NEED to KNOW

Quick and easy revision

Key content at your fingertips

HIGHER BIOLOGY

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HODDER GIBSON
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Contents

Getting the most from this book

This *Need to Know* guide is designed to help you throughout your Higher Biology, as a course companion to your learning but also as a revision aid, to be used in preparation for course assessments and for your final examination.

The following features in each Key Area will help you get the most from this book.

You need to know

Each Key Area begins with a list of the learning outcomes adapted from the SQA course specification for Higher Biology. These summarise the general themes of learning within the topic.

The Key Area continues with bullet notes covering the success criteria for each learning outcome. These contain the emboldened vocabulary and phrasing needed to ensure exam success. Some terms are highlighted in green if they are defined as selected key terms.

Key terms

The **selected** key terms are only a small sample of the terms you need to know for your exam. There are many more terms you need to know, which you'll find **emboldened** and defined throughout bullet points in the book.

Exam tips

Exam tips focus on areas that are tricky and are often asked about in the exam. These may contain a hint, a memory aid or a note of what to watch for.

Synoptic links

These are references to other Key Areas in the book to show where related knowledge for Higher Biology can be found – these are *always* worth checking out.

Do you know?

Questions at the end of each Key Area can be used to test yourself on the main knowledge needed. These are in the form of extended-response questions worth between 3 and 10 marks each. Give yourself about 2 minutes for each mark, so a 5-mark question should take you about 10 minutes.

Mark your own work here: **hoddereducation.co.uk/needtoknow/answers**

Techniques

These are experimental techniques with which you are expected to be familiar for your exam – we give a brief outline of each technique and its purpose.

Area assessment

A group of ten structured questions worth 50 marks designed to give you examination practice across a whole area of the biology course.

Mark your own work here: **hoddereducation.co.uk/needtoknow/answers**

3.3 Crop protection

You need to know

- that weeds compete with crop plants, while other pests and diseases damage crop plants, all of which reduces productivity
- about the control of weeds, other pests and diseases by cultural methods such as ploughing, weeding and crop rotation
- the advantages of pesticides that are either selective or systemic
- about the control of weeds, other pests and diseases by biological control and integrated pest management

Weeds, pests and diseases

- Weeds compete with crop plants and pests and diseases damage crop plants, thus reducing crop productivity.
- **Annual weeds**, such as the poppy, complete their life cycle in one year. Properties of annual weeds include rapid growth, short life cycle, high seed output and long-term seed viability, as summarised in Figure 3.13.
- **Perennial weeds** such as rye grass and buttercup can persist in the soil over many years. Their properties include competitive adaptations such as storage organs and **vegetative reproduction**, as summarised in Figure 3.14.
- Most of the animal pests of crop plants are invertebrates such as insects, nematode worms and molluscs.
- Plant diseases can be caused by fungi, bacteria or viruses, which are often carried by invertebrates.

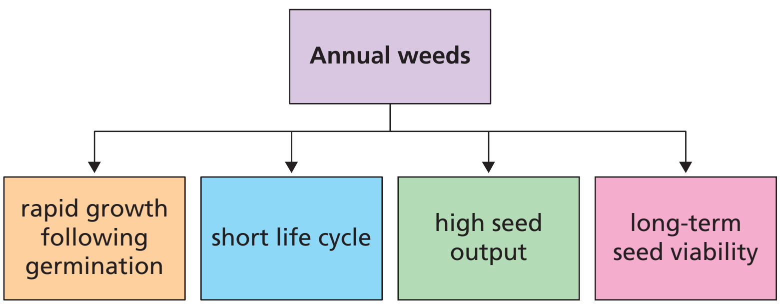


Figure 3.13 Properties of annual weeds

Key terms

Annual weeds Weeds that complete their life cycle in one year, have rapid growth, a short life cycle, high seed output and long-term seed viability.

Perennial weeds Weeds that persist in the environment by continuing to grow year after year. Competitive adaptations include storage organs and vegetative reproduction.

Vegetative reproduction A form of asexual reproduction in plants.

Perennial weeds

storage organs | vegetative reproduction

Figure 3.14 Competitive adaptations of perennial weeds

Chemical and cultural control methods

- Weeds, other pests and diseases can be controlled by **cultural** methods that include traditional behaviours and procedures such as ploughing, weeding and crop rotation.

