# Pesticides
# Introduction to Module 3

Many horticultural settings will require their employees to apply pesticides and will encourage them to take Certificates of Competence in the Safe Use of Pesticides. This module looks at some of the skills that learners will need if they are to achieve competence in these certificates and to maintain safe working practices with pesticides. The module has two main aspects:

- reading and understanding information about pesticides
- numeracy skills required for calibrating knapsack sprayers.

The materials in this module are quite complex, which reflects the demands of this area of work. This module will be suitable for learners who have Level 1 (and above) literacy and numeracy skills. Entry 3 learners will require substantial support and practice to complete the module. Trainees or learners who have literacy and numeracy skills below Entry 3 should **not** complete this module and should be receiving additional support in all the underpinning skills.

# Skills checklist

Pesticides are used in many different horticultural settings. They can be very hazardous substances. You must be properly trained and qualified to deal with this on your own, or you must be properly supervised.

You will need good skills in order to use pesticides safely. The following list includes many of the skills you will need if you are doing a pesticide application certificate. Tick all the skills you have already and then look again at the checklist when you have used the materials.

| Skills for using pesticides | Now | Later |
|---|---|---|
| Finding the right product | | |
| Understanding the law relating to pesticides | | |
| Understanding the product labels | | |
| Knowing the calibration process | | |
| Measuring and calculating for calibration | | |
| Keeping records about pesticides | | |

## PAGES 3:1–3:2

# Finding the right product

The *Green Code* is essential reading for all learners taking the compulsory National Training Proficiency Council Pesticide Application (NPTC PA1). It is a critical document, containing complex information. This theme develops some of the reference skills needed to use this document, in order that learners can locate the required information efficiently. The theme looks at the organisational and structural features of the *Green Code*, scanning skills and confirms alphabetic skills.

## Materials

*Green Code* – one copy for each learner

*The UK Pesticide Guide 2004* – one copy for each learner

## Learning outcomes

1 To locate information in the *Green Code* using contents, headings, subheadings, paragraphs and points (focus page, Task 1)
2 To locate information using alphabetical order (focus page, Task 2)

### Introduction

- This is a useful opportunity to introduce the *Green Code* manual and its purpose. What information does it contain? Why is it important? Who is it for? When should it be used? Other documents mentioned are *The UK Pesticide Guide*.
- Ask learners to find a particular section of the *Green Code* (e.g. What causes spray drift?) as quickly as possible.
- How did they find the information? Discuss the strategies used (e.g. contents page, index). What was the most effective way of finding the information?

### Focus page

- Note: page references refer to the November 2002 edition of the *Green Code*.
- To find the section on 'What causes spray drift?' refer to contents; Parts 1, 2, 3; Sections 1–7 in part 3; subsections of section 6; What causes spray drift? (In section 6)
- Turn to the correct page (65). Notice the numbered paragraphs. Notice points a–g. Notice the different coloured sections.
- Draw learners' attention to the glossary of the *Green Code* and ask them to locate it. Explain its use in helping to understand technical language. Relate it to the glossary for this material.
- Repeat the steps above if necessary, using a different example of a paragraph to be located.
- Ask learners to turn to the glossary on pages 88–91 and find a definition of a pesticide.
- Explain how alphabetical order works (first, second, third letter, etc).
- Explain that if further information is required, it might be necessary to refer to the index of other books (e.g. *The UK Pesticide Guide 2004*) where items are arranged in alphabetical order.
- Apply the steps above plus alphabetical order to *The UK Pesticide Guide* to locate information selected by the teacher, for example Admix-P in Section 2 Adjuvants.
- You may also want to refer to the *Orange Code*.

| Curric. refs | NOS | Key Skills |
|---|---|---|
| Rt/L1.4<br>Rw/E3.4<br>Rt/E3.7 | CU78 | C2.2 |

### Task 1

Use the contents of the *Green Code* to scan for information
Rt/L1.4
Rt/E3.7

- Explain that this task requires scanning skills (to locate key words quickly) and an understanding of how the contents of the *Green Code* are structured.
- The organisational headings (Part 4, Section 3, Annex C) are the first things to look for.
- You may then need to help learners decide on the relevant key words (e.g. records, COSHH, equipment, legislation).
- Stress that it is not necessary to know the manual by heart, but it is important to be able to find information quickly.

*If the learner has difficulty*

- Using question-and-answer techniques and extra practice, ensure that the learner understands page and paragraph numbering conventions, the use of font and format to guide the reader to particular information, and terminology such as contents, glossary, paragraph, alphabetical order.
- Learners with dyslexia may need support to understand the organisation of information. It may help to use a flow chart or tree diagram to explain the different layers of information.
- Learners with dyslexia may need support with the tracking skills required for scanning. This can be practised using a highlighter pen to track through a text and highlight a chosen key word in a longer piece of text (e.g. the word 'back' in a manual handling leaflet).

*Extension*

Ask learners to locate information about a particular pest/disease/weed/pesticide using the contents pages from a range of reference materials (e.g. books, the Internet).

### Task 2

Find information in an alphabetical list

Rt/L1.4
Rw/E3.4

- Introduce *The UK Pesticides Guide* (current edition) and explain its purpose, who it is intended for, and when and why it should be used. You may have this as a manual or on CD-ROM.
- This may be a useful opportunity to discuss health and safety issues.
- Look at how the guide is organised, in the manual or on CD-ROM.
- This task could be conducted orally, or with learners in pairs.

*If the learner has difficulty*

- Ensure the learner understands that the left-hand column gives the diseases and the right-hand column the active ingredients or chemicals that can be used to control the disease.
- Dyslexic learners may have problems with the following aspects of this activity: alphabetical order; letter reversal (the letter 'p' may be difficult to interpret visually for some dyslexic learners – may be confused with 'b' or 'd' in lower case or 'R' in upper case); positional vocabulary (words that determine order, such as 'before').
- Work with the learner, ensuring that they understand each question and show the learner how to locate the information (e.g. for question 2, ask the learner which words he or she is looking for in the list – it should be petal blight, in the left-hand list).
- You may need to provide a list of upper- and lower-case letters in alphabetical order for reference.
- Additional practice may be needed in locating particular words/phrases from an alphabetical list relevant to the learner.
- Many words in this list are difficult to understand. The learner does not need to understand all the chemical names but should have at least a working knowledge of most of the disease names. Check this. One strategy may be to develop a set of cards with the disease name on the front and useful information on the back, such as signs and symptoms of the disease (or infestation), photographs and pronunciation guidance.
- Learners may not understand that three treatments are listed for powdery mildew, as there are five words in the chemicals list; the commas show that three of the words are actually one chemical.

*Extension*

Ask learners to find information about a particular pest/disease/weed/pesticide using the indexes or contents pages from a range of reference materials.

## Theme assessment

This set of reference skills is best practised within research tasks for the NVQ evidence gathering and in skills development for other aspects of work (e.g. finding out what chemicals to use in particular circumstances). Learners should log this research, showing the information sought, sources used, location of the information and the information found (e.g. information about how deep you have to bury containers: *Green Code* Part 5: Disposal, section on burial of containers; containers must be buried at least 0.8 m deep).

# Finding the right product

Focus

Finding your way around the *Green Code*, or any reference book, is easier when you know how it is organised.

The **contents** are divided into **parts**.

The parts are divided into **sections**.

The sections are divided into smaller sections or **subsections**.

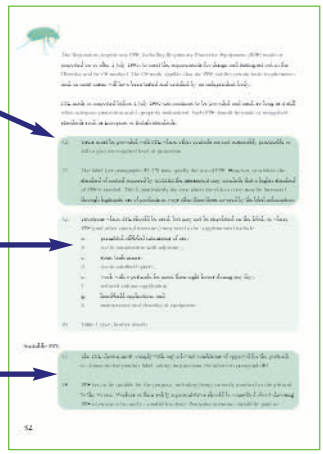
The contents section tells you where to find information you need.


When you are looking for something in the contents of a book, let your eyes wander down the list until you see what you are looking for. This is called **scanning**.

Each part and section has a **page number**.


The book is divided into numbered paragraphs.

Some paragraphs are divided into points labelled a, b, c and so on.



The paragraphs are in coloured boxes depending on whether they:

- have a legal status
- are part of a code of practice
- are general guidance or information.

A **glossary** is an alphabetical list of technical words to do with a particular subject.

296 glyphosate (fruit, horticulture, forestry, amenity etc)
a translocated non-residual phosphonic acid herbicide; see also diuron + glyphosate

**Products**

1. Asteroid
2. Azural
3. Barclay Barbarian
4. Barclay Gallup
5. Barclay Gallup Amenity
6. Barclay Gallup Biograde 360

The index is arranged in alphabetical order.

When you are looking for words in an alphabetical list, you often need to look at the second word.

Sometimes you may need to look even further.

# Finding the right product

Task

## Task 1

Where can this information be found in the *Green Code*?
Write the page number.

Part 4: Keeping records ☐
Section 3: The COSHH assessment ☐
Annex C: Equipment terminology ☐
Legislation governing the disposal of waste pesticides and containers ☐

## Task 2

Use this list to find the answers to the questions.

| Flowers – Bedding plants, general | |
|---|---|
| **Diseases** | **Active ingredient** |
| Alternaria | iprodione (seed treatment) |
| Black root rot | carbendazim (*off label*) |
| Botrytis | thiram |
| Damping off | furalaxyl |
| Petal blight | mancozeb |
| Phytophthora | propamocarb hydrochloride |
| Powdery mildew | bupirimate, copper ammonium carbonate, dinocap |
| Pythium | propamocarb hydrochloride |
| Rust | azoxystrobin (*off label – in pots*), mancozeb, oxycarboxin, propiconazole (*off label*), thiram |
| Soil-borne diseases | metam-sodium |

**1** How many diseases on the list begin with the letter p? _____

**2** What is recommended to treat petal blight? _____

**3** Is mancozeb recommended to treat rust? _____

**4** Is botrytis mentioned before black root rot? _____

**5** How many treatments are recommended for powdery mildew? _____

**6** Is thiram a recommended treatment for alternaria? _____



Find information in reference books using the contents and index.

Rt/L1.4; Rt/E3.7, Rw/E3.4

## PAGES 3:3–3:5

# Understanding the law

A lot of complex text must be read and understood to achieve the Certificates of Competence in the Safe Use of Pesticides (Modules PA1 and PA6). A range of reading techniques can help understanding of difficult texts. These include scanning to locate information, using headings, and understanding critical or key words. These reading techniques will also be useful in other aspects of the learners' work, particularly in relation to health and safety.

## Materials

*Green Code* for every learner

Introduction to the *Green Code* from the Source material (0:06–07)

Glossary

Dictionary

## Learning outcomes

1 To know about techniques that can make accessing difficult text easier:
- Using a glossary to find the meanings of unknown words and acronyms (focus page, Task 1)
- Using a dictionary to find the meaning of unknown words (Task 2)
- Using context to find the meaning of unknown words (Tasks 5 and 6)
- Explaining meaning to another person (Tasks 2–4)
- Re-writing in simpler, more accessible language (Task 4)
- Using headings, subheadings and bullets to locate information (Task 5)

### Introduction

- Discuss the laws involved in the safe use of pesticides and why such legislation is necessary.
- Discuss legal language and any experience learners have of it (e.g. the 'small print' in car insurance forms). Is it easy to understand? Why is it so complicated? Confirm that everyone finds this kind of language difficult. It is complex because it needs to cover all legal possibilities. You might want to illustrate this by reading out a section from an insurance form or the *Green Code* (e.g. burning of containers or other packaging).
- Discuss existing strategies learners have for reading difficult texts, for example re-reading several times, asking someone what it means. Discuss the risks involved in avoiding complex reading tasks (e.g. in car insurance, the 'small print' can sometimes catch you out). Look at the section from the *Green Code* mentioned above. What does it mean? Can you burn things or can't you? If you can, when and how?
- Point out that there is no magic solution to reading difficult text and that it will take effort. However, knowing about and exploring different techniques can help find methods that will make it easier.
- Point out that difficult terminology, once mastered and practised, can provide a quick and more accurate way of explaining precisely what is meant (e.g. 'humane methods' is a more accurate way of talking about 'methods that do not cause unnecessary or prolonged suffering to animals, birds or insects'). If you learn the right technical term, you will be using proper, professional language.

### Focus page

- Use the text on the page to discuss how knowledge of format (e.g. bullets, headings) can help find your way around a difficult text and aid understanding. Look at other texts to confirm this.
- Looking up or asking about words, phrases and abbreviations you do not know or understand can help with understanding of complex text. Try this out with some of the words on the focus page, for example regulation, pesticide (in the glossary) or creature, approval (in a dictionary). Try out the alternative meanings given to see if this helps to make the text easier to understand.

