



Reproduction and life cycles

Part 1: Parts of a flower



Science and Plants for Schools (SAPS), an initiative launched in 1990, works with teachers to:

- develop new resources that support the teaching of plant science and molecular biology in schools and colleges
- promote exciting teaching of plant science and molecular biology
- interest young people in plants and in molecular biology

We hope that our approach will help young people to become more aware of the importance of plants in the global economy, and to encourage more of them to follow careers in plant science and molecular biology.

Science and Plants for Schools
Homerton College
Cambridge CB2 2PH
Telephone: 01223 507168
www.saps.org.uk

Plants for primary pupils

2.

Reproduction and life cycles

Part 1: Parts of a flower

*The activities in this booklet have been developed by
SAPS (Science and Plants for Schools) in collaboration with
FSC (Field Studies Council).*



Science and Plants for Schools,
Homerton College, Cambridge CB2 2PH
Telephone: 01223 507168
www.saps.org.uk



Field Studies Council,
Preston Montford, Shrewsbury,
Shropshire SY4 1HW
Telephone: 0845 3454072
www.field-studies-council.org



Safety

Teachers using these activities with classes of Primary pupils are advised to refer to the SAPS Safety Notice on the SAPS website, and to undertake their own risk assessment where appropriate.

Further information on safety may be found from the sources listed in the SAPS Safety Notice.

Please remember...

- When working with plants, pupils and teachers should **ALWAYS** wash their hands after handling plants (including seeds), soils, composts, manures, equipment and other related materials
- Plants (or parts of plants) can be poisonous, cause allergic reactions in some people or may have been treated with chemicals (such as pesticides)
- It is particularly important that pupils understand that they must **NEVER** eat plants found in the wild or in the school grounds, unless given instructions that they may do so
- Wild flowers should not be picked and it is illegal for anyone (without the permission of the landowner or occupier) to uproot any wild plant

This booklet is part of a series written to support work that must be undertaken with plants as part of the Primary Curriculum in England, Wales, Northern Ireland and Scotland. The booklet is also available on the SAPS website (www.saps.org.uk) and can be downloaded freely for use by teachers with their classes.

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Paul Beaumont, Science and Plants for Schools, Homerton College, Cambridge CB2 2PH
email: saps@homerton.cam.ac.uk

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Acknowledgments

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Illustrations used in Figure 8 are reproduced by courtesy of The Cavendish School, London.

The members of the writing group would like to thank Maggie Bolt for her skilful efforts in converting their work into a format suitable for design and printing.

SAPS would also like to thank the following people for reviewing the draft text and offering a variety of comments, many of which were then incorporated into the final published version of the booklet: Rosemary Boaz, Mary Howarth, Judy Vincent and Paul Warwick.

Members of the Writing Group: Anne Bebbington (FSC and SAPS), Colin Bielby (Manchester Metropolitan University), Janette Kean (Westfield Primary School, West Lothian), Ruth Thomas (Cavendish School) and Erica Clark, editor (SAPS).

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CD (for Part 1)

Templates
Flower parts for 'Building a flowering plant game'
Card sets 1, 2 and 3
Grids for bingo and splat
Cards for taboo
Additional background information for teachers
Asexual reproduction – some notes and drawings
Examples of dissected flowers
Wallflower, sugar snap pea

Looking at plant life cycles – a seasonal teaching planner

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The timing of studies on plants may depend on the rest of the school curriculum but the following plan suggests the ideal times for studying different aspects of the life of plants. Some of these activities are covered in Part 1 whereas others are covered in Part 2 of the booklet.

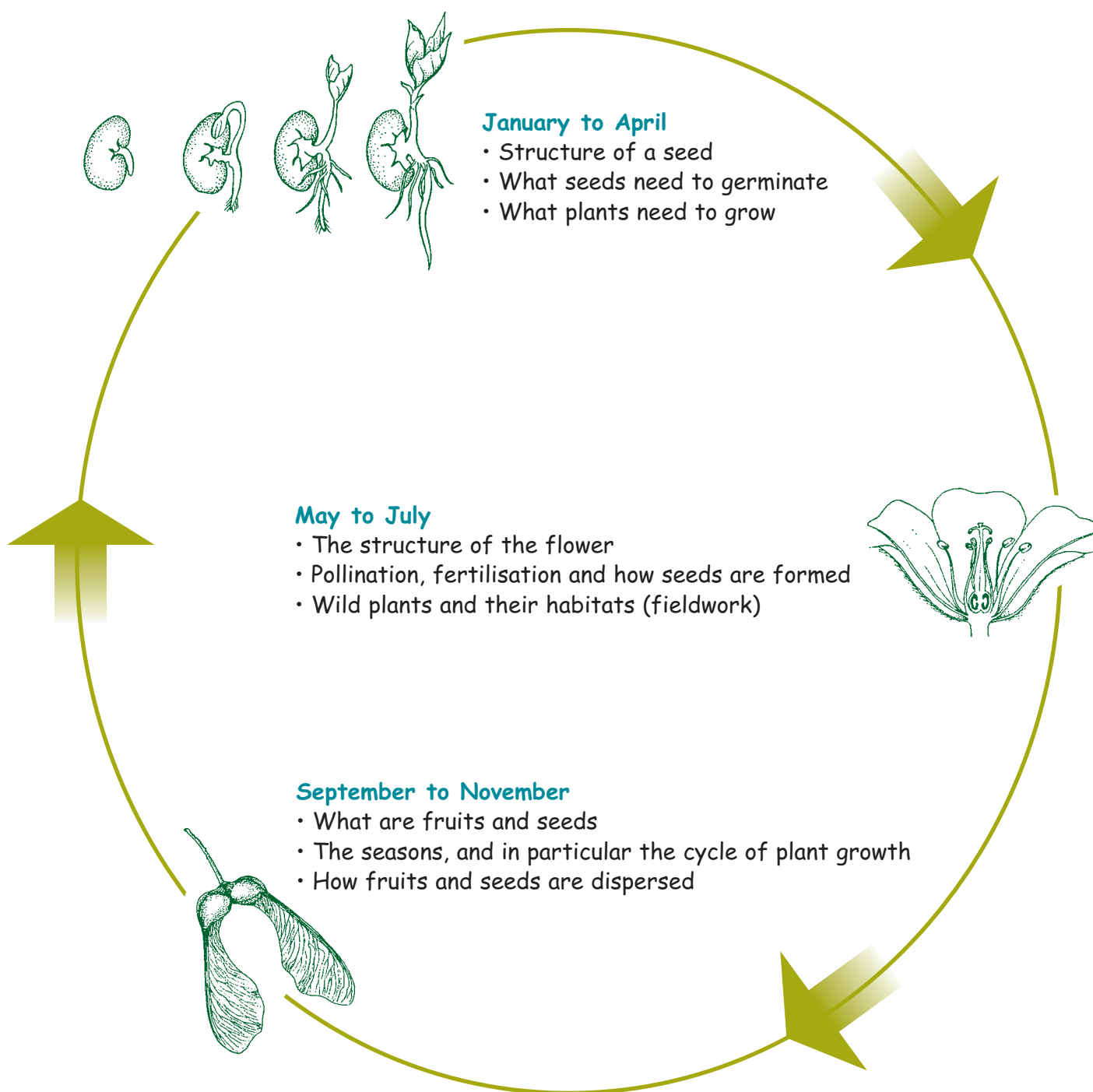


Figure 1. How to plan your plant studies in relation to the seasons – some suggestions

Introduction

This series of activities aims to cover work that must be undertaken with plants as part of the Primary Curriculum (e.g. in Key Stages 1 and 2 in England, Wales and Northern Ireland, and Scottish Primary P1 to P7 or equivalent). The activities have been developed by SAPS in collaboration with FSC (Field Studies Council).

The activities are being developed under a number of themes, each of which is published in a separate booklet and is also presented as website material (see SAPS website).

- The parts of a plant and their functions
- Reproduction and life cycles – Part 1: Parts of a flower and Part 2: Pollination, fertilisation, fruits and seed dispersal
- Living processes and what plants need to grow
- Grouping and classification
- Plants in their natural environment

Within each set of topics, you will find different types of activities. Some are based in the classroom while others involve growing plants outside (say in tubs in a school yard or in a school garden) or making observations of plants growing in the wider environment. Teachers are encouraged to let children explore links between classroom and outdoor fieldwork activities.

The activities give emphasis to the growing of plants so that children can make first-hand observations, often on their own plant, and become familiar with plants and how they grow. This is supported by a range of activities such as making models of plants, card games that reinforce learning and simple investigations that help children find out more about how plants work. You may not wish to use all the activities in a set, but you will find a good range to choose from, to suit your class and curriculum requirements.

Each topic includes a description of the activity and appropriate information for teachers. There may also be 'pupil worksheets', particularly with the activities intended for older children. An important feature in this series is the inclusion of 'Background information for teachers', written to give advice and guidance to teachers less familiar with botanical jargon or who lack confidence in their teaching on plant topics. In some cases, these notes indicate further sources of information that may be helpful to teachers, including other publications and useful websites.

The illustrations have usually been drawn from living plant material, so they are fresh, botanically accurate and show what a child is realistically likely to see. The activities are also generously supported by photographs – again many taken specially for this series.

At the end of each activity, you will find a 'Curriculum Links' box, to help you see where you could use this activity within the appropriate national curriculum framework.

Reproduction and life cycles

This is the second theme in the series. It is published in two separate booklets: Part 1 (Parts of a flower) and Part 2 (Pollination, fertilisation, fruits and seed dispersal). A CD accompanies each booklet. The CDs carry full-sized templates for preparation of some items required for the activities together with some further background information for teachers. The CD for Part 2 also contains a PowerPoint presentation entitled 'Pollination' for use independently or as part of the learning strategy for pollination.

In Part 1, the topic starts by introducing children to the basic parts of a flower and their functions, helping to build on their understanding of the parts of a plant, covered in booklet 1 of the series. It provides a range of activities that include dissection of a flower to see its parts – the sepals, petals, stamens and stigma, style and ovary – and how they are arranged, ways of making simple models of a plant and card games that are fun but at the same time reinforce children's learning and help them to be ready to move on to the next stage.

