

# SPIDERS

**Spiders** is one of a series of enquiries and additional resources which together form **Beyond fair testing: Teaching different types of scientific enquiry**,

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Science Enhancement Programme



University of London

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## SPIDERS: OVERVIEW

Enquiry type: Identifying enquiry

Section	Activity	Links to KS3 PoS/ Scheme of work	Links to KS4 PoS	Learning objectives Students will be able to:	Assumed prior knowledge and Understanding
1. Core enquiry	1.1	<p><b>Sc1: investigative skills:</b> The main emphases are concerned with Planning, Obtaining and presenting evidence, Considering evidence and Evaluating. In order to do these students have to use knowledge and understanding from Sc2.</p>	<p><b>How science works:</b> Practical and enquiry skills. Communication skills. The main emphases are selecting suitable analytical tests and ordering them so as to identify spiders efficiently.</p>	<ul style="list-style-type: none"> <li>use appropriate procedures to collect spiders</li> <li>handle spiders with care</li> <li>ask good questions in order to split a group of spiders into sub-groups</li> <li>ask good questions in order to identify a specific spider</li> <li>decide what questions would be suitable for each stage of the identification process</li> <li>construct a key to identify species of spiders</li> <li>use a key to identify spiders</li> <li>decide what makes a good identification key.</li> </ul>	<ul style="list-style-type: none"> <li>different species of spiders, the parts of their bodies and the use and function of their webs</li> <li>selecting questions to ask when constructing an identification key</li> </ul>
2. Background knowledge	2.1	<p><b>Sc2: Variation, classification and inheritance</b></p> <p><b>QCA SoW:</b> 7D Variation and classification</p>	<p><b>Organisms and health:</b> 5(b) Similarities and differences between species can be measured and classified</p>	<ul style="list-style-type: none"> <li>name parts of the body of a spider and describe their role</li> <li>identify the place of different parts of the body of a spider on a diagram.</li> </ul>	None
	2.2			<ul style="list-style-type: none"> <li>describe a variety of reasons why spiders build webs.</li> <li>draw simple diagrams to show how a web is constructed.</li> </ul>	None
	2.3			<ul style="list-style-type: none"> <li>describe the main differences between spiders and insects</li> <li>describe the distinguishing features of arachnids and name some of them.</li> <li>describe how spiders feed</li> <li>name and describe some types of web.</li> </ul>	None
	2.4	<p><b>Sc2: Variation, classification and inheritance</b></p> <p><b>QCA SoW:</b> 7D Variation and classification</p>		<ul style="list-style-type: none"> <li>name some British spiders and describe some facts about them</li> <li>write a five-bullet-point description of one British spider</li> <li>draw a picture of this spider.</li> </ul>	None
2.5	<ul style="list-style-type: none"> <li>name groups to which spiders belong</li> <li>name groups of spiders</li> <li>name spider species.</li> </ul>		None		

Section	Activity	Links to KS3 PoS/ Scheme of work	Links to KS4 PoS	Learning objectives Students will be able to:	Assumed prior knowledge and Understanding
3. Procedural understanding	3.1	<b>Sc1 Investigative skills:</b> Planning	<b>How science works:</b> Data evidence, theories and explanations Practical and enquiry skills.	<ul style="list-style-type: none"> <li>decide what criteria can be used to judge good questions for identification.</li> <li>decide which questions are good for splitting a group of given animals into smaller groups</li> <li>decide which questions are good for identifying a separate species of spider within a given number of spiders</li> <li>split a group of spiders gradually so as to separate it into individual species.</li> </ul>	None
	3.2	<b>Sc1 Investigative skills:</b> Planning	<b>How science works:</b> Practical and enquiry skills.	<ul style="list-style-type: none"> <li>identify groups to which spiders belong.</li> <li>identify groups into which spiders are divided.</li> <li>distinguish between features shared by all spiders and features which are distinctive for some spiders.</li> <li>use knowledge and understanding of spiders to construct a key.</li> </ul>	Information contained in activity 2.5
	3.3	<b>Sc1 Investigative skills:</b> Obtaining evidence, Considering evidence	<b>How science works:</b> Data evidence, theories and explanations Practical and enquiry skills. Communication skills	<ul style="list-style-type: none"> <li>use appropriate procedures to collect pond invertebrates from a sample of pond water</li> <li>use a key to identify the invertebrates they find</li> <li>explain how they used the key to identify the invertebrates</li> <li>describe what is important in a key so as to help identify animals.</li> </ul>	Knowledge of how to collect and handle pond invertebrates safely

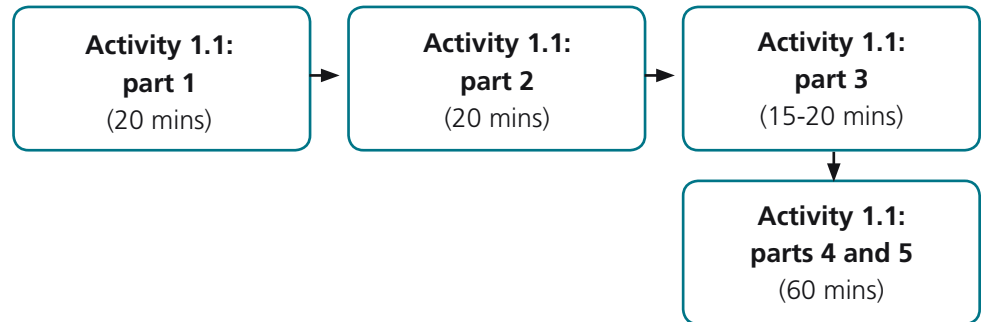
**HEALTH AND SAFETY**

For practical activities, the Science Enhancement Programme has tried to ensure that the experiments are healthy and safe to use in schools and colleges, and that any recognised hazards have been indicated together with appropriate control measures (safety precautions). It is assumed that these experiments will be undertaken in suitable laboratories or work areas and that good laboratory practices will be observed. Teachers should consult their employers' risk assessments for each practical before use, and consider whether any modification is necessary for the particular circumstances of their own class/school. If necessary, CLEAPSS members can obtain further advice by contacting the Helpline on 01895 251496 or e-mail [science@cleapss.org.uk](mailto:science@cleapss.org.uk).

## SPIDERS: ROUTES

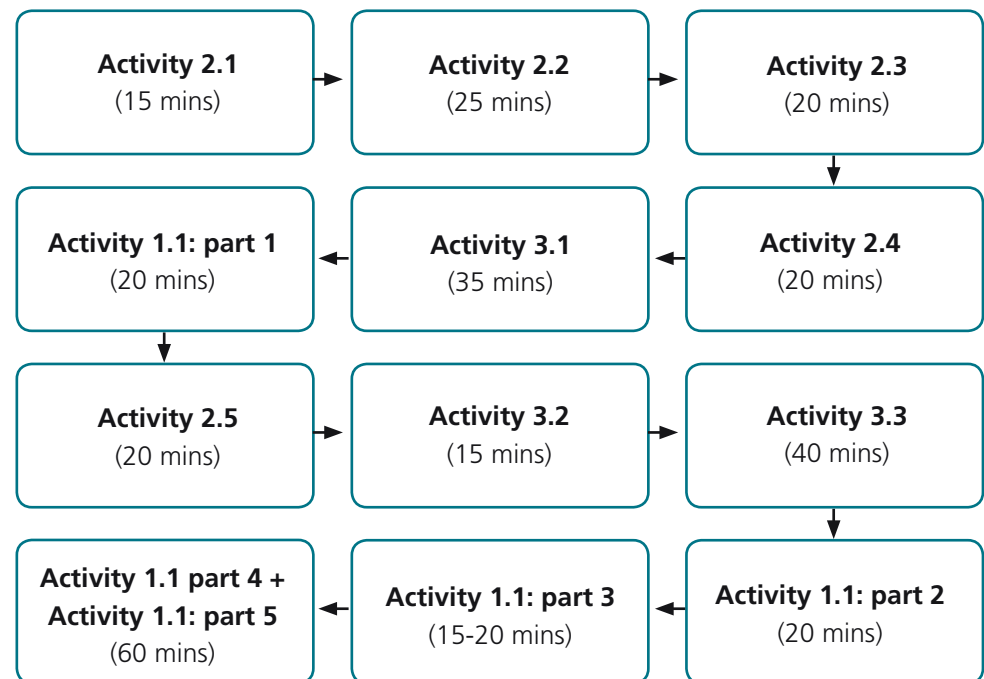
**Route 1** (assumes students have already identified skills and knowledge to begin activity 1.1)

Overall time is roughly 3 to 5 hours.



**Route 2** (uses all activities from sections 2 and 3 to provide relevant knowledge and procedural understanding to begin core enquiry in section 1)

Overall time is roughly 4 to 5 hours







# ACTIVITY 1.1: DESIGNING AND USING A KEY FOR IDENTIFYING SPIDERS (CORE ENQUIRY ACTIVITY)

## WHAT STUDENTS DO

Students collect spiders using appropriate procedures. They construct an identification key using a set of ten spider cards and use their key to identify the spiders they have collected.

### Learning objectives

Students will be able to:

- use appropriate procedures to collect spiders
- handle spiders with care
- ask good questions in order to split a group of spiders into sub-groups
- ask good questions in order to identify a specific spider
- decide what questions would be suitable for each stage of the identification process
- construct a key to identify species of spiders
- use a key to identify spiders
- decide what makes a good identification key.

### Resources needed

- **Student Activity 1.1: Designing and using a key for identifying spiders.**
- Equipment for the collection of spiders. (See **part 4: Collecting spiders**, below for details).
- Large sheets of paper (for creating the key)
- A selection of pens and markers.

## NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

We recommend you do the following activities before starting Activity 1.1: **Activities 2.1-2.4**. These provide students with information about different species of spiders, the parts of their bodies and the use and function of their webs. **Activity 3.1**. This introduces students to asking questions when constructing an identification key.

**Note:** 'Size' on the spider cards refers to the overall length of head plus abdomen, but does not include legs, and this is the likely size of an adult spider: young spiders will be smaller than this.

**Note:** We recommend you do **Activity 2.5**, **Activity 3.2** and **Activity 3.3** before moving on with the enquiry.

The enquiry falls into five parts:

- 1 Planning your key
- 2 Constructing your key
- 3 Using somebody else's key to identify the spiders on the cards
- 4 Collecting spiders
- 5 Evaluating your key

## Part 1: Planning your key

### Plenary:

Provide each group of students with a set of spider cards (**Set A**, from **Student Activity 1.1**). Ask the students to suggest questions which might help to sort the spiders into groups. Ask them to explain why they think their questions are good for sorting the spiders into groups. Check that students understand that they should avoid asking questions specific to any one particular type of spider early on.

### Group work:

Arrange the students in groups and ask each group to think of

- the questions they are going to ask first and
- what questions they think could ask in order to identify individual spiders.

Whilst they are working, look at the questions that they are writing and discuss in their groups their reasons for choosing those questions.

## Part 2: Constructing your key

### Plenary:

Lead a class discussion about how a key could be presented. Elicit the point that keys should consist of 'yes/no' questions, which gradually lead to the identification of each species of spider.

