

GCSE

Edexcel GCSE in Additional Science Interdependence (Concept approach)

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Support material

Edexcel GCSE in Additional Science
Interdependence
(Concept approach)

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Topic 4: Interdependence

Introduction

- 1 This booklet contains a concept-driven scheme of work and some suggested activities for the Edexcel GCSE in Additional Science Unit B2 Topic 4: Interdependence.
- 2 Two schemes of work are available for each topic in separate booklets. One of these booklets contains a scheme of work that is concept-driven ie scientific ideas are presented before their applications are explored. The other booklet contains a scheme of work that is context-driven ie applications of science are presented before the scientific principles used in these applications are explored.
- 3 Booklets for each GCSE in Additional Science topic are provided free of charge to centres who are offering the Edexcel GCSE suite of Science qualifications via the secure area of the Edexcel website (www.edexcel.org.uk).
- 4 Although Edexcel owns the copyright for the booklets, they are provided in Word format so that Edexcel centres may customise the schemes if required.
- 5 Each lesson is designed to last for 50 minutes although the total teaching time is not stated in the specification; teachers may adjust the schemes of work to accommodate the time available in individual centres.
- 6 Centres are responsible for the overall risk assessment of experimental work undertaken by students.
- 7 Attention is drawn to the need for safe practice when students carry out laboratory experiments or observe demonstrations. Particular attention is drawn to the possible hazards associated with electrical equipment, the handling of micro-organisms and ionising radiation. Strict aseptic conditions should be used when undertaking practical work. Reference must be made to COSHH regulations and any specific local education authority restrictions.

Relevant advice can be obtained from the following publications.

- *CLEAPSS Laboratory Handbook* (available from CLEAPSS School Science Service, website www.cleapss.org.uk)
- *Control of Substances Hazardous to Health Regulations* (HSE, 2005) ISBN 0717629813
- *Hazcards* (2004 update available from CLEAPSS School Science Service)
- *Topics in Safety, Third Edition* (ASE January, 2001) ISBN 0863573169

Scheme of work for Topic 4: Interdependence

LESSON 1: Principles of interdependence							
Spec. code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B2 4.1	8D Ecological relationships. 7C Environment and feeding relationships.	Understand and apply the principles of interdependence, competition and predation. Define population, community, habitat and environment.	Explain the terms population, community, habitat and environment. Extend this to adaptation. You could use a woodland, or the sea or even a fish tank. Revise food chains and food webs. Extend this to predator-prey relationships. Introduce the idea of competition for limited resources (food, space, water and mates). Explain intra- and inter-competition.	Longman's GCSE Biology. Use real environments — video if no suitable environments to access. Computer simulations CD ROM: Multimedia Science School — Food web. Activity sheet 4.1: Competition for resources.	Explore the principles of interdependence, adaptation, competition and predation.		
Homework: Complete activity sheet 4.1.							

Scheme of work for Topic 4: Interdependence

LESSON 2: Impact of human activity on the environment — air pollutants 1							
Spec. code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B2 4.2 B2 4.3	9G Environmental chemistry.	<p>Know some of the reasons why humans make demands on the environment.</p> <p>Understand how carbon dioxide, sulphur dioxide and carbon monoxide can adversely affect the environment.</p>	<p>Students should consider why humans make increasing demands on the environment.</p> <p>Students may be familiar with global warming from Topic 3 — this should be revised and extended. The greenhouse effect should be explained. Temperatures could be compared inside and outside a greenhouse.</p> <p>Explain the formation of acid rain from SO₂ and the problems it can cause. Students could test the effect of dilute acid on sandstone.</p> <p>Outline the problems of exhaust fumes, including the dangers of carbon monoxide.</p> <p>Students could work in groups and present findings of their research to the rest of the class. Effects of different economical and industrial conditions should be considered.</p>	<p>Longman's GCSE Biology.</p> <p>www.e4s.org.uk</p> <p>Greenhouse, if available.</p> <p>www.cln.org</p> <p>Pictures of the effects of acid rain on stonework.</p> <p>Examples could be industrial 'accidents' in locality; the peppered moth story; Chernobyl.</p>	<p>Use primary and secondary data to consider how human activity, including differing economical and industrial conditions can affect the environment and cause changes in sizes of population.</p> <p>Investigate, using primary and secondary data the impact of human activity on the environment.</p>	<p>C: 2.1</p> <p>ICT: 2.1 2.3</p> <p>WO: 2.1 2.2</p>	<p>Care should be taken when using dilute acid, not to let it make contact with skin or clothes.</p>
Homework: Finish preparing presentation.							