- Long, complicated text should be tackled a bit at a time. Explore the following, using the text on the focus page.
- Read a whole piece of text for gist. What is it about?
- Re-read chunks of the text, sentence by sentence or even phrase by phrase.
- Look up any unfamiliar words and replace them in the text. Does this make it easier to understand?
- Read each bit aloud to yourself or in pairs – sometimes this makes it easier to understand.
- Try explaining what you have read to a colleague. Does he or she understand it? Does it make sense?
- If necessary, repeat the above using a page from the *Green Code* (e.g. page 12).
- Finally, emphasise how important it is to ask if you do not understand something. Pesticide use can be dangerous and is surrounded by legislation; ultimately the user is responsible for what he or she does.

| Curric. refs | NOS | Key Skills |
|---|---|---|
| Rt/L1.5<br>Rw/L1.1<br>Rw/L1.2<br>Rt/L2.8<br>SLc/L1.3<br>Rt/L1.4<br>SLlr/L1.1 | CU78 | C2.2 |

## Task 1

Find the meanings of abbreviations to help read difficult texts
Rw/L1.1

- Discuss abbreviations and acronyms in the context of horticulture. Why are they used? What might be a problem with using them? (You may not understand exactly what they mean. Everyone uses them and seems to understand them, but you don't.)
- Explain, if necessary, that the first letters of words are used to form the abbreviation/acronym.
- Learners could try guessing what each of them means, before looking them up.
- You could make cards with the abbreviations and meanings and use them as a matching game or 'Abbreviation bingo'.

***If the learner has difficulty***

- Learners may need support using the glossary (alphabetic skills).
- Provide the answers in the wrong order and ask learners to match the abbreviation with the answer.
- You could make cards with the abbreviations and meanings and use them as a matching game. Learners need to know this information, so making it more enjoyable might help.
- ESOL learners may need some support with understanding the meaning of these organisations and documents. They would certainly need help if it is common to read acronyms as words (e.g. lerap as opposed to L.E.R.A.P.)

***Extension***

- Look through the *Green Code* or *Agricultural Information Sheet 16* for other abbreviations and list their meanings.
- Visit www.hse.gov.uk/acronym/htm to find other acronyms used in health and safety.

## Task 2

Put meanings into everyday language to aid understanding
Rw/L1.2

- This task is more demanding as it requires learners to give meanings to familiar phrases. Look at the worked example. Ask learners what they would have said for this term.
- This task is best done orally, with learners trying out versions before reaching one that they are satisfied with.
- Learners can do this in pairs then compare results. Who gets closest to the model answer in the answer book?

***If the learner has difficulty***

- Take each example a word at a time and ask learners to explain in their own words. Link the explanations and rearrange to make sense.
- Provide explanations in everyday language for learners to match with abbreviations and/or the full version of the terms.

- It is important that learners understand the terms shown here so you may need to spend some time with learners who find this difficult in order to achieve a result.

***Extension***

- Find further examples of important terms to reword (e.g. COSHH).
- Ask learners to develop a set of quiz questions involving abbreviations/acronyms and their meanings.

## Task 3

Extract meaning from a complex text
Rt/L2.8

- This is quite a difficult task, requiring good reading skills and the ability to explain technical vocabulary. You may need to work through this task with learners as a group.
- Learners should read each point carefully. Give them time to read the points two or three times. They should look up any words they do not know.
- They should then discuss (in pairs or group) what each point means. *What is it about?* The task is not to re-phrase the points, but to put into words what each one is about.
- Encourage learners to try out their explanations on each other. Whose explanation is the clearest? The most accurate?
- You may want to discuss the meanings of words such as 'adequate', 'humane', 'competent'. These words are fairly loaded in this text and may need some interpretation of their importance.
- Use Task 4 as a way of confirming skills. This task can be tackled individually.

***If the learner has difficulty***

- You may need to read the points to the learner – you may find that learners are able to understand the text better if they don't have to read it themselves.
- Check that the learner understands all the words. Substitute technical words in the text with simpler words.
- Can they tell you broadly what it is about?

***Extension***

Ask the learner to prepare an explanation of a short process to present to the group.

## Task 4

Explain something to another person to clarify meaning
SLc/L1.3

- Learners should tackle this task individually, coming up with a clear explanation of what the text means. The text is complex but gives a fairly obvious instruction.
- Share attempts and choose the clearest explanation.

***If the learner has difficulty***

- You may need to read the sentence to the learner – you may find that learners are able to understand the text better if they don't have to read it themselves.
- Check that the learner understands all the words. Substitute technical words in the text with simpler words.
- Can they tell you broadly what the sentence is about?

***Extension***

Ask learners to explain to colleagues other pieces of difficult text from procedures, legal documents, policy documents, etc.

## Task 5

Find information in the *Green Code* using reference skills and find meanings of words
Rt/L1.4
Rw/L1.1

- This is further development of reference skills. Ideally, learners should tackle the task individually. It requires an understanding of the simple alpha-numeric code used to locate information in the *Green Code*; learners then look up words in a dictionary.
- Encourage learners to look up or be prepared to explain the following words: contaminate, concentrate, exposure, active, valid.
- Ask them to rewrite the phrases, substituting meanings found in the dictionary or by discussion.

***If the learner has difficulty***

- The learner may need support to locate the information using the alpha-numeric code.
- The learner may need support to look up words in a dictionary and select an appropriate option from the range of meanings given. Do some

work on dictionary skills if necessary. You may need to explain the format of the dictionary and how to select appropriate meanings (needs to be tested in context).

- It may be necessary to remove the burden of writing from dyslexic learners and allow them to give you the information verbally, for you to write.

### Extension

- Use *Agricultural Information Sheet 16;* highlight difficult words for learners to look up.
- Give further referencing tasks, linked to research to locate specific information, for instance to inform a practical task.
- Learners can put this information into a brief set of instructions or points to remember, for use by other learners.

### Task 6 18

Listen for detail in text
SLlr/L1.1

- This task requires learners to listen carefully to a piece of technical information being read aloud. They have to relate this to the text on the page and write in missing words. This practises listening skills, but is also a way of demonstrating that listening to complex information in chunks is sometimes a good way to understand it. Note that spelling is not tested here.
- Play the whole passage through for learners to get the gist. Encourage learners not to look at the text on the page at this stage.
- Discuss learners' understanding of the passage. What is it about?
- Listen to the passage in chunks. Stop after each chunk so that learners can fill in the missing words in the text on the page.
- Play the passage through again, to allow checking.
- Discuss if reading in chunks makes the text easier to understand. Chunking text like this is a useful way to help read a difficult piece of text.

#### *If the learner has difficulty*

- Replay the passage in chunks, giving more time between sections.
- You may need to read sections to the learner or you could ask the learner to read each section to him/herself.
- Take away the burden of writing in the missing words, by asking the learner to tell you what to write.
- Encourage discussion of the meaning of the text.

#### *Extension*

Practise separating longer pieces of text into chunks to see if it helps with working out meaning.

## Theme assessment

- Learners should apply these reading techniques to other difficult but important pieces of text, such as Part 1 of the *Green Code*.
- This could lead to the development of a leaflet for other learners about the requirements of the certificates.
- Check the use of reading techniques during NPTC PA1 test item 1.

# Understanding the law

Focus

Pesticides are strictly controlled by law. To gain the Certificates of Competence, it is necessary to know how to use pesticides safely under up-to-date regulations. Reading the regulations is not always

Once you understand technical words you will find that you use them as part of your everyday language.

You do not need to read the whole document.

Use the **headings** and **subheadings** to find the part you want to read. You can spot them because they stand out in some way. They may have a different colour, size or *print*. They may be **bold** or in CAPITAL LETTERS.

Look out for abbreviations and find out what they mean.

FEPA takes the first letter of each of the words in **F**ood and **E**nvironment **P**rotection **A**ct.

Use a glossary to look up words you may not have come across before. Try out the meaning in your own words to see if it is clearer.

**Legislation: law, legal responsibility**

## The Legislation

Food and Environment Protection Act 1985 (FEPA) and The Control of Pesticides Regulations 1986 (as amended) (COPR)

*Aims*

Statutory powers to control pesticides are contained within Part III of the Food and Environment Protection Act 1985 (FEPA). Section 16 of the Act describes the aims of the controls as being to:

- protect the health of human beings, creatures and plants;
- safeguard the environment;
- secure safe, efficient and humane methods of controlling pests; and
- make information about pesticides available to the public.

The mechanism by which these aims are to be achieved is set out in regulations made under the Act. The Control of Pesticides Regulations (COPR) 1986 (SI1986/1510) define in detail those types of pesticides which are subject to control and those which are excluded; prescribe the approvals required before any pesticide may be sold, stored, supplied, used or advertised; and allow for general conditions on sale, supply, storage, advertisement, and use, including aerial application, of pesticides.

Bullet points are a way to make important points stand out. They may also be written as numbers or letters:

- 1 2 3
- a b c
- i ii iii
- A B C

Combinations might also be used:

- 1.2a
- 2.3iii

If you look a word up in a dictionary you might find several meanings.

**Mechanism: machinery, way.**

Put the different meanings in place of the word you have looked up and see which one makes sense.

Read long pieces of text a bit at a time.

- Read each bit out loud.
- Read it more than once.

Check that you have understood it.

- Put each bit in your own words.
- Explain what you have read to somebody else.

If you can't find out about something you don't understand – ask somebody who might know! You are responsible for what you do!

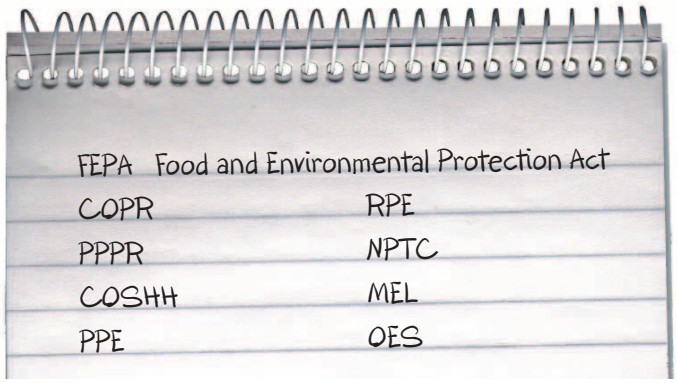
# Understanding the law

Task

Getting to know the *Green Code* is an important part of the training in how to use pesticides.

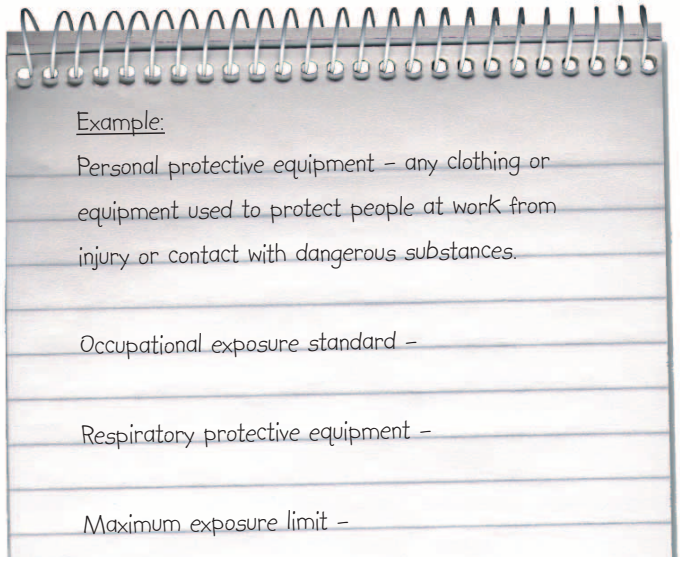
## Task 1

These abbreviations can be found in the *Green Code*. Use the glossary to find their meanings, and write them down.




## Task 2

Look at these phrases. Discuss what each one means. Write down a clear meaning for each.




## Task 3

Which sentence best sums up the meaning of this regulation? Tick your answer.

COPR requires:
"Anyone who uses pesticides in the course of business or employment to have received adequate instruction and guidance in the safe, efficient and humane use of pesticides and to be competent for the duties they are called on to perform."

1 Anyone who has to use pesticides must make sure they do it properly and humanely. ☐

2 Everyone who uses pesticides must be trained and assessed to prove they know how to use them properly. ☐

3 If you use pesticides for your business, you can give others guidance about how to use them safely. ☐

# Understanding the law

Task

## Task 4

Put this sentence into your own words and explain it to a partner:

"Any person who uses a pesticide shall confine the application of that pesticide to the land, crop, structure, material or other area intended to be treated."

## Task 5

Find these references in the *Green Code*. Write down what you find and the meanings of any words you do not know.

92. d. _____

200. d. _____

23. c. _____

139. b. _____

158. b. _____

18

## Task 6

Listen to part of the FEPA and use the words in the box to fill in the gaps.

creatures any applies organisms protecting plants if prepared other

Part III of FEPA _____ to:

**a** any pesticide; or

**b** _____ substance, preparation or organism

_____ or used for any of the following purposes

as _____ it were a pesticide:

- _____ plants or wood or _____ plant products from harmful _____ ;
- regulating the growth of _____ ;
- giving protection against harmful _____ .

## PAGES 3:6–3:7

# Reading the product label (1)

Everyone who uses pesticides must read the product label, in order to find crucial health and safety information, as well as instructions on use. The term 'label' includes any leaflets or advisory information associated with the product. Reading and understanding labels is an essential part of the NPCT module PA1.

This information is often very technical and is written in small print. However, understanding of the layout of the information and the different information types, as well as strategies for understanding technical vocabulary, can assist learners to extract meaning from this material.