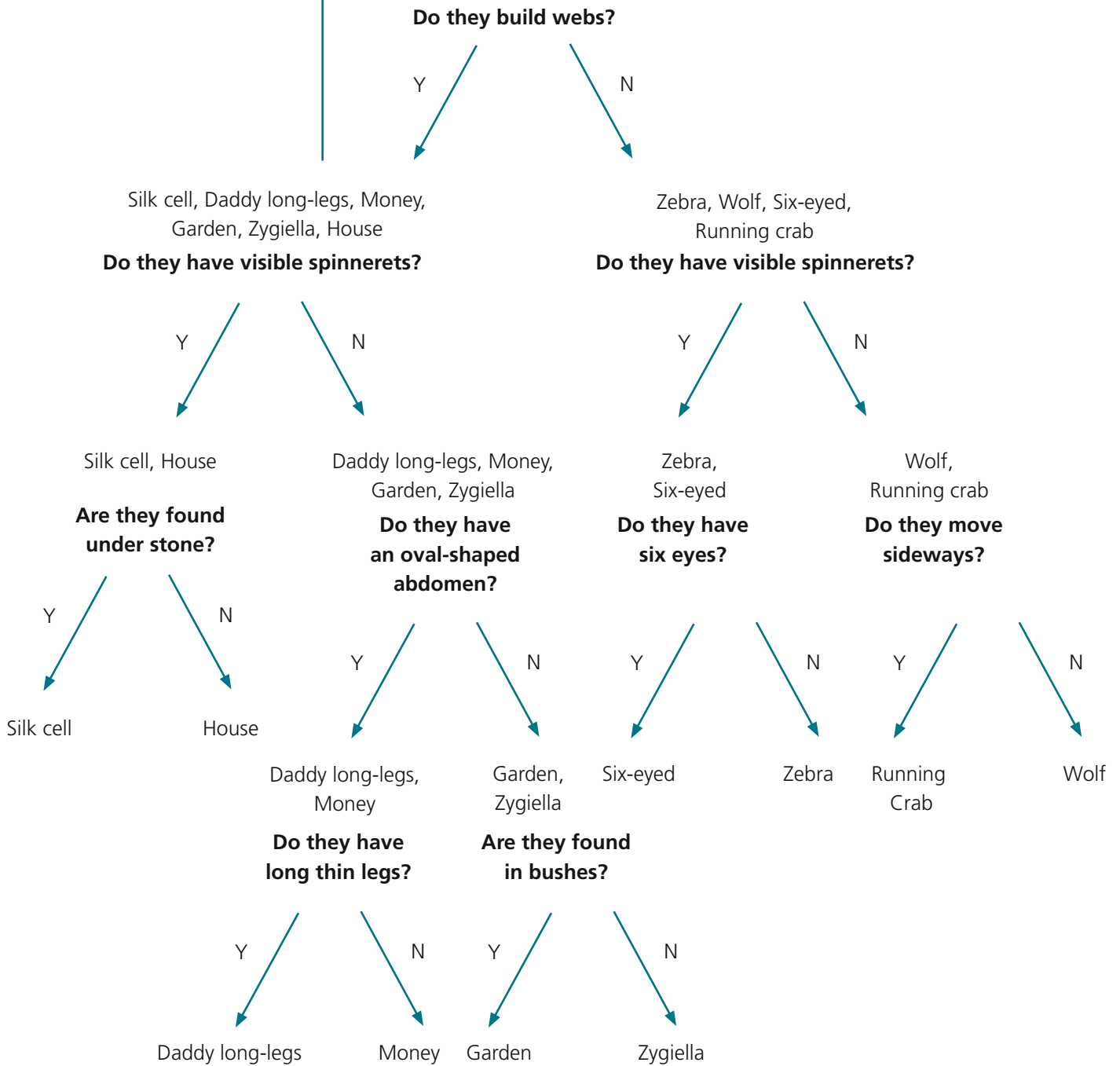
### Group work:

Provide each group of students with a large sheet of paper, which they will use to construct their key. Ask students to write down the questions they are going to ask in order to identify each species of spider **before** they start constructing their key.

The table presents information provided in the spider cards (Set A).

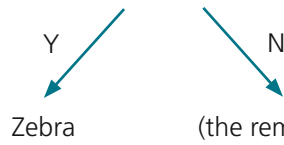
	Feature	Name of spider									
		Silk Cell spider	Zebra spider	Daddy Long-legs spider	Wolf spider	Six-eyed spider	Running crab spider	Money spider	Garden spider	Zygiella/orb web spider	House spider
Written information	Colour	Brown and yellow	Black & white	Pale grey	Brown	Orange/pink	Green	Dark bars on paler background	Brown	Silvery	Brown
	Number of eyes	8	8	8	8	6	8	8	8	8	8
	Size in mm	8	6	10	7	2	5	3.5	12	6	16
	Web	Y	N	Y	N	N	N	Y	Y	Y	Y
	Silk	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Found	Under stones and bark	Bushes, grass and trees and on walls	Inside buildings	Trees, bushes and grass	Bushes, trees and grass	Bushes, trees and grass	Stones and bark, grass, bushes and trees	Bushes, trees and grass	On buildings, (corner of window and door frames)	Inside buildings
	Move	Forwards	Jumping	Forwards	Forwards	Forwards	Forwards	Sideways	Forwards	Forwards	Forwards
Visual information	Spinnerets Visible	Y	Y	N	N	Y	N	N	N	N	Y
	Legs Hairy	Y	N	N	Y	N	N	Y	Y	Y	Y
	Shape of abdomen	Oval	Oval	Oval	Oval	Oval	Oval	Oval	Round	Round	Oval
	Pattern on abdomen	Y	Y	N	Y	N	N	Y	Y	Y	Y
	Other feature			Long, thin legs							

This is an example of a good key: no more than four questions are needed to identify any of the spiders.

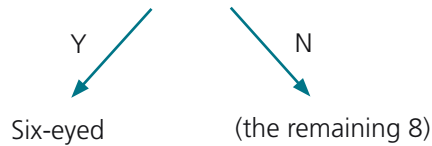


This is an example of key which is not so good: it is possible to identify the Zebra spider with one question, but it needs nine questions to identify the House spider.

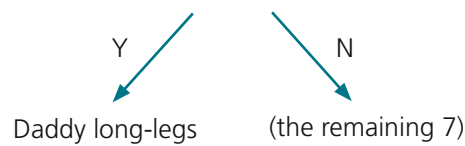
**Do they move by jumping?**



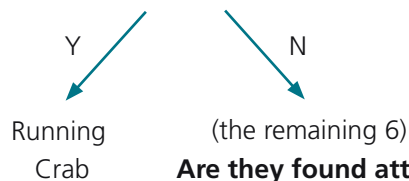
**Do they have six eyes?**



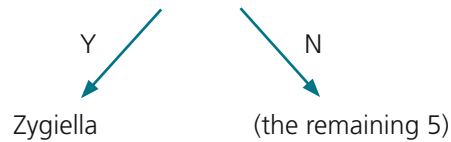
**Do they have long thin legs?**



**Do they move sideways?**



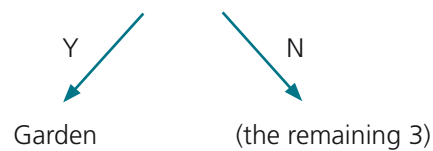
**Are they found attached to buildings?**



**Do they build a web?**



**Is their abdomen rounded?**



**Are their spinnerets visible?**



**Do they live under stones?**



## Part 3: Using somebody else's key to identify the spiders in the cards

### Group work:

Provide each group of students with **Spider Cards, Set B**, from **Student Activity 1.1**. (These are the same spider cards without the names of the different species on). Have students swap their keys with other groups. Ask students to use the second key to identify four of the spiders.

### Plenary:

Once students have used the second key and answered the questions, discuss their answers in whole class.

There are two key points to bring out:

- A first test for the usefulness of a key is whether it actually helps to identify an unknown spider.
- A better key is one which helps identify each species of spider with as few questions as possible.

## Part 4: Collecting spiders

### Resources needed for part 4

- **Student Activity 1.1: Collecting spiders**
- **Student Activity 1.1: Spider recording sheet**

Each group will need:

- White tray
- Meter rule
- Magnifying glass
- Pooter
- Net
- Paintbrush
- Clipboard and pencil
- A few Jam Jars/Petri Dishes
- Cotton Wool.

## NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

Students do this activity in groups of three or four.

- Most spiders can be found from early spring till late autumn.
- Show students how to use each piece of equipment for collecting the spiders.
- In case some students do not want to collect spiders, it might be useful if you or a technician collected some for the class: place a small piece of damp cotton wool in each jar to stop the spider from drying out and make sure there is some ventilation. Place the jars in a dark area of the lab.
- Encourage students to keep a good record of the spiders they collect. Also, encourage them to collect a small number of obviously different spiders rather than several which appear to be identical.
- There is probably going to be time for each group to collect and identify two or three spiders only. The Spider Recording Sheet has spaces for more than this so that students can collect and identify more spiders if time allows or add results from other groups, if you wish. If you have a computer with data projector and whiteboard, you could use the Word version of this sheet to display combined class results. This may also lead to some interesting discussion of the best places to find particular kinds of spiders, as well as the diversity (or otherwise) of spiders in the school grounds.
- A digital microscope or digital camera with good magnification would allow you to capture photographs of the spiders which could be referred to again in other lessons. (Avoid keeping the spider under a hot light for too long).
- Remind students to return the spiders to where they were found and to release them carefully before the end of the lesson, and allow time for this to happen.

### **Managing the class outside the science laboratory is an important issue.**

You will need to:

- know where each group will work, and
- set time limits for students to collect spiders.

Make sure you know who else may be working on the field - and where - during these sessions, as well as identifying any potential hazards, or features which would make adequate supervision difficult.

- Some (very few) spiders might bite. Tell students to avoid handling spiders with their bare hands.
- Remind students to wash their hands thoroughly after any fieldwork.

**Note:** The spiders shown on the spider cards are British spiders. Some of them are very common whereas others are more rare. It is likely that some of the spiders students will collect will be among the ones found in the cards and therefore the keys the students have constructed will be appropriate for identifying them. However, it is possible that students might collect spiders which are not among the ones shown on the spider cards - the keys will be inappropriate for identifying these spiders. This is a limitation of every key: Each key is good for identifying the species that were used in order to construct it. (In fact, an identification key is like a door key: it only opens the doors it is made for!)

## Part 5: Evaluating your key

### Group work:

Students use their keys in order to identify each of the spiders they have collected then answer the relevant questions in **Student Activity 1.1**.

### Plenary:

Lead a discussion about whether students' keys were good at identifying the collected spiders. Discuss strong and weak points of different keys. Ask students to suggest reasons why their keys might not be efficient or appropriate for identifying all the collected spiders (if such instance arises).

### Additional information to help with identification

The Field Studies Council website, at [www.field-studies-council.org/](http://www.field-studies-council.org/) has details of several publications which may help in identification, ranging from fold out charts and leaflets such as, 'A guide to house and garden spiders' by Lawrence Bee and Richard Levington, to more comprehensive texts .



# ACTIVITY 2.1:

## PARTS OF A SPIDER

### WHAT STUDENTS DO

Students match the description of the parts of the body of a spider with the appropriate name and then label the diagram of a spider with the relevant parts.

#### Learning objectives

Students will be able to:

- name parts of the body of a spider and describe their role
- identify the place of different parts of the body of a spider on a diagram.

