



Cranedale Centre
Supporting the 2015 AQA Biology Syllabus



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 AQA 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 *Genetic information, variation and relationships between organisms* has highly relevant content covered in Cranedale field studies.

Equally at A Level, topics 5 *Energy transfers in and between organisms*, 6 *Organisms respond to changes in their internal and external environments* and topic 7 *Genetics, populations, evolution and ecosystems* have numerous aspects that we are able to cover through our fieldwork investigations.

Teachers also have the option of also undertaking 5 out of the 12 compulsory 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 the much of the content of AS/A-level Topic 4 and A-Level Topics 5, 6 & 7 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 Skills (PS)

At least 15% of the overall assessment of AS and A-level Biology will assess knowledge, skills and understanding of Practical Work. We endeavour to foster the practical skills necessary for students to demonstrate their competence in all aspects of scientific enquiry (including the CPAC). 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.

Required Practical Activities

Out of the 12 'Required Practicals' each student must accomplish for AQA A-Level, Practicals 1, 5, 7, 10 and 12 can be completed as part of a field course at the Centre should you want to include them.

Practical 1: 'Investigation into the effect of a named variable on the rate of an enzyme-controlled reaction'.

Practical 5: 'Dissection of animal or plant gas exchange or mass transport system or of an organ with such a system'.

Practical 7: 'Use of chromatography to investigate the pigments isolated from leaves of different plants' - at Cranedale this could take the format of collecting different seaweed species from the intertidal zone.

Practical 10: 'Investigation into the effect of an environmental variable on the movement of an animal using either a choice chamber or a maze'.

Practical 12: 'Investigation into the effect of a named environmental factor on the distribution of a given species'.



Use of Apparatus and Techniques Skills (AT)

In addition, courses at the Cranedale Centre provide opportunities for students to develop many of the skills associated with apparatus and techniques now required by all A-level Biology specifications. Of the AT skills required by AQA, the following 8 skills will be encountered during a field course:-

AT a) use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH)

AT b) use appropriate instrumentation to record quantitative measurements, such as a colorimeter or photometer

AT d) use of light microscope at high power and low power, including use of a graticule

AT e) produce scientific drawing from observations and annotations

AT h) safely and ethically use organisms to measure: plant or animal responses, physiological functions

AT j) safely use instruments for dissection of an animal organ, or plant organ

AT k) use sampling techniques in fieldwork

AT l) 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:

MS 0.1 Recognise and make use of appropriate units in calculations

MS 0.3 Use of ratios and calculations of percentages

MS 0.4 Estimate results

MS 1.1 Use appropriate number of significant figures

MS 1.10 Standard deviation & standard error

MS 1.11 Calculating percentage error

MS 1.2 & 1.6 Mean, median and mode

MS 1.3 & MS 1.7 Constructing and interpretation of graphs, scattergraphs, charts, histograms

MS 1.4 Understand the principles of sampling as applied to scientific data

MS 1.4 Use words probability and chance

MS 1.9 Selecting and using a statistical test (including Chi², SRCC & T-test)

MS 2.2 Change the subject of an equation (including $NPP = GPP - R$)

MS 2.3 & 2.4 Substitute numerical values into algebraic equations (including Simpsons Index)

MS 4.1 Calculate the circumferences, surface areas and volumes of regular shapes



Syllabus Links covered by the Cranedale Centre AQA 2015

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

Rocky Shore Ecology

Topic 4 (5): Phylogenetic classification, taxonomy

Topic 4 (5): Adaptation and evolution, natural selection

Topic 4 (7): Random sampling

Topic 7 (4): Species occupy a niche governed by abiotic and biotic factors.

Topic 7 (4): Ecosystems are dynamic systems

Topic 7 (7): Random quadrats, belt transect

Topic 7 (4): Ecosystems, community, populations, habitat, niche, biotic/abiotic factors, competition, predation, % frequency, % cover

Marine Conservation

Topic 4 (6): Biological diversity, species richness, Diversity Index

Topic 7 (4): Management of the conflicts between human needs and conservation in order to maintain the sustainability of natural resources

Topic 7 (4): Evaluate evidence and data concerning issues relating to the conservation of species and consider conflicting evidence

Topic 7 (4): Species occupy a niche governed by abiotic and biotic factors.

Topic 7 (4): Ecosystems, community, populations, habitat, niche, competition, predation

Marine Energetics

Topic 4 (4): Adaptation (anatomical, physiological and behavioural), evolution

Topic 5 (3): Transfer of biomass and stored chemical energy in a community from one organism to another

Topic 7 (4): Ecosystems, community, populations, habitat, niche, biotic/abiotic factors, competition, predation

Biodiversity in Freshwater

Topic 3 (2): Adaptations for gas exchange in insects (trachea, tracheoles and spiracles)