## Materials

Product labels

Product label from the Source material (0:08)

## Learning outcomes

1 To recognise the different types of information on a pesticide label (focus page, Task 1)

### Introduction

- Assess existing knowledge of product labels through a question-and-answer session. *Why are these labels important? What kinds of information can be found on them? How do you know where to look and what you are looking for?*
- What are the legal implications of not reading or understanding product labels? This might be a good opportunity to discuss health and safety responsibilities.
- Make sure learners understand the jargon and language associated with labels, for example statutory, mandatory, fields of use, product approval number, MAFF, HSE, etc.
- Make a set of cards with jargon and meanings. Learners can then match meanings with jargon on cards – 'jargon bingo', 'jargon snap' or pelmanism.
- Make a series of cards, each containing one of the features of the label (maximum individual dose, environmental protection requirements, directions for use and dose, standard risk phrases, etc.) to check learners' understanding of the typical phrases used on labels. Learners sort the cards into three piles: advisory information; risk statements and safety precautions; statutory conditions relating to use. This activity can be developed into a snap or pelmanism game.

### Focus page

- Note: the label on the focus page is not a real one, but is based on components of real labels. The layout, data and technical content mirror real horticultural chemical labels, though it is less lengthy than most labels.
- Using the label on the page, locate the three different types of information:
  - advisory information
  - risk statements and safety precautions
  - statutory conditions relating to use.
- *Is there any other data on the label? What is the purpose of this information?*
- This is a useful opportunity to discuss first aid. *What does 'harmful if swallowed' mean? What would you do if you swallowed some? What does 'irritating to eyes and skin' mean? What should you do if the chemical comes into contact with your eyes or skin? What does 'flammable' mean?*
- It is also a useful opportunity to discuss personal protective equipment (PPE).
- You may also want to look in more detail at the content of the sections on advisory information, risk statements and safety precautions, and statutory conditions relating to use.

| Curric. refs | NOS | Key Skills |
|---|---|---|
| Rs/L1.1<br>Rt/L1.2<br>Rt/L1.4 | CU78 | C1.2 |

## Task 1

Match statements from a typical label with the correct sections of the label

Rt/L1.4

- Learners need to look carefully at each statement in turn and decide whether it is advisory information, a risk statement/safety precaution, or a statutory condition. This could be done as a discussion in pairs.
- You could photocopy and make the statements into cards for learners to arrange into the three categories.
- Learners need to understand each statement (its purpose, if not the precise detail of what it says) in order to do this task.
- Encourage them to look up any unfamiliar words in the glossary or a dictionary. They do not need to look up chemical names.

***If the learner has difficulty***

- Learners may need to re-visit the three categories of information, to ensure that they are clear about the differences between them. Learners may find it useful to colour-code different types of information using highlighter pens.
- Learners may need support to look up technical words.
- The PA1 (Foundation Module) CD from PCPC has further exercises to familiarise learners with the requirements of the assessment.

***Extension***

- Locate information from a variety of labels, including those from chemicals used in the workplace.
- It would be useful for learners to make posters demonstrating how to locate information on the labels of commonly used chemicals, as done on the focus page.

# Reading the product label (1)

Focus

By law every pesticide and herbicide container must have a label. Before using any product you must read and understand the whole label.

EXAMPLE

## Herbicide

*For the control of broad-leaved weeds in grassland and scrub control in forestry and uncropped areas*

An emulsifiable concentrate containing 200 g/litre 2,4 D as the Ethyl Hexyl Ester, 85 g/litre Dicamba and 65 g/litre Triclopyr as the Butoxyethyl Ester

For use only as an agricultural/horticultural and forestry herbicide

Read all PRECAUTIONS on this pack before use.

**HARMFUL *IF SWALLOWED***
**IRRITATING TO *EYES AND SKIN***

**FLAMMABLE**

**PRECAUTIONS**

* WEAR SUITABLE PROTECTIVE CLOTHING (COVERALLS), PROTECTIVE GLOVES, RUBBER BOOTS AND FACE PROTECTION (FACESHIELD) when handling the concentrate.
* WEAR SUITABLE PROTECTIVE CLOTHING (COVERALLS), PROTECTIVE GLOVES, RUBBER BOOTS AND FACE PROTECTION (FACESHIELD) when applying by hand-held equipment and handling contaminated surfaces
* WEAR SUITABLE PROTECTIVE CLOTHING (COVERALLS) when applying by vehicle-mounted equipment

**Scimitar®**

Contains 200g/litre (19.34% w/w) 2,4-D as the Ethyl Hexyl Ester, 85 g/litre (8.22% w/w) Dicamba and 65 g/litre (6.29% w/w) Triclopyr as the Butoxyethyl Ester as an emulsifiable concentrate

A selective herbicide for the control of certain broad-leaved weeds in grassland and scrub control in forestry and uncropped areas.

DO NOT SPRAY WHERE CLOVERS OR OTHER LEGUMES ARE AN IMPORTANT PART OF THE SWARD
**STATUTORY CONDITIONS RELATING TO USE**
FOR USE ONLY AS AN AGRICULTURAL/HORTICULTURAL AND FORESTRY HERBICIDE
For use in grassland, forestry and land not intended for cropping

Maximum dose: see under DIRECTIONS FOR USE

Operator protection: engineering control of operator exposure must be used where reasonably practical in addition to the following personal protective equipment. See PRECAUTIONS marked *

MAFF zzzz

A LERAP must be carried out in accordance with PSD published guidance or the statutory buffer zone must be maintained

e **1L**itre
Batch 10022004

Scimitar PLC, Herbicide House, Bugville, Pestshire 01928 374655

All labels look different, but they must all have the following.

### Advisory information

- product trade name
- name and amount of each active ingredient
- first aid information
- PPE requirements

### Risk statements and safety precautions

Manufacturers must use the exact words that apply to the product.

- VERY TOXIC IF SWALLOWED
- WASH HANDS AND EXPOSED SKIN before eating, drinking or smoking and after work

### Statutory conditions relating to use

This is the legal section, which includes such things as:

- field of use
- the crops, plants or situations where the product can be used
- operator protection
- maximum number of treatments.

# Reading the product label (1)

Task

## Task 1

Match the statements with the correct sections of the label.

**STATUTORY CONDITIONS RELATING TO USE**

**ADVISORY INFORMATION**

**RISK STATEMENTS AND SAFETY PRECAUTIONS**

| CROPS/ SITUATIONS | MAXIMUM INDIVIDUAL DOSE (PRODUCT/HECTARE) | MAXIMUM NUMBER OF TREATMENTS |
|---|---|---|
| broccoli, calabrese, cauliflower, Brussels sprout, cabbage, kale, swede, turnip, sage, onion | 13.0 litres/hectare | 2 per crop |

For use only as an agricultural/horticultural herbicide.

READ ALL PRECAUTIONS BEFORE USE

WEAR SUITABLE PROTECTIVE GLOVES AND FACE PROTECTION (FACESHIELD) when handling the concentrate.

5 Litres

HARMFUL IF SWALLOWED

**Wedekilla**

Wedekilla PLC, Wedekilla House, Loamshire.
01564 738299

Contains 480 g/litre Propachlor

(A bar code)
Lot number: 09876
Production date: 5/4/2003

IRRITATING TO THE EYES AND SKIN

AVOID ALL CONTACT BY MOUTH

## PAGES 3:8–3:9

# Reading the product label (2)

Everyone involved in using pesticides must read and understand product labels. The term 'label' includes any leaflets or advisory information associated with the product. It is an essential part of NPTC Module PA1. This theme looks at a range of strategies for confirming the meanings of words and abbreviations found on labels.

## Materials

Glossary from this set of materials

Good-quality dictionary for each learner

Product labels

Internet access if possible

## Learning outcomes

1 To practise the skill of finding the meaning of words by analogy (focus page, Tasks 1 and 3)
2 To check for meaning using reference sources (focus page, Tasks 2 and 3)

### Introduction

- Ask learners about their existing strategies for working out the meaning of unknown words, especially technical vocabulary. Expect: dictionary, glossary, asking someone, working it out (or guessing).
- Acknowledge that there are many valid strategies to achieve better understanding of words and therefore of the information on a label.
- Look at some examples of labels from products. Confirm that the vocabulary is complex and contains many technical words. No one is expected to know all these words, but it is important to work them out.

### Focus page

- Look at the label. It might be useful to highlight any technical words or words learners identify as being difficult. It may be a good idea to do this for just one section of the label.
- **Looking up words:** discuss the various places where the meanings of words might be found – dictionary, glossary, website, specialist books – and vocational examples. What is the most appropriate place to find a specialist word used in the right context? A glossary will direct you to a word in your given area; a dictionary will include words and meanings not relevant to a vocational area.
- **Predicting the meaning of words:** this is a way of working out meaning by using the context of the text (i.e. 'static' will have a different meaning depending on whether you are talking about water or electricity); finding similar patterns in words (e.g. include, inclusion); using prefixes and suffixes in combination with root words (e.g. post + emergence, where 'post' means 'after').
- **Abbreviations and acronyms:** use initial letters as clues, looking up meanings in specialist books, websites etc.
- Acknowledge that not all words need be memorised, although some will be vital to the vocational area. Talk about developing a personal glossary (alphabetically indexed notebook) to record important words and their meanings.
- Stress that knowing where and how to access information is an important skill.

| Curric. refs | NOS | Key Skills |
|---|---|---|
| Rw/L1.1<br>Rw/L1.3<br>Rw/L1.2 | CU78 | C1.2 |

### Task 1

With the knowledge that '-cide' means killing, work out the meanings of other words with the same ending
Rw/L1.3

- Ask learners to look at the words in the list. What do they have in common? (the ending '-cide'). The meaning of this suffix could be checked in a dictionary, or you could explain that it means 'killing'. So most words that end in '-cide' are to do with killing something.

- Ask for examples of words ending in '-cide' – you could use the example of 'herbicide' in the task, which means something to do with killing herbs – or plants.
- Learners work out the meaning of each word, based on an understanding of the '-cide' ending.
- You might want to extend this task to think about other words ending in '-cide', to complete the picture.
- Once the task is completed, stress how important it is to distinguish these words, in particular 'herbicide' and 'pesticide'. Getting it wrong could be disastrous.

*If the learner has difficulty*

- Discuss how the learner can work out the obvious examples first and, if necessary, check the meanings in a glossary or dictionary. They may need help to do this.
- ESOL learners may find it difficult to work out meanings of words from root words (e.g. 'fungi-'), depending on whether their first language has a common source with English. More support may be needed.
- Write the word ending on one card and root words on a series of other cards. Ask the learner to match a root word with the word ending and pronounce the word at the same time. Ask if they can think of any other words that sound like the root word (e.g. fungi-, fungus).
- Encourage learners to keep a notebook of useful terminology or a personal glossary in their portfolio.

*Extension*

Repeat the task using other vocabulary found on product labels, for example use the word ending '-culture' and find other words in the group (horticulture, agriculture). What does the word ending '-culture' mean?

## Task 2

Use a dictionary/glossary to check the meaning of words
Rw/L1.1

- These are specialist words, with usage limited mainly to horticulture. Knowing the word ending does not help to work out what they mean.
- Explain that a glossary is more likely to have specialist words from a given vocational area and to describe them in the correct context.
- Use a specialist dictionary to find the meanings.
- These are all important words. Learners need to understand them and the different uses of the chemicals.

*If the learner has difficulty*

- Some learners may need help to access and use reference materials – dictionary/glossary.
- They may also need support extracting a meaning from a dictionary.
- Encourage learners to keep a notebook of useful terminology or a personal glossary in their portfolio.

*Extension*

- Repeat the task using words based on '-culture', (e.g. monoculture).
- Give learners some definitions. Ask them to find the correct word on the label.

## Task 3

Use the context/own knowledge to work out the meaning of words
Rw/L1.1
Rw/L1.2

- Encourage learners to find these words on the label. Can they work out what the words mean by using context clues (i.e. does the sentence or paragraph in which the word occurs give a clue as to the meaning?).
- It would be useful to note the 'good guesses' at this stage. This could be done orally.
- Learners should now look up the words in a dictionary. Note: dictionaries will give a range of meanings; learners will need to select the meaning that matches the context in the label.
- Finally use the glossary for this set of materials. This should confirm the appropriate meaning. Confirm that it is a good idea to keep a personal glossary to ensure that you are clear about technical words.

*If the learner has difficulty*

- Provide a range of meanings to match with the words. This could be done using cards and could be developed into a game.
- Ensure learners enter the words into their personal glossaries.

***Extension***

- Ask the learner to rewrite part of a label in simple everyday language that anybody can understand.
- Gather words and meanings for a glossary for use by colleagues.

## Theme assessment

Use the techniques in this theme to find out the meaning of a different pesticide label.

Find areas of information (advisory, risk, statutory) on genuine product labels.

Conduct a similar exercise using the *'Roundup'* label from the Source material. Learners can present the results to the group (i.e. areas of information, words, what it all means).

# Reading the product label (2)

Focus

Once you know the meanings of the difficult and unusual words on a label, you can begin to make sense of what it means.

## Herbicide

**Example**

For the control of broad-leaved weeds in grassland and scrub control in forestry and uncropped areas

An emulsifiable concentrate containing 200 g/litre 2,4 D as the Ethyl Hexyl Ester, 85 g/litre Dicamba and 65 g/litre Triclopyr as the Butoxyethyl Ester

For use only as an agricultural, horticultural and forestry herbicide.

Read all PRECAUTIONS on this pack before use.