In Part 2, the topic continues with activities that can help children become familiar with the events that occur during pollination, leading to fertilisation. This is followed by activities linked to fruits and seed dispersal so that children have a chance to observe the different types of fruits and their means of dispersal and gain understanding of their importance in the life cycle of a plant.

In addition to the type of activities used in the first booklet (*Parts of a plant and their functions*), this second booklet offers a wider range of approaches. Children are encouraged to develop greater independence, for example, in carrying out investigative work, in devising tables to record results or using IT to draw a graph. Teachers should also be aware of opportunities offered in the different activities for development of skills in literacy, numeracy, investigative work and strategies for assessment. (See note below *Reference to literacy, numeracy, assessment and investigative skills*).

Remember you can use Curriculum Links (on the SAPS website) to find more material to give support within your teaching programme.

Reference to literacy, numeracy, assessment and investigative skills

The activities in this booklet can be used to support the pupils' development in literacy, numeracy and investigative science, as defined in the relevant sections of the National Curriculum for Science and the Literacy and Numeracy Strategy Frameworks in England, and also in the 5-14 guidelines in Scotland.

For literacy, there are activities on listening, reading, talking, phonics and spelling. In Part 1, these are found mainly in the card games and loop cards, but also in some of the pupil sheets linked with the dissection of a flower (finding out more about flower parts). There is a word wall, with all the key terms listed (see the CD for Part 2). This can be enlarged and pinned on the classroom wall for the pupils to use in their work.

For numeracy, there are opportunities for work on numbers and number systems, information and data handling, problem solving and using mathematics in a relevant context. Relevant examples are included in the activities: (in Part 1) floral dissection and flower part number patterns and (in Part 2) flower colour analysis and variation in Horse-chestnut flowers.

There are also clear opportunities for both formative and summative assessment. Examples include the graphic organiser exercise on functions of flower parts and the loop card games.

Finally, many of the activities can be developed to help in the teaching of scientific investigation as there are ample opportunities for predicting, planning, observing, recording, analysing and evaluating.

Using the CD (Part 1)

Converting templates into cards and other items

In several of the activities, templates are provided for certain items so that the teacher can make these up into the required form for use with children in the class. These items include card sets for the card games, grids for bingo and splat and flower parts for building a flowering plant game. In the booklet, reduced size versions are given so that you can see at a glance what is available. Full-sized templates (A4) are provided on the CD and are also available on the SAPS website, usually as both pdf and Word files. You can download the pdf files and use them as they are, or you may prefer to adapt the Word files to your particular version of the game or activity.

Usually it would be appropriate to make your sheets out of lightweight card. To do this, print out the template and photocopy onto appropriately coloured card or paper. Alternatively you may be able to print directly onto the card. You can then make good durable sets by laminating the pages. When you have your whole page, you then cut out the cards or parts for use with your class.

Additional background information for teachers

The material on the CD supplements the background information given in the booklet. Further examples of dissected flowers are provided on the SAPS website, and teachers should refer to this as more are added in the future.

Parts of a flower

➔ Teacher Guidance

Introducing the parts of a flower

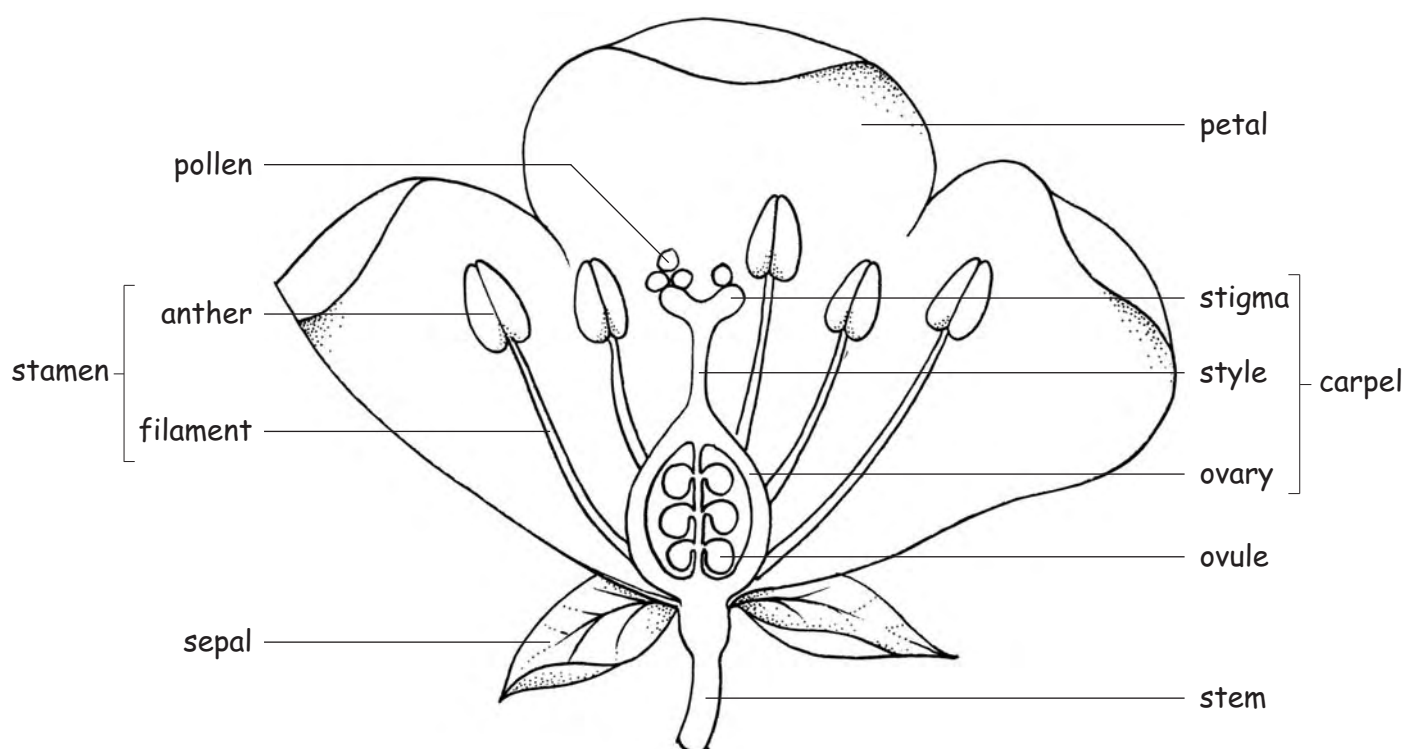


Figure 2. A half flower, showing the basic parts: sepal, petal, stamen (anther, filament), carpel (stigma, style and ovary with ovules), and stem

This 'ideal' flower shows the basic parts of a flower. Children need to recognise these parts in different flowers and understand their role or function in flowering plant reproduction.

For the first activity, it is often a good idea to give children the opportunity to dissect a flower. Different methods are suggested in the 'Teacher Guidance' for this activity. When doing the dissection, the children look closely at the different parts and become aware of their arrangement in the flower. This can be followed by using one or both of the Pupil Sheets (*Finding out more about flower parts*). Depending on which are selected, these sheets give opportunities for development of literacy and numeracy skills, or they can be used as revision or assessment activities.

Flowers don't all look the same, so for whatever flower you use you will need to work out which are the sepals, petals and so on. You will find guidance as to which flowers are suitable for study on page 31, together with two examples of dissected flowers. Further examples are provided on the CD (Part 1) and also on the SAPS website.

Parts of a flower

➔ Teacher Guidance

Dissecting a flower

The activity

You need a suitable flower for each child. The choice of flower depends on the time of year and what is available. (For suggestions and diagrams of some dissected flowers, see *Background information for teachers*.)

To make it easier for the children to carry out the dissection, the child can push the flower stalk into a lump of Blu-tack or into a bung with cross-cuts in it.

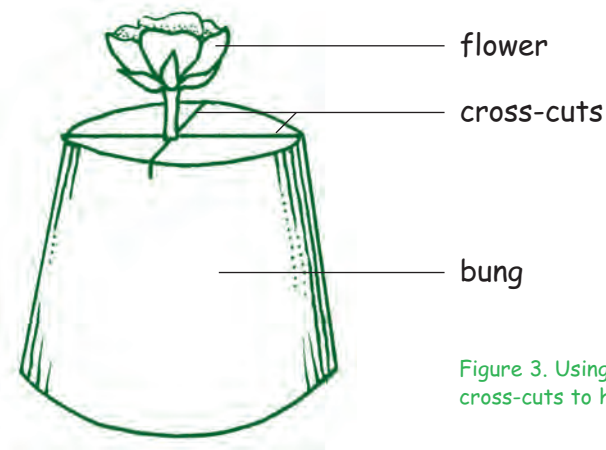


Figure 3. Using a bung with cross-cuts to hold a flower.

The parts of the flower that are removed can be displayed in a number of different ways. Three suggestions are given below.

Method 1

Cut a piece of Sellotape, approximately 25 cm in length. Make it into a loop by sticking the ends together but with the sticky surface facing outwards. Stick this loop on a piece of card, about 12 cm x 8 cm.

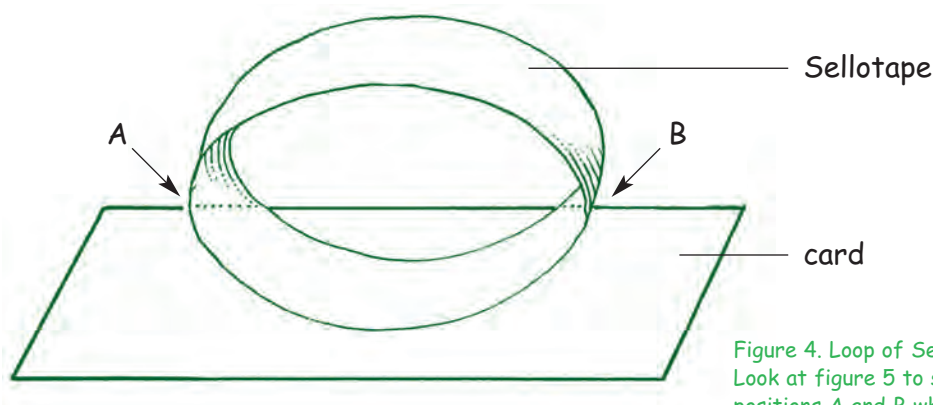


Figure 4. Loop of Sellotape on a piece of card. Look at figure 5 to see what happens to positions A and B when the loop is cut and then stuck down on paper.