#### Resources needed

- **Student Activity 2.1: *Parts of a spider.***

### NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

This activity familiarises students with the anatomy of a spider. It links with **Activity 1.1.**

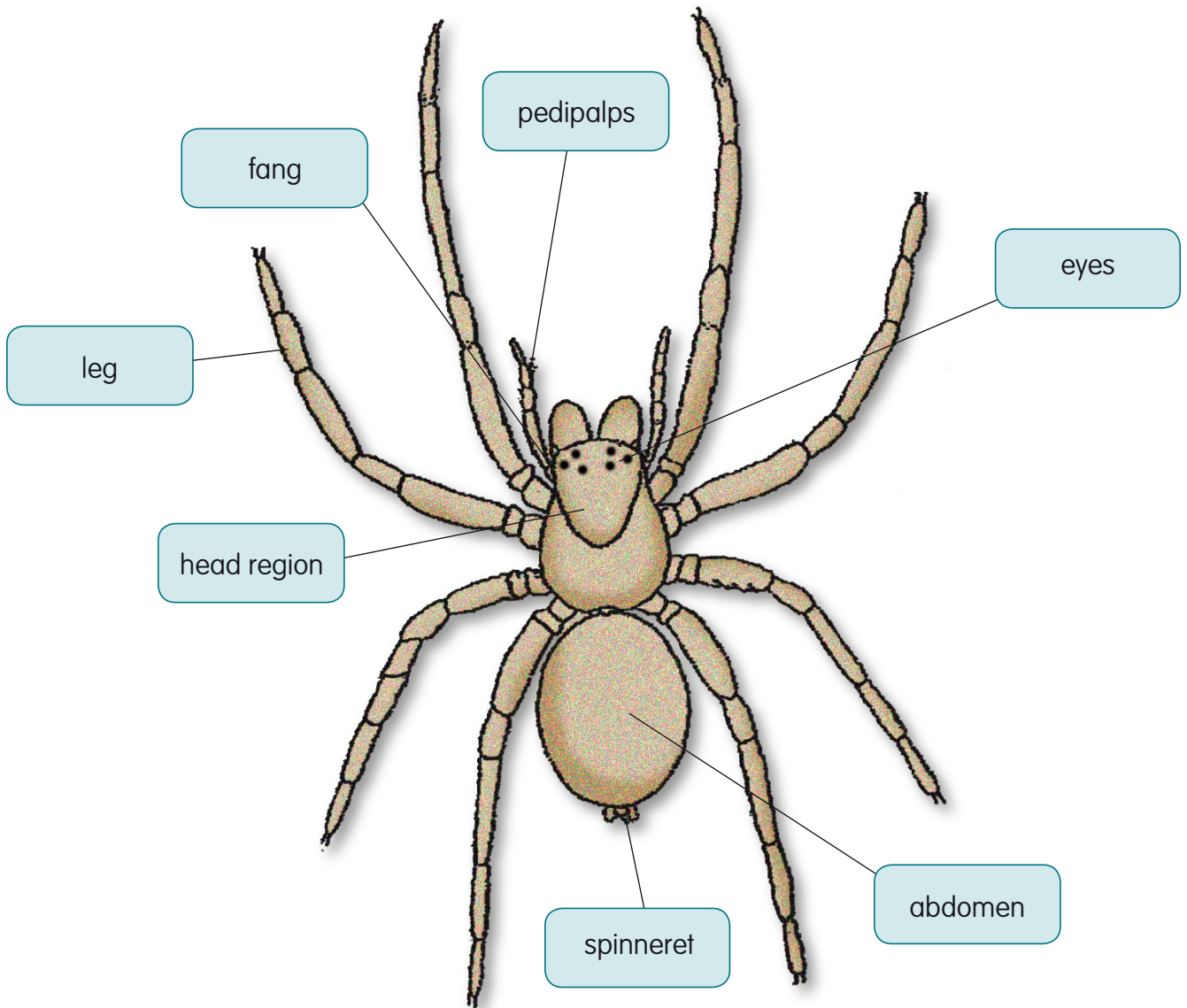
Students could complete this activity on their own or in groups.

The completed activity looks like this

1.

Description	Parts of a spider
Spiders usually have eight of these to see with	Eyes
The eyes can be found here	Head region
Leg-like mouthpart, used by the spider to feel its way	Pedipalp
The second of the two major body parts	Abdomen
Structure at the back of the body, which spiders use to spin silk with	Spinneret
Used by the spider for support and movement	Leg
Dracula-like tooth structure used by spiders to pierce prey	Fang

2.



## ACTIVITY 2.2: WHY AND HOW DO SPIDERS BUILD WEBS? EXERCISE 1: THE FUNCTION OF WEBS

### WHAT STUDENTS DO

Students read a text and underline reasons for spiders building webs.

#### Learning objectives

Students will be able to:

- describe a variety of reasons why spiders build webs.

#### Resources needed

- **Student Activity 2.2, Exercise 1: *The function of webs.***

### NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

Web-building is a distinctive behaviour unique to spiders. It is one of the major features used for their scientific classification. It is important for students to appreciate the role the web plays in the spider's life along with the ways the web is actually constructed.

#### Group work:

Students carry out the task described in **Student Activity 2.2, Exercise 1.**

#### Plenary:

After students have underlined the reasons spiders build webs, it might be useful to ask students to comment on some of these reasons.

#### The completed exercise should look like this:

Spiders' favourite food is insects, and spiders use the web to catch insects. The web itself serves as a filter but it is the spider itself that actually catches the prey. The insect can escape if the spider does not restrain it. The spider rushes up to its prey as soon as it lands in the web and wraps it in silk to subdue it. Some spiders inject their prey with venom before they wrap the prey whereas others throw a sheet of silk over their prey before wrapping it. The mesh size of the web will determine what size prey is caught in the web. If the mesh size is big, then smaller insects will escape the trap.

The web serves many other functions for the spider, such as providing shelter and support for the spider, allowing early detection of mates or predators and providing the spider with a place to lay her eggs. The threads of the web transmit information in the form of vibration that the spider is very sensitive to. The spider can move at high speed along the web. The web also serves as the male's dance floor; this is where he performs a song and dance routine of plucking threads and twitching his body to attract and stimulate the female.

# ACTIVITY 2.2:

## WHY AND HOW DO SPIDERS BUILD WEBS?

### EXERCISE 2: THE STRUCTURE OF WEBS

#### WHAT STUDENTS DO

Students read a text about constructing a web and draw pictures of a web at different stages.

#### Learning objectives

Students will be able to:

- Draw simple diagrams to show how a web is constructed.

#### Resources needed

- **Student Activity 2.2, Exercise 2: *The structure of webs.***
- Coloured pens or pencils and extra paper.

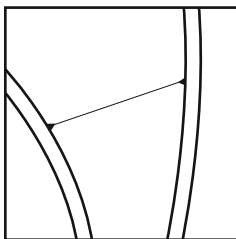
#### NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

This activity offers students some room for creativity. While the three stages of the web structure should be shown, students' drawings may differ and they should be free to decide on additional features of their webs.

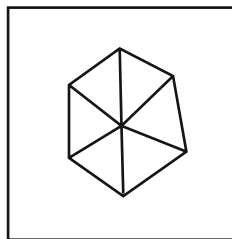
Some students might need more space for their drawings than the one provided in **Student Activity 2.2, Exercise 2**. In this case, they might choose to draw in their books or on extra paper.

The completed sequence should look similar to this:

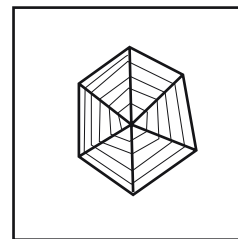
Stage 1



Stage 2



Stage 3



## ACTIVITY 2.3:

### IS THERE MORE TO SPIDERS THAN MOST PEOPLE KNOW ABOUT THEM?

#### WHAT STUDENTS DO

Students use the internet to find out some facts about spiders and to resolve some common misunderstandings about them.

#### Learning objectives

Students will be able to:

- describe the main differences between spiders and insects
- describe the distinguishing features of **arachnids** and name some of them.
- describe how spiders feed
- name and describe some types of web.

#### Resources needed

- **Student Activity 2.3: *Is there more to spiders than most people know about them?***
- Access to the internet

#### NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

This activity could be set as class work or as homework. Ideally, each student would find out the answers to all of these questions, but if time is limited you might direct different groups of students to different questions and use a plenary session to combine all the information.

## ACTIVITY 2.4: BRITISH SPIDERS

### WHAT STUDENTS DO

Students use the internet to find out some facts about British spiders, and then do some research on a spider of their choice.

#### Learning objectives

Students will be able to:

- name some British spiders and describe some facts about them
- write a five bullet-point description of one British spider
- draw a picture of this spider.

#### Resources needed

- **Activity 2.4: British spiders.**
- Access to the internet.

### NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

Some or all of this activity could be set as homework.

#### Answers to questions

1. About 650 different species of spiders.
2. Four Spot Orb Weaver (*Araneus quadratus*).
3. Missing sector orb weaver (*Zygiella x-notata*).
4. The zebra spider (*Salticus scenicus*).

## ACTIVITY 2.5: WHAT KIND OF ANIMAL ARE SPIDERS?

### WHAT STUDENTS DO

Students carry out an interactive reading comprehension activity (a 'DART') on the classification of spiders.

#### Learning objectives

Students will be able to:

- name groups to which spiders belong
- name groups of spiders
- name spider species.

#### Resources needed

- **Student Activity 2.5: *What kind of animal are spiders?***
- Black, red and blue pens or pencils.

### NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

**Note:** This activity links with **Activity 3.2: *Representing groups of animals using a tree diagram.*** We recommend that the two activities are carried out together.

**Note:** The information provided in this task does not strictly follow the scientific classification scheme. This is to avoid going into too much detail for students of this age.

This is an important activity to introduce students to the idea of scientific classification of spiders. It aims at helping students understand that, within the hierarchy of classification, organisms belong into more inclusive groups and are also divided into mutually exclusive groups. Building a hierarchy of mutually exclusive groups lies at the heart of constructing an identification key and, therefore, this activity links directly with Activity 1.

Some of the scientific names used in the text (the name of families of spiders) students will find hard to read. They were only used because there are no alternative common names. They are not meant to constrain the activity. Rather than learning to pronounce the names of the families, the important feature is for students to recognise them as mutually exclusive groups of spiders.

#### The completed activity should look like this:

Animals are divided into vertebrates and invertebrates. Spiders are **invertebrates**, which means they do not have a backbone. Instead they have a hard outside skeleton called an exoskeleton. Spiders belong to a group of invertebrates called **arthropods**.

Arthropods are divided up into smaller groups, two of which are the insects and the arachnids. Spiders belong to the **arachnids**, and share this group with ticks, scorpions and mites.

Spiders have eight legs, a head region and an abdomen. They have a pair of fangs, which they use to kill and eat their prey. They are abundant in both number and species, showing great diversity.

Some spiders build webs, where they spend most of their lives, so spiders are divided into web-builders and non-web builders. Different spiders build different types of webs, but the most well known is the orb-web. This is the type we often think of when thinking about spiders. Web-builders are divided into orb-weavers and non orb-weavers.

Orb-weavers form different families. When grouping animals, the word 'family' means 'a group of similar species'. It is a different use of the word from the idea of a family of parents and their young. In Britain, there are spiders which belong to the following families: the Araneidae, the Uloboridae, the Tetragnathidae, the Theridiosomtidae and the Metidae. Each one of these families builds an orb web unique to them, so we can tell which family a spider is from by looking at its web.

One spider in the Araneidae family is the tropical *Nephila*. It builds giant orb-webs, which are up to 2 metres wide. This spider itself is two or three inches long with leg spans of up to 20 cm across. Another member of the Araneidae family is the *Araneus diadematus*, which is also known as the garden spider. It builds a typical orb-web which is quite large compared to the size of the spider (which is about 1 cm long). It is found all over Britain from late spring to early autumn.



# ACTIVITY 3.1:

## ASKING QUESTIONS TO IDENTIFY

### EXERCISE 1: TEN QUESTIONS

#### WHAT STUDENTS DO

Students take it in turns to think of an animal, while the others ask 'yes/no' question to try to identify the animal.