Scheme of work for Topic 4: Interdependence

LESSON 3: Impact of human activity on the environment — air pollutants 2							
Spec. code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B2 4.3 B2 4.2	9G Environmental chemistry.	<p>Know some of the reasons why humans make demands on the environment.</p> <p>Understand how carbon dioxide, sulphur dioxide and carbon monoxide can adversely affect the environment.</p> <p>Understand how different economical and industrial conditions can affect the environment and cause changes in sizes of population.</p>	<p>Students should present their research findings to the rest of the group. This could be used as a teaching exercise to correct and reinforce the main points about air pollution. Students could be invited to contribute to the evaluation process.</p> <p>Students could work in groups and present findings of their research to the rest of the class. Effects of different economical and industrial conditions should be considered.</p>	<p>Whiteboard.</p> <p>Presentation package.</p> <p>LCD projector.</p>	<p>Investigate, using primary and secondary data the impact of human activity on the environment.</p> <p>Use primary and secondary data to consider how human activity, including differing economical and industrial conditions, can affect the environment and cause changes in sizes of population.</p>	<p>C: 2.1</p> <p>ICT: 2.1 2.3</p> <p>WO: 2.1 2.2</p>	
Homework: Write a summary of the key air pollutants, where they come from and the effects that each has on the environment.							

Scheme of work for Topic 4: Interdependence

LESSON 4: Impact of human activity on the environment — water pollution 1							
Spec. code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B2 4.3 B2 4.2	9G Environmental chemistry.	<p>Know the impact of human activity on the environment — water pollution.</p> <p>Know how human activity, including differing economical and industrial conditions, can affect the environment and cause changes in sizes of population.</p>	<p>Students may have some knowledge of eutrophication from Topic 3.</p> <p>Explain why raw sewage needs to be treated.</p> <p>Discuss why this sometimes does not happen and raw sewage gets discharged into rivers and the sea.</p> <p>Discuss the need for fertilisers — the role of nitrates and phosphates in plants.</p> <p>Students could test samples of water from ponds for nitrates and phosphates.</p> <p>Explain the problems caused by fertilisers getting into rivers — eutrophication story.</p> <p>Students could work in groups to investigate environmental accidents. They could present findings of their research to the rest of the class. Effects of different economical and industrial conditions should be considered.</p>	<p>Visit to local sewage works.</p> <p>Visit from local farmer.</p> <p>Nitrate and phosphate testing kits.</p> <p>Internet: Google advanced search on ‘environment accidents’ with the words water and nitrates, pollution by sewage, lead.</p> <p>Pollution on large rivers such as the Rhine.</p>	<p>Investigate, using primary and secondary data the impact of human activity on the environment.</p> <p>Use primary and secondary data to consider how human activity, including differing economical and industrial conditions, can affect the environment and cause changes in sizes of population.</p>	<p>C: 2.1</p> <p>ICT: 2.1 2.3</p> <p>WO: 2.1 2.2</p>	
Homework: Finish preparing presentation.							