Topic 4 (4): Adaptation (anatomical, physiological and behavioural), evolution

Topic 4 (6): Biological diversity, species richness, Diversity Index

Topic 5 (4): Fertilisers, leaching, eutrophication

Topic 7 (4): Conflict between human needs and conservation

Freshwater Energetics

Topic 4 (6): Biological diversity, species richness, Diversity Index

Topic 4 (4): Adaptation (anatomical, physiological and behavioural), evolution

Topic 5 (4): Fertilisers, leaching, eutrophication

Topic 5 (3): Transfer of biomass and stored chemical energy in a community from one organism to another

Topic 7 (4): Ecosystems, community, populations, habitat, niche, biotic/abiotic factors, competition, predation



Freshwater Pollution

- Topic 3 (2): Adaptations for gas exchange in insects (trachea, tracheoles and spiracles)
- Topic 4 (4): Adaptation (anatomical, physiological and behavioural), evolution
- Topic 4 (6): Biological diversity, species richness, Diversity Index
- Topic 4 (6): Farming techniques reduce biodiversity
- Topic 5 (4): Fertilisers, leaching, eutrophication
- Topic 7 (4): Conflict between human needs and conservation

Impact of Farming

- Topic 4 (6): Farming techniques reduce biodiversity
- Topic 4 (6): The balance between conservation and farming
- Topic 4 (6): Biological Diversity, Species Richness, Diversity Index
- Topic 5 (4): Role of nutrient cycling in ecosystems
- Topic 5 (4): Nitrogen Cycle, Micro-organisms, Saprobionts
- Topic 5 (4): Fertilisers (natural/inorganic), leaching, eutrophication

Agricultural Energetics

- Topic 4 (6): Farming techniques reduce biodiversity
- Topic 4 (6): The balance between conservation and farming
- Topic 5 (1): Evaluate data from agricultural practices used to overcome limiting factors
- Topic 5 (3): Productivity, $GPP = NPP - R \text{ \& } N = I - (F + R)$
- Topic 5 (3): Productivity is affected by farming practices, manipulation of energy efficiencies, reducing respiratory losses, biomass
- Topic 7 (1): Genotypes, phenotypes, alleles, dominant, recessive, heterozygous, homozygous, mono/dihybrid crosses, sex linkage
- Topic 7 (4): Conflict between human needs and conservation
- Topic 7 (4): Sustainability

Sustainable Woodland Ecosystems

- Topic 5 (3): Biomass can be measured in terms of mass of carbon or dry mass of tissue per unit area per given time
- Topic 7 (4): Management of the conflicts between human needs and conservation in order to maintain the sustainability of natural resources
- Topic 7 (4): Species occupy a niche governed by abiotic and biotic factors
- Topic 7 (4): Evaluate evidence and data concerning issues relating to the conservation of species and consider conflicting evidence
- Topic 4 (7): Random sampling
- Topic 7 (4): Ecosystems, community, populations, habitat, niche, biotic/abiotic factors, competition, predation, % frequency, % cover



Chalkland Succession

Topic 3 (2): Adaptations to limit water loss in xerophytic plants

Topic 4 (7): Random sampling

Topic 7 (4): Ecosystems, community, populations, habitat, niche, biotic/abiotic factors, competition, predation, % frequency, % cover

Topic 7 (4): Succession, primary succession, pioneer species, climax community

Topic 7 (4): Conservation of habitats frequently involves management of succession

Sand Dune Succession

Topic 3 (2): Adaptations to limit water loss in xerophytic plants

Topic 7 (7): Belt transects

Topic 7 (4): Ecosystems, community, populations, habitat, niche, biotic/abiotic factors, competition, predation, % frequency, % cover

Topic 7 (4): Succession, primary succession, pioneer species, climax community

Wetland Succession

Topic 4 (7): Random sampling

Topic 7 (4): Ecosystems, community, populations, habitat, niche, biotic/abiotic factors, competition, predation, % frequency, % cover

Topic 7 (4): Succession, primary succession, pioneer species, climax community

Topic 7 (4): Conservation of habitats frequently involves management of succession

Moorland Succession

Topic 5 (3): Biomass can be measured in terms of mass of carbon or dry mass of tissue per unit area per given time

Topic 7 (4): Management of the conflicts between human needs and conservation in order to maintain the sustainability of natural resources

Topic 7 (4): Species occupy a niche governed by abiotic and biotic factors

Topic 7 (4): Evaluate evidence and data concerning issues relating to the conservation of species and consider conflicting evidence

Topic 4 (7): Random sampling

Topic 7 (4): Ecosystems, community, populations, habitat, niche, biotic/abiotic factors, competition, predation, % frequency

Topic 7 (4): Conservation of habitats frequently involves management of succession

Population Studies

Topic 4 (4): Genetic diversity and principles of natural selection

Topic 7 (4): Isolation of populations, natural selection, variation, carrying capacity, inter/intra-specific competition, predation

Topic 7 (1): Genotype, phenotype, alleles, dominant, recessive, codominant

Topic 7 (2): Calculating gene frequencies using Hardy-Weinberg concepts of gene pools and allele frequency

Topic 7 (3): Populations, population size of motile organisms, Mark Release Recapture and its assumptions, competition, predation