#### Learning objectives

Students will be able to:

- decide what criteria can be used to judge good questions for identification.

#### Resources needed

- **Student Activity 3.1, Exercise 1: Ten questions.**

#### NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

#### Plenary:

Demonstrate the process to the students. Think of an animal and have the students ask questions. Direct them towards asking only 'yes/no' questions until they identify your animal.

#### Group work:

Ask students to repeat the process in their group. If time allows, each student should have a chance to think of an animal. Encourage them to identify best and worst questions and to be ready to explain their answers.

#### Plenary:

Repeat the process once more, writing the questions on the board. After the identification of the animal, go back to the questions and ask which ones were good and which were weak. Ask why some questions are good and others not so good.

#### **Effective sets of questions are ones that enable identification in as few steps as possible.**

If the questions are specific to a certain species early on, you might be lucky and pick the right question on the first attempt. However, if you are unlucky, you might end up asking endless questions. *It is a good strategy to start with some general questions to allocate the animal into a group. This can be followed up with more detailed questions until the question specific to the species will identify the target animal.*

### What counts as a good question depends on the stage within the identification process

#### *At the beginning:*

Good questions are the ones which help assign an animal to a group of animals within a classification scheme (the scientific or other). Allocating the animal to a group is useful because groups have a number of shared features, so placing the animal in a group gives us more information about it.

This can guide the identification process. For example, if the question is 'Is it a mammal?' and the answer is 'No', then it is not helpful to ask questions about distinguishing features of mammals, such as 'Does it give birth to live young?', but it is helpful to ask questions about groups mutually exclusive with mammals, such as 'Is it a bird?'. Thus, allocating an animal within a group in the (scientific) classification scheme can make the identification process quicker.

#### *Later on:*

Having narrowed down what the animal might be, good questions are the ones specific to a particular animal. These are about distinctive features of the animal to be identified. For example, a good question for the identification of a zebra would be 'Does it have black and white stripes?'

**The following types of questions are not helpful in identifying at any stage:**

Example	Type of question The question is about a feature which is....
Does it have eight legs? (when trying to distinguish among spiders)	.....shared by all the members of the sample
Is it small or big?	.....not operationalised
Is the length of the legs of the spider more than 1 cm?	.....one for which there is too much variability within the species
Does it have brown fur?	.....not a single one

# ACTIVITY 3.1:

## ASKING QUESTIONS TO IDENTIFY

### EXERCISE 2: ASKING QUESTIONS TO IDENTIFY SPIDERS

#### WHAT STUDENTS DO

Students fill in a table with features of six spiders based on the information (written and visual) provided in the cards. Then, they ask questions to split spiders into groups and to identify each species of spider. Finally, they start from a larger group, which they split into finer and finer groups so that they end up with specific spiders.

#### Learning objectives

Students will be able to:

- decide which questions are good for splitting a group of given animals into smaller groups
- decide which questions are good for identifying a separate species of spider within a given number of spiders
- split a group of spiders gradually so as to separate it into individual species.

#### Resources needed

- **Student Activity 3.1, Exercise 2: Asking questions to identify spiders.**
- Spider cards (from **Student Activity 1.1, Set A**) for Silk Cell spider, Zebra spider, Daddy Long-Legs spider, Running Crab spider, Zygilla spider and Money spider.

#### NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

This activity is best done in groups. Give each group a the set of six spider cards. This is an introductory activity into the construction of an identification key: students work with a set of six cards out of the ten they are going to use in part 1 of **Student Activity 1.1**.

This activity differs from **Activity 3.1, Exercise 1**, in two ways:

- the animals which are to be identified are given (each one of the six different spiders) and
- the features which will be used in order to aid the identification are given as well (in a diagram or in written form).

The purpose is to manage to identify each species of spider as quickly as possible. Therefore, as in **Activity 3.1, Exercise 1**:

**Effective sets of questions are ones that enable identification in as few steps as possible.**

If the questions are specific to a certain species early on, you might be lucky and pick the right question on the first attempt. However, if you are unlucky, you might end up asking endless questions. It is a good strategy to start with some

**Note:** For this task, it does not really matter much if the criteria are the scientifically relevant ones or not as long as the group of six spiders is split into roughly equal sized sub-groups.

**Note:** 'Size' refers to the overall length of head plus abdomen, but does not include legs, and this is the likely size of an adult spider: young spiders will be smaller than this.

general questions to allocate the spider into groups, and this can be followed up with more detailed questions until the question specific to the species will identify the target spider.

### What counts as a good question depends on the stage within the identification process:

- At the beginning:

Good questions are the ones which help to split the group of spiders into sub-groups of roughly equal size.

- Later on:

Good questions are the ones which identify each spider individually.

## Part A

Students will need to look both at the information provided in written form in the spider cards, and also at the pictures of the spiders themselves. Features which students can see on the pictures include:

- the shape of abdomen (oval or round)
- whether the abdomen has a pattern or not
- whether the spinnerets are visible or not
- whether the legs are hairy or not.

**The completed table should look like this:**

Name	Colour	Number of eyes	Web	Shape of abdomen	Size (mm)	Found	Other features (examples)
Silk cell	Brown and yellow	8	Yes	Oval	8	Under stones and bark	Visible spinnerets
Zebra	Black and white	8	No	Oval	6	In bushes, trees, grass or on walls	Moves by jumping
Daddy long-legs	Grey	8	Yes	Oval	10	Inside buildings	Long, fragile looking legs
Running crab	Green	8	No	Oval	5	In bushes, trees, grass	Moves sideways
Zygiella	Silvery	8	Yes	Round	6	Attached to buildings, outside	Hairy legs
Money	Dark bars on a paler background	8	Yes	Oval	3.5	Under stones and bark, in bushes, grass, trees	No visible spinnerets, has pattern on abdomen

## Part B

### Examples of helpful questions:

*Does it live in bushes, grass and trees?* (splits the group into 3 and 3)

*Does it build a web?* (splits the group into 4 and 2)

*Is it yellow?* (splits the group into 2 and 4)

### Examples of questions which are not helpful:

*What shape is the abdomen?* – it is not a ‘yes/no’ question

*Does it have eight eyes?* –all of these six spiders do

*Is it larger than 7 mm?* –all of these spiders can be smaller than 7 mm.

*Does it have long, fragile looking legs?* –it splits the six spiders into one group of five and another ‘group’ of only one spider.

### Examples of good questions for identifying individual spiders

*Does it have long, fragile looking legs?* – Good for identifying daddy long-legs: It is the only spider with this type of legs.

*Does it run sideways?* - Good for identifying the running crab spider: It is the only one which moves this way.

*Does it have a round abdomen?* – Good for identifying the zygiella: It is the only one in this group of six spiders which has a round abdomen.

## Part C

Some students might need guidance to do this task. Emphasise the fact that once the initial group has been split into two sub-groups, it is important to concentrate on one of the sub-groups and try to select features which will help to divide this sub-group into smaller sub-group.

### Examples of possible questions and their effects:

*What questions could you ask to split this group further?*

**Question:** Do they live under stones and bark?

**Yes**

Silk cell

**No**

Daddy long-legs

Money

Zygiella

*What questions could you ask to split the ‘yes’ group even further so that you identify each spider?*

**Question:** Does it have visible spinnerets?

**Yes**

Silk cell

**No**

Money

## ACTIVITY 3.2: REPRESENTING GROUPS OF ANIMALS USING A TREE DIAGRAM

### WHAT STUDENTS DO

Students use the printed resources to create a tree diagram which shows how spiders are classified.

#### Learning objectives

Students will be able to:

- identify groups to which spiders belong,
- identify groups into which spiders are divided,
- distinguish between features shared by all spiders and features which are distinctive for some spiders,
- use knowledge and understanding of spiders to construct a key.

#### Resources needed

- **Student Activity 3.2: Representing groups of animals using a tree diagram.**
- **Student Activity 2.5: What kind of animal are spiders? for students to refer to.**
- Scissors, glue and pens
- Extra paper sized A3 (optional) for students to re-draw the diagram on a larger sheet
- Access to IT facilities (optional) to allow students to carry out the activity as a 'drag- and-drop' or 'copy-and-paste' activity using the Word version available on the CD.

### NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

Students will need to refer to **Activity 2.5: What kind of animal are spiders?** This outlines the relationship between different groups of animals which are to be placed in the tree diagram, along with distinctive features of some groups.

#### Plenary:

Explain to students what a tree diagram is. Tell them that it is like an upside down tree, in which we get to smaller groups of animals as we go further down.

Ask one student to read the first sentence of the text in **Activity 2.5**. Lead students to understanding that the information in this sentence helps to fill in the first line of the tree-diagram. Point out to the students that the information already provided in the tree diagram helps us to place the label 'invertebrate' in the group which includes 'spiders'.

**Group work:**

Assign students to groups and ask them to complete the tree diagram.

This activity should help students to appreciate important aspects which underlie the construction of classification schemes and which are also central for identification keys.

These are key points:

- Classification schemes are hierarchical systems. Within each level of hierarchy they consist of mutually exclusive groups of organisms
- The organisms in the second row of a hierarchy all share the distinctive characteristics of the level above them, but the distinctive features of each of the groups in the second row are not shared by all the organisms in the row above. For example, all branches of organisms which stem from invertebrates do not have a backbone, whereas having eight legs is a feature only shared by some of the arthropods (it is a feature of the arachnids but not of the insects).
- A feature which is shared by a group of organisms cannot be used in order to divide the organisms in this group into sub-groups.

**Plenary:**

After students have completed the diagram, ask students questions in order to reinforce understanding of the above aspects. It might be useful to ask students to explain their answers by referring to the diagram. Some examples are given below:

- Are mites vertebrates? How do you know?

*No. The diagram shows that they are a sub-group of arthropods, which are invertebrates.*

- Do all spiders build webs?

*No. Spiders are divided into web-builders and non-web-builders.*

- Are non orb-weavers spiders?