Scheme of work for Topic 4: Interdependence

LESSON 5: Impact of human activity on the environment — water pollution 2							
Spec. code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B2 4.3 B2 4.2	9G Environmental chemistry.	<p>Know the impact of human activity on the environment — water pollution.</p> <p>Know how different economical and industrial conditions can affect the environment and cause changes in sizes of population.</p> <p>Understand how sewage, nitrates and phosphates can adversely affect the aquatic environment.</p>	<p>Students should present their research findings to the rest of the group. This could be used as a teaching exercise to correct and reinforce the main points about water pollution. The students could be invited to contribute to the evaluation process.</p> <p>Students could work in groups to investigate ‘environmental accidents’. They could present findings of their research to the rest of the class. Effects of different economical and industrial conditions should be considered.</p> <p>Students could summarise the effects of pollution using diagrams and flow charts.</p> <p>Students could do a case study of the River Thames.</p> <p>Students could look at areas where water is scarce or investigate the world of ‘Dune’.</p>	<p>Whiteboard.</p> <p>Presentation package.</p> <p>LCD projector.</p>	<p>Investigate, using primary and secondary data the impact of human activity on the environment.</p> <p>Use primary and secondary data to consider how human activity, including differing economical and industrial conditions, can affect the environment and cause changes in sizes of population.</p>	<p>C: 2.1</p> <p>ICT: 2.1 2.3</p> <p>WO: 2.1 2.2</p>	
Homework: Design a poster to tell the ‘eutrophication story’.							

Scheme of work for Topic 4: Interdependence

LESSON 6: Why protect natural populations?							
Spec. code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B2 4.5	B1a in GCSE Science.	The importance of protecting natural populations.	<p>Ask students to think about why dinosaurs became extinct.</p> <p>Introduce students to current endangered species, such as the whale, red squirrel, etc.</p> <p>Students could research why these species have become endangered and what is being done about it. They could also find out why it is important to protect such species.</p> <p>Students could produce a booklet, working in groups, or give a presentation. They could also have debates about the use of money to save endangered species.</p>	<p>Posters of dinosaurs.</p> <p>Internet.</p> <p>Film: Jurassic Park.</p> <p>www.worldwildlife.org</p> <p>www.endangeredspecies.org</p> <p>www.stopextinction.org</p>	Explain the importance of protecting natural populations.	<p>C: 2.1</p> <p>ICT: 2.1 2.3</p> <p>WO: 2.1 2.2</p>	
Homework: Finish preparing booklet or presentation.							

Scheme of work for Topic 4: Interdependence

LESSON 7: Extreme environments							
Spec. code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B2 4.6	7C Environment and feeding relationships. 8D Ecological relationships.	Understand the nature of some extreme environments. Know how certain species have adapted to be able to live there.	<p>Introduce the students to extreme environments:</p> <ul style="list-style-type: none"> • the Antarctic • high altitudes • deep-sea volcanic vents. <p>Ask students to make a list of the problems species living there might encounter.</p> <p>Find out the names of some of the species living in each environment.</p> <p>Describe how these species have adapted to live there.</p> <p>Students could be asked to research one or two species or a particular environment.</p> <p>Students could use a variety of methods to present their data to the rest of the class. The results of their individual findings could make good classroom displays.</p>	<p>Internet: eg</p> <p>www.antarctica.ac.uk</p> <p>www.bio.davidson.edu</p> <p>www.thedeep.co.uk</p> <p>www.ourplanet.com</p>	Describe the special nature of some extreme environments, notably deep-sea volcanic vents, the Antarctica and high altitudes.	<p>C: 2.1</p> <p>ICT: 2.1 2.3</p> <p>WO: 2.1 2.2</p>	
Homework: Finish preparation of presentations.							

Scheme of work for Topic 4: Interdependence

LESSON 8: Pollution indicators							
Spec. code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B2 4.7 B2 4.4		Be able to interpret data from living and non-living indicators to assess the effects of human activity.	<p>Discuss with students possible indicators of air pollution, eg temperature, carbon dioxide levels, particulates such as soot, ozone depletion, incidence of skin cancer, lichen distribution.</p> <p>Students could carry out a practical investigation into the amount of lichen present in the vicinity of a factory (this is best done in a rural area).</p> <p>Students could measure the oxygen content of streams and ponds to assess BOD levels.</p> <p>Students could search for data showing effects of pollution.</p> <p>Students could write summaries of some of the above material they find, interpreting changes in the environment.</p>	<p>Longman's GCSE Biology.</p> <p>Internet.</p> <p>Ruler to measure the amount of lichen on trees and walls.</p> <p>Map of area to measure distance of sample areas from factory.</p> <p>Data logger with oxygen probe.</p> <p>Activity sheet 4.8: Interpreting data on environmental changes.</p>	<p>Interpret data to show the impact of human activity on the environment to include:</p> <ul style="list-style-type: none"> • living indicators • non-living indicators. <p>Interpret data on environmental change.</p>	<p>C: 2.2</p> <p>N: 2.1 2.3</p> <p>WO: 2.1 2.2</p>	
Homework: Complete activity sheet 4.4.							