Let the children carefully dissect the flower as follows.

- Start at the base of the flower and first remove the outer whorl (ring) of parts. These are the sepals. Use either fingers or tweezers (forceps) to do this.
- Then, starting at the **right hand** end, place these sepals on the sticky loop. Try to arrange them so they are at approximately half cm intervals along the loop, moving from the right hand end, along to the left. To make sure the parts are arranged in the correct sequence, you must start at the right hand end.
- Next remove the second whorl of parts. These are the petals.
- Place the petals onto the loop, to the left of the sepals.
- Repeat the process with the stamens and finally the carpels. Continue sticking them on the loop, in sequence, to the left of the sepals and petals.
- Cut the Sellotape at the positions marked A and B.
- Turn the tape over and stick it down on a worksheet or in a workbook.

You now have a row of flower parts in the order they occur in the flower, starting from the outside of the flower.

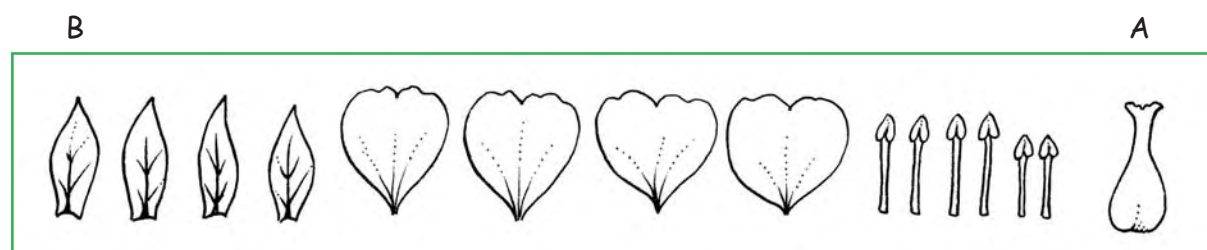


Figure 5. Drawing of a dissected flower, prepared using Method 1, showing the loop after it has been cut, turned over and stuck down. You will see, starting from the left hand side of the diagram (letter B), that the parts are in the order in which they were dissected. This flower has 4 sepals, 4 petals, 6 stamens and 1 stigma, style and an ovary.

Method 2

Cut a piece of double-sided Sellotape, approximately 15 cm in length. Stick it down on a worksheet or in a workbook.

Dissect the flower as described in Method 1, removing each whorl in turn. Stick the parts in order onto the strip of Sellotape but in this method, start the sequence from the **left**. When complete, cover the flower parts with a piece of wider Sellotape or sticky-backed plastic.



Figure 6. Photograph of dissected cultivated blue geranium flower (Crane's-bill), prepared using Method 2. The flower parts are held on double-sided Sellotape and covered with sticky-backed plastic. This flower has 5 sepals, 5 petals, 10 stamens, a 5-branched stigma, a style and an ovary.

Method 3

Prepare a sticky square (15 cm x 15 cm) using several strips of double-sided Sellotape and put this on a worksheet or in a workbook.

Dissect the flower as described in Method 1, removing each whorl in turn. Then arrange the parts of each whorl in concentric circles, as they are arranged in the flower, with sepals forming an outer ring and so on with the carpel(s) finally in the centre. When complete, cover the flower parts with sticky-backed plastic.



Figure 7. Photograph of pink geranium with parts displayed as described in Method 3. The flower parts have been arranged on a sticky square of strips of Sellotape and covered with sticky-backed plastic. This flower has 5 sepals, 5 petals, 10 stamens, a 5-branched stigma, a style and an ovary.

Reminder – see *Background information for teachers* for examples of dissected flowers

Further activities

1. Finding out about the numbers of flower parts (Pupil Sheet and Teacher Guidance).
2. Graphic organiser: whole-parts relationship (Pupil Sheet and Teacher Guidance).

Curriculum links

National Curriculum (Sc2)	KS2: 3d
QCA guidelines – Scheme of work	Unit 5B
Scottish ISE 5-14 framework/attainment targets	LT-D2.5

Parts of a flower

➡ Teacher Guidance

Finding out more about flower parts

These two activities encourage children to find out more about the parts of a flower that they may have dissected. In particular the activities give opportunities for development of literacy, numeracy and thinking skills. For each activity, a 'Pupil Sheet' is provided and some suggestions as to how these can be used with, or adapted for, your children are given in the relevant section of the *Teacher guidance*. (See also note *Reference to literacy, numeracy, assessment and investigative skills*, on page 2 of the booklet.)

Activity 1: Finding out about the number of flower parts

This activity (see Pupil Sheet on page 9) is useful to help develop numeracy skills, as the children have opportunities for work on numbers and then link the pattern of numbers or parts in different flowers.

Using the 'Dissecting a flower' instruction sheet, let the class either all dissect the same species of flower or dissect different species of flower. During or after the dissection, they can record how many sepals, petals, stamens and carpels they found in their flower.

Then here are some things they can do.

- See if there are any links between the numbers of different parts (e.g. are there the same number of petals and sepals?). Discuss why there are links, if any.
- Compare their results with those of others in the class.
- Record everyone's results on a class chart and discuss the findings. This could be an opportunity to use IT skills, by using a spreadsheet.

Children should begin to see a pattern in the relationship between parts. Usually the flower parts are multiples of 2, 3 or 5 (see also *Background information for teachers*).

Suggestions for suitable flowers to use for this activity are given in the *Background information for teachers*.

Finding out about the number of flower parts

Name of your flower _____

The flowers of most plants have sepals, petals, stamens and carpels.

The **number** of sepals, petals, stamens and carpels is not the same in all plants. Count the number in your flower.

sepals _____

petals _____

stamens _____

carpels _____

The carpels are sometimes joined together (look for the join marks) or they can be separate. What happens in your flower?

In my flower the carpels are _____

Can you describe any pattern that you see in these numbers?

(Clue - Are the numbers of the different sets of flower parts all the same?)



Parts of a flower

Teacher Guidance

Activity 2: Whole-parts relationship - using a graphic organiser

This activity (see Pupil Sheet on page 11) can be used to invite the children to identify the relationship between the parts of a flower and their function and to make the connections between them become more obvious.

A graphic organiser caters for a variety of learning styles, but uses a visual framework that enables children to develop an awareness of their own thinking.

Here are some suggestions as to the best way to use the graphic organiser:

- use the graphic organiser part way through a topic to review what has been learnt and to inform the next steps in learning
- use the graphic organiser at the end of a topic to measure pupil understanding
- you can use the graphic organiser as an individual or a small group activity. As an individual activity, you can use it to inform you of the individual child's ideas. Used as a small group activity, you can use it to encourage discussion and provide opportunities for collaborative working.

Further activities

1. Dissecting a flower (Teacher Guidance)
2. Games with cards (Teacher Guidance)

Curriculum links

National Curriculum (Sc2)	KS2: 3d
QCA guidelines – Scheme of work	Unit 5B
Scottish ISE 5-14 framework/attainment targets	LT-D2.5

A graphic organiser

Can you name these flower parts?

What would happen if one of the parts was missing?

petal

→

stigma

→

stamen

→

Pollen would not be made and there would be no pollination or seed formation

ovary

→

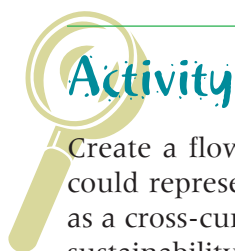
sepal

→

Parts of a flower

➔ Teacher Guidance

Create a flower



Create a flower using a variety of materials from the box. The box contains materials that could represent different parts of the flower. Depending on your selection, this can be used as a cross-curricular activity. You could, for example, use this as an opportunity to talk about sustainability and only put recycled items in the box.

Here are some ideas of materials you could use and suggestions as to how many of each flower part you will need for each flower that is being made.

Part of plant	Possible materials
Sepals (four)	• coloured paper or card or pelmet vilene, cut into sepal shapes
Petals (four)	• coloured paper or card or pelmet vilene, cut into petal shapes
Stamen filaments (six)	• pipe cleaners • art straws • wire
Stamen anthers (six)	• packing nodules (foamed starch) • cotton wool • small pieces of sponge
Pollen (lots)	• rice stained yellow (teaspoonfull)
Ovary (one)	• small plastic fizzy drink / water bottle (the cap or top represents the stigma)

Let the children select from the box and construct a flower. They can stick it down on card. You can discuss with the children what each item represents as they construct the flower.

As an alternative, you can encourage children to make a 3D version of the flower. For an example of a 3D flower, see 'A model *Brassica* flower' on the SAPS website. This also gives templates that you can use for the sepals and petals. A completed 'SAPS *Brassica* flower' is illustrated in Part 2.