*Yes. They are found below web-builders so they are a sub-group of web-builders. Web-builders in turn are spiders and so are all their sub-groups.*

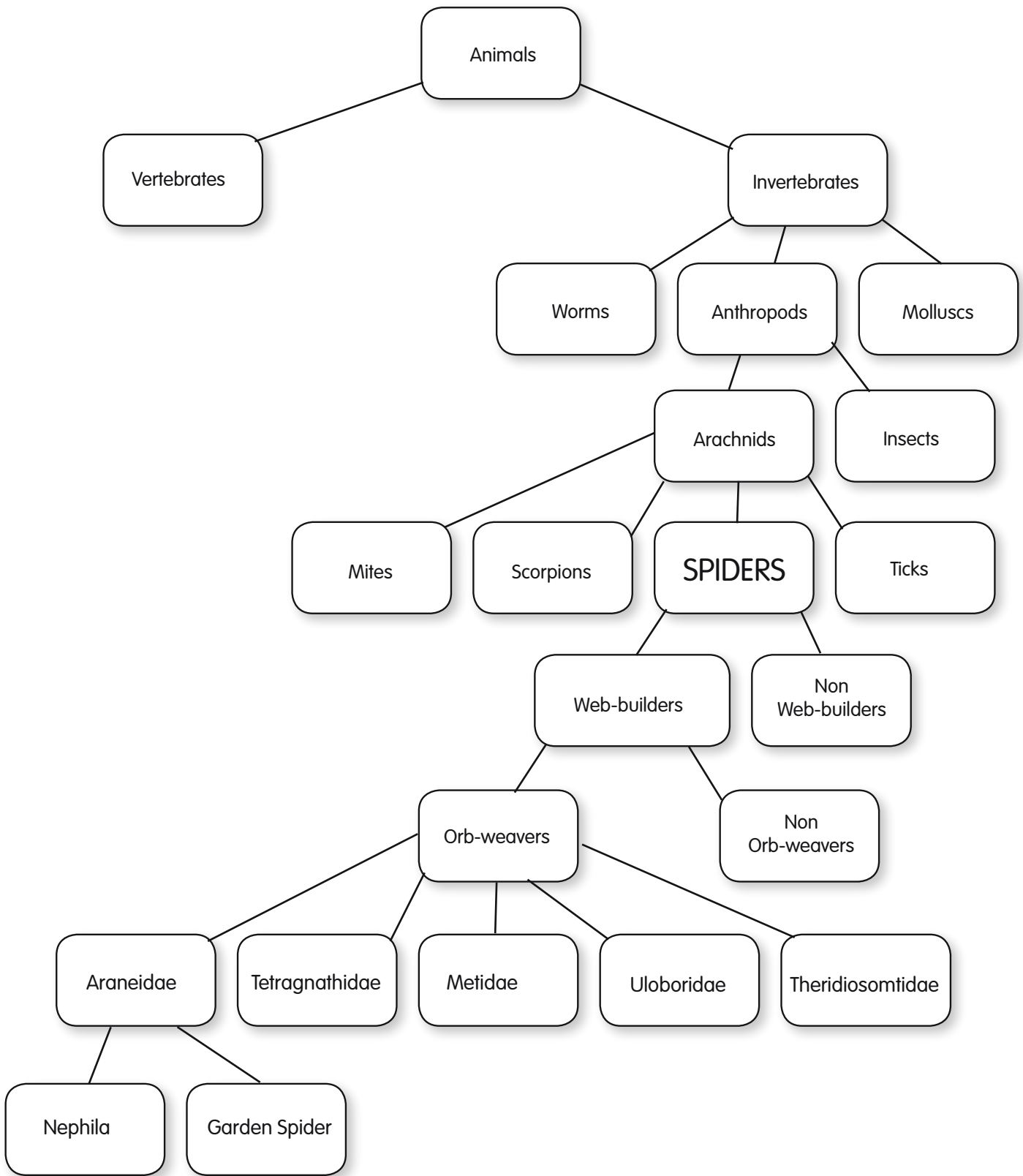
- If I want to distinguish different spiders, should I look for which of them have eight legs? Why?

*No. Having eight legs is a feature common to all spiders and therefore it cannot be used to distinguish between them.*

Students may wish to cut and paste the available labels or write-in the information in the diagram. They could also do this using the Word version of this activity if computers are available.

Alternatively, students might wish to re-construct the tree diagram in larger pieces of paper. (Again, it may help some students to preserve correct spellings if they are able to use the Word version at a computer to produce text boxes with enlarged text, before printing out for cutting and pasting).

The completed diagram should look like this:





# ACTIVITY 3.3:

## USING AN IDENTIFICATION KEY TO IDENTIFY POND INVERTEBRATES

### WHAT STUDENTS DO

#### What students do

Students carry out a practical activity and identify the pond invertebrates they find in pond water using a pond invertebrate identification key.

#### Learning objectives

Students will be able to:

- use appropriate procedures to collect pond invertebrates from a sample of pond water
- use a key to identify the invertebrates they find
- explain how they used the key to identify the invertebrates
- describe what is important in a key so as to help identify animals.

#### Resources needed

- **Student Activity 3.3: *Using an identification key to identify pond invertebrates.***
- Each group will need:
- Pond water: this needs to be collected carefully so that it contains as many invertebrates as possible.
- Pond invertebrate key: most science departments have suitable examples. **The Field Studies Council** website at <http://www.field-studies-council.org/> has details of useful publications, including inexpensive fold-out charts.
- Magnifying glass
- Paintbrush
- A few petri dishes
- White tray.

### NOTES AND SUGGESTIONS FOR CLASSROOM ACTIVITIES

If there is only a short time available for this activity, you might wish to provide each group of students with a petri dish containing two or three noticeably different invertebrates to identify.

As an alternative to this activity, you might wish to ask the students to conduct a Leaf Litter identification task.

#### Plenary:

Show students how to use the key for an animal they have collected. Emphasise the need to go through successive steps of the key until they identify each species.

**Group work:**

Assign students to groups of three or four. You might want to ask them to take turns at the two different parts of the activity, that is:

- collecting an invertebrate
- observing it with the magnifying glass, making a drawing of it and writing a description.

Encourage students to describe their invertebrates as fully as possible.

**Plenary:**

Discuss students' answers in a feedback session.

**Answers to questions**

1. The answers may vary according to the invertebrates found. Features will include the existence or lack of legs, their number, the body shape, the relative size of different parts of the body and so on.

2. This will vary according to the invertebrates identified.

3. A good answer may include the following:

Start from the beginning of the key. Answer the first question and follow the branch corresponding to your answer. Do the same for the rest of the questions, one at a time, until you get to name the invertebrate.

Alternatively, you might be able to place the invertebrate at some approximate point within the key. You might start the identification process from this place and go down until you identify the invertebrate.

4. A good answer will include the following:

- The key contains yes/no questions. This allows you to give definite answers to each question.
- Every time you answer a question, you are directed to only one following question.

## ACTIVITY 1.1: DESIGNING AND USING A KEY FOR IDENTIFYING SPIDERS

How can you identify spiders you collect in the field?

Find out by designing a key to identify ten different spiders. You will have to decide which questions will need to be in your key and at what stage you are going to ask a specific question.

Use the spider cards provided to produce a key to identify each spider.

### Part 1: Planning your key

Look at the spider cards (Set A):

What are some good 'yes/no' questions to split spiders into groups?

Which questions could you ask that would definitely identify a spider individually?

### Part 2: Constructing your key

You will be given a large sheet of paper on which to construct your key.

When you are clear what questions you will be putting in your key and why you have chosen those questions, start to construct your key.

How are you going to present your key?

Are you going to have pictures and diagrams in your key?

### Part 3: Using somebody else's key to identify the spiders in the cards

Collect a set of spider cards (Set B) from your teacher.

Swap your key with another group and use their key to identify four of the spiders.

Answer the following questions:

- Did their key help you to identify the spiders?
- If, yes, how many questions did you ask to identify each spider?
- What do you think makes their key a good key?

## ACTIVITY 1.1: DESIGNING AND USING A KEY FOR IDENTIFYING SPIDERS

### Part 4: Collecting spiders

Look for different types of spiders in the field, and collect one or more spiders for identification. Just collect one of each type: do not collect two spiders which look the same.

- Use the **Collecting spiders** sheet to find out what to do.
- Record information about each spider in your **Spiders Recording Sheet**.

### Part 5: Evaluating your key

Use your key to identify at least one of the spiders you collected.

Write a paragraph evaluating your key. Consider the following questions:

- Did your key help you to identify the spider?
- If yes, what do you think makes your key a good key?
- If you could design your key again, would you make any changes?

## ACTIVITY 1.1: DESIGNING AND USING A KEY FOR IDENTIFYING SPIDERS

### Collecting Spiders

#### Equipment

White trays	Meter rule
Magnifying Glass	Pooters
Nets	Paintbrushes
Clipboards	Pencil
Jam Jars/Petri Dishes	Cotton Wool
Labels	
Spider recording sheet	

#### Ways of collecting spiders

##### 1. Pooters

Pooters can be used to suck small spiders into a container. You will often spot the spider by eye in this method and you can only use these for small species.

##### 2. Nets

Nets can be used to sweep through areas of bushes. Sweep the net through in a figure of eight motion. Look carefully in the net after sweeping three times to see if you have got anything. If you do, using the paintbrush, gently transfer the spider to a collecting jar.

##### 3. Bush/Tree Beating

Hold the white tray underneath a tree or bush. Another member of the group hits the tree or bush with the meter rule a few times above the white tray. Any animals living in the tree will be knocked into the bush. See if you have got any spiders. Place any spider into a collecting jar.

#### What to do

- Each group needs to collect a set of apparatus.
- You will carry out this activity in the school grounds. Make sure you know where you are meant to be working.
- Try to find and collect two different kinds of spider: if you are able to collect two spiders quickly, check if you should collect any more. You will use your key to identify the spiders before returning them to where you found them.
- You will need to look on the outside of school buildings round the windows, in bushes and trees and on fences, hedges etc. Spiders need somewhere to live so you will not often find them just running around.
- Fill in the recording table so you have a record of where you found them and what they look like. Give each spider you find a number.
- Make sure you put the number on the collecting jar so you know which spider is which back in the lab.
- Remember to wash your hands thoroughly at the end of any 'fieldwork' session.

#### Good spider care

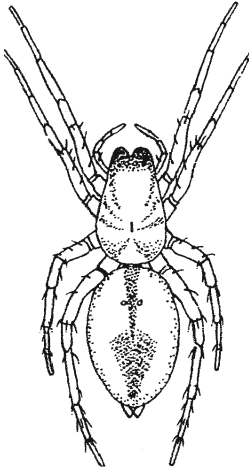
- Try not to place more than one spider in each jar.
- Be gentle with them. Use the paint brush to carefully sweep them into collecting jars.

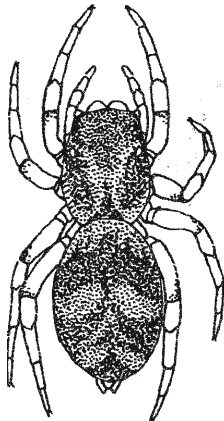
## ACTIVITY 1.1: DESIGNING AND USING A KEY FOR IDENTIFYING SPIDERS

## SPIDER RECORDING SHEET

Spider	Where was it found? Was it in a web?	Size (mm)	Description of colour? Any patterns?	Other features?	What species do you think it is?
1					
2					
3					
4					
5					
6					
7					
8					
9					

## ACTIVITY 1.1: SPIDER CARDS (SET A)

(Clubiona corticalis; Family=Clubionidae) <b>Silk Cell Spider</b>		
	Colour:	Brown and yellow
	Number of eyes:	8
	Size:	8 mm long
	Web:	Yes
	Make silk:	Yes
	Found:	Under stones and bark
	Move:	Forwards

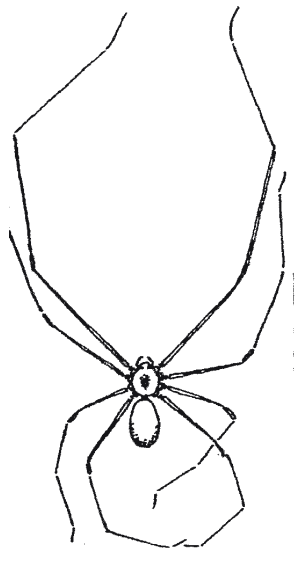
(Salticus scenicus; Family = Salticidae) <b>Zebra Spider ( a type of Jumping Spider)</b>		
	Colour:	Black and white
	Number of eyes:	8
	Size:	6 mm long
	Web:	No
	Make silk:	Yes
	Found:	In bushes, grass and trees, and on walls
	Move:	Forwards, by jumping

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## ACTIVITY 1.1: SPIDER CARDS (SET A)

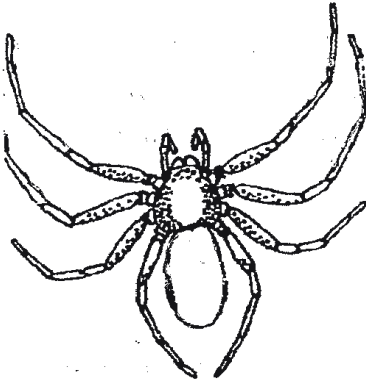
(Pholcidus phalangioides; Family = Pholcidae)

