



Cranedale Centre
Supporting the Edexcel A Biology Syllabus 2015



Our objective is to make our A Level 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 2015 Edexcel 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 AS/A Level, topic 4 *Biodiversity and Natural Resources* has highly relevant content covered in Cranedale field studies.

Equally at A Level, topic 5 *On the Wild Side* has numerous aspects that we are able to cover through our fieldwork investigations.

In a full field trip, teachers have the option of also undertaking 5 out of the 18 required core practicals whilst at the Centre.

Furthermore, we hope that by the end of the fieldtrip, students will have come across 8 of the 12 apparatus and techniques skills and are able to show progression in the mastery of the practical competencies outlined in the Common Practical Assessment Criteria (CPAC).

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!



Overview

Our fieldwork topics are tailored to coach students through much of the content of AS/A Level Topic 4 and A Level Topic 5 examined in Papers 1, 2 and 3. 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, statistical calculations 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 Endorsement

As part of a wider field course at the Centre, students could complete practical fieldwork fulfilling the competencies of the Common Practical Assessment Criteria (CPAC). We also can provide opportunities for students to gather data from a range of environments for the additional Level 3 Extended Research Project qualification.

Practical Skills (PS)

We endeavour to foster the practical skills necessary for students so that they are able to demonstrate their competency in all aspects of scientific enquiry; encouraging them to apply themselves and their understanding of scientific ideas to fieldwork. These skills would include, a critical appreciation of methods, application of skills, the processing and interpretation of results, evaluating their studies and considerations towards margins of error, precision and accuracy. We also aim to widen perspectives, broaden the skills and deepen the knowledge required by the A Level whilst hopefully inspiring students about Biology and future career possibilities.

Core Practical Activities

Out of the 18 'Core Practicals' each student must accomplish for A Level, Practicals 4, 10, 12, 13 & 18 will be able to be completed as part of a wider field course at the Centre if required.

Practical 4: Investigate the effect of enzyme and substrate concentrations on the initial rates of reactions

Practical 10: Be able to carry out a study on the ecology of a habitat (for example using quadrats, transects or kick sampling where appropriate). Measuring abiotic factors appropriate to the habitat, understanding patterns in the abundance and distribution of organisms found.

Practical 12: Investigate the effect of temperature on the rate of an enzyme-catalysed reaction

Practical 13: Investigate the effects of temperature on the development of organisms

Practical 18: Investigate habituation to a stimulus



Apparatus and Techniques (AT)

Depending upon time and topics chosen, courses at the Cranedale Centre will provide opportunities for students to develop many of the skills associated with apparatus and technique; required by all A-level Biology specifications. Of the skills required by Edexcel (Appendix 5c) the following 8 skills will be encountered during a field course:-

- 1) use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH)
- 2) use appropriate instrumentation to record quantitative measurements, such as a colorimeter or photometer
- 4) use of a light microscope at high power and low power, including use of a graticule
- 5) produce a scientific drawing from observation with annotations
- 8) safely and ethically use organisms to measure: plant or animal responses, physiological functions
- 10) safely use instruments for dissection of an animal organ, plant organ
- 11) use sampling techniques in fieldwork
- 12) use ICT such as computer modelling, or data logger to collect data, or use software to process data

Mathematical Requirements (MS)

At least 10% of the marks assessing either AS or A-level Biology will assess mathematical skills. Depending on the time and topics chosen, a Cranedale fieldtrip offers practical experience of the following mathematical skills at AS and A-level:

- A 0.1 Recognise and make use of appropriate units in calculations
- A 0.3 Use of ratios and calculations of percentages
- A 0.4 Estimate results
- A 1.1 Use appropriate number of significant figures
- A 1.10 Standard deviation & standard error
- A 1.11 Calculating percentage error
- A 1.2 & 1.6 Mean, median and mode
- A 1.3 & MS 1.7 Constructing and interpretation of graphs, scattergraphs, bar charts, histograms
- A 1.4 Understand the principles of sampling as applied to scientific data
- A 1.4 Use words probability and chance
- A 1.9 Selecting and using a statistical test (including Chi², SRCC & T-test)
- A 2.2 Change the subject of an equation (including $NPP = GPP - R$)
- A 2.3 & 2.4 Substitute numerical values into algebraic equations (including Simpsons Index)
- A 4.1 Calculate the circumferences, surface areas and volumes of regular shapes



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

Syllabus Links Common to Most Fieldwork Days

Topic 4 (4.1 i) Understanding the terms 'biodiversity' and 'endemism'

Topic 4 (4.1 ii) Simpsons Biodiversity Index

Topic 4 (4.2) Understand the concept of niche and discuss examples of adaptation of organisms to their environment (behavioural, physiological, anatomical).

Topic 5 (5.1) Understand the concepts of ecosystems, communities, populations and habitats.

Topic 5 (5.2) Understand that the numbers and distribution of organisms in a habitat are controlled by biotic and abiotic factors.

Topic 5 (5.3) Understand how the concept of niche accounts for the distribution and abundance of organisms in a habitat.

Topic 4 and 5 (A.1.5) Understand the principles of sampling as applied to scientific data

Rocky Shore Ecology

Topic 4 (4.5 i) Understanding classification as a means of organising the variety of life.

Topic 4 (4.5 ii) Understand the process and importance of critical evaluation of new data by the scientific community, which leads to new taxonomic groupings (including the three domains of life based on molecular phylogeny).

Topic 5 (5.2) Understand that the numbers and distribution of organisms in a habitat are controlled by biotic and abiotic factors.

Marine Energetics

Topic 4 (4.1 i) Understand the terms: 'biodiversity' and 'endemism'

Topic 4 (4.1 ii) Know that biodiversity can be measured within a habitat using species richness using Simpson's Biodiversity Index

Topic 5 (5.10 i) Know how to calculate net primary productivity

Topic 5 (5.10 ii) Understand the relationship between gross primary productivity, net primary productivity and plant respiration.

Topic 5 (5.11) Know how to calculate the efficiency of energy transfers between trophic levels.

Freshwater Energetics

Topic 4 (4.1 i) Understand the terms: 'biodiversity' and 'endemism'

Topic 4 (4.1 ii) Know that biodiversity can be measured within a habitat using species richness using Simpson's Biodiversity Index

Topic 5 (5.10 i) Know how to calculate net primary productivity

Topic 5 (5.10 ii) Understand the relationship between gross primary productivity, net primary productivity and plant respiration.

Topic 5 (5.11) Know how to calculate the efficiency of energy transfers between trophic levels.



Biodiversity in Freshwater

Topic 4 (4.1 i) Understanding the terms 'biodiversity' and 'endemism'

Topic 4 (4.1 ii) Simpsons Biodiversity Index

Topic 5 (5.1) Understand the concepts of ecosystems, communities, populations and habitats.

Topic 5 (5.2) Understand that the numbers and distribution of organisms in a habitat are controlled by biotic and abiotic factors.

Topic 5 (5.3) Understand how the concept of niche accounts for the distribution and abundance of organisms in a habitat.

Freshwater Pollution

Topic 4 (4.1 i) Understand the terms: 'biodiversity' and 'endemism'

Topic 4 (4.1 ii) Know that biodiversity can be measured within a habitat using species richness using Simpson's Biodiversity Index

Topic 4 (4.2) Understand the concept of niche and discuss examples of adaptations

Topic 4 (4.10) Understand the importance of water and inorganic ions (nitrate, calcium and magnesium ions) to plants.

Topic 5 (CP 10) Kick sampling, quadrats, measuring abiotic factors of a habitat

Agricultural Energetics

Topic 2 (2.13 i) Know the meaning of the terms: gene, allele, genotype, phenotype, recessive, dominant, incomplete dominance, homozygote and heterozygote.