Scheme of work for Topic 4: Interdependence

LESSON 9: Recycling — why do we do it and is it worthwhile?							
Spec. code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B2 4.8		<p>Have an awareness of the principles of recycling.</p> <p>Know what materials are recycled in their local environment.</p> <p>Have an awareness of how waste is disposed of in their area.</p> <p>Be able to put forward reasoned arguments concerning the effectiveness of recycling.</p>	<p>Link to work on the principles of cycles.</p> <p>Discuss with students what they know of recycling — paper, plastics and metals.</p> <p>Students could undertake an investigation into materials recycled in their school/home.</p> <p>They could suggest ways that recycling could be improved.</p> <p>Students could carry out research to find out what the recycling policy is in their area and how effective it is.</p> <p>They could also find out how waste material is disposed of.</p> <p>Following their research, students could present their findings to the rest of the class, arguing whether it reduces demand for resources and reduces the problem of waste disposal.</p>	<p>Longman's GCSE Biology.</p> <p>Local council recycling facilities.</p> <p>Internet.</p> <p>Students could consider the cost of recycling.</p>	<p>Explore whether recycling reduces demand for resources and reduces the problem of waste disposal.</p>	<p>C: 2.1 2.2</p> <p>ICT: 2.1</p> <p>N: 2.1 2.2 2.3</p> <p>PS: 2.1 2.2</p>	
<p>Homework: Prepare a report to the school management outlining their findings about recycling in school and how it might be improved.</p>							

Scheme of work for Topic 4: Interdependence

LESSON 10: Conservation management							
Spec. code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B2 4.9		<p>Understand the meaning of the term conservation and why it is desirable.</p> <p>Be able to describe some conservation techniques, eg reforestation, coppicing, replanting.</p> <p>Be able to contribute to a discussion about conservation leading to greater biodiversity.</p> <p>Understand the meaning of biodiversity.</p>	<p>Explain to students what conservation means — the idea of managing the ecosystem.</p> <p>Students could check their understanding of the problems of deforestation.</p> <p>They could carry out research into reforestation projects.</p> <p>Explain that there are techniques for managing woodland, eg coppicing and replacement planting.</p> <p>Introduce students to the term biodiversity.</p> <p>Students could find out about areas where biodiversity has increased through land management.</p> <p>They should work in groups to summarise their findings.</p>	<p>Longman's GCSE Biology.</p> <p>Internet, eg</p> <p>www.coppice.org.uk</p> <p>www.coppicing.com</p> <p>www.darwin.gov.uk</p> <p>www.eco-index.org</p> <p>http://nature.org</p> <p>www.sustainableharvest.org</p>	<p>Consider conservation management techniques, including reforestation, coppicing, replacement planting and discuss how conservation can lead to greater biodiversity.</p>	<p>C: 2.1 2.2</p> <p>ICT: 2.1 2.2</p>	
Homework: Finish summarising their findings of research/revise unit in preparation for examination.							