Further activities

1. Create a 3D SAPS model flower (see SAPS website)

Curriculum links

National Curriculum (Sc2)

KS2: 3d

QCA guidelines – Scheme of work

Unit 5B

Scottish ISE 5-14 framework/attainment targets

LT-D2.5

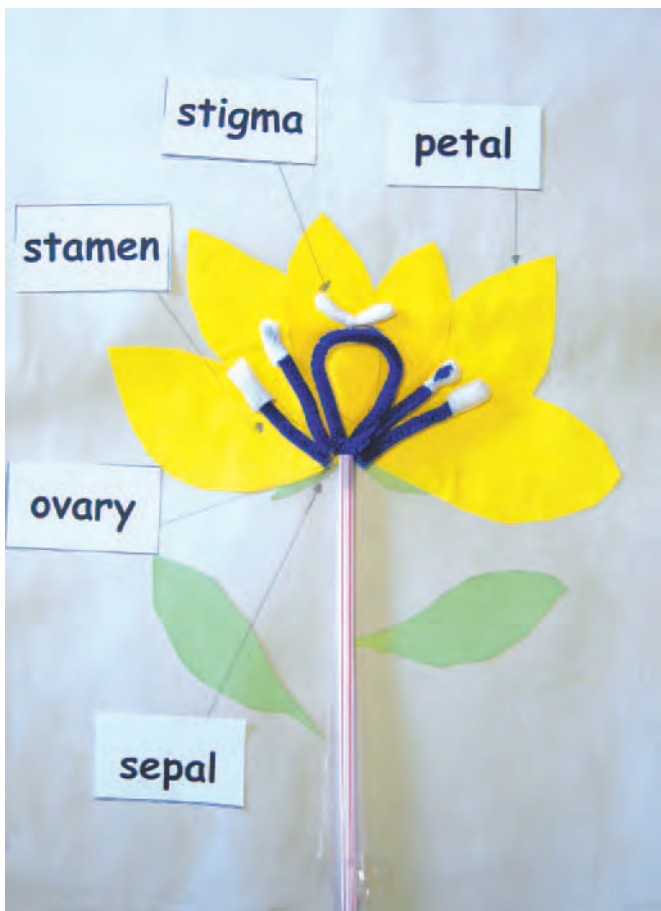
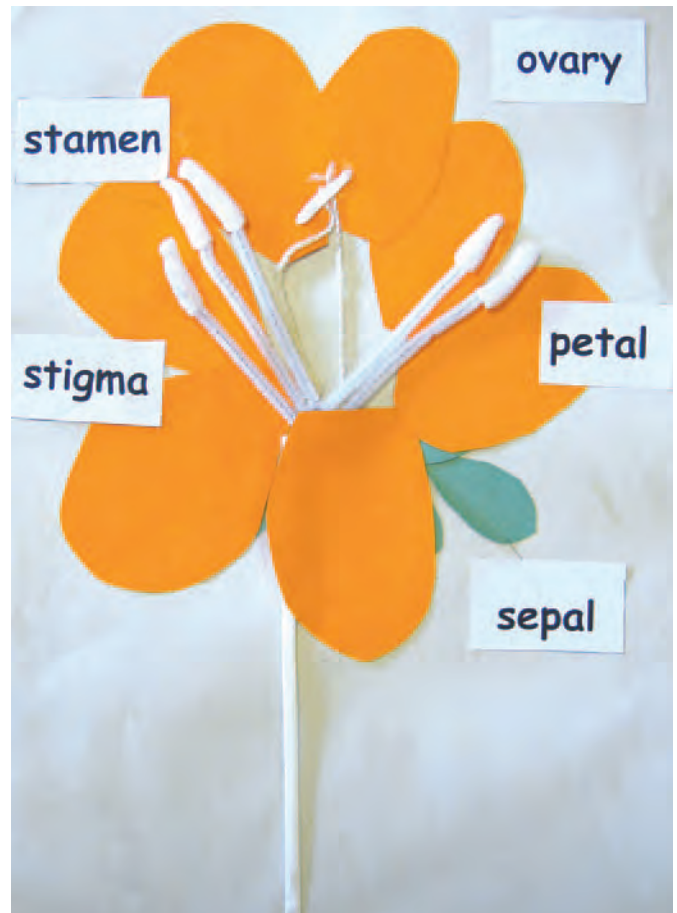


Figure 8. Some flowers created by children (in Year 4 at the Cavendish School, in 2004). These collages were made using a selection of different art materials and the labels were added by the children.

Parts of a flower

Teacher Guidance

Building a flowering plant game

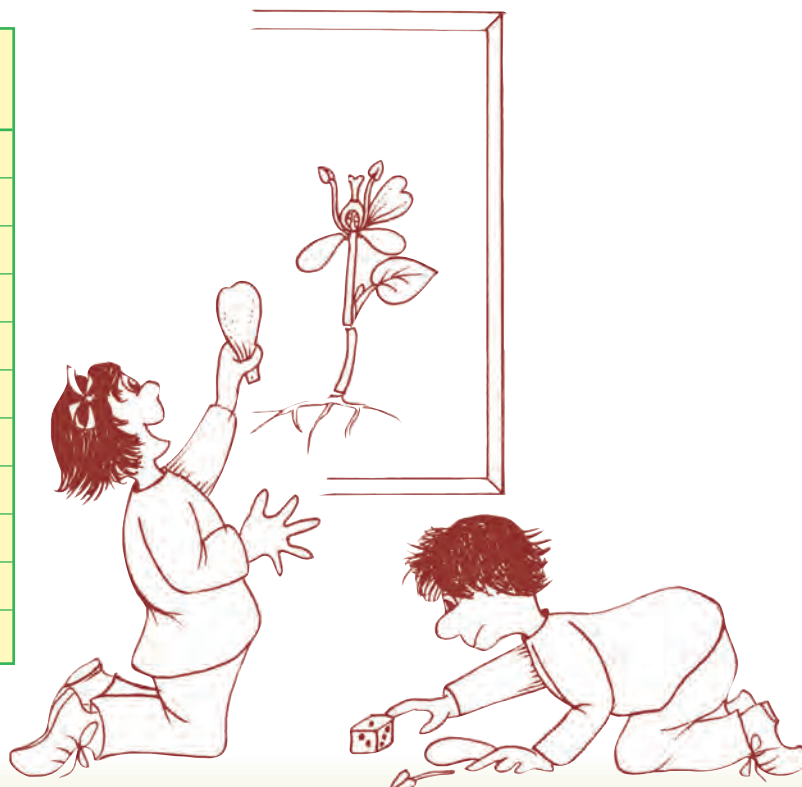
Resources and preparation for the activity

- ☒ Two dice – each with 1 to 6 dots, or a dodecahedron die
- ☒ Parts of the flowering plant and bee – full-sized templates are provided on the CD (Part 1) and on the SAPS website. Instructions for preparing these are given on page 3 of this booklet. You may wish to use different colours of green to differentiate between the leaf and the sepals and we suggest that you use OHTs for the bee's wings. You will need one set for each child or group
- ☒ Two stamens (for each set) – made out of pipe cleaners, with packing nodules (foamed starch) or small pieces of sponge attached to the end of the pipe cleaner
- ☒ Pollen – represented by yellow self-adhesive spots
- ☒ Pupil Sheet (page 17) – this gives a reference table showing the numbers allocated to each part and a picture of the completed flowering plant and bee. You will need one for each child or group. These numbers are also given in the table below

Activity: Playing the game

The game can be played in groups of two to four children. Each group needs a complete set of the items listed above and one or more copies of the Pupil Sheet (page 17) for reference. An alternative simpler version of the game, without using dice, is also described.

Number on the dice	Part to be collected
2	Free choice
3	Pollen
4	Stem (two)
5	Petal (two)
6	Sepal (two)
7	ROOT (start)
8	Stamen (two)
9	Carpel
10	Bee body
11	Wings (two)
12	Leaf



Let the children take turns to throw the dice. They then collect the part that corresponds with the number shown on the two dice. They **must** throw a total of 7 (root) to start the game. When they have a root they can begin to build the plant from the parts they collect.

If they throw a 2, they can choose any part. If they throw a number for a part they have already collected, they miss a turn.

For some of the flowering plant parts, two pieces are required. In the table, these are shown with (two) after the name of the part. The appropriate number on the dice must be thrown twice to collect both parts.

The winning group is the one that first completes the flowering plant and bee.

For the **alternative version** (without dice), divide the children into two teams. Each team lines up and has a box containing the flower parts. Place a board about 10 m away from each team. When you say 'GO', the first child in each team takes one flower part out of the box and runs to the board, puts the part on the board, then runs back to the team. The next child then takes another part to the board, helping to build up the flower and runs back to the team ... then another child, and so on. The first team to complete the flower wins.

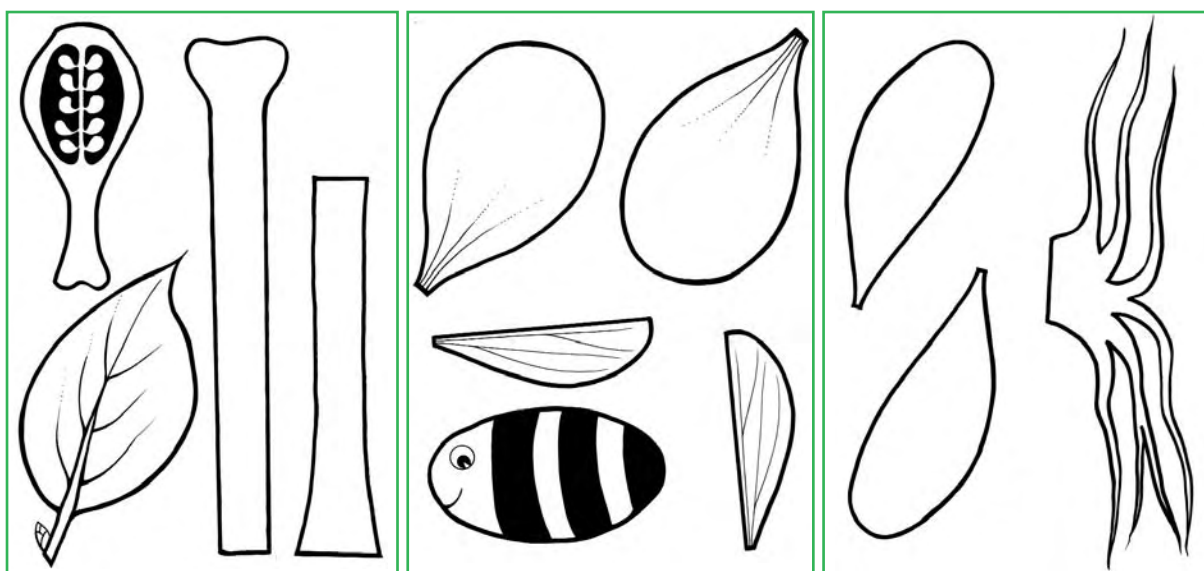


Figure 9. Reduced size version of flower parts and bee for 'Building a flowering plant game'. Full-sized templates are provided on the CD (Part 1) and on the SAPS website.

