Define the term vaccine. • Brainstorm all the diseases against which routine vaccinations have been given. • Focus on MMR. • Evaluate the advantages and disadvantages of being vaccinated against a particular disease – decrease in death rate, discomfort, boosters, inactive but alive pathogens, what cells viruses are grown on, vaccines for travel, storage, administration in developing countries, cost, herd immunity etc.	
Total hours: 4	**11.5 What determines where particular species live and how many of them there are?**		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Survival		• Brainstorm requirements for survival • Link to previous topics on what microorganisms need to survive, what do humans need to survive? • Investigate rate of colony growth of bacteria on nutrient agar with and on agar without nutrients.	

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Competition		• What do plants compete with each other for? • What do animals compete with each other for? • Choose a local habitat, eg school pond, and suggest factors for which organisms are competing. Use sensors and data loggers. • Brainstorm how animals and plants are adapted for survival in the above chosen habitat.	Gardening techniques – 'thinning out', 'weeding' etc.
Adaptation		• Draw up table of how plants (changes to surface area, water-storage tissues) and animals (changes to surface area, thickness of insulating coat, amount of body fat, camouflage) are adapted to desert conditions and Arctic conditions. • Brainstorm for ISA	
ISA		• Modelling the huddling of animals to keep warm.	
Defence		Brainstorm adaptations for defence that animals and plants have, especially against being eaten eg thorns, poisons, warning colours.	

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Distribution		• Using sensor and data loggers, suggest reasons for the distribution of animals or plants in a particular habitat: investigate woodlice behaviour in choice chambers; investigate the distribution of Pleurococcus on tree trunks.	
Total hours: 9	**11.6 Why are individuals of the same species different from each other? What new methods do we have for producing plants and animals with the characteristics we prefer?**		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Why plants and animals are similar to their parents		• Define genes, chromosomes, characteristics, nucleus, gametes. • Look at prepared slides of garlic root tips/locust testes/giant chromosomes of fly larvae salivary glands.	
Reproduction		• Define genetic variation, sexual and asexual reproduction, and clones. • Investigate distribution of inherited characteristics in class (continuous and discontinuous).	

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Cuttings		• Definition of cuttings as a kind of cloning technique. • Make cuttings of suitable plants (using rooting compound). • Compare time taken to grow and cost to that of planting from seeds. Seeds not genetically identical.	
Modern cloning techniques		• Define tissue culture, embryo transplants, fusion cell and adult cell cloning. Discuss applications. • Using websites such as the National Centre for Biotechnology Education Dolan DNA Learning Centre, interpret information about cloning techniques. Make informed judgements about the economic, social and ethical issues concerning cloning.	Tissue culture can be done in schools, BUT contamination with microorganisms is a problem Visit www.plantsci.cam.ac.uk Science and plants for schools and search site for protocols eg Worksheet 12. www.dnalc.org www.ncbe.reading.ac.uk

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Genetic engineering techniques		• Define genetic engineering: use of enzymes, transfer of genes to other organisms including plants and animals in early stage of development. Discuss applications. • Using websites such as the Dolan DNA Learning Centre, interpret information about genetic engineering techniques. Make informed judgements about the economic, social and ethical issues concerning genetic engineering, including GM crops.	www.ncbe.reading.ac.uk www.aphis.usda.gov/biotech/index.html
Total hours: 6	**11.7 Why have some species of plants and animals died out? How do new species of plants and animals develop?**		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Evolution		• Brainstorm possibilities of how life began – Creationism, Intelligent Design, the Theory of Evolution • Define fossil evidence, extinction, mutation, theory of evolution, species	

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Evolution contd…		• Suggest reasons why evolution is a theory and not a law and why scientists cannot be certain about how life began eg incomplete fossil evidence.	
Evidence of evolution		• Interpret evidence relating to evolutionary theory eg link to MRSA, banded snails, peppered moth, resistance to pesticides. • Examine fossil evidence. Is it complete? Is it open to interpretation?	
Similarities and differences between species		• Do case studies on: - evolutionary relationships eg African elephant, Asian elephant, hyrax **or** cannabis and hops. - ecological relationships eg animal-pollinated flowers **or** predator-prey relationships.	
Darwin's Theory of Evolution		• Outline how evolution occurs by natural selection. • Brainstorm reasons why Darwin's theory of natural selection was only gradually accepted.	

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Other Theories		• Outline different theories of evolution such as Lamarck's • Identify differences to Darwin's theory of evolution • Suggest reasons for differences – lack of evidence and/or scientific knowledge	www.ucmp.berkeley.edu – click on evolution
Total hours: 7	**11.8 How do humans affect the environment?**		
Topic outline		**Teaching approach including possible experiments/investigation opportunities**	**Additional notes**
Effects of human population growth		• Use of raw materials and non-renewable energy sources. • Production and disposal of waste. • Plot increase in human population and compare with an increase in carbon dioxide, water pollutants. • Web search on average family consumption of fuel, water, food and average family production of household waste.	www.environment-agency.gov.uk

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Pollution		• Water • Air • Land	
Indicators of Pollution	 	• Pollution affects the number and type of organisms that can live in a particular place. • Analyse and interpret scientific date on: - invertebrate species numbers upstream and downstream from a sewage outlet. - numbers of lichens from city centre to surrounding countryside.	
ISA		• The effect of acid rain on seed germination and growth **or** A field study to investigate the effects of human intervention on the distribution of plants and animals.	

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Deforestation	 	• Definition, causes and effects • Link loss of biodiversity to extinction and/or medical drug developments • Analyse and interpret scientific data from field studies concerning endangered species and 'bioprospecting'.	www.conbio.org/resources/education - Society for Conservation Biology
Greenhouse gases and the greenhouse effect	 	• Agricultural activities that increase levels of carbon dioxide and methane in the atmosphere. • Effect on global temperature, climate and sea levels. • Evaluate methods used to collect environmental data for environmental change. How valid is the correlation between carbon dioxide levels and global warming?	

Topic outline		Teaching approach including possible experiments/investigation opportunities	Additional notes
Sustainable development		• Define this term • Find out what planning is happening at local, regional and global levels. The use of data from field studies. • Using the internet weigh evidence and form balanced judgements about some of the major environmental issues facing society eg sustainable fishing, link to GM crops, alternative energy sources.	