**Daddy Long-Legs Spider**

	Colour:	Pale grey
	Number of eyes:	8
	Size:	10 mm long
	Web:	Yes
	Make silk:	Yes
	Found:	Inside buildings
	Move:	Forwards

(Philodromus dispar; Family = Philodromidae)

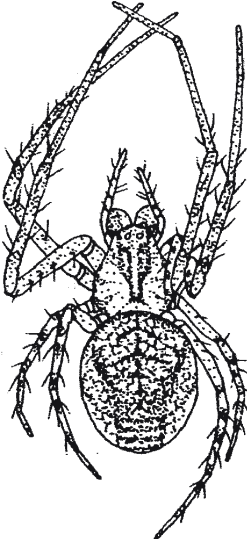
**Running crab spider**

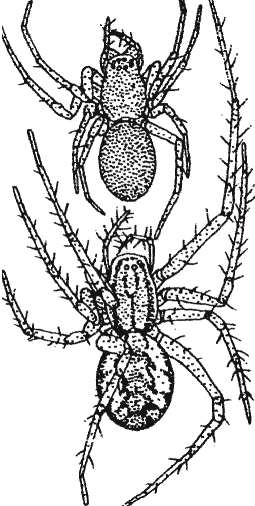
	Colour:	Green
	Number of eyes:	8
	Size:	5 mm long
	Web:	No
	Make silk:	Yes
	Found:	In bushes, grass and trees
	Move:	Sideways

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## ACTIVITY 1.1: SPIDER CARDS (SET A)

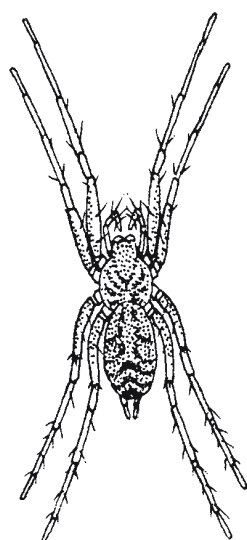
(Zygiella x-notata; Family = Araneidae) <b>Zygiella ( no common name, a type of Orb web spider )</b>		
	Colour:	Silvery
	Number of eyes:	8
	Size:	6mm long
	Web:	Yes
	Make silk:	Yes
	Found:	On buildings (corner of window and door frames)
	Move:	Forwards

(Leptyphantes leprosus; Family = Lynphiidae) <b>Money spider</b>		
	Colour:	Dark bars on a pale background
	Number of eyes:	8
	Size:	3.5 mm long
	Web:	Yes
	Make silk:	Yes
	Found:	In bushes, grass and trees and under bark
	Move:	Forwards

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## ACTIVITY 1.1: SPIDER CARDS (SET A)

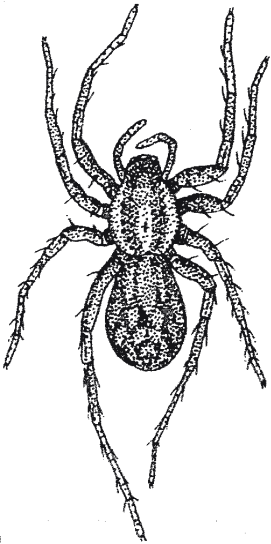
(Araneus diadematus; Family = Araneidae) <b>Garden Spider</b>		
	Colour:	Brown
	Number of eyes:	8
	Size:	12 mm long
	Web:	Yes
	Make silk:	Yes
	Found:	In bushes, grass and trees
	Move:	Forwards

(Tegenaria gigantea; Family = Agelenidae) <b>House spider</b>		
	Colour:	Brown
	Number of eyes:	8
	Size:	16 mm long
	Web:	Yes
	Make silk:	Yes
	Found:	Inside buildings
	Move:	Forwards

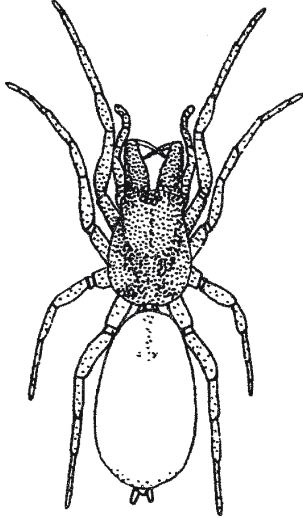
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## ACTIVITY 1.1: SPIDER CARDS (SET A)

**(Pardosa amentata; Family = Lycosidae)****Wolf spider**

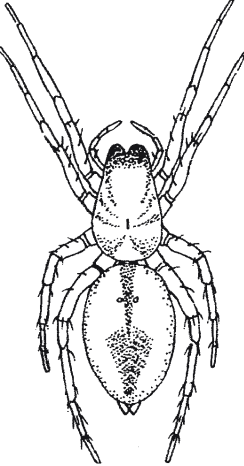
	Colour:	Brown
	Number of eyes:	8
	Size:	7 mm long
	Web:	No
	Make silk:	Yes
	Found:	In bushes, grass and trees
	Move:	Forwards

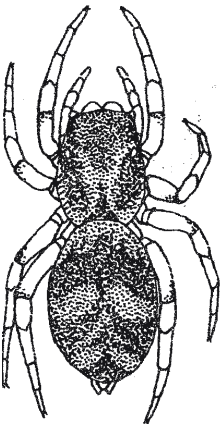
**(Oonops domesticus; Family = Oonopidae)****Six-eyed spider**

	Colour:	Orange/pink
	Number of eyes:	6
	Size:	2 mm long
	Web:	No
	Make silk:	Yes
	Found:	Under stones and bark
	Move:	Forwards

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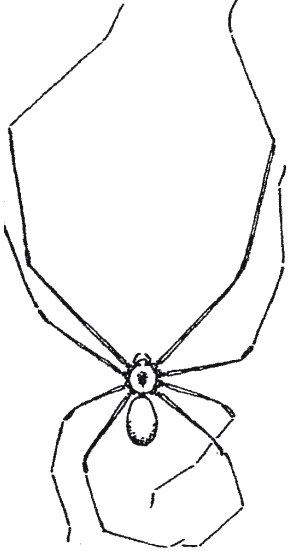
## ACTIVITY 1.1: SPIDER (SET B)

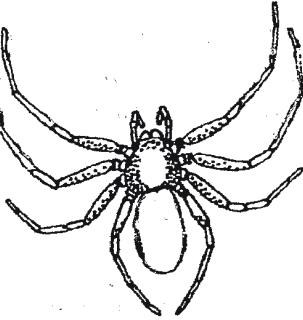
	Colour:	Brown and yellow
	Number of eyes:	8
	Size:	8 mm long
	Web:	Yes
	Make silk:	Yes
	Found:	Under stones and bark
	Move:	Forwards

	Colour:	Black and white
	Number of eyes:	8
	Size:	6 mm long
	Web:	No
	Make silk:	Yes
	Found:	In bushes, grass and trees, and on walls
	Move:	Forwards, by jumping

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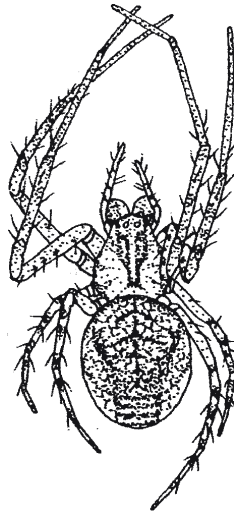
## ACTIVITY 1.1: SPIDER (SET B)

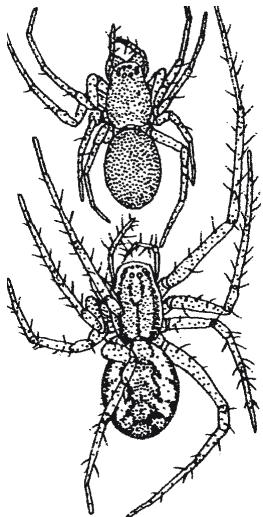
	Colour:	Pale grey
	Number of eyes:	8
	Size:	10 mm long
	Web:	Yes
	Make silk:	Yes
	Found:	Inside buildings
	Move:	Forwards

	Colour:	Green
	Number of eyes:	8
	Size:	5 mm long
	Web:	No
	Make silk:	Yes
	Found:	In bushes, grass and trees
	Move:	Sideways

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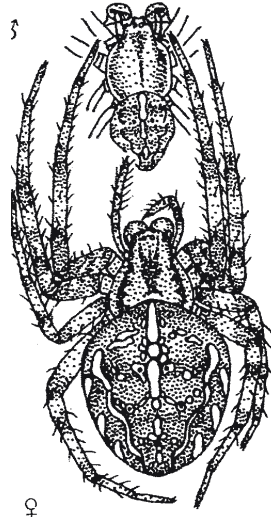
## ACTIVITY 1.1: SPIDER (SET B)

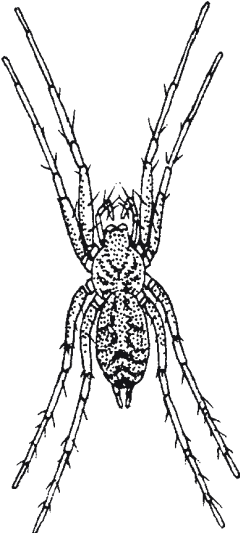
	Colour:	Silvery
	Number of eyes:	8
	Size:	6mm long
	Web:	Yes, with a small segment missing
	Make silk:	Yes
	Found:	On buildings (corner of window and door frames)
	Move:	Forwards

	Colour:	Dark yellow with orange-red legs
	Number of eyes:	8
	Size:	3.5 mm long
	Web:	Yes
	Make silk:	Yes
	Found:	In bushes, grass and trees and under bark
	Move:	Forwards

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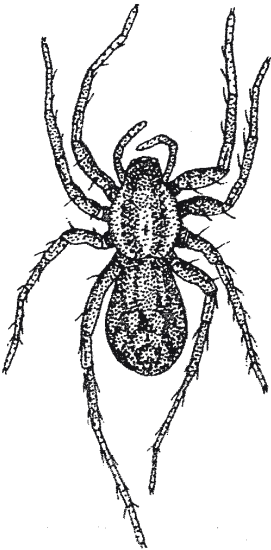
## ACTIVITY 1.1: SPIDER (SET B)

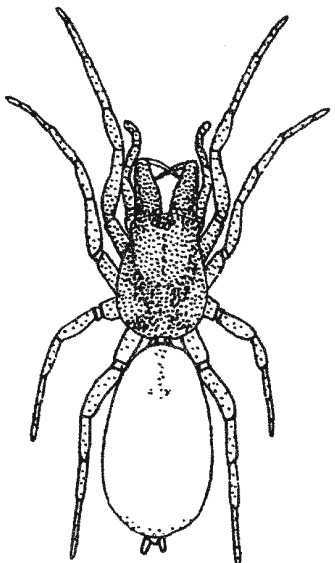
	Colour:	Brown
	Number of eyes:	8
	Size:	12 mm long
	Web:	Yes
	Make silk:	Yes
	Found:	In bushes, grass and trees
	Move:	Forwards

	Colour:	Brown
	Number of eyes:	8
	Size:	16 mm long
	Web:	Yes
	Make silk:	Yes
	Found:	Inside buildings
	Move:	Forwards

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## ACTIVITY 1.1: SPIDER (SET B)

	Colour:	Brown
	Number of eyes:	8
	Size:	7 mm long
	Web:	No
	Make silk:	Yes
	Found:	In bushes, grass and trees
	Move:	Forwards

	Colour:	Orange/pink
	Number of eyes:	6
	Size:	2 mm long
	Web:	No
	Make silk:	Yes
	Found:	Under stones and bark
	Move:	Forwards

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## ACTIVITY 2.1: PARTS OF A SPIDERS

Spiders might look a bit scary from a distance. Let's have a closer look at the parts of their bodies. In this activity you will find out about spiders' body parts.