Table 3.1 Cultural methods to control weeds, pests and diseases

Pesticides	These include herbicides to kill weeds, fungicides to control fungal diseases, insecticides to kill insect pests, molluscicides to kill mollusc pests and nematicides to kill nematode pests.
Selective herbicides	These are absorbed through green leaves and so have a greater effect on certain plant species, killing broad-leaved weeds quickly because large quantities of the chemical enter through their large surface area. Narrow-leaved plants that include cereals and grasses don't take up so much of the herbicide because they have a much smaller surface area.
Systemic herbicides	These spread through the vascular system of plants and prevent regrowth. These types of herbicide kill nearly all plants and so cannot be sprayed over a crop without killing it. They are used to clear extensive areas of weeds before planting a crop in the cleared ground.

- Systemic insecticides, molluscicides and nematicides spread through the vascular system of plants and kill pests feeding on the plants.
- Applications of fungicide based on disease forecasts are more effective than treating diseased crops.

Problems with chemical control

- Widespread and uncontrolled use of pesticides is not sustainable because of side effects including toxicity to non-target species, **persistence** in the environment, **bioaccumulation** or **biomagnification** in food chains and the production of resistant populations of pests.

Exam tip

Make sure you can explain the difference between a selective herbicide and a systemic herbicide.

Key terms

Persistence Substances that are unable to be broken down by enzymes and remain in the environment and in the tissues of living organisms.

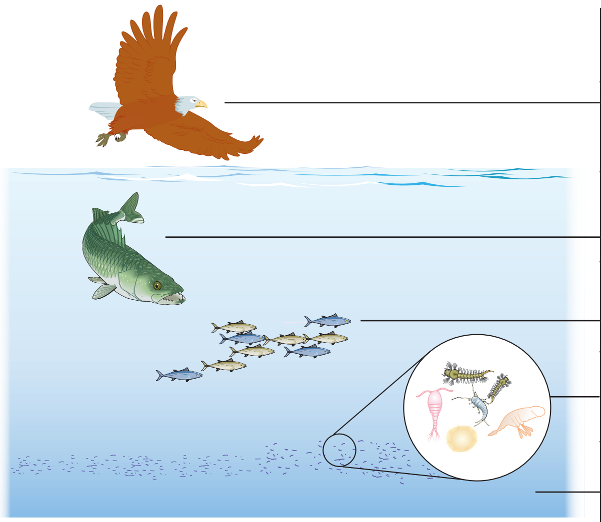
Bioaccumulation The build-up of a chemical within an organism.

Biomagnification An increase in the concentration of a chemical as it moves between trophic levels of a food chain.

Exam tip

In your exam you may be asked to explain the difference between bioaccumulation and biomagnification. Revise their definitions and don't mix them up.

- Bioaccumulation is a build-up of a chemical in an organism.
- Biomagnification is an increase in the concentration of a chemical moving between trophic levels, as shown by the example of the pesticide DDT in Figure 3.15.



DDT concentration (parts per million)
25.0 in fish-eating bird
2.0 in large fish
0.5 in small fish
0.04 in animal plankton
0.000003 in water

Figure 3.15 Biomagnification of DDT between trophic levels in a food chain

Synoptic link

Resistant populations of pests can arise because of resistance mutations being selected in populations exposed to pesticides. You can read more about natural selection in Key Area 1.7 (page 22).

Biological control and integrated pest management

- Weeds and other pests and diseases can also be controlled by using biological control and integrated pest management.
- In biological control, the control agent is a natural predator, parasite or pathogen of the pest.
- **Integrated pest management (IPM)** is a combination of chemical, biological and cultural control.
- A risk associated with **biological control** is that the control organism may become an invasive species and threaten other native species.

Synoptic link

You can read more about introduced and invasive species in Key Area 3.8 (page 84).

Exam tip

Be aware of the risks associated with the biological control of a pest species. Remember that the introduced control organism may become an invasive species and parasitise, prey on, become a pathogen to, out-compete or hybridise with a native species.

Do you know?

1 Give an account of chemical methods used to protect crop plants. (5 marks)

2 Give an account of the biological control of pests. (3 marks)