Curriculum links

National Curriculum (Sc2)

KS2: 3d

QCA guidelines – Scheme of work

Unit 5B

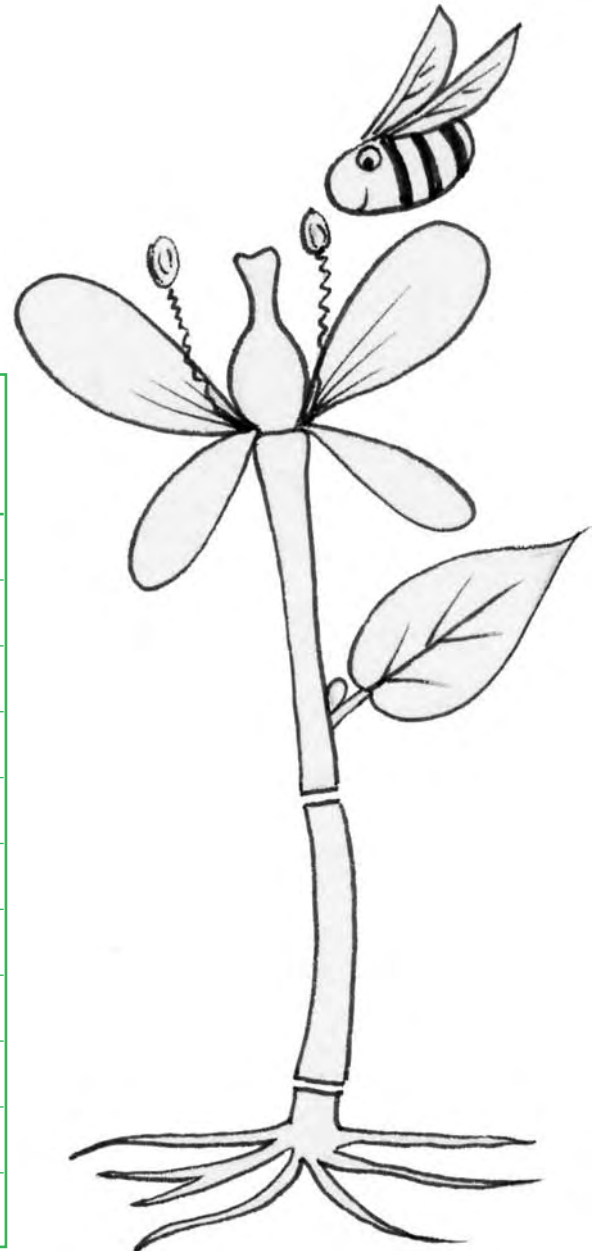
Scottish ISE 5-14 framework/attainment targets

LT-D2.5

Building a flowering plant game

Throw the dice. Pick up the part of the flowering plant to match the number you have thrown. As you collect the parts build up the flowering plant.

Number on the dice	Part to be collected
2	Free choice
3	Pollen
4	Stem (two)
5	Petal (two)
6	Sepal (two)
7	ROOT (<i>start</i>)
8	Stamen (two)
9	Carpel
10	Bee body
11	Wings (two)
12	Leaf



Parts of a flower

➔ Teacher Guidance

Colouring a flowering plant game

Resources

Each child or group will need the following:

- ☒ two dice, each with 1 to 6 dots
- ☒ Pupil Sheet (page 19) of the flowering plant (one for each child)
- ☒ a list of numbers and corresponding parts of the flowering plant to be coloured (as on Pupil Sheet)
- ☒ colouring pencils or felt tips



Each part of the plant is numbered:

- 2 = sepals
- 3 = flower stem
- 4 = roots
- 5 = carpel (stigma, style and ovary)
- 6 = stamens
- 7 = leaf
- 8 = leaf bud
- 9 = pollen
- 10 = ovules
- 11 = petals
- 12 = any part of the flower

Activity: Playing the game

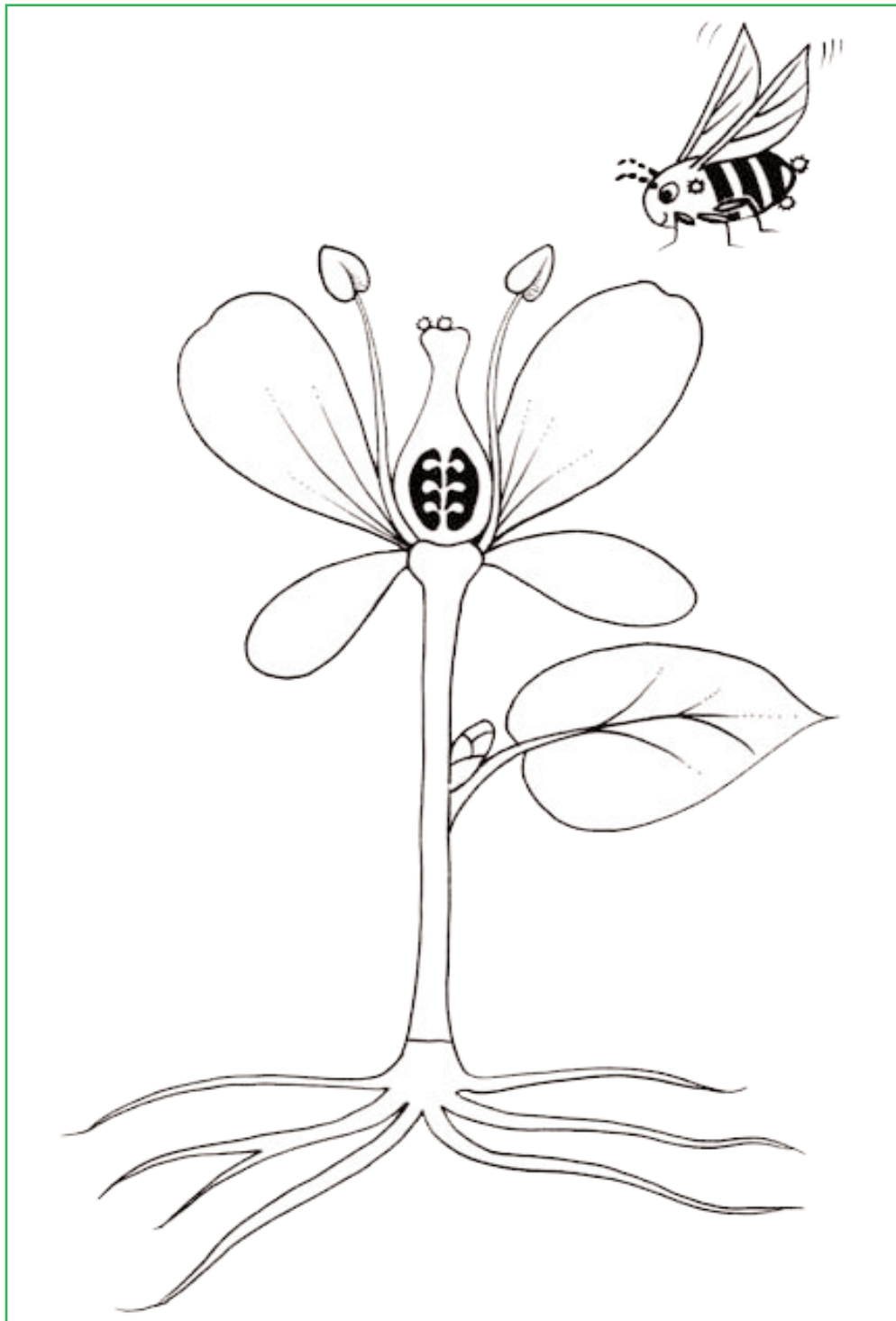
The game can be played in groups of two to four children, with each child taking it in turns to throw the dice.

The first child throws the dice and colours in the appropriate part of the plant that corresponds to the number on the dice. The winner is the first child or group to complete the colouring of their flower correctly.



Colouring a flowering plant game

Throw the dice. Colour the part of the flowering plant to match the number you have thrown. Look at the box below to see the number you need for each part.



2 = sepals	3 = flower stem	4 = roots	5 = carpel (stigma, style and ovary)	6 = stamens
7 = leaf	8 = leaf bud	9 = pollen	10 = ovules	11 = petals
				12 = any part

Parts of a flower

➔ Teacher Guidance

Games with cards

These are useful activities for 'starters', 'plenaries' and identifying the children's misconceptions. Full-sized templates for the three card sets are provided on the CD (Part 1) and on the SAPS website. You can use these templates to make sets of cards for your class. Instructions for preparing these are given on page 3 of this booklet. Reduced size versions of the card sets are given on page 25, so that you can see what is available.

Activity 1: Matching pairs (card set 1)

These cards have the names on the left and the correct picture on the right. Prepare the cards by cutting them up so that you separate the names from the pictures. Each set will contain nine picture cards and nine word cards (18 cards in total). Some activities are suggested here but you may think of others.

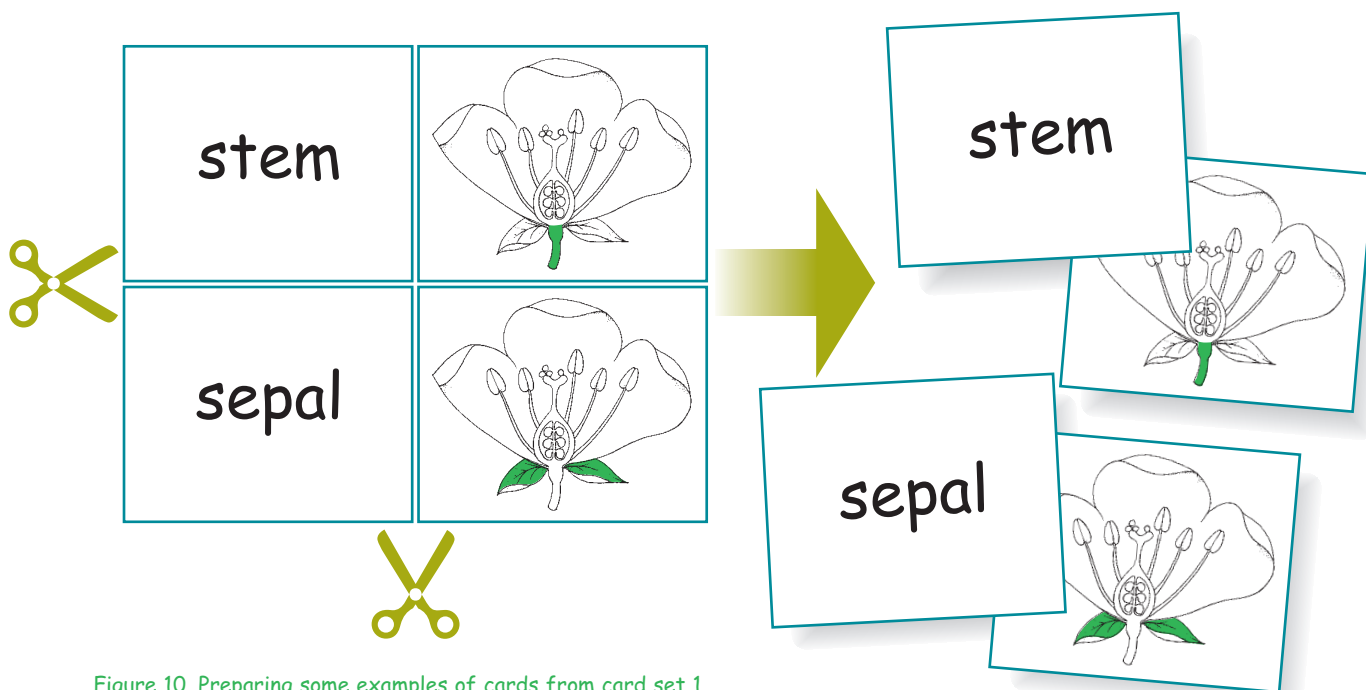


Figure 10. Preparing some examples of cards from card set 1.