A CONTACT AND RESIDUAL HERBICIDE FOR USE AS A POST-EMERGENCE TREATMENT FOR THE CONTROL OF ANNUAL GRASSES AND A WIDE RANGE OF BROAD LEAVED WEEDS.

*Environmental protection*

* EXTREMELY DANGEROUS TO FISH OR OTHER AQUATIC LIFE. Do not contaminate surface waters or ditches with chemical or used container.
* DO NOT ALLOW DIRECT SPRAY from horizontal boom sprayers to fall within 5m of the apex of the bank of a static or flowing waterbody, unless a LERAP† permits a narrower buffer zone or within 1m of the top of a ditch which is dry at the time of application. Direct spray away from water.
* This product qualifies for inclusion within the LERAP† scheme. Before each spraying operation from a horizontal boom sprayer, either a LERAP must be carried out in accordance with PSD published guidance or the statutory buffer zone must be maintained. The results of the LERAP must be kept available for inspection for three years.

LERAP† B

†Local Environmental Risk Assessment for Pesticides

You can find technical words, such as the names of chemicals, in a specialist glossary or on a specialist website.

You can work out the meaning from your knowledge of other words that are similar.

Herbi**cide** is similar to insecti**cide** and pesti**cide**.

You can use the other words in the sentence to help you work out the meaning of a word.

e.g. 'fish or other **aquatic** life'

Meanings of words can be found in a glossary or dictionary.

Use this method to **check** meanings.

You may be able to work out abbreviations. You can also check them in a specialist glossary.

You cannot remember everything!

Keep a small notebook to jot down any important words and their meanings.

Don't be caught out. If you are in any doubt about words on a label – ASK!

# Reading the product label (2)

Task

## Task 1

Look at the words. Explain each one to a friend or write the correct meaning next to each word.

**a** herbicide plant killer

**b** pesticide _____

**c** bactericide _____

**d** fungicide _____

**e** insecticide _____

| | | | | |
|---|---|---|---|---|
| bacteria killer | pest killer | fungi killer | plant killer | insect killer |

If the words are useful to you, make a note of them in your portfolio or keep a notebook of words.

## Task 2

Check the meanings of these words in the glossary. Explain them to a friend or write the meanings next to each word.

**a** acaricide _____

**b** biocide _____

**c** molluscicide _____

**d** vermicide _____

**e** virucide _____

## Task 3

Some of the technical words on the label have been listed. Work out what they mean or look them up.

**a** residual _____

**b** post _____

**c** emergence _____

**d** annual _____

**e** contaminate _____

**f** apex _____

# PAGE 3:10
# Applying pesticides (1)

Many different numeracy skills are involved in calibrating for spraying. It is important that learners have all these skills before they begin. This is covered on the second focus page (3:11). It is also important that learners understand the whole process and can follow step-by-step procedures. This first focus page (3:10) introduces the concept of calibration and introduces a step-by-step approach. The steps are then exemplified and practised on the subsequent task pages. This procedure should not be seen as the only approach to calibration. These calculations can be completed in many different ways. The underpinning skills are common, however, and must be taught and practised if learners are to apply pesticides accurately and safely.

## Learning outcomes

1 To understand the step-by-step procedures of calibration described (focus page)

### Introduction

- Discuss with the group the possible consequences of incorrect pesticide application – this may include case studies (if known) of overuse or underuse.
- Use an example of an application rate from a label. This is normally given in litres per hectare. Why can't the product be used as it is? Ask small groups or pairs to discuss and list all the variables that make it impossible to have one spray application for all circumstances. Answers will include size of plot, different spray applicators, different speeds, different reasons for applying, etc. This leads on to the process of calibration.

### Focus page 3:10

- Make sure learners understand what calibration means and ask them to think about other jobs in which they may need to calibrate a machine.
- Use the focus page to emphasise that calibration is a multi-step process that can be divided into two sections. If learners follow the process accurately, they can complete a calibration. Understanding what they are doing will ensure accuracy and enable proper checking.
- Go through the list of skills needed. These are checked on the next focus page (page 3:14). Do not assume that learners will have all these skills. Learners need to know that they cannot use the imperial system for spray calibration.
- Dyslexic learners will have difficulty with a multi-step process such as this and will need to focus on one part at a time. They will rely on a checklist such as the one given in the Source material to keep track of the process.

| Curric. refs | NOS | Key Skills |
|---|---|---|
| Rt/L1.2<br>MSS1/L1.5<br>MSS1/L1.7<br>MSS1/L1.9 | CU78 | C1.2 |

# Applying pesticides (1)

Focus

## Skills for calibration

In order to apply pesticides properly, you need to understand calibration. Calibration involves working out the spray application needed for a particular job. All the calculations are based on a common standard application rate or base figure. You may also need to calibrate machines for seed drilling and fertiliser applications.

Calibration can be divided into two main parts.

**Part 1: Collect the information you need for the job in hand**

**Step 1:** Measure and work out the area of the ground you want to spray.

**Step 2:** Work out your walking speed in kilometres per hour.

**Step 3:** Measure the swath width.

**Step 4:** Measure the flow rate with the selected nozzle.

**Part 2: Use the information you have gathered to calculate the application rate based on the standard formula.**

**Step 5:** Calculate the spraying volume per hectare.

**Step 6:** Work out the volume of mixture needed for the area you are spraying.

**Step 7:** Work out the amount of chemical you will need.

You need to know how to work with:

- metres (m) and square metres ($m^2$)
- kilometres (km)
- hectares (10,000 $m^2$)
- litres (l) and millilitres (ml)
- time in seconds, minutes and hours
- averages
- area (square metres)
- decimals
- calculators.

Photo redacted due to third party rights or other legal issues

You will need to multiply and divide to complete your calibration.

Use a calculator to work in decimals and whole numbers and to check your calculations.

## PAGES 3:11–3.13

# Applying pesticides (2)

Pesticides are dangerous substances. It is important that anyone learning to use them has the adequate numeracy skills to complete the calculations accurately. This focus page gives you and the learners the opportunity to check their numeracy skills and brush up on them if necessary.

## Materials

Calculators

Spray labels

Step-by-step calibration sheet from the Source material (0:09)

Stopwatch

100 m tape

## Learning outcomes

1 To ensure that learners have the required numeracy skills and concepts to perform calibration calculations correctly (focus page, Tasks 1–5)

### Focus page

- This focus page provides learners with the opportunity to check underpinning numeracy skills needed for calibration (see below). Learners should be secure in the skills practised here before they continue with this module.
- Learners should complete the questions alone. Observe them completing these questions to identify strategies used and any common errors. After completion, discuss the different strategies that learners use.

### Multiplication and division

- It is important that learners understand the calculation that is required, can enter numbers into a calculator accurately, and are able to see if answers are unrealistic. Encourage learners to make rough estimates before they use the calculator.
- Watch out for learners who are confused by the decimal point or the number of zeros required. 10 000 will be a number that learners come across frequently in calibration. It may be written with a comma, which can be confused as a decimal point.
- The issue of rounding to two decimal places may come up in **h** and rounding to the nearest whole number in **e**. This can be discussed with the group or in pairs.

### Measuring length

- There is no substitute for lots of practical measurement to give learners confidence and a good feel for distance. Good estimation is a powerful skill that should be encouraged. Some learners may have difficulty reading tapes accurately or may be confused by imperial scales, which are often on the same measuring tapes. Some additional support should be offered to ensure that these skills are secure. Learners should also know equivalents within the metric system – how many millimetres in 1 metre etc.
- Learners can develop memory cards to help with metric equivalents or be directed towards diaries, which often include these. There are websites where learners can convert measures, for example http://convert.french-property.co.uk.

### Time

- Many learners have difficulty calculating with time because they will be working in a different base (60) and they cannot use a calculator. Learners need to know the relationship between seconds, minutes and hours.

### Hectares

- Understanding the area of a hectare is important to learners' understanding of calibration. Most knapsack spraying will be of areas that are less than 1 hectare but product labels will refer to dose per hectare. Learners need to know the formula for calculating area and be able to calculate in square metres. Some learners may be more familiar with acres or imperial measures.

### Average stride length

- The concept of average is useful for calibration calculations and can also be applied to other areas of work, such as germination times, time to do particular jobs, and plant losses. If the principle of averages is understood, learners will have no difficulty applying it to many different situations.

### Liquids

- Learners should be able to use marked divisions on a scale and be able to read between divisions. This activity is best practised in a practical and realistic setting. Check that learners know equivalents within the same system. Learners should be able to interpret basic fractions as decimals.

### Abbreviations

- Understanding the abbreviations used for measurement is critical to calibration. A prompt card could be developed to support learners who have difficulty with this skill. Learners will come across some variations in the way abbreviations are used. For example, kph and km/hr are both used for kilometres per hour. The use of the forward slash to signify 'per' is also an important point that needs to be discussed.

| Curric. refs | NOS | Key Skills |
|---|---|---|
| N2/L1.7<br>N2/L1.11<br>HD1/L1.3<br>MSS1/E3.3<br>MSS1/E3.5<br>MSS1/E3.7<br>MSS1/L1.4<br>MSS1/L1.7<br>MSS1/L1.9 | | N1.2 |

## Step 1: Measure and work out the area of ground you want to spray

### Task 1

Work out the area of a rectangle
MSS1/L1.9

- Check that learners understand the concept of area as the calculation of the surface of a space, not a linear measurement.
- Make sure learners understand that they need to use the same units for both dimensions. For example, if one measurement is in metres and the other in centimetres, they will need to convert to metres before doing the calculation. Compare this to calculating with money and emphasise the importance of putting the decimal point in the correct place.
- Use the area of a football pitch as an example – this is approximately a hectare. *If you sold the turf of Old Trafford for £1 a square metre how much would you make?*
- Look carefully through the worked example on the page.
- Make sure learners use a calculator to complete the practice in task 1. Check that learners record their answers in $m^2$.

#### *If the learner has difficulty*

- Learners may have difficulty with the concept of area – it is often confused with perimeter. Use other analogies such as tiles or paving slabs to explain, or use graph paper. Learners unable to grasp the concept of surface measurement will need additional support.
- Use squared paper or a paved area to count rows and columns to further demonstrate the concept of area.
- There are more materials about area in *Skills for Life* Level 1, Unit 4

#### *Extension*

- Give learners more areas to calculate using mixed measures including measurements in centimetres.
- Give the learners who are confident more complex shapes made up of rectangles.

### Task 2

Estimate, measure and work out the area of a piece of ground
MSS1/L1.5
MSS1/L1.9

- Identify with learners the piece of ground they will work on.
- Talk about the difference between estimation and accurate measurement. Discuss how to estimate using their experience of known areas such as a tennis court, football pitch, etc.
- Ask learners to record their estimate before actually measuring. This task can be completed in pairs with an element of competition to see who makes the most accurate estimate.

*If the learner has difficulty*

- Learners having difficulty will need a lot of practice in order to estimate distance. This is best achieved using practical activities in real workplace settings. How long is this bed? How wide is this tunnel? Use known measures of length to help them estimate.
- If learners are unable to measure a piece of ground using tapes and/or strides, they will require significant additional support before they can complete calibration calculations.

*Extension*

Ask learners to find out how to calculate the area of other regular shapes such as triangles and circles. In pairs, learners can discuss how they will work out the area of less regular shapes or compound shapes, such as a piece of ground with a pond in the middle.

## Step 2: Work out your walking speed in kilometres per hour

### Task 3

These require the following skills: measuring, timing, dividing and working out averages.
MSS1/E3.5
MSS1/E3.3
N2/L1.7
N2/L1.11
HD1/L1.3

- Explain why you need to work out your walking speed in order to regulate the application of spray.
- With the group, go through the process of measuring and calculating as shown on the page.

*If the learner has difficulty*

- Observe learners completing the calculations to see which of the skills needed are secure and which need additional support.
- Learners may need support to round the calculator read-out to two decimal places.

*Extension*

- Give a range of examples for learners to complete for practice.
- Ask learners to work out why 360 is used in this formula. Refer them back to the Time questions completed on page 3:11.

### Task 4

Complete an average calculation
N2/L1.11

- Explain the variables that can affect walking speed (gradient, weight of knapsack, length of spraying task) and the need to establish a steady pace when spraying.
- Be aware that learners may use either 'average' or 'mean' to describe the same process. (This needs to be established at the start.) Go through the process of working out an average or mean with examples.

*If the learner has difficulty*

Explain the concept of average (mean) if this is unknown. Use examples from everyday life such as batting averages in cricket, attendance averages, average hours to complete a job, average size for a plant. Support learners as they go through the calculations, and observe where the difficulty arises.

*Extension*

Move on to the next task.

### Task 5

Measure, time and calculate walking speed
MSS1/E3.3
N2/L1.7
N2/L1.11
HD1/L1.3

- Check that learners are familiar with the whole process and have suitable watches and tapes to complete the task.
- Remind learners of the need for accuracy when marking out 100 metres.
- Remind learners to record all their timings.

*If the learner has difficulty*

Support learners to complete the task one step at a time. Observe and identify problem areas within the process. Additional support will be needed for learners whose numeracy skills are below Entry 3.

*Extension*

Learners should be working to a speed of about 4 kph. They should practise walking at a steady pace that they can sustain for long periods of work.

# Applying pesticides (2)

Focus

## Checking numeracy skills

You need lots of different skills for calibration. Check out your skills before you start. (Use a calculator for the calculations.)

