



GCSE OCR BIOLOGY A AT THE CRANEDALE CENTRE

(September 2016 Onwards)

Our objective is to make our GCSE field courses a richly rewarding experience for students; stimulating their ecological awareness, developing enquiring minds and inspiring students to widen their ecological experience both during and after the course.

The 2016 OCR A Biology specification offers many exciting new opportunities and challenges for biology students. To meet this challenge the Cranedale Centre has developed many new field studies units for students working towards a new course.

At GCSE, topics 4 Ecosystems and 5 *Genes, inheritance and selection* have highly relevant content covered in Cranedale field studies.

Equally at GCSE, numerous aspects of topic 6 *Monitoring and maintaining the environment* will be covered through our fieldwork investigations.

Teachers also have the option of undertaking two of the eight 'Practical Activity Group' tasks whilst at the Cranedale Centre.

Furthermore, we hope that by the end of the fieldtrip, students will have come across several of the apparatus and techniques skills and are able to show progression in the mastery of the skills associated with the 'Working Scientifically' aspects of the formal exams.

Finally, a special feature of a course at the Cranedale Centre is that we are able to shape a course to your specific needs, choices and course duration. Inevitably the key decision will not be what to include, but what to leave out!

Our fieldwork topics are tailored to coach students through the content of GCSE Topics B4, B5 and B6. Each fieldwork topic is planned with a lab-based introduction in the morning and a full day of studies in the field (with a wide range of field equipment). With the aid of iPads, student data is collated in the field, producing means and graphs which allow interpretation of their results. This data can also be emailed back to school. Evening activities more often take the format of practical outdoor experiences that cover unique and exciting aspects of the syllabus.





Practical Activity Group Tasks

Out of the eight 'Practical Activity Group' tasks each student must accomplish for OCR GCSE, PAG 1 and PAG 3 can be completed as part of a field course at the Centre should you want to include them.

PAG 1: 'Microscopy – Investigate different magnification techniques to draw scientific diagrams from a number of biological specimens'

PAG 3: 'Sampling techniques – Investigations into the differences in habitats using ecological sampling techniques'.

Mathematical Requirements (MS)

Exams will include questions allowing students to demonstrate associated mathematical skills with content knowledge and their ability to apply these mathematical skills. Depending on the time and topics chosen, a Cranedale fieldtrip offers practical experience of the following mathematical skills at GCSE:

MS 1a Recognise and use expressions in decimal form

MS 1b Recognise and use expressions in standard form

MS 1c Use ratios, fractions and percentages

MS 1d Make estimates of the results of simple calculations

MS 2b Find arithmetic means

MS 2c Construct and interpret frequency tables and diagrams, bar charts and histograms

MS 2e Understand simple probability

MS 2f Understand the terms mean, mode and median

MS 2h Make order of magnitude calculations

MS 3a Understand and use the symbols: =, <, <<, >>, >, \propto , \sim

MS 3b Change the subject of an equation

MS 3c Substitute numerical values into algebraic equations using appropriate units for physical quantities

MS 3d Solve simple algebraic equations

MS 4a Translate information between graphical and numeric form

MS 4c Plot two variables from experimental or other data



Working Scientifically (WS)

Skills for working scientifically will be assessed across all GCSE papers. We endeavour to foster the practical skills necessary for students to demonstrate their competence in all aspects of scientific enquiry. This includes; a critical appreciation of methods, application of skills, the processing and interpretation of results, evaluating their studies and considerations of margins of error, precision and accuracy. Of the 33 skills students are required to be able to demonstrate, we aim to deliver the following 24 through a Cranedale field trip:

WS 1.1c Understand the power and limitations of science

WS 1.1d Discuss the ethical issues arising from developments in science

WS 1.1e Explain everyday and technological applications of science

WS 1.1f Evaluate associated personal, social, economic and environmental implications

WS 1.1g Make decisions based on the evaluation of evidence and arguments

WS 1.1h Evaluate risks both in practical science and the wider societal context

WS 1.2b Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena

WS 1.2c Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment

WS 1.2d Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative

WS 1.2e Evaluate methods and suggest possible improvements and further investigations