1. Snap. Each group of children will need three sets of cards to make a pack of 54 cards. The children use these to play the traditional game of snap. A child calls 'snap' when a name matches a name (or a picture matches a picture or a name matches a picture).

2. Memory game. Each pair of children needs two sets of cards making a pack of 36 cards. The cards are placed face down and, in turn, each child tries to select two cards that match – so that a name matches a name (or a picture matches a picture or a name matches a picture).

Activity 2: Loop cards - flower part dominoes, with pictures (card set 2)

These cards have names on the left but the picture on the right does not correspond with the name. Cut the cards out but do not separate the names from the pictures. Each set contains nine cards. The design of the cards is such that you can start with any word and match it with the correct picture on another card so that when all the cards are put down in sequence on the table, the cards form a loop. Below we give two ways in which these cards can be used to reinforce the names of flower parts and encourage the children to read the terms. There are lots of other versions of this game so you can let the children think of different ways of playing.

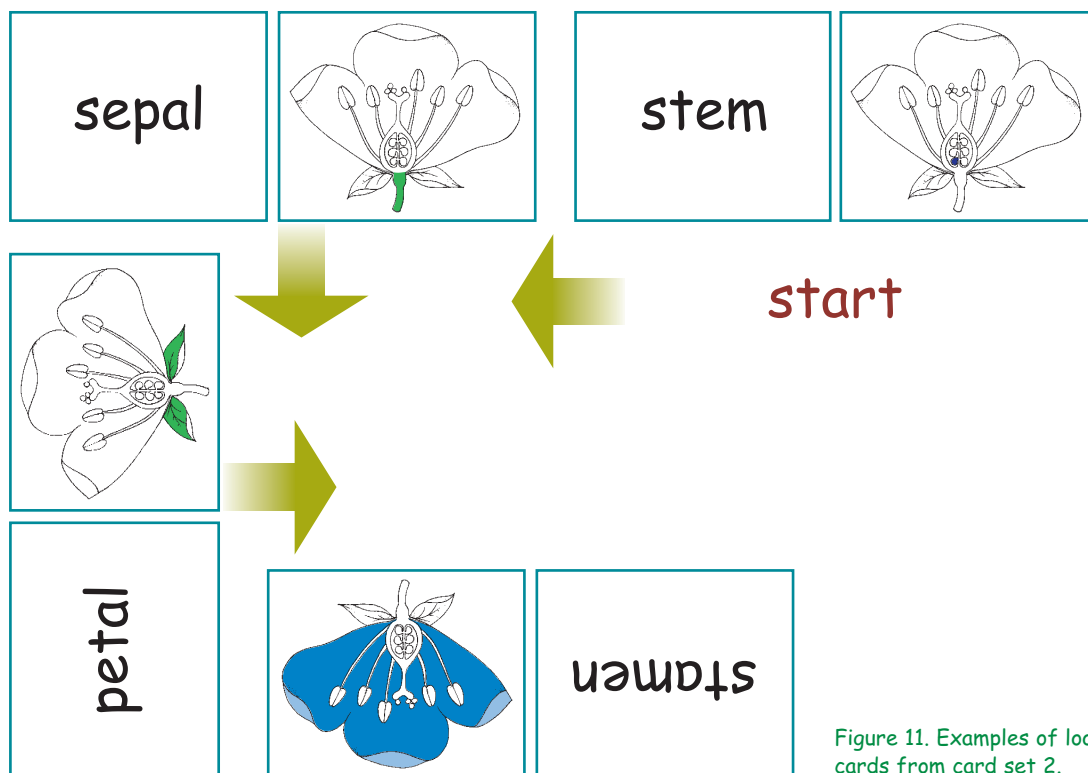


Figure 11. Examples of loop cards from card set 2.

- 1. Whole class activity.** The teacher displays all the cards from one set on a board. To start the game, a child can read the name of the flower part on any card. Then another child identifies the correct picture on a different card. Then yet another child reads the name on that second card for other children to identify the next picture on a third card and continue until all the cards are matched and in a loop.
- 2. Group activity.** Divide the children into groups of nine. Each group needs a set of nine cards. Within a group, give each child a card from the set. To start the game one child reads out the name on their card. The child holding a card with the picture that matches this name goes and stands next to them. This child then reads out the name on their card to find the child with the corresponding picture. The game continues until all the children are standing in a loop.



Activity 3: Loop cards - flower dominoes with definitions (card set 3)

These cards have names on the left but the definition on the right does not correspond with the name. These cards can be used in the same way as the cards in card set 2.

sepal	<i>supports the flower</i>	stem	<i>develops into the seed</i>
-------	----------------------------	------	-------------------------------

Figure 12. Examples of loop cards from card set 3.

The correct definitions for flower parts in these loop game cards are given in the table below.

sepal	often green and protects the rest of the flower
petal	often brightly coloured and attracts insects
stamen	the male part of the flower, where pollen is made
pollen	dust-like powder made in the stamens
carpel	the female parts of the flower
stigma	the part of the carpel that the pollen sticks to
ovary	the part of the carpel that contains the ovules
ovule	develops into the seed
flower stem	supports the flower

Activity 4: Traditional game of bingo

Use the bingo template to make a grid for your class. A full-sized template is provided on the CD (Part 1) and on the SAPS website (with a reduced version on page 26 of this booklet). Instructions for preparing a suitable grid from the template are given on page 3. Fill in the eight blank spaces with either the words or pictures from 'Introducing the parts of a flower'. You can cut out the words or pictures from card set 1.

	pollen		carpel
stigma		ovary	
	petal		sepal
stamen		ovule	

Here is an example of a bingo grid you could prepare. Each group will need a different bingo card.

The teacher calls out the name or shows a picture of the part of the flower. The child covers over the corresponding word / picture until all words / pictures have been covered. This is best played in small groups because of the high success rate.

Alternatively, give the children a blank bingo grid and get them to choose their own eight words (from sepal, petal, stamen, pollen, carpel, stigma, ovary, ovule, flower stem) and write them in any order in the blank spaces. They can copy the words from the board and this will encourage them to write out these key words.

Activity 5: Flower splat

Use the splat parts of a flower template to make a grid for your class. A full-sized template is provided on the CD (Part 1) and on the SAPS website (with a reduced version on page 26 of this booklet). Instructions for preparing a suitable grid from the template are given on page 3 of this booklet. A version of the grid is provided and you can adapt it for your own use. You can, for example, replace the words with pictures to represent the different parts of a flower (sepal, petal, stamen, pollen, carpel, stigma, ovary, ovule, flower stem).

You can use the grids to make overhead transparencies (OHTs) and then use an overhead projector to project them onto a wall. Alternatively, you can download an electronic copy from the CD (Part 1) or the SAPS website and project this onto a wall from a laptop connected to a data projector or you can use an interactive white board.

The projected image needs to be at an appropriate height and size so that children can place their hands over each of the words in the grid. Alternatively, the children can use a 'prop' that will reach and cover each word. An idea for this would be a large two dimensional flower shape, cut out of card and stuck to a short stick-like fly swatter.

Divide the class into two teams. One child from each team stands at the side of the grid projected onto the wall. The teacher asks a question and the first child to cover the correct square, shouting 'splat' at the same time, wins a point. Then repeat with another child, and so on.

A livelier version is to have several teams, each with a team leader. The team then discusses together before the team leader runs to the grid on the wall, covers the answer and shouts 'splat'.

Here are some examples of questions that you can use.

What is the name of the part of a flower...

...that is generally brightly coloured?

...that produces pollen?

...that the pollen sticks to?

...that is often green and protects the rest of the flower?

...that develops into the seed?

...that contains the female parts of the flower?

For more suggestions you can use definitions from the table given for the loop cards on page 22.



Activity 6: Plant taboo

The objective of the game is for the team to guess which plant word is on their team member's card. The game can be played with two teams of three or more. The game is particularly suitable for upper primary but can readily be used with other age groups.

Resources

You will need the following:

- ☒ a timer
- ☒ set of 'Plant taboo' words



A full-sized template for some suggested taboo cards is provided on the CD (Part 1) and on the SAPS website (with a reduced version on page 25 of this booklet). Instructions for preparing the cards from the template are given on page 3.

One child in the team chooses a taboo card. He / she then tries to describe the word at the top of the card but without mentioning any of the 'taboo' words on the card. You will need to appoint a referee to check that the child doing the describing does not mention any taboo words.

The team has a one minute time limit. A correct guess within the time limit gains 2 points. The opposing team gains 1 point for a correct guess (after the time limit has expired), but they can have only one guess. Spelling of the word is not allowed.

Players cannot mention any of the following:

1. the word 'plant'
2. parts of the word or plurals of the word to be guessed
3. words that rhyme with the word to be guessed
4. the first letter of the word to be guessed
5. any of the taboo words

You can adapt the game – say by removing cards or omitting or changing the taboo words – and change the rules to suit your children's age and ability range.