The following parts of the spider match up with the descriptions in the table.

1. Match each of the parts of a spider to the correct description.

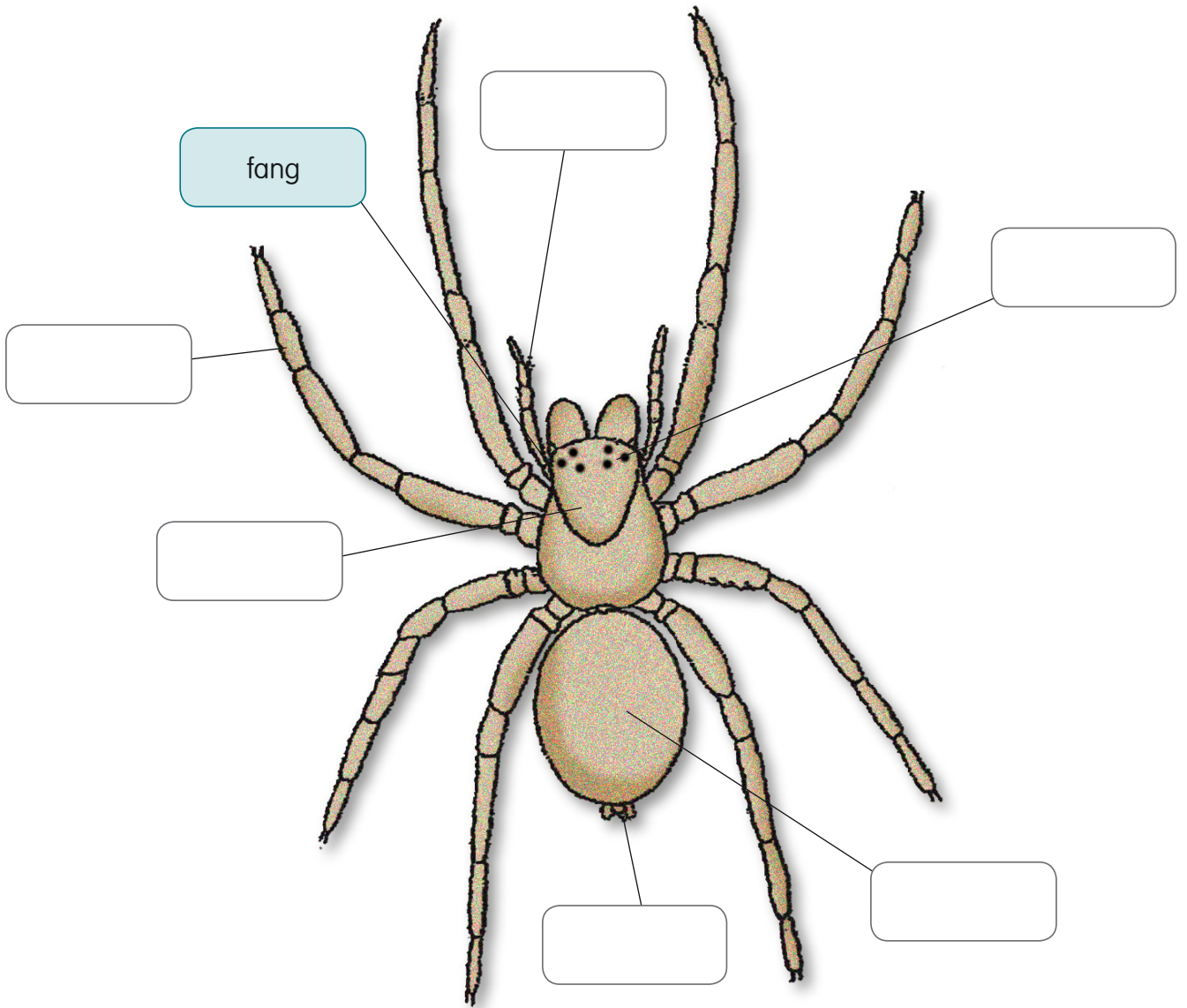
abdomen, eyes, head region, pedipalp, leg, fang, spinneret

Description	Name of part
Spiders usually have eight of these to see with	
The eyes can be found here	
Leg-like mouthpart, used by the spider to feel its way	
The second of the two major body parts	
Structure at the back of the body, which spiders use to spin silk with	
Used by the spider for support and movement	
Dracula-like tooth structure used by spiders to kill prey	

ACTIVITY 2.1: PARTS OF A SPIDER

2. Label the diagram of the spider with the body parts. To help you with the labelling, one of the labels has been filled-in.

- leg
- abdomen
- spinneret
- eyes
- pedipalps
- 
- head region



## ACTIVITY 2.2: WHY AND HOW DO SPIDERS BUILD WEBS?

### Exercise 1: The function of webs

Why do spiders build webs?

In this exercise you will find out why spiders need their webs.

Read the following text. Underline the parts which give reasons for a spider building its web.

#### **Spiders' webs**

Spiders' favourite food is insects, and spiders use the web to catch insects. The web itself serves as a filter but it is the spider itself that actually catches the prey. The insect can escape if the spider does not restrain it. The spider rushes up to its prey as soon as it lands in the web and wraps it in silk to subdue it. Some spiders inject their prey with venom before they wrap the prey, whereas others throw a sheet of silk over their prey before wrapping it. The mesh size of the web will determine what size prey is caught in the web. If the mesh size is big, then smaller insects will escape the trap.

The web serves many other functions for the spider, such as providing shelter and support for the spider, allowing early detection of mates or predators and providing the spider with a place to lay her eggs. The threads of the web transmit information in the form of vibration that the spider is very sensitive to. The spider can move at high speed along the web. The web also serves as the male's dance floor; this is where he performs a song and dance routine of plucking threads and twitching his body to attract and stimulate the female.

## ACTIVITY 2.2: WHY AND HOW DO SPIDERS BUILD WEBS?

### Exercise 2: The structure of webs

How can I make a web like spiders do?

In this exercise you will find out how spiders make their webs.

Read the text below and then construct your web.

#### How to build a web

Baby spiders which have just hatched can build a web without any previous experience. The spider completes its web in three stages.

#### Stage A: the bridge line

The first thread is called the bridge line.

The spiders pull the silk out from their spinnerets. At the beginning, the spider ejects a loose thread with a very sticky end. The spider waits, letting the thread hang down until the wind blows it and the sticky end catches on a far branch. Once the thread is fixed the spider will tighten it and secure it with several lines of silk.

#### Stage B: the radial threads

Next, the spider places the radial threads.

First, the spider drops a thread from the centre of the bridge line to make a 'Y' shape, and then it makes some more threads spreading out from the middle like the spokes of a bicycle wheel: these are the radial threads. Next, the spider makes the bits of the web that form the support around the edge, a bit like scaffolding. Spiders build their webs at night and have poor eyesight, so they use other senses to help them in their web building.

#### Stage C: the capture spiral

Finally, the spider builds the web's capture spiral.

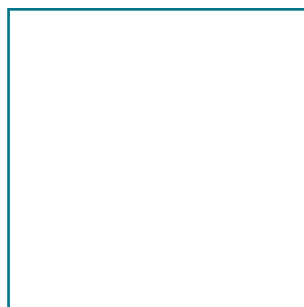
Before doing so, it has to erect a temporary spiral to make sure the web stays together. The capture spiral begins at the outside of the web and the spider circles inward with equal spacing, using gravity to determine the exact direction to move in next. The spiral thread has adhesive droplets on it and is very sticky: this is the thread that is used to trap the prey.

#### Construct your web here!

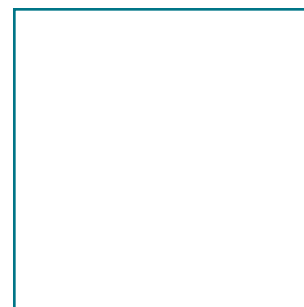
Stage A



Stage B



Stage C



**ACTIVITY 2.3:** IS THERE MORE TO SPIDERS THAN MOST PEOPLE KNOW ABOUT THEM?

Are spiders insects? How do they feed?

In this activity you will find out some interesting facts about spiders.

Use the following site to answer the questions.

[www.washington.edu/burkemuseum/spidermyth/myths/general.html](http://www.washington.edu/burkemuseum/spidermyth/myths/general.html)

This site deals with the common misunderstandings about facts related to spiders. Click on the related 'false' statements on the website to answer the questions below.

1. Are spiders insects? Explain your answer.
2. What makes an animal an arachnid?
3. Name some examples of other arachnids which are not spiders.
4. Do all spiders make silk?
5. What is an orb web?
6. What are some different types of web? What do they look like?
7. Are daddy long-legs spiders?
8. How do male and female spiders look different?
9. What time of year do you find the most spiders?
10. Do spiders eat their prey like vampires? Describe how they feed.

## ACTIVITY 2.4: BRITISH SPIDERS

Is there anything special about British spiders?

In this activity you will find out some interesting facts about British spiders and then you will do some research on one British spider of your choice.

The site below deals with facts about British spiders. Log on to the site and answer the questions below.

[www.arachnophiliac.com/burrow/british\\_spiders.htm](http://www.arachnophiliac.com/burrow/british_spiders.htm)

1. How many different species of spider are there in the UK?
2. What is the largest spider in the UK?
3. Which spider is active in the winter - unlike most spiders - and is often found in the corners of windows?
4. Which spider can jump around and has very good eyesight?

Use the same website to find information about the British spider which you think is the most interesting:

5. Imagine you have to produce an information card for your spider. Produce a five bullet-point 'key facts' card.
6. Use the information on your card to help you draw a diagram of the spider.

## ACTIVITY 2.5: WHAT KIND OF ANIMAL ARE SPIDERS?

What kind of animal are spiders?

In this activity you will find out about how scientists group spiders.

Read the passage below. Use coloured pens/pencils to circle words or phrases as indicated below.

- Find the words denoting groups of animals to which spiders belong. Highlight or underline these in RED.
- Find the words denoting groups of spiders. Highlight or underline these in BLUE.
- Find the words denoting species of spiders. Highlight or underline these in GREEN.

### Grouping animals

Animals are divided into vertebrates and invertebrates. Spiders are invertebrates, which means they do not have a backbone. Instead, they have a hard outside skeleton called an exoskeleton. Spiders belong to a group of invertebrates called arthropods. Arthropods are divided up into smaller groups. Spiders belong to the arachnids, and share this group with ticks, scorpions and mites.

Spiders have eight legs, a head region and an abdomen. They have a pair of fangs, which they use to kill and eat their prey. They are abundant in both number and species, showing great diversity.

Some spiders build webs, where they spend most of their lives, so spiders are divided into web-builders and non-web builders. Different spiders build different types of webs, but the most well known is the orb-web. This is the type we often think of when thinking about spiders. Web-builders are divided into orb-weavers and non orb-weavers.

Orb-weavers form different families. When grouping animals, the word family means a group of similar species. It is a different use of the word from the idea of a family of parents and their young. In Britain, there are spiders which belong to the following families: the Araneidae, the Uloboridae, the Tetragnathidae, the Theridiosomtidae and the Metidae. Each one of these families builds an orb web unique to them, so we can tell which family a spider is from by looking at its web.