WS 1.3a Presenting observations and other data using appropriate methods

WS 1.3c Carrying out and representing mathematical and statistical analysis

WS 1.3d Representing distributions of results and make estimations of uncertainty

WS 1.3e Interpreting observations and other data

WS 1.3f Presenting reasoned explanations

WS 1.3g Being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility

WS 1.3h Identifying potential sources of random and systematic error

WS 1.3i Communicating the scientific rationale for investigations, methods used, findings and reasoned conclusions

WS 1.4a Use scientific vocabulary, terminology and definitions

WS 1.4d Use prefixes and powers of ten for orders of magnitude

WS 2a Carry out experiments

WS 2b Make and record observations and measurements using a range of apparatus and methods

WS 2c Presenting observations and measurements using appropriate methods

WS 2d Communicating the scientific rationale for investigations, methods used, findings and reasoned conclusions



Fieldwork Topics at the Cranedale Centre OCR 2016

The following is a summary of the OCR fieldwork topics that are on offer at the Cranedale Centre and gives an overall flavour of what students can expect to cover. The specific syllabus links relevant to each topic can be found in an adjoining document on our website.

Biodiversity in Freshwater

Students design and carry out fieldwork to identify how changes in biotic and abiotic factors affects the freshwater communities, meaning this is a session which can easily be used to fulfil Required Practical 9. Students will use quadrats and kick sample to measure the abundance of all freshwater species and identify them using hand-lenses and dichotomous keys. Abiotic variables including dissolved oxygen concentration, nitrate and turbidity are measured and used to conclude how and why communities differ. Students then utilise their own primary data to evaluate conflicting evidence regarding the future conservation of native species. Students also have the opportunity to use a light microscope at low power to make a scientific drawing of an olive mayfly nymph. Students highlight adaptations and then use the formula ($\text{magnification} = \frac{\text{size of image}}{\text{size of actual object}}$) to establish an appropriate scale for their individual drawings.

Freshwater Pollution

Chalk streams are globally rare habitats. Renowned for their pristine water quality and fragility they are becoming increasingly threatened by human activity. Pocklington Beck exhibits areas of superb biological richness as well as the impact of sewage treatment and fertiliser run off from nearby agricultural land. Students assess the impact of the distribution of aquatic organisms within the stream environment to assess the consequences of pollution. Students visit and kick sample control and polluted stream sites, identifying pollution-indicator species using hand-lenses and dichotomous keys. Abiotic variables are also measured including oxygen, heavy metals, ammonium, nitrate and phosphate for eutrophication, as well as temperature, pH, turbidity and conductivity. Students will discuss how human interactions have led to changes between areas of the stream and impacted upon stream biodiversity.

Rocky Shore Ecology

The peninsula of Filey Brigg (SSSI) has tremendous opportunities for students to test two shores with contrasting wave powers, meaning this is a session which can easily be used to fulfil Required Practical 9. Students design their own study, and participate in a range of classic fieldwork techniques (such as belt transects and random sampling with quadrats) to gather robust primary data. Differences in the populations of limpets and the effect of desiccation on seaweed are two of the most popular studies. Students will measure abiotic variables including refractometers for seawater salinity, anemometers for wind speed and a site-specific wave height chart to establish if these affect the communities present.



Biomass in Marine Ecosystems

Filey Brigg (SSSI) is a biologically rich rocky shore environment which provides a dramatic and engaging ecosystem for fieldwork. Students place random quadrats within the inter-tidal zone and quantify the biomass of organisms found whilst also observing adaptations of species found. The efficiency of biomass and energy transfers between trophic levels are then quantified and the students use their own primary data to construct pyramids of biomass. Students may also be able to visit Bempton Cliffs SSSI to view spectacular seabird assemblages from 130m high chalk cliffs. As top carnivores, seabirds indicate the health of an ecosystem and students are able to evaluate evidence and data concerning climate change and conservation of iconic species such as the gannet or puffin.