Topic 2 (2.13 ii) Understand patterns of inheritance, including the interpretation of genetic pedigree diagrams, in the context of monohybrid inheritance.

Topic 5 (5.10 i) Know how to calculate net primary productivity

Topic 5 (5.10 ii) Understand the relationship between gross primary productivity, net primary productivity and plant respiration.

Topic 5 (5.11) Know how to calculate the efficiency of energy transfers between trophic levels.

Topic 5 (5.16) Understand the effect of temperature on the rate of enzyme activity and its impact on plants, animals and microorganisms.

Sustainable Woodland Ecosystems

Topic 4 (4.1 i) Understand the terms 'biodiversity' and 'endemism'

Topic 4 (4.11) Understand how the uses of plant fibres and starch may contribute to sustainability

Topic 5 (5.12) Understand the different types of evidence for climate change and its causes, recognising correlations and causal relationships.

Topic 5 (5.13) Understand the causes of anthropogenic climate change – including the role of greenhouse gases CO₂ and CH₄

Topic 5 (5.14) Understand that data can be extrapolated to make predictions and that these are used in models of future climate change, limitations of models.

Topic 5 (5.15) Understand the effects of climate change on plants and animals

Topic 5 (5.15) Understand the effect of temperature on the rate of enzyme activity and its impact on plants, animals and microorganisms

Topic 5 (5.21) Understand the carbon cycle

Topic 5 (5.22) Understand how reforestation and the use of sustainable resources including biofuels are examples of effective management of the conflict between human needs and conservation.



Chalkland Succession

Topic 4 (4.1 i) Understanding the terms 'biodiversity' and 'endemism'

Topic 4 (4.1 ii) Simpsons Biodiversity Index

Topic 5 (5.1) Understand the concepts of ecosystems, communities, populations and habitats.

Topic 5 (5.2) Understand that the numbers and distribution of organisms in a habitat are controlled by biotic and abiotic factors.

Topic 5 (5.3) Understand how the concept of niche accounts for the distribution and abundance of organisms in a habitat.

Topic 5 (5.4) Understand the concept of succession to a climax community.

Sand Dune Succession

Topic 4 (4.1 i) Understanding the terms 'biodiversity' and 'endemism'

Topic 4 (4.1 ii) Simpsons Biodiversity Index

Topic 5 (5.1) Understand the concepts of ecosystems, communities, populations and habitats.

Topic 5 (5.2) Understand that the numbers and distribution of organisms in a habitat are controlled by biotic and abiotic factors.

Topic 5 (5.3) Understand how the concept of niche accounts for the distribution and abundance of organisms in a habitat.

Topic 5 (5.4) Understand the concept of succession to a climax community.

Wetland Succession

Topic 4 (4.1 i) Understanding the terms 'biodiversity' and 'endemism'

Topic 4 (4.1 ii) Simpsons Biodiversity Index

Topic 5 (5.1) Understand the concepts of ecosystems, communities, populations and habitats.

Topic 5 (5.2) Understand that the numbers and distribution of organisms in a habitat are controlled by biotic and abiotic factors.

Topic 5 (5.3) Understand how the concept of niche accounts for the distribution and abundance of organisms in a habitat.

Topic 5 (5.4) Understand the concept of succession to a climax community.

Population Studies

Topic 2 (2.13 i) Know the meaning of the terms: gene, allele, genotype, phenotype, recessive, dominant, incomplete dominance, homozygote and heterozygote.

Topic 4 (4.3) Understand how natural selection can lead to adaptation and evolution.

Topic 4 (4.4 i) Understand how the Hardy-Weinberg equation can be used to see whether a change in allele frequency is occurring in a population over time.

Topic 4 (4.4 ii) Understand that reproductive isolation can lead to accumulation of different genetic information in populations potentially leading to the formation of new species.

Topic 5 (5.17) Understand how evolution (a change in allele frequency) can come about through gene mutation and natural selection.