### Multiplication and division

**a** 360 ÷ 80 =

**b** $15\frac{1}{2}$ metres × 30 metres =

**c** 10000 ÷ 250 =

**d** (62 + 69 + 73) ÷ 3 =

**e** You need 1000 pots. They are in packs of 70. How many packs will you need?

**f** 68 ÷ 10000 =

**g** 24.3 × 0.6 ÷ 3 =

**h** 14.3 ÷ 3 = (round your answer to 2 decimal places)

### Time

**a** It takes a minute and a half to walk the length of the polytunnel. How many seconds is this?

**b** How many seconds are there in 1 hour?

**c** You can pot up 120 plants an hour. How many plants per minute?

**d** Time a partner running 100 metres. Give your answer in seconds.

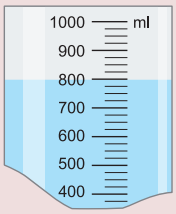
**e** You are travelling at 6 kilometres per hour. How far can you go in 15 minutes?

### Liquids

**a** What abbreviation is used for litres?

**b** What abbreviation is used for millilitres?

**c** Write 450 millilitres as litres.




**d** How many millilitres in $1\frac{1}{2}$ litres?

**e** How many millilitres in $\frac{3}{4}$ litre?

**f** How much liquid is shown on the scale?

### Measuring length

**1** m is the abbreviation used for:

**a** metres? **b** square metres? **c** miles?

**2** How many 100 metre lengths make 1 kilometre?

**3** Write these in metres:

**a** 150 cm **b** 68 cm **c** 5 cm

**4** Measure out these distances accurately:

**a** 10 metres **b** 36 metres

**c** 1.4 metres

### Hectares

**a** How many square metres in 1 hectare?

**b** How many 100 metre lengths 1 metre wide can you fit into 1 hectare?

**c** A hectare is about the same size as a football pitch. True/False

**d** What abbreviation is used for hectares?

### Average stride length

From a mark on the floor, step out 5 strides.
Mark your finishing point.
Measure the total length. Divide by 5.
Repeat the process to check it.

### Abbreviations

**a** What does km/hr mean?

**b** What does l/ha mean?

**c** What does l/min mean?

**d** What does kph mean?

**e** What units are used to measure pressure?

**f** What does $m^2$ mean?

# Applying pesticides Step 1

Task

| Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6 | Step 7 |
|---|---|---|---|---|---|---|

**Step 1: Measure and work out the area of ground you want to spray**

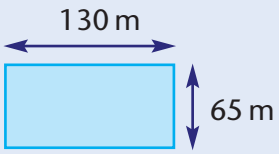
To work out the area of a rectangular plot you first need to know the width and the length.

Find out the width and length.

- Some work places have beds which are all the same size – you don't need to measure these.
- You may need to use a tape measure. Check that it is long enough. Check that it is marked in metres and that you can read it in accurately.
- You can measure a large plot of ground by pacing it out. One stride is about 1 metre. Check this before you start.

Area of a rectangle = length × width
Answers will be in square units.

**Example**




Area =
130 m × 65 m = 8450 $m^2$

## Task 1

Try these for practice.

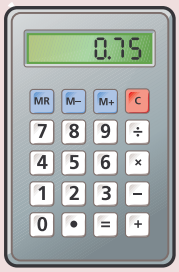
1 The beds in your nursery are 100 metres long and 7 metres wide. What is the area for each bed?

2 You have been asked to spray a public path. It is 1.5 metres across and 2 kilometres long. What is the total area?

3 You need to spray a narrow verge beside a road. It is 80 centimetres wide and 400 metres long. What is the area?

4 You need to spray a bed which is 4.5 metres wide and 6.75 metres long. What is the area?

Convert all measurements to metres first.
75 cm = 0.75 metres.




## Task 2

Choose an area at work or outside. Work out the area in square metres.

1 Estimate how long and how wide it is.

2 Use a tape to measure actual size or strides to check your estimate.

3 Record your measurements using a simple drawing.



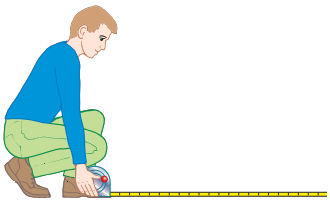
MSS1/L1.9; MSS1/L1. 5

# Applying pesticides Step 2

Focus

| Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6 | Step 7 |
|---|---|---|---|---|---|---|

**Step 2: Work out your walking speed in kilometres per hour.**

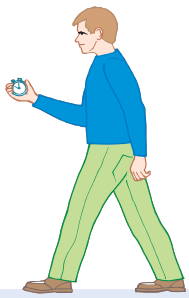


Walking speed in km/h = 360 ÷ your time over 100 metres

1 Measure 100 metres accurately – use a tape.

2 Set a stop watch to zero. Time how many seconds it takes to walk the 100 metres at a steady pace. Write it down.

3 Divide 360 by the time taken to give your walking speed in kilometres per hour (km/h).



## Task 3

1 It takes Martin 86 seconds to walk 100 metres. What is his walking speed?

2 It takes Jamila 93 seconds to walk 100 metres. What is her walking speed?

## Task 4

Jim walks 100 metres three times. His times are as follows:

Time 1 = 93 seconds  Time 2 = 97 seconds
Time 3 = 98 seconds

1 What is his average time?

2 What is his average walking speed?

## Task 5

1 Measure 100 metres. Time yourself walking 100 metres three times.

Time 1 = _____

Time 2 = _____

Time 3 = _____

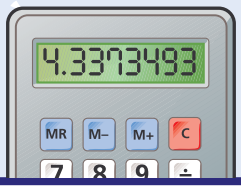
2 Work out your average time.

3 Work out your average walking speed in kilometres per hour.

**Tip**

Round the answer on your calculator to 2 decimal places.

*Example: 4.3373493 is rounded to 4.34 kph*




It's a good idea to time yourself several times to work out your average speed. For example:

Time 1 = 90 seconds
Time 2 = 93 seconds
Time 3 = 92 seconds

Add the three times together and divide by the number of tries (3):

90 + 93 + 92 = 275

To get the average time, divide 275 by 3.



Working out walking speed over 100 metres.

N2/L1.11; N2/L1.7; HD1/L1.3; MSS1/E3.3; MSS1/E3.5

## PAGES 3:14–3:15

# Applying pesticides (3)

Manufacturers recommend different nozzle sizes to suit a range of conditions; changing nozzles or nozzle deflector tips will affect the width or spread of spray. The height at which a lance is held will also affect the width of spray. Learners will need some understanding of nozzles and be able to select from a chart or table. They will also need to measure the swath accurately in metres.

## Materials

Tape measures

Pesticide labels

Nozzle table from the Source material (0:10)

## Learning outcomes

1 To extract information from a nozzle table (focus page, Tasks 1 and 2)

2 To measure swath width accurately (Task 3)

### Introduction

- Establish what learners understand by the term 'swath'. Some learners may use the word 'bout'.
- Check that learners understand how to measure the swath width and why it should be measured accurately.

### Focus page

- Discuss factors that will affect the swath width (or bout). This will include choice of nozzle, height of nozzle and use of deflector tips.
- Look at some labels to find recommended nozzle codes and spray qualities. Discuss the advantages and disadvantages of fine, medium or coarse spray in different conditions.
- The British Crop Protection Council (BCPC) issues a nozzle card to help people select correct nozzles. Go through examples with the group to familiarise them with the tabular format and ensure that they can access the information.
- Check that learners are familiar with bars as a unit for measuring pressure.

### Check

There are many other tables used in calibration and on product labels. These can be used to check that learners can use tables to access specific information.

### Apply

Learners need to demonstrate knowledge of nozzle components and be able to select correct nozzles for the PA6 Certificate.

| Curric. refs | NOS | Key Skills |
|---|---|---|
| HD1/L1.1<br>MSS1/L1.4<br>MSS1/L1.7 | CU78 | N1.1 |

### Step 3 – Swath width and nozzles

#### Task 1

Use information on the focus page
HD1/L1.1

- Make sure learners have a copy of the nozzle chart from the Source material.
- Learners use the information on the focus page to answer the questions.
- Check that they are familiar with the table format and understand its purpose.

*If the learner has difficulty*

- Some learners may find the amount of information on the page quite daunting. Encourage them to think about each question separately and decide what they are looking for.
- Support learners to scan for key words or headings in order to pinpoint the appropriate piece of text. Give learners support to read and answer questions if required.
- An L-shaped card will help some learners to focus on one section of the table at a time.

#### Task 2

Find a nozzle to match the requirements on the label
HD1/L1.1

- Remind learners that manufacturers recommend nozzle sizes and spray qualities on their labels and give guidelines about the expected spray output for each nozzle at a range of pressures.
- Ask learners to read the examples given and use the information on the focus page to find a suitable nozzle for each example. Find the expected output for the nozzle they have selected at 2 bar pressure. (There is more than one answer for both questions. Ask learners to select just one.)

***If the learner has difficulty***

- Check that learners understand the terminology used in the questions and are able to use a table by tracking across and using headings.
- If learners have difficulty selecting a spray nozzle from the choice on the table, advise them to go for the first nozzle within the category of 'fine', 'medium' etc.

***Extension***

Ask learners to look in the BCPC *Handheld and Amenity Sprayers Handbook* for more information about spray drift and nozzles. Find out when fine spray quality should and should not be used.

## Task 3

Read swath width from a scale

MSS1/L1.4

MSS1/L1.7

- Remind learners of the method used for measuring swath width.
- Learners may want a tape measure to confirm their answers.

***If the learner has difficulty***

Use concrete activities with a tape measure. Ask learners to locate the same point on the tape as shown on the page and support them to read the scale.

***Extension***

Spray using water only to measure the width of different nozzles and tips at different heights. This will highlight the variation in swath width (and therefore spray output) that can be achieved.

# Applying pesticides (3)

Focus

| Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6 | Step 7 |
|---|---|---|---|---|---|---|

## Step 3: Swath width and nozzles

Swath is the width of spray. It is sometimes called the 'bout'. This is measured by spraying water onto dry concrete using the selected nozzle. Swath width should be written in metres.

Different spray nozzles are used to give different spray quality, spray width and output. You must read the product label and a nozzle table to select a suitable nozzle.

**Conventional hydraulic sprayers**

Your knapsack sprayer should be capable of applying accurately 80–400 l/ha within a pressure range of **1.5–2.5 bars** (20–30 psi).

Nozzles producing a **medium** or **coarse spray** should be used to minimise the risk of drift. Below are examples of suitable nozzles:

Medium Volume Application

(2–2.5% solution or 200–250 l/ha)

Nemark AN2, AN4.0 Copper Pegar

Deflector tips: yellow, green, blue or red.

This label recommends a **medium** or **coarse** spray nozzle with a pressure range of **1.5–2.5 bars**.

Check this on the nozzle table below.

Different deflector tips change the width of the swath. These are also colour coded. These are **not** the same as the colour codes for nozzle tips.

The label states that you need a pressure range of 1.5–2.5 bars.

The pressure set and the nozzle chosen will determine the spray output.

These colours refer to the nozzle tips, which control spray output. These will give a standardised output regardless of the nozzle manufacturer.

They also have a nozzle code. The nozzles in this range would be suitable.

| Nozzle code | | 11001 | 11002 | 11002 | 11003 | 11004 | 11005 | 11006 | 11008 |
|---|---|---|---|---|---|---|---|---|---|
| ISO colour | | Orange | Green | Yellow | Blue | Red | Brown | Grey | White |
| Pressure in bar | 1.5 | 0.29 | 0.42 | 0.56 | 0.85 | 1.13 | 1.41 | 1.70 | 2.26 |
| | 2.0 | 0.33 | 0.49 | 0.65 | 0.98 | 1.31 | 1.63 | 1.96 | 2.61 |
| | 2.5 | 0.37 | 0.55 | 0.73 | 1.10 | 1.46 | 1.82 | 2.19 | 2.92 |
| | 3.0 | 0.40 | 0.60 | 0.80 | 1.20 | 1.60 | 2.00 | 2.40 | 3.20 |
| | 3.5 | 0.43 | 0.65 | 0.86 | 1.30 | 1.73 | 2.16 | 2.59 | 3.45 |
| | 4.0 | 0.46 | 0.69 | 0.92 | 1.39 | 1.85 | 2.31 | 2.77 | 3.69 |
| | | Nozzle output = litres/minute | | | | | | | |
| Spray quality | | Fine | | Fine/Medium | Medium | | Medium/Coarse | | Coarse |

Track across the row until you find the columns for Medium/Coarse spray quality.

# Applying pesticides Step 3

Task

| Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6 | Step 7 |
|---|---|---|---|---|---|---|

**Step 3: Measure the swath width**

## Task 1

Use the information on the focus page to answer these questions.

1 What do the words 'fine', 'medium' and 'coarse' refer to?

2 How is swath width measured?

3 What setting is measured in bars?

4 What units are used to measure nozzle output?

5 What is the nozzle code for a red-tip nozzle?

6 What do deflector tips do?

7 What is another word for 'swath'?

## Task 2

There may be more than one nozzle that is suitable. Select just one.

Select a suitable nozzle code for each of these applications. Use the table to find the expected nozzle output for each one if the pressure was set at 2 bar.