Biomass in Food Production

Students will visit two contrasting agricultural-ecosystems and learn how the efficiency of food production might be improved by restricting energy transfer from food animals to the environment. Students calculate and contrast the efficiency of biomass transfer of indoor commercial breed pigs and outdoor rare breed pigs. Punnett square diagrams are completed using genetic trees of rare breed pigs that students will get to meet. Students also use observations of the characteristics of the pig herd to interpret and predict the results of a genetic cross. Students will get to meet the farmers at the two contrasting systems and hear first-hand about selective breeding of individuals and how the systems are run. Students are then encouraged to evaluate personal, social, economic and environmental implications of both farm practise.

Biodiversity and Ecosystem Change

Students will be introduced to an afforested area and a contrasting deforested peat-bog in the North York Moors National Park and will establish positive and negative human interactions in the two ecosystems and their impacts on biodiversity. Students will compare the plant and animal biodiversity of the two sites and assess the potential for carbon storage. Links to the implications of deforestation and destruction of peat bogs will be discussed, and how these are both impacting on biodiversity. The role of these two ecosystems in the carbon cycle and the importance of the cycle to living organisms will also be highlighted. Students will use their own primary data to evaluate social, environmental and economic implications and decide how ecosystems should be managed. Students summarise why conservation of these sites is important for biodiversity and how they have a role in storing carbon and reducing carbon dioxide emissions.



Population Studies

Whilst at Cranedale, dependent upon the number of studies chosen, students are able to participate in a range of highly engaging evening fieldwork activities that explore population dynamics. These include;

Owl Pellet Dissection

Using light microscopes at low power students safely use instruments to dissect barn owl pellets to help illustrate the relationship between predators and prey. The adaptations which enable barn owls to capture prey are also highlighted.

*Natural Selection in *Cepaea nemoralis**

Students explore the allele's effects on shell phenotype in this species which wears its genes on its banded back. Woodland and grassland habitats are sampled to investigate whether selection is at work.





Syllabus Links covered by the Cranedale Centre OCR 2016

The following document provides the syllabus links which the Cranedale Centre will cover for each fieldwork topic.

Biodiversity in Freshwater

Topic 4 (1) Biotic and abiotic factors interact in an ecosystem and have an effect on communities

Topic 4 (1) Living organisms are interdependent and show adaptations to their environment

Topic 4 (1f) Explain how abiotic and biotic factors can affect communities

Topic 6 (1a) Explain how to carry out a field investigation into the distribution and abundance of organisms in a habitat and how to determine their numbers in a given area

Topic 6 (1b) Describe both positive and negative human interactions within ecosystems and explain their impact on biodiversity

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Biomass in Marine Ecosystems

Topic 4 (1i) describe pyramids of biomass and explain, with examples, how biomass is lost between the different trophic levels

Topic 4 (1i) Production of ecological pyramids

Biomass in Food Production

Topic 4 (1i) describe pyramids of biomass and explain, with examples, how biomass is lost between the different trophic levels

Topic 4 (1j) Calculate the efficiency of biomass transfers between trophic levels and explain how this affects the number of trophic levels in a food chain

Topic 4 (1i) Production of ecological pyramids

Topic 4 (1j) Calculation of the biomass transfers using real data

Topic 5 (1ii) Understand and use the concept of probability in predicting the outcome of genetic crosses



Topic 5 (1a) Explain the following terms: gamete, chromosome, gene, allele/variant, dominant, recessive, homozygous, heterozygous, genotype and phenotype

Topic 5 (1i) Explain single gene inheritance

Topic 5 (1j) Predict the results of single gene crosses

Biodiversity and Ecosystem Change

Topic 4 (1c) Explain the importance of the carbon cycle to living organisms

Topic 6 (1b) Describe both positive and negative human interactions within ecosystems and explain their impact on biodiversity

Topic 6 (1c) Explain some of the benefits and challenges of maintaining local and global biodiversity

Population Studies

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