One spider in the Araneidae family is the tropical *Nephila*. It builds giant orb-webs, which are up to 2 metres wide. This spider itself is two or three inches long, with leg spans of up to 20 cm across. Another member of the Araneidae family is the *Araneus diadematus*, which is also known as the garden spider. It builds a typical orb-web which is quite large compared to the size of the spider (which is about 1cm long). It is found all over Britain from late spring to early autumn.

## ACTIVITY 3.1: ASKING QUESTIONS TO IDENTIFY

### Exercise 1: Ten Questions

What animal am I?

Ask ten questions to find out which animal has been chosen.

Get one member of the group to think of an animal without telling anyone else: the rest of the group need to try and work out what the animal is by asking questions.

The person who has thought of the animal can only answer 'yes' or 'no'.

Each member of the group needs to take it in turn to ask a question until they guess the animal correctly.

You have ten questions to try to find out the right animal, so choose your questions carefully.

You can use the table on the sheet '**Record of questions asked**' to keep a record of the questions you asked and how many questions it needed to identify the animal.

After each set of ten questions:

- write down the name of the animal
- write down the number of the best question and the worst question



## ACTIVITY 3.1: ASKING QUESTIONS TO IDENTIFY

### Exercise 1: Ten questions

#### Record of questions asked

	Question
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
<b>The animal was:</b>	
<b>Best question was number:</b>	
<b>Worst question was number:</b>	

	Question
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
<b>The animal was:</b>	
<b>Best question was number:</b>	
<b>Worst question was number:</b>	

	Question
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
<b>The animal was:</b>	
<b>Best question was number:</b>	
<b>Worst question was number:</b>	

## ACTIVITY 3.1: ASKING QUESTIONS TO IDENTIFY

### Exercise 2: Asking questions to identify spiders

How do you split a group of spiders into smaller and smaller groups until you separate each one of them?

In this activity, you are going to think of 'yes/no' questions that help you to distinguish between one spider species and another.

This exercise has three parts, part A, part B and part C. Each is on a separate sheet.

**Part A:** You will need the set of six spider cards and the **'Six spiders'** table for this

Look carefully at the information on each spider card and at the picture of each spider. Fill in the table for each of the spiders.

#### Six spiders

Name	Colour	Number of eyes	Web	Shape of abdomen	Size (mm)	Found in	Other features
Silk cell							
Zebra							
Daddy long-legs							
Running Crab							
Zygiella (Orb –web spider)							
Money							

## ACTIVITY 3.1: ASKING QUESTIONS TO IDENTIFY

### Exercise 2: Asking questions to identify spiders, part B

**Part B:** You will also need the 'Six spiders' table from part A for this.

Write down some 'yes/no' questions which would help you to split the six spiders into two groups. Write down the two new groups produced by each question.

**Question:**

Yes group

No group

**Question:**

Yes group

No group

**Question:**

Yes group

No group

Now use the table to fill in three 'yes/no' questions which you could use to identify individual spiders. Write down the name of the spider you would identify with each question.

Question	Spider identified

**ACTIVITY 3.1: ASKING QUESTIONS TO IDENTIFY**

1. What are some good 'yes/no' questions to split spiders into groups?
  
  
  
  
  
  
  
  
  
  
2. What are some not so good 'yes/no' questions to split spiders into groups? Why?
  
  
  
  
  
  
  
  
  
  
3. Which are some good 'yes/no' questions to identify a spider individually? Why?

## ACTIVITY 3.1: ASKING QUESTIONS TO IDENTIFY

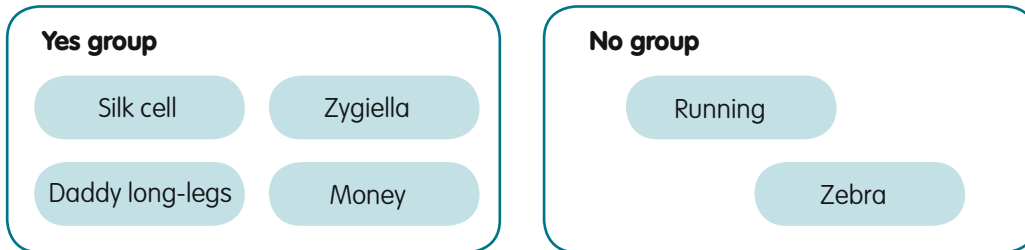
**Exercise 2: Asking questions to identify spiders, part C**

**Part C:** You will also need the 'set of six spider cards' or the 'Six spiders' table from part A for this.

One student has made the table you made in Part A. and has started separating the spiders.

He asked the question 'Does it build a web?'

This question split the spiders into the following groups:



Place the cards for the 'yes' group in front of you, or look at the information about these spiders in your completed table: What question could you ask to split this group further?

**Question:**

**Yes group**

**No group**

What question could you ask to split the 'yes' group even further so that you identify each spider?

**Question:**

**Yes group**

**No group**

**ACTIVITY 3.2: REPRESENTING GROUPS OF ANIMALS USING A TREE DIAGRAM**

How can we represent groups of animals using a tree diagram?

In this activity you will use the information from Activity 2.5 to construct a tree diagram.

A tree diagram is like an upside down tree. The trunk is at the top, and going down it divides into branches and then twigs. A tree diagram of animals helps us to see what kind of animals spiders are and how they are related to other animals.

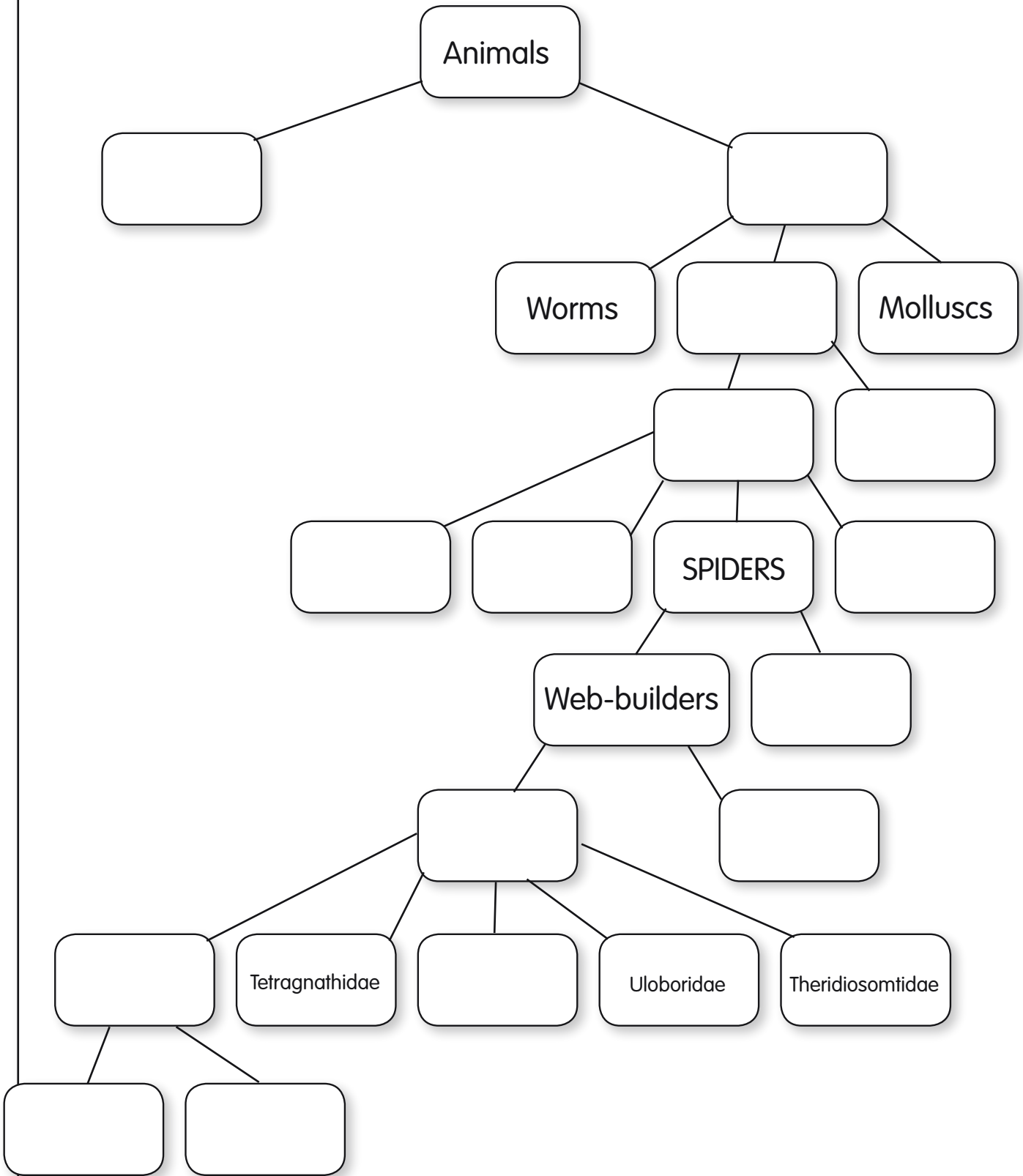
Use the information about 'Grouping animals' given in Activity 2.5 to construct a tree diagram of animals, using words from the list below. To help you with this task, some words have already been placed in the diagram for you.

Words which still need to be placed in the tree diagram:

**Mites****Arachnids****Insects****Nephila****Ticks****Metidae****Araneidae****Arthropods****Non web-builders****Garden spider****Non orb-weavers****Vertebrates****Orb-weavers****Invertebrates****Scorpions**

ACTIVITY 3.2: REPRESENTING GROUPS OF ANIMALS USING A TREE DIAGRAM

Tree diagram showing how spiders are classified:



### ACTIVITY 3.3: USING AN IDENTIFICATION KEY TO IDENTIFY POND INVERTEBRATES

Do you know how to use a key?

In this activity, you will learn how to use a key to identify pond invertebrates.

Keys help us to find out the name of an organism which we have not seen before.

In this activity you are going to use a pond invertebrate key to help you identify the animals you will find in the school pond. Afterwards, you will answer some questions about how the key helped you to identify them.

#### Collecting and identifying pond invertebrates

##### Equipment:

Pond water  
Pond invertebrate key  
Magnifying glass  
Paintbrush  
Petri dishes  
White tray

- Collect some pond water in the white tray.
- Fill some petri dishes with a bit of the pond water: this is to place your pond invertebrates in while you try to identify them
- Using your eye and the magnifying glass, carefully start to look at the mini animals (invertebrates) that are swimming around in the pond water.
- Carefully collect one or two of the invertebrates and place them in the petri dish. Use the magnifying glass to look at them more carefully.
- Start to identify your invertebrates using the key. Fill in your results as you identify each invertebrate: there is a table on the next page.
  
- Try to identify as many invertebrates as you can. Do not rush. **Many invertebrates are fast and will hide, so look slowly and gently through the water.**
- When you have finished, return all the invertebrates to where you got them from.



**ACTIVITY 3.3: USING AN IDENTIFICATION KEY TO IDENTIFY POND INVERTEBRATES****Table of pond invertebrates**

Name	Drawing	Description

**ACTIVITY 3.3: USING AN IDENTIFICATION KEY TO IDENTIFY POND INVERTEBRATES****Answer the following questions:**

1. Looking at your drawings and make a list of similarities and differences between the species you have found.

**Similarities:****Differences:**

2. What were the main features of each invertebrate that helped you to distinguish between different species? (For example, was it the number of legs, the body shape, the size?)
3. How did you use the key to help you identify the invertebrates?
4. What features do you think it is important to have in a key that helps you to identify animals?