1 *Apply through a medium nozzle with a pressure of 2–3 bar.*

Suitable nozzle: _____

Expected output: _____

2 *For a low volume application use a fine spray at 1.5–2 bar.*

Suitable nozzle: _____

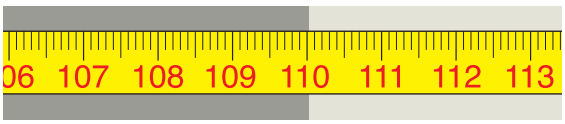
Expected output: _____

## Task 3

There are 100 cm in 1 metre.

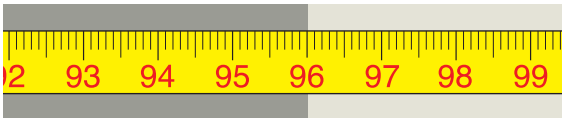
Record these swath widths in metres.

1

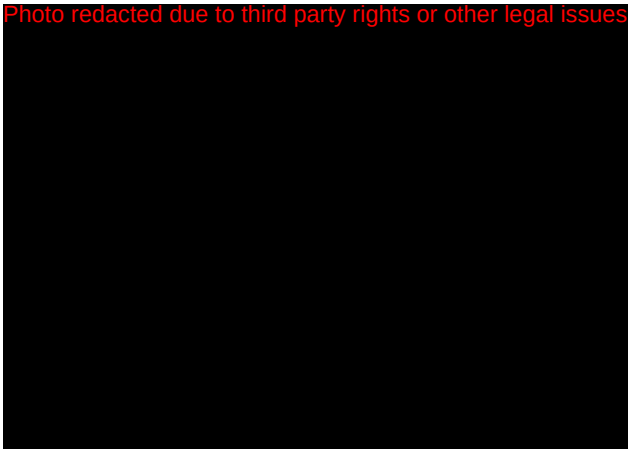



Answer _____

2




Answer _____






HD1/L1; HD1/L1.1; MSS1/L1.4; MSS1/L1.7

## PAGES 3:16–3:17

# Applying pesticides (4)

Manufacturers provide guidelines about the flow rate of particular nozzles. However, badly maintained or faulty spraying equipment will seriously affect the pressure and flow rate of a sprayer. Part of the calibration process is to measure the flow rate per minute. This can be done accurately using water. The output can then be checked against the manufacturer's recommendations and the label.

## Materials

Spray labels

Manufacturers' guidelines for nozzles

Measuring jugs/sprayers

## Learning outcomes

1 To read liquid capacity using marked and unmarked divisions (focus page, Tasks 2 and 3)

2 To double output where a sample has been collected over 30 seconds only (Task 3)

### Introduction

- Note: teaching for this focus will be more engaging if completed in a practical setting.
- Ask learners to identify different units used to measure liquid capacity. List these on the board.
- Put the different units (metric and imperial) on to cards or sticky notes and get pairs to sort the units into imperial and metric measures and put them in order of size.
- Point out that for calibration, only metric units will be used. As a group, look at the relationship between the metric units only. Learners must be able to understand and work out equivalent measures (i.e. that half a litre is 500 ml, 2 litres is 2000 ml) etc.

### Focus page

- Ask learners why they need to measure flow rate if there are manufacturers' guidelines about nozzle output at certain pressures. (It is important that this is checked each time the equipment is used and checked against these guidelines in case the equipment is faulty.)
- Refer back to the nozzle table on page 3:14 and ask learners to identify the units used to measure output (litres per minute).
- Go through the method shown on the focus page and give particular attention to the problem areas for learners who are not confident with measuring liquid capacity:
  - reading between marked divisions
  - counting on from 1 litre
  - converting millilitres to litres (division by 1000)
  - calculating with numbers that are less than 1 litre
  - zero as a place holder.
- Give examples for learners to practise.

| Curric. refs | NOS | Key Skills |
|---|---|---|
| N2/E3.4<br>MSS1/L1.4<br>Rt/L1.3 | CU78 | N1.2 |

### Step 4 – Measure the flow rate with the selected nozzle

#### Task 1

Check understanding of the general information on the focus page

Rt/L1.3

- Remind learners that measuring output is part of the calibration process and that it is important to follow the method outlined.
- Direct learners to the focus page. Remind them that all the information they need is on this page.

*If the learner has difficulty*

- Learners may have difficulty with the reading skills needed for this task. They need to be able to scan to locate information rather than read every word.
- Question 2 requires understanding of the concept of what they are doing within the process of calibration – the answer is implied but not specifically outlined on the focus page. Learners may need some support to unpick this.

## Task 2

Read liquid capacity from a scale and record in litres only

MSS1/L1.4

- Refer back to practical activities learners may have completed earlier.
- Remind them that output volumes must be recorded in litres.

*If the learner has difficulty*

- Learners may have difficulty reading capacity between divisions or where divisions are unlabelled. They need supported practical activities to build these skills, starting with marked and labelled divisions.
- Learners may also need support with recording and converting quantities from millilitres to litres. This depends on understanding equivalents, decimals and place value.

*Extension*

- Give more examples where quantities fall between marked divisions.
- Give examples of 30-second measurements that require doubling to determine the flow rate per minute.

## Task 3

Read liquid capacity from a scale and double the result

MSS1/L1.4

N2/E3.4

- Ask learners to think about the problems of measuring if the output is high. How can this be addressed?
- Remind them to work in litres and think about the decimal point if using a calculator.

*If the learner has difficulty*

Learners having difficulty with measuring liquids will need additional support to gain confidence – see previous task.

*Extension*

- Practical application of these skills is the best way to reinforce and extend knowledge.
- If learners are able to do practical flow rate tests, they should check their results against the manufacturer's guidelines and work within a reasonable tolerance range.

# Applying pesticides (4)

Focus

| Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6 | Step 7 |
|---|---|---|---|---|---|---|

## Flow rate

You now need to know the flow rate for the nozzle and pressure you have set. This means how much liquid is coming out of the nozzle each minute.

To measure the flow rate:

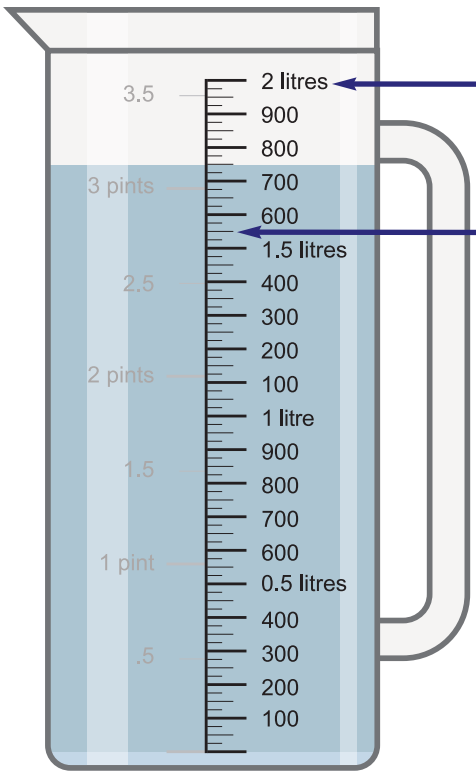
1. Spray water into a measuring jug for 1 minute – keep the pressure constant.
2. Carefully read the amount of liquid collected. This is recorded as litres per minute (l/min).
3. Empty the jug and repeat the process to check that you get the same result.

Many measuring jugs will show both metric and imperial measures.

Check that you are using the right scale before you start.

After 1 litre the labelled divisions begin again at 100 ml.

1000 millilitres = 1 litre




Some divisions are **labelled**. This jug is labelled every 100 ml.

Smaller divisions have no labels. These divisions are every 25 ml.

If the level of the liquid you are measuring is between marked divisions, you will have to estimate using your own experience and judgement.

**This output measures 1.75 l/min**

If the output for 1 minute is more than 2 litres, spray for 30 seconds only and then double the result.

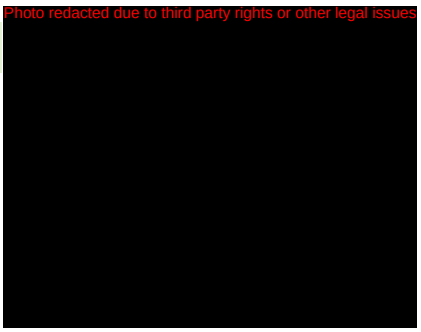
Flow rate will be affected by faulty spraying equipment or blocked nozzles. It is important to check your results against the manufacturer's guidelines.

# Applying pesticides Step 4

Task

| Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6 | Step 7 |
|---|---|---|---|---|---|---|

**Step 4: Measure the flow rate with the selected nozzle.**




## Task 1

What do you know about measuring flow rate? Use the information on the focus page to help you with these questions.

1 How long will you need to spray water into the measuring jug to measure the flow rate?

2 What will affect the flow rate through a nozzle?

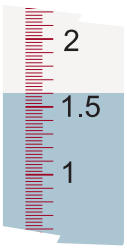
3 What size jug should you use to measure flow rate?

4 What abbreviations do you use to record flow rate?

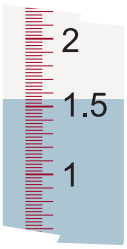
## Task 2

These liquids have been collected for 1 minute. Record the outputs in litres per minute (l/min).

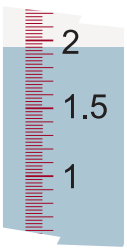
1



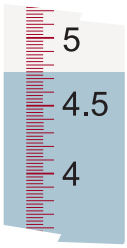

2




3




4

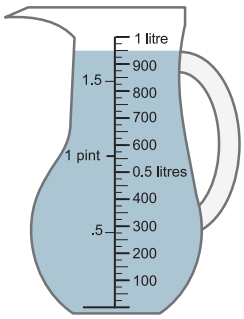



## Task 3

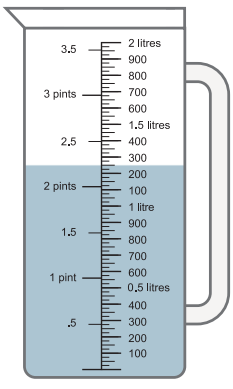
These outputs have been measured over 30 seconds only. How many litres per minute is this?

Use a calculator. Be careful where you put the decimal point.

1




2






Rt/L1.3; MSS1/L1.4; N2/E3.4

## PAGES 3:18–3:19

# Applying pesticides (5)

- Different methods are used for calibration but all methods involve the use of formulae. It is important that learners feel comfortable with formulae and know how to substitute numbers as required. This focus page looks at some calibration formulae as examples but does not attempt to teach the whole calibration process.
- Learners should be confident with the number work practised in the previous focus pages.
- Understanding the structure of formulae is very useful and will allow learners to apply and transfer their skills to other situations. Using a systematic step-by-step approach is vital to successful calibration.

## Materials

Step-by-step calibration sheet from the Source material or in-house prompt sheets used in the training setting

## Learning outcomes

1 To understand how to use a formula (focus page, Tasks 1–3)

2 To substitute numbers and calculate using a formula (focus page, Tasks 1–3)

### Introduction

Review the focus page and the steps used to gather information for calibration (Steps 1–4).

### Focus page

- Use the focus page to check Steps 1–4, which learners have already completed. This leads on to what they do with the information they have gathered. It can now be used for the final calibration calculations. Learners need to adjust the standard application rate to fit their own circumstances. In order to do this they must use a formula.
- Introduce the concept of a formula. Learners have already used formulae to complete calculations for speed and area.
- The analogy of a recipe is used to describe what a formula is and how it can be used to produce the required result.
- Go through the formula for spray volume, step by step. Some learners may want to know what 600 represents. This can be explained as described on the focus page. A more detailed explanation is as follows.
  - If you were walking at 1 kph, with a swath width of 1 metre, it would take 600 minutes to cover 1 hectare.
  - You multiply this by the flow rate of your sprayer (600 × flow rate.) This gives you the amount of spray (litres) per hectare at the standard speed and swath.
  - You then divide this by your own walking speed and swath width to adjust it to your situation.
- Show learners how to substitute their numerical information into the formula and do the calculation.
- Give learners copies of the step-by-step calibration sheet and show them how filling in the empty boxes will ensure that they have included all the data they need.

| Curric. refs | NOS | Key Skills |
|---|---|---|
| N1/L2.4<br>N2/L1.11 | CU78 | N2.2 |

### Step 5: Calculate the spraying volume per hectare

### Task 1

Use a given formula to calculate volume per hectare

N1/L2.4

N2/L1.11

- Direct learners to the information at the top of the page for a given area.
- Encourage them to use the empty boxes as a way to check that they have all the information they need.

*If the learner has difficulty*

- Learners who have not used formulae before will need support in the initial stages.
- Use direct questioning to identify the data that needs to be substituted into the formula.
- Once they have all the data in place (use the boxes as a guide), encourage learners to work through the calculation in a systematic way.
- Encourage learners to do these calculations more than once.
- Working in pairs initially will give more confidence.

*Extension*

Give other scenarios or sets of data for learners to gain additional practice at using the formula.

### Step 6: Work out the amount of mixture needed for the area you are spraying

#### Task 2

Use a given formula to calculate volume of mixture for a given area
N1/L2.4
N2/L1.11

- Check the answer to Task 1 and re-do it if necessary.
- Discuss the need to adjust the volume they have for a hectare to the area they will be spraying.
- Direct learners to the information at the top of the page for a given area.
- Encourage learners to use the empty boxes as a way to check that they have all the information they need.