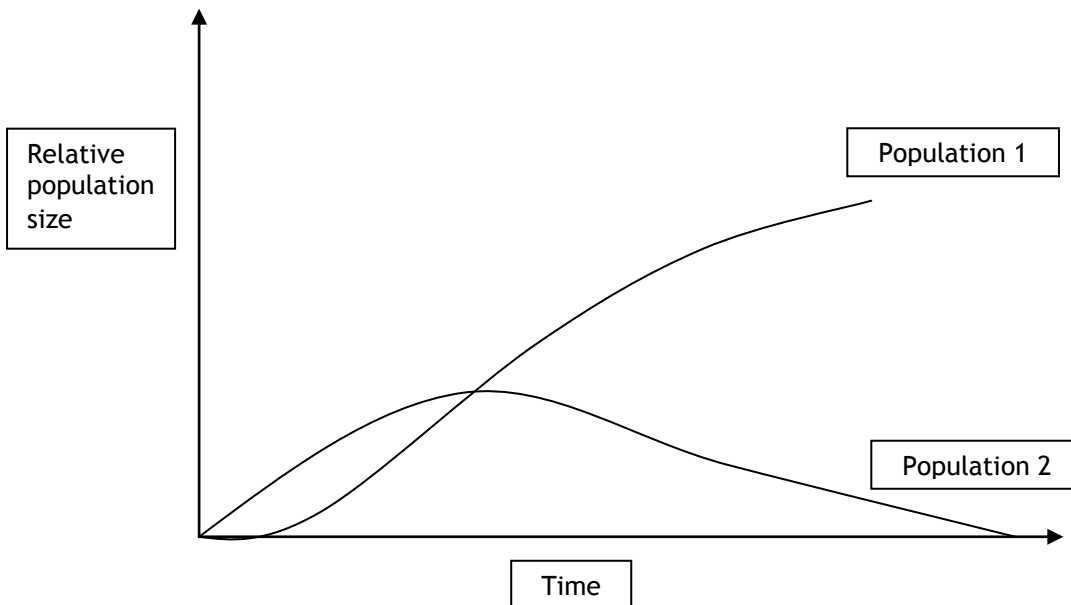
Activity 4.1: Competition for resources

What you will learn from this activity

In this activity you will learn about different types of competition.

What you do

This graph shows how the populations of two species have changed over five years.



(a) What is the name given to competition between species?

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(b) Describe the shape of the curve for population 1.

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(c) Describe the shape of the curve for population 2.

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(d) Both populations are plants. Explain the shape of the curve for population 2.

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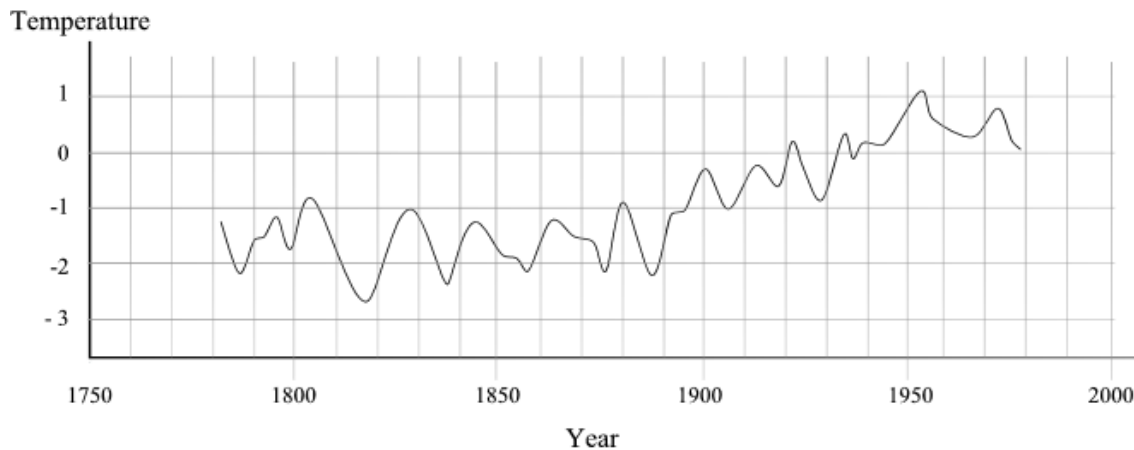
Activity 4.8: Interpreting data about environmental changes

What you will learn from this activity

In this activity you will practise interpreting data about environmental changes.

What you do

The graph shows changes in the annual mean surface temperature of Toronto since 1780. The temperatures are shown as differences from the 1901-1959 mean, which appears as '0' on the vertical axis.



(a) Describe the general shape of the curve.

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(b) Suggest why the curve has peaks and troughs.

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(c) Does the graph provide sufficient evidence for global warming? Explain your answer.

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Activity 4.8: Interpreting data about environmental changes

(d) What information would be needed to identify the possible cause of the changes in temperature?

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