The version given here was developed by some Year 6 pupils (equivalent to P7 in Scotland). You can encourage your class to develop their own version and the taboo words chosen can be differentiated according to their level of understanding.

Curriculum links

National Curriculum (Sc2)

KS2: 3d

QCA guidelines – Scheme of work

Unit 5B

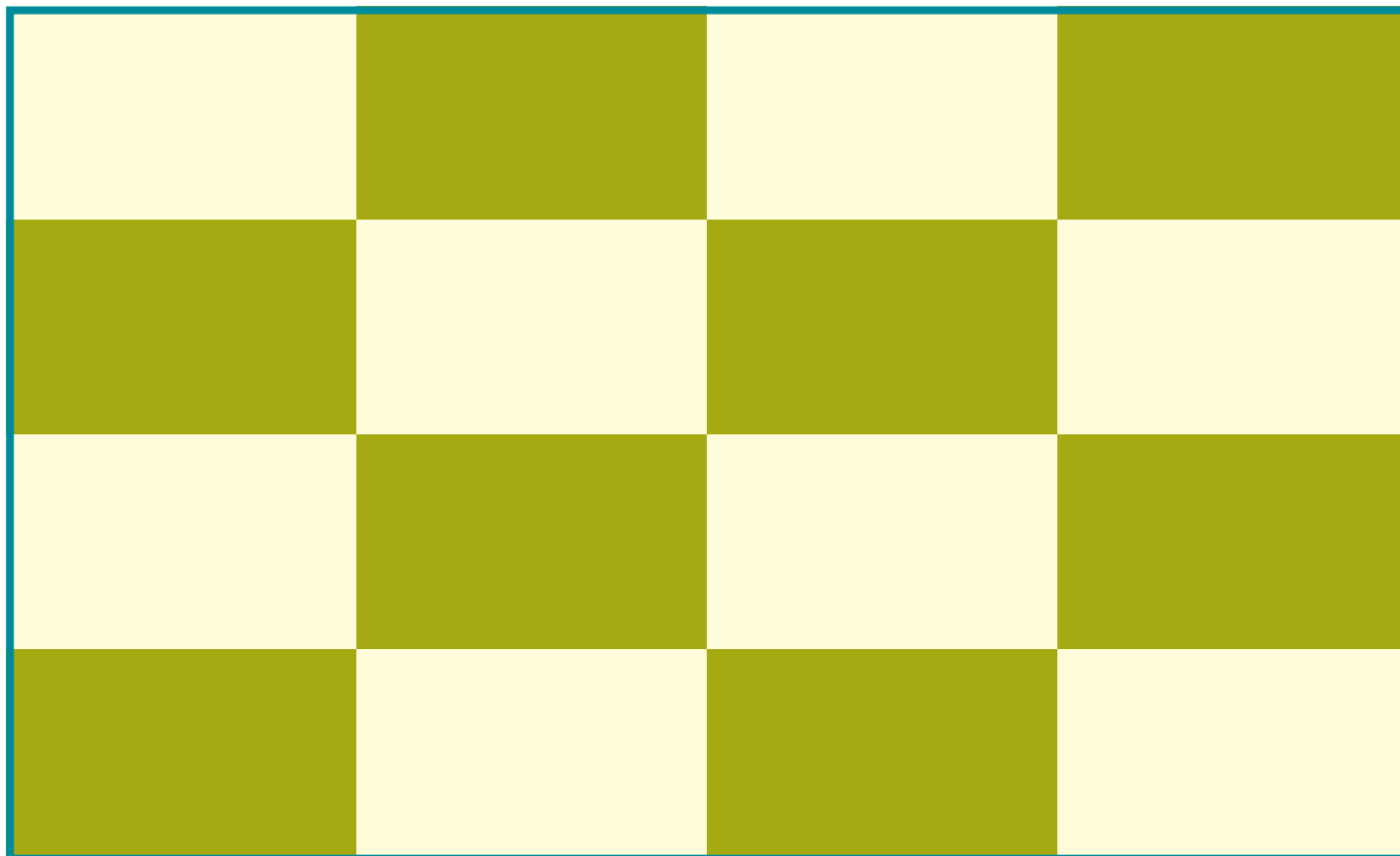
Scottish ISE 5-14 framework/attainment targets

LT-D2.5

Card set 1	sepal		pollen		ovary	
	petal		carpel		ovule	
	stamen		stigma		stem	
Card set 2	sepal		pollen		ovary	
	petal		carpel		ovule	
	stamen		stigma		stem	
Card set 3	sepal	<i>supports the flower</i>	pollen	<i>the male part of the flower, where pollen is made</i>	ovary	<i>the part of the carpel that the pollen sticks to</i>
	petal	<i>often green and protects the rest of the flower</i>	carpel	<i>dust-like powder made in the stamens</i>	ovule	<i>the part of the carpel that contains the ovules</i>
	stamen	<i>often brightly coloured to attract insects</i>	stigma	<i>the female parts of the flower</i>	stem	<i>develops into the seed</i>
Taboo	leaf green leaves stem food	pollen stamen yellow insect ovary pollination	pollen tube pollen down male/female cell ovary	fruit juicy name of any fruit ovary seed seeds	bud flower unopened	
	stem leaf leaves flower flowers stalk root	stigma carpel pollen top	ovary seed seeds	stamen pollen filament anther flower bee	pollination stamen pollen stigma carpel anther bee insect reproduction	petal flower
	root water down hold stalk underground soil worm	flower perfume smell colour colourful attract bouquet name of a flower	carpel ovary seed	seed young plant disperse dispersal wind animal fruit	reproduction female cells male cells sex baby babies	seed dispersal wind animal bird scatter spread

Figure 13. Reduced size versions of cards - card sets 1, 2 and 3 and taboo card. Full-sized templates are provided on the CD (Part 1) and on the SAPS website.

Bingo grid *to be adapted by teacher*



SPLAT Parts of a flower grid

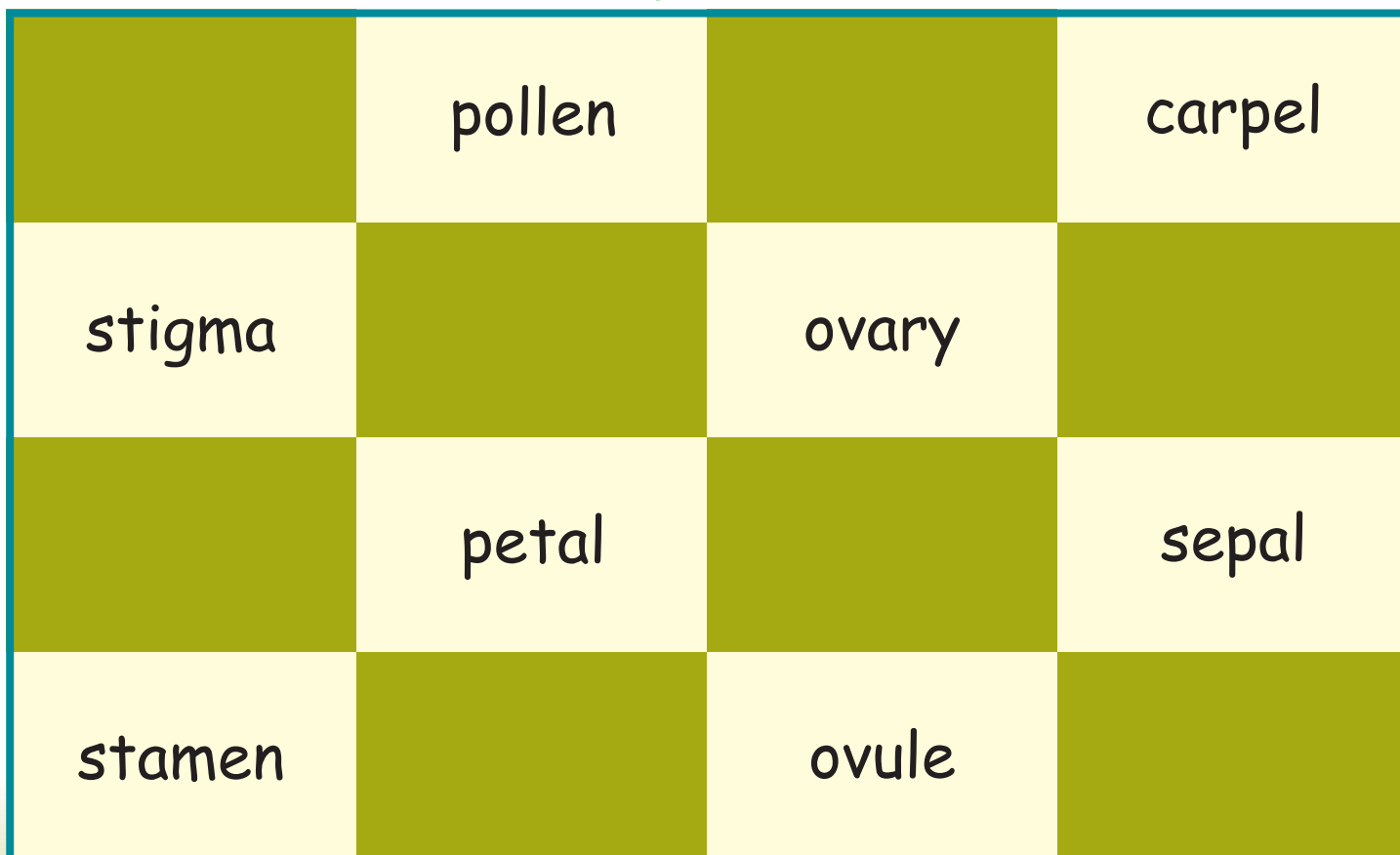


Figure 14. Reduced size version of grids for bingo and splat. Full-sized templates of these grids are available on the CD (Part 1) and on the SAPS website.

Background information for teachers

These notes are provided to give teachers the background they may need when teaching these topics on plants. The vocabulary and words used are botanically correct. It is always advisable to keep closely to the standard terminology so that pupils have a firm foundation to build on and don't have to 'undo' their learning and vocabulary at a later stage. However, it is not intended that you pass these notes on to pupils in the form presented here.