*If the learner has difficulty*

- See notes for Task 5.
- Some learners will need additional support to break down the task.
- Give learners more practice examples as they gain confidence.

*Extension*

Give learners more practice examples as they gain confidence.

### Step 7: Work out the amount of chemical you will need

#### Task 3

Select and use a formula to calculate volume of mixture for a given area
N1/L2.4
N2/L1.11

- Ask learners to think about how they can work out the amount of chemical they need in the mixture. Draw attention to the application rate given at the top of the page and on labels.
- Point out that application rates are given in litres per hectare, so adjustments need to be made.
- Ask learners to identify the correct formula to complete this calculation and to substitute the value they need.

*If the learner has difficulty*

- Direct learners to the correct formula and support them to complete the calculation.
- It may be useful to use the step-by-step calibration guide in the Source material, which has boxes to complete, as for Tasks 1 and 2.

*Extension*

- Ask learners to think about the whole calibration process.
- What further steps do they need to complete before they can actually get on with the spraying?

## Theme assessment

- Apply the skills learned in this theme to a range of practical spraying tasks.
- Have a range of cards prepared with different information for each variable. Pairs of learners choose one of each and use this combination to complete a calibration calculation.

# Applying pesticides Steps 5, 6 and 7

Focus

| Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6 | Step 7 |
|---|---|---|---|---|---|---|

## Spraying volume and amount of mixture

You now have all the information you need from Steps 1–4 to work out your spraying volume:

Step 1: Area of ground to be sprayed ($m^2$)
Step 2: Walking speed (km/h)
Step 3: Swath width (m)
Step 4: Flow rate (l/min)

You use a standard formula to work out the spraying volume per hectare.

**Example**

Area = 1500 $m^2$
Walking speed = 4.0 kph
Swath width = 0.80 m
Flow rate = 1.20 l/min

A formula is a set method – like a recipe. You put in the right ingredients or numbers to get a result.

**Volume/hectare** = **600** × **flow rate (l/m)** ÷ **swath width (m)** ÷ **walking speed (km/h)**

**Volume/hectare**: **Spraying volume** is the amount of pesticide (litres) you would spray on 1 hectare, using the walking speed, the swath width and the flow rate you have calculated.

**600**: **600** is a base figure used for all sprayer calibration. It is the standard application time for 1 hectare.
**600**

**flow rate (l/m)**: You have calculated this by measuring the spray output in 1 minute. The answer is in litres/minute.
**1.20**

**swath width (m)**: You have measured the width sprayed using a particular nozzle. Your answer is in metres
**0.80**

**walking speed (km/h)**: You have calculated how many seconds it takes to walk 100 metres and converted it to kilometres per hour.
**4.0**

**Volume/hectare** = **225 litres per hectare**

The numbers in the formula need to be put into the calculator in the order they are shown.

Make sure the decimal point is put in correctly.

Now you can work out the volume of mixture needed for your area (if applied at the same rate):

Litres of mixture = volume/hectare ÷ 10 000 × area

**Example**

For an area of 1500 $m^2$ and using the information above:

225 ÷ 10 000 × 1500 = 33.75 litres*

*This is the total amount of mixture (water and chemical) you need for the area you have measured.

Dividing by 10 000 gives you the volume for each square metre. You then multiply by your area to get the volume for that area.

# Applying pesticides Steps 5, 6 and 7

Task

| Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6 | Step 7 |
|---|---|---|---|---|---|---|

**Step 5: Calculate the spraying volume per hectare.**

These are some of the formulae you will use for calibrating sprayers:

Spraying volume/hectare = 600 × flow rate ÷ swath width ÷ walking speed

Amount of mixture for plot area (litres) = volume/hectare ÷ 10 000 × area

Amount of chemical for plot area (litres) = *application rate ÷ 10 000 × area

* This can be found on the label

Example figures for a plot:

Plot area = 600 $m^2$
Walking speed = 4.0 km/h
Swath width = 1.20 m

Flow rate = 1.50 l/min
Application rate = 3.5 l/ha

Write in the numbers for each part of the formula first. Use the boxes as a guide.

## Task 1

Use the example values and the formula for spraying volume to work out the volume per hectare.

Volume/ha = 600 × flow rate ÷ swath width ÷ walking speed

Volume/ha = 600 × ☐ ÷ ☐ ÷ ☐ = ☐ litres

(l/min) (m) (km/h)

**Step 6: Work out the amount of mixture needed for the area you are spraying.**

## Task 2

Use the answer to Task 1, the area of the plot and the formula to work out the volume of mixture needed for the plot.

Amount of mixture = volume/hectare ÷ 10 000 × area

Amount of mixture = ☐ ÷ 10 000 × ☐ = ☐ litres

**Step 7: Work out the amount of chemical you will need.**

## Task 3

1 Use the values you have and the correct formula from the top of the page to work out how much chemical you will need.

2 How many millilitres is this?

## PAGES 3:20–3:21

# Keeping records

A lot of information about the use of pesticides must be recorded and some of the records are kept for up to 40 years. It is essential that information is entered accurately and clearly. This theme develops the skills required for accurate completion of records.

## Materials

Record sheets from the workplace

Health surveillance record form from the Source material (0:11)

## Learning outcomes

1 To know how to read a form, using the format to locate and place particular information (focus page, Tasks 1 and 3)

2 To check that information has been entered accurately (focus page, Tasks 2 and 3)

### Introduction

- Ask learners about forms that are difficult to complete, for example those with specialist vocabulary, lengthy forms, those with unclear or unfamiliar instructions. Discuss practical advice – use headings, look up meanings, ask for help. What strategies do learners use?
- Exemplify the types of instructions found on records (delete, circle, etc.) and the conventions (bold type, capital letters, etc).
- Find headings, titles, etc. on the focus page.

### Focus page

- If possible, present the focus page on screen as an OHT or on a whiteboard and use to illustrate the following discussion/teaching points.
- The page is divided into three sections in different bubbles.
- **Before you start**
  - Point out that headings are written in bold or capitals to draw attention to them.
  - Understand what you need and gather all the information before you start.
  - Check learners know how to measure and write: temperature, rainfall, wind direction, wind speed, time and date.
  - Provide practical examples for any areas that require practice.
- **Filling in the form**
  - Chemicals can have many names that look very similar, so accurate copying is important. Suggest and practise tactics such as remembering a few letters at a time.
  - Check for accuracy – is the information in the correct place on the form? Is all the information provided? Is the handwriting legible?
  - Provide examples for practice. Do learners have any other tactics they find useful?
- **After you have filled in the record sheet**
  - Proofread for accuracy of spelling and of content.
  - Use capital letters if handwriting is untidy.

| Curric. refs | NOS | Key Skills |
|---|---|---|
| Wt/L1.2 | CU78 | C1.2 |
| Wt/L1.5 | | C1.3 |
| Wt/L1.6 | | |
| Rt/L1.4 | | |

### Task 1

Complete a pesticide application record accurately, using given information

Rt/L1.4

Wt/L1.5

- Discuss different layouts of forms – ask learners to identify the differences between the layout of this form and the form on the focus page. You may want to consider the similarities such as bold type, columns, rows in both forms, as well as differences such as space for narrative in the focus page form, different column/row layouts.

- Which form looks easier to complete? Why?
- Ask learners to complete the form.

*If the learner has difficulty*

- If the learner has difficulty with headings, support them to look up words in the glossary.
- If the difficulty is confusion with remembering what has been entered, or entering the same information more than once, suggest that the learner draws a line through each item as it is used, or uses a marker guide to go down the list.
- Dyslexic learners may find it easier to write the category alongside the listed items first and then transfer them to the form.
- Complete the record with the learner as a paired activity.
- Provide further information for the learner to enter using the worked example as a model.

*Extension*

Provide a scenario and ask learners to write information that requires more detail in their own words (e.g. a description for the 'Notes' section).

## Task 2

Check details of a record for accuracy
Wt/L1.6
Wt/L1.5

- Ask learners to spot the similarities between the form for Task 1 and this form.
- Remind learners to use clues in the headings to help check information.
- Remind learners to check information carefully for accuracy.

*If the learner has difficulty*

- Line up information on the form/information on the notepad item by item and check this against the heading
- Dyslexic learners may have problems with sequencing (e.g. numbers in dates).
- They may also have difficulties with tracking or holding visual information from different sources – show them how to use a finger or something to point with, or a crossing-out approach.
- Some learners may experience 'information overload' – cover additional information as each section is checked.

*Extension*

Learners can check their own writing in the notes from Task 2 for spelling, punctuation and accuracy.

## Task 3

Fill in a form with given information and then check for accuracy
Wt/L1.2
Wt/L1.5
Wt/L1.6
Rt/L1.4

- Discuss the differences between the Health surveillance record form from the Source material with the last two forms completed.
- Discuss any difficulties in completing this form (e.g. with the number of dates; accuracy of dates under each heading; the amount of information to be organised). Ask for suggestions about ways to manage these, such as crossing out, using sticky notes, etc.
- Discuss looking up difficult words.

*If the learner has difficulty*

- Dyslexic learners and those with reading difficulties may benefit from paired reading of the information.
- Divide information into manageable chunks (e.g. cut up as sentences, write on sticky notes and place in time order (sequencing time), starting at the top).
- Line up information in chunks or on sticky notes item by item and check these against the headings.
- Dyslexic learners and those with additional spelling difficulties would benefit from having technical words on cards for copying.
- Check that dyslexic learners have no problems with sequencing when copying – possible sequencing errors include numbers in dates.
- Many dyslexic learners have difficulty tracking or holding visual information from different sources. Suggest that they use a finger or something to point with, or a crossing-out approach.
- Some learners may experience 'information overload' – cover additional information as each section is checked.

***Extension***

Complete another form at this level from the learner's workplace/training using the learner's own information.

## Theme assessment

- Ask the learner to bring in a completed form and identify any errors.
- Ask the learner to bring in a form to be completed, together with the information required, and complete it.

# Keeping records

Focus

It is very important to keep good records at work. Records show which pesticide was applied, where and when. If you don't keep records, no one will know what you have done. The law also demands that accurate records of pesticide application are kept.

*Before you start to fill in a record sheet:*
- *read it through*
- *find out the meaning of anything you do not understand*
- *check that you have all the information you need.*

*Look at the title. Are you filling in the correct form?*

*Look at the headings carefully to decide what information goes where.*

**Pesticide Application Record**

| | | | |
|---|---|---|---|
| **Location** | **Product(s) used** | **Dose** | **Volume** |
| **Crop, material, structure treated** | | | |
| | | | |
| | | | |
| **Reasons for treatment** | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| **Other details** | **Spray time** | | |
| | Start | | |
| | End | | |
| **Operator** | **Weather at spraying** | | |
| | Temperature | | |
| | Rainfall | | |
| | Wind direction | | |
| | Wind speed | | |
| **Area sprayed** | **Number of tanks** | **Date applied** | |
| **LERAP Details** | | | |

*If you want to, write in pencil first, check it through, make changes and complete in pen.*

*Think carefully about the spaces where extra information is needed.*
- *Keep to the facts.*
- *Make it clear.*

Make sure you know how to measure and write:
- temperature
- rainfall
- wind direction
- wind speed
- time
- the date.

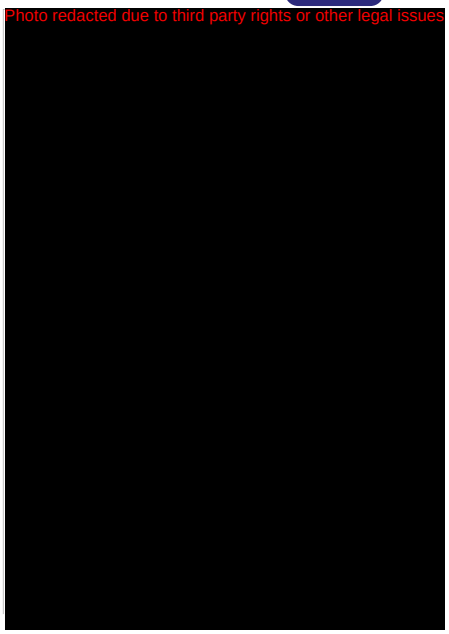
*While you are filling in the form, make sure:*
- *you are following the instructions on the record sheet*
- *your handwriting can be understood by anybody reading it*
- *you copy unusual words, such as the names of chemicals, accurately.*

*Is the handwriting easy to read?*
*Is the meaning clear?*

*After you have filled in the record sheet, check that:*
- *all the information is in the proper places*
- *the information is accurate*
- *words are spelt correctly.*

# Keeping records

Task




## Task 1

Identify and read all the headings on this spray record sheet. Fill in the sheet using the information from the notepad.

Name: *Bernard Rossiter*

| Date | Product | Reason for use | Volume of water | Quantity of product | Intended rate of application | Location sprayed | Spraying time | | | Crop, Variety growth stage |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Start | End | Total | |
| | *Flexidor* | | | | | | | | | *Herbaceous stock* |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

## Task 2

Check that all the information has been entered correctly into this calibration record. Circle the incorrect information and correct it.

| | |
|---|---|
| Operator's name | Bernard Rossiter |
| Date of calibration | 16/20/04 |
| Spray volume | 20 ml/m² (100 litres/ha) |
| Time per 100 metres | 'LO' |
| Nozzle | B/2.5/1 Deflector |
| Pressure setting | 95 seconds |

20 ml/m² (200 litres/ha)
95 seconds
D/2.5/1 Deflector
'LO'
Bernard Rossiter
16/02/04

Check that information matches the heading. What sort of information would you select for a heading asking for 'Time' or 'Pressure setting'?

## Task 3

Use this information about an employee and the Health surveillance record from the Source materials to fill in as much of the information as you can. Check it through when you have finished.

Look at the headings on the form carefully first. Check the spellings of technical words. Check handwriting.

Mr Andrew Smith was born on July 1st 1978. He lives at 10 Woodland Road, Knapford, Beds. KN5 LN6. He started work on 18th August 2002. Until then, he had worked as a supermarket assistant and had never used pesticides. Since completing his training on 1st September 2002, he has used XYZ fungicide and Xthrin insecticide about once a month and AB phosrock fertiliser about once a week. His hands, forearms and lower legs have been checked on 1/9/02, 4/12/02, 25/3/03, by the occupational health nurse, Mrs T. Ford. She has noted no visible or reported effects.



Know where to write information on a record sheet.
Write information accurately and check for errors.

Rt/L1.4; Wt/L1.5; Wt/L1.6; Wt/L1.2

# Check it

**1** In an alphabetic list, which one of these treatments comes first?

**A** Mancozeb

**B** Metam-sodium

**C** Imidacloprid

**D** Malathion

Rw/E3.4

**2** What does the abbreviation FEPA stand for?

**A** Future Earth Protection Agency

**B** Food and Environment Protection Association

**C** Food and Environment Protection Act

**D** Food and Earth Policy Act

Rw/L1.2

**3** Which is the best definition of 'contaminant'?

**A** To pollute the environment

**B** A substance that pollutes

**C** Something that kills fish

**D** A chemical

Rs/E3.2

**4** On a pesticide label, under which section would you find information about any laws relating to environmental safety?

**A** Advisory information

**B** Risk statements and safety precautions

**C** Statutory conditions relating to use

**D** Company details

Rw/L1.2

**5** A bed measures 14.5 metres long by 10 metres wide. Which of these is the area of the bed?

**A** 145 m

**B** 24.5 m

**C** 49 m

**D** 145 $m^2$

MSS1/L1.9

**6** The beds in a greenhouse are 10 m by 10 m. There are 17 on each bench. There are 4 benches. What is the total area of beds in the greenhouse?

**A** 6800 $m^2$

**B** 3400 $m^2$

**C** 1700 $m^2$

**D** 4000 $m^2$

MSS1/L1.9

**7** You can prick out 180 seedlings in an hour. How many seedlings can you prick out in 5 minutes?

**A** 18

**B** 12

**C** 3

**D** 15 MSS1/L1.3

**8** How many millilitres in $10\frac{1}{4}$ litres?

**A** 1025 ml

**B** 10.25 ml

**C** 102.5 ml

**D** 1025 litres MSS1/L1.7

**9** 360 ÷ time in seconds to walk 100 m = walking speed in km/h

You take 2 minutes to walk 100 m. Using the formula, what is your walking speed?

**A** 180 km/h

**B** 1 km/h

**C** 3 km/h

**D** 480 km/h MSS1/L2.2

**10** For an area of 1500 $m^2$ you need to use 27.5 litres of spray mix. How much of the same spray mix would you need for an area measuring 15 m x 5 m?

**A** 27.5 litres

**B** 20 litres

**C** 9.5 litres

**D** 1.375 litres MSS1/L1.9

# Audio

PAGES 3:3–3:5

## Understanding the law

### Task 6 18

Part III of FEPA applies to:

a. any pesticide; /or

b. any substance, preparation or organism prepared or used for any of the following purposes as if it were a pesticide: /
   - protecting plants or wood or other plant products from harmful organisms;/
   - regulating the growth of plants;/
   - giving protection against harmful creatures./

# Answers

PAGES 3:1–3:2

## Finding the right product

### Task 1

Note: answers are based on the November 2002 edition of the *Green Code*.

Part 4: Keeping records – page 72

Section 3: The COSHH assessment – page 25

Annex C: Equipment terminology – page 92

Legislation governing the disposal of waste pesticides and containers – page 78

### Task 2

**1** 4
**2** mancozeb
**3** yes
**4** no
**5** 3
**6** no

PAGES 3:3–3:5

## Understanding the law

### Task 1

COPR = Control of Pesticides Regulations

PPPR = Plant Protection Products Regulations 1995 (as amended)

COSHH = Control of Substances Hazardous to Health Regulations 1994 (as amended)

PPE = personal protective equipment

RPE = respiratory protective equipment

NPTC = National Proficiency Test Council

MEL = maximum exposure limit

OES = occupational exposure standard

### Task 2

You might have put something like this:

Occupational exposure standard – the set amount of time that anyone working in horticulture is allowed to work with a pesticide

Respiratory protective equipment – anything you wear to prevent you from breathing in fumes from the pesticides

Maximum exposure limit – the most time you are allowed to work with a pesticide

### Task 3

**2** Everyone who uses pesticides at work must be trained and assessed to prove they know how to use them properly.

### Task 4

You may have described it like this:
When you are applying a pesticide, you must keep it within the intended area.

### Task 5

92. d. – Before eating, drinking or smoking, take off any PPE which could contaminate food, liquid or cigarettes, etc. (Contaminate – pollute)

200. d. – Return any unused pesticide concentrate to safe storage. (Concentrate – something that is not diluted)

23. c. – The likely ill-effects of exposure (Exposure – contact with)

139. b. The name of the pesticide to be applied and its active ingredient. (Active – working)

158. b. – The COSHH assessment has been made and is still valid. (Valid – legal)

### Task 6

Part III of FEPA applies to:
a. any pesticide; or
b. any substance, preparation or organism prepared or used for any of the following purposes as if it were a pesticide:
- protecting plants or wood or other plant products from harmful organisms;
- regulating the growth of plants;
- giving protection against harmful creatures.

PAGES 3:6–3:7

## Reading the product label (1)

### Task 1

| STATUTORY CONDITIONS RELATING TO USE | | |
|---|---|---|
| For use only as an agricultural/horticultural herbicide. | | |
| WEAR SUITABLE PROTECTIVE GLOVES AND FACE PROTECTION (FACESHIELD) when handling the concentrate. | | |
| READ ALL PRECAUTIONS BEFORE USE | | |
| CROPS/ SITUATIONS | MAXIMUM INDIVIDUAL DOSE (PRODUCT/HECTARE) | MAXIMUM NUMBER OF TREATMENTS |
| broccoli, calabrese, cauliflower, Brussels sprout, cabbage, kale, swede, turnip, sage, onion | 13.0 litres/hectare | 2 per crop |

| ADVISORY INFORMATION | |
|---|---|
| **Wedekilla** | |
| Contains 480 g/litre Propachlor | |
| 5 Litres | (A bar code)<br>Lot number: 09876<br>Production date: 5/4/2003 |
| Wedekilla PLC, Wedekilla House, Loamshire.<br>01564 738299 | |

| RISK STATEMENTS AND SAFETY PRECAUTIONS | |
|---|---|
|  | HARMFUL IF SWALLOWED |
| | IRRITATING TO THE EYES AND SKIN |
| AVOID ALL CONTACT BY MOUTH | |

PAGES 3:8–3:9

## Reading the product label (2)

### Task 1

**b** **pesticide:** pest killer
**c** **bactericide:** bacteria killer
**d** **fungicide:** fungi killer
**e** **insecticide:** insect killer

### Task 2

**a** **acaricide:** mite or tick killer
**b** **biocide:** algae killer
**c** **molluscicide:** slug and snail killer
**d** **rodenticide:** rodent killer (rats, mice, etc.)
**e** **vermicide:** virus killer

### Task 3

**a** **residual:** left over after most of something has gone
**b** **post:** after
**c** **emergence:** becoming visible
**d** **annual:** every year
**e** **contaminate:** pollute
**f** **apex:** the highest point of something

PAGES 3:11–3:13

## Applying pesticides (2)

**Multiplication and division**

**a** 4.5
**b** 465 square metres (or $m^2$)
**c** 40
**d** 68
**e** 15
**f** 0.0068
**g** 4.86
**h** 4.77

**Measuring length**

**1** metres
**2** 10
**3** a) 1.5 m b) 0.68 m c) 0.05 m

**Time**

**a** 90 (seconds)
**b** 3600 (seconds)
**c** 2 (plants per minute)
**d** Check your answer with your teacher.
**e** 1.5 kilometres

**Hectares**

**a** 10000 sq metres = 1 hectare
**b** 100
**c** True
**d** ha

**Average stride length**

Check your answers with your teacher.

**Liquids**

**a** l is used as an abbreviation for litres. L is also used.
**b** ml
**c** 0.45 l
**d** 1500 ml
**e** 750 ml
**f** 800 ml

**Abbreviations**

**a** kilometres per hour
**b** litres per hectare
**c** litres per minute
**d** kilometres per hour
**e** bars
**f** square metres

### Task 1

**1** 700 $m^2$
**2** 3000 $m^2$
**3** 320 $m^2$
**4** 30.375 $m^2$ (30.38 $m^2$ rounded to 2 decimal places)

### Task 4

**1** 4.19 km/h (rounded to 2 decimal places)
**2** 3.87 km/h

### Task 5

**1** 96 seconds
**2** 3.75 km/h (kph)

### Task 6

Check your answers with your teacher.

PAGES 3:14–3:15

## Applying pesticides (3)

### Task 1

**1** Spray quality
**2** By spraying water onto a dry concrete surface and measuring the width of the spray
**3** Pressure
**4** Litres per minute (litres/minute; l/min)
**5** 11004
**6** Change the width of the swath
**7** Bout

### Task 2

**1** Suitable nozzle: 11003 or 11004
Expected output at 2 bar: 0.98 litres/minute (nozzle 11003) or 1.13 litres/minute (nozzle 11004)

**2** Suitable nozzle: 11001 or 11002
Expected output at 2 bar: 0.33 litres/minute (nozzle 11001) or 0.49 litres/minute (nozzle 11002)

### Task 3

**1** 1.1m **2** 0.96m

PAGES 3:16–3:17

## Applying pesticides (4)

### Task 1

**1** 1 minute
**2** nozzle size and pressure
**3** 2 litre
**4** l/min

### Task 2

**1** 1.6 l/min
**2** 1.55 l/min
**3** 1.95 l/min
**4** 4.75 l/min

### Task 3

**1** 1.9 l/min
**2** 2.5 l/min

PAGES 3:18–3:19

## Applying pesticides (5)

### Task 1

Volume/hectare = 600 × 1.50 ÷ 1.20 ÷ 4.0
= 187.5 litres/ha

### Task 2

Amount of mixture =
187.5 ÷ 10 000 × 600 = 11.25 litres

### Task 3

**1** Amount of chemical for plot area
= application rate ÷ 10 000 × area
= 3.5 ÷ 10 000 × 600 = 0.21 litres
**2** 210 ml

PAGES 3:20–3:21

# Keeping records

## Task 1

| Name: *Bernard Rossiter* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Product | Reason for use | Volume of water | Quantity of product | Intended rate of application | Location sprayed | Spraying time | | | Crop, Variety growth stage |
| | | | | | | | Start | End | Total | |
| *24/10/03* | *Flexidor* | *Broad-leaved weeds* | *365 l* | *170 ml* | *2147 l/hectare* | *Beds 1-8* | *10.45* | *11.30* | *45 mins* | *Herbaceous stock* |
| | | | | | | | | | | |

## Task 2

The circled text shows the correct answer.

| | |
|---|---|
| Operator's name | Bernard Rossiter |
| Date of calibration | 16/02/04 |
| Spray volume | 20 ml/m² (200 litres/ha) |
| Time per 100 metres | 45 seconds |
| Nozzle | D/2.5/1 Deflector |
| Pressure setting | 'LO' |

## Task 3

**Employee**

| | | | |
|---|---|---|---|
| Surname | *Smith* | Forename | *Andrew* |
| Sex | *M* | Date of birth | *1/7/78* |
| Home address | *10 Woodland Road<br>Knapford,<br>Beds.<br>KN5 LN6* | | |
| National Insurance number | | Started work | *18/8/02* |

**Previous employment**

| Date | Job title | Pesticides exposed to |
|---|---|---|
| *before 18/8/02* | *Supermarket assistant* | *none* |
| | | |
| | | |

**Substance** contact record since work started

| Date | Pesticides exposed to | Frequency |
|---|---|---|
| *1/9/02* | *XYZ fungicide<br>Xthrin insecticide* | *monthly* |
| *1/9/02<br>18/8/02* | *AB phosrock fertiliser* | *weekly* |
| | | |

**Skin surveillance**

| Date | Observation | Signature |
|---|---|---|
| *1/9/02* | *no visible or reported effects* | *T. Ford* |
| *4/12/02* | *no visible or reported effects* | *T. Ford* |
| *25/3/03* | *no visible or reported effects* | *T. Ford* |

## Check it

1 D
2 C
3 B
4 C
5 D
6 A
7 D
8 A
9 C
10 D