Reproduction and life cycles – the flower, fruits and seeds

At primary level, when learning about reproduction, the children are first expected to know about the parts of a flower and their role in the life cycle of flowering plants. These topics are covered in Part 1. They should then learn how the events taking place at pollination lead to seed formation and how the seeds are dispersed and these topics are covered in Part 2. For activities relating to the topic of germination, teachers are referred to the third theme in this series: *Living processes and what plants need to grow*.

A summary of the whole life cycle of a flowering plant (using rapid-cycling brassicas as an example) is given in Part 2. A simpler form of the life cycle (of a sugar snap pea) is given in the first booklet (*Parts of a plant and their functions*), on page 10.

The activities in Part 1 and Part 2 should give children opportunities to become familiar with all the required vocabulary for the parts of the flower and also to understand the processes occurring at pollination leading to fertilisation. A number of activities in Part 2 introduce children to the concept of dispersal of fruits and their seeds.

In Part 1, these notes give you some extra information about sexual reproduction in flowering plants and brief reference to asexual (vegetative) reproduction. Accompanying the notes for sexual reproduction are drawings of flowers that you could use for dissection. These drawings display the floral parts and provide additional information that should help you when doing floral dissections with the children. Further drawings are provided on the CD (Part 1) and on the SAPS website.

Reproduction in flowering plants

Reproduction results in the production of new individuals. This booklet emphasises the role of the flower in sexual reproduction. However, many plants can form new individuals asexually. Examples include bulbs (e.g. onion), stem tubers (e.g. potato) and fragments of certain plants (e.g. speedwell). These three examples are illustrated on the CD (Part 1), together with brief notes to indicate how the reproduction (asexual) occurs.

Sexual reproduction takes place within the flower. During this process there is a mixing of male and female genetic material. This genetic mixing results in offspring that all have a slightly different genetic makeup from each other and from the parent plants. This variability may be an advantage and help promote the survival of at least some offspring in each generation. The variability also provides the raw material for natural selection and evolution.

Asexual (vegetative) reproduction is particularly useful in helping a plant to survive and produce more individuals during harsh conditions, when the more complex process of sexual reproduction might fail. The disadvantage is that all the offspring (from asexual reproduction) have the same genetic material as the parent. In other words, they are clones. If environmental conditions change significantly, there is a danger that, because there is no variability, none will survive and the species could be wiped out.

The structure of the flower

There is an astonishing variety in the structure and colour of flowers. This is linked closely to the fact that many flowering plants rely on insects (and in some countries on other animals) to transfer the pollen (male cells) from one plant to the female parts on another. The diversity of flower structures has evolved to suit a wide range of different pollinators.

When looking for a flower to study it is best to choose one with a simple basic structure. It is also ideal if the children can see the plant growing so that they see where the flowers are situated on the plant and have some idea of how many flowers each plant produces. The list (given on page 31) suggests flowers that can be chosen for study at different times of year.

The basic flower consists of four main parts. The collective name for the part is given in brackets:

- sepals (calyx)
- petals (corolla)
- stamens (androecium) – the male part of the plant
- carpels (gynoecium) – the female part of the plant

Sepals

The sepals are situated on the outside of the flower. They are often green and leaf-like and their main function is to protect the flower, particularly when it is in bud. Note that in some flowers the sepals drop off as soon as the flower opens (e.g. in the Poppy) and you may miss them unless you look at a bud.

Petals

The petals lie inside the sepals. They also (like the sepals) help to protect the male and female parts of the flower but, in insect-pollinated flowers, the main function of the petals is to attract insects and provide them with a landing platform. Petals are usually brightly coloured and may also produce nectar, which acts as a reward for visiting insects. Special markings, known as nectar guides, may also be present and these direct the insect into the flower in such a way that pollination is carried out most effectively. Since many insects do not see well towards the red end of the light spectrum, red flowers are uncommon amongst British wild flowers. Ultraviolet (UV) signals are not visible to the human eye, but are clearly seen by insects. UV signals may be present on some flowers.

The special term **tepals** can be used when the sepals and petals cannot be distinguished. Examples are the tulip and a number of lilies.

Stamens

The stamens usually form a ring around the central female parts and they produce the pollen grains. The pollen grains contain the male cells. Each stamen usually consists of a stalk, known as the filament, and the anther, which is the part that actually produces the pollen.

The pollen is visible to the naked eye as a dust-like powder, often yellow but sometimes may be other colours (such as dark purple in some of the poppies). Under a microscope with a magnification of about x 400, the pollen grains of the majority of plants can be seen to be unique. They have different shapes and an amazing range of textures and sculptured patterns on their outer coat. This outer coat is made of material able to resist chemical breakdown or decay for thousands or even millions of years. This makes it an increasingly useful tool for people in certain investigations. For example, in a criminal investigation, the police now use special techniques to collect pollen grains from the bodies and clothes of suspects. These pollen grains can give the police a good idea where the suspect has been. (See *Osmosis* 23 2002 on the SAPS website for more information.)

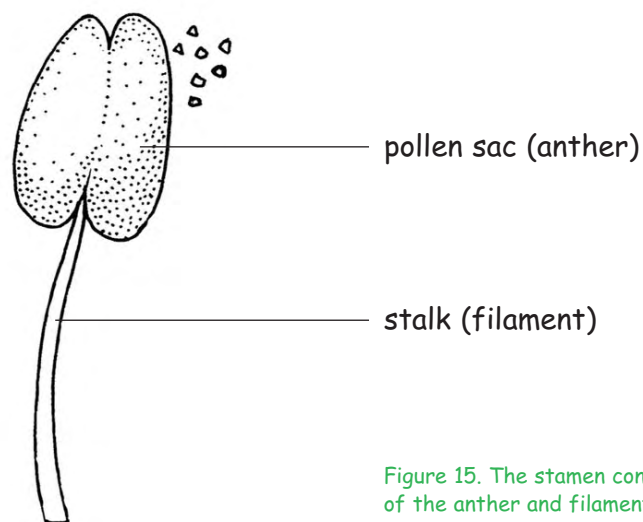


Figure 15. The stamen consists of the anther and filament.

Carpels

The carpels occupy the centre of the flower. Each carpel consists of an ovary and stigma. The stigma is often joined to the ovary by a stalk, known as the style. Inside the ovary are the ovules, which contain the female egg cells. A flower may contain a single carpel (as in the pea family), several free carpels (as in buttercups) or two or more carpels, which have fused together to a greater or lesser extent. It is often possible to see how many carpels have fused by looking at the stigma and the number of chambers in the ovary. For example, the lily has three fused carpels and this is indicated by the three arms to the stigma and the three chambers within the ovary.

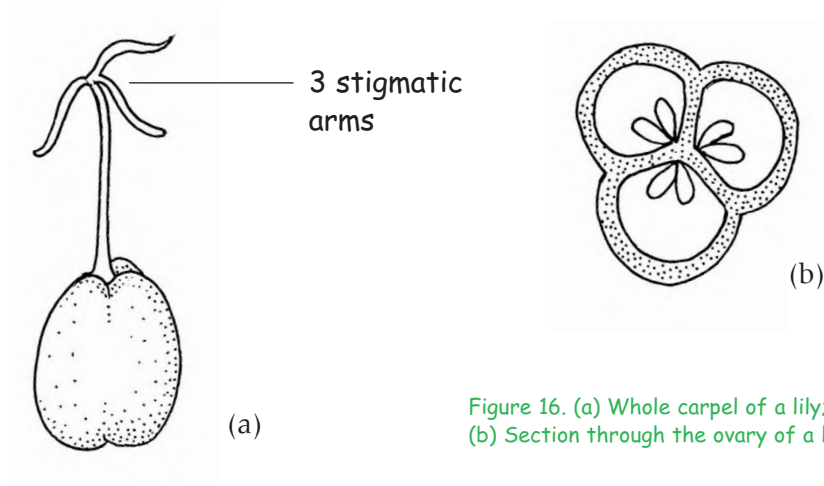


Figure 16. (a) Whole carpel of a lily;
(b) Section through the ovary of a lily

For primary children it is probably best to choose a flower in which the female part is relatively large and just use the terms ovary, style and stigma without worrying about the number of carpels. It is often easier to see structures in those flowers where the fruits are forming. Avoid flowers with a large number of small free carpels (e.g. buttercups).

In some flowers the ovary may be sunk into the top of the flower stalk and fused to it. Examples are daffodils and fuschias. The ovary is then described as **inferior**, and appears as a lump below the other flower parts. Watch out when studying the rose. The rose hip is a flask-like structure made from the flower stalk which contains several free one-seeded carpels (note that these are not seeds).

The numbers of flower parts

The number of sepals, petals, stamens and carpels are often (but not always) multiples of a prime number. For example, in the Crane's-bill the prime number is 5, in the star gazer lily it is 3 and in the Wallflower it is 2. This can be useful when trying to work out the number of flower parts, particularly when they are small. In a flower with 5 sepals and 5 petals, the number of stamens is most likely to be 5 or 10.

In the same flower family, most members have the same prime number. These families are arranged in two major groups: the monocotyledons and the dicotyledons. For monocotyledons the prime number is most often 3 and in the dicotyledons the prime number is most often 2 or 5.

Flowers to study – some suggestions

Here are some suggestions of plants with flowers in which the structure is easy to see and understand and which are usually readily available.

Winter

Hyacinth (*note this has tepals – i.e. the petals and sepals are alike*)
 Snowdrop
 Winter Jasmine

Spring to early summer

Campanula
 Honesty
 Paeony
 Perennial geraniums (*garden varieties*)
 Ramsons (wild garlic)
 Wallflower

Summer and autumn

Campanula
 Evening-primrose
 Foxglove
 Lilies
 Rosebay Willowherb
 Rose-of-Sharon
 Sweet Pea

All year around (in the classroom)

Rapid-cycling brassicas (*a bit small*)

Campanulas, Rosebay Willowherb and Evening-primroses are good for study but note that they have inferior ovaries (*see Background information for teachers*).

The plants listed below are probably best avoided at primary level:

All members of the **Asteraceae** (i.e. daisy, dandelion and their allies) – here the ‘flower’ is a collection of tiny florets and the structure is very difficult to see

Buttercup – has lots of separate small carpels and this causes confusion

Convolvulus – in the large *Calystegia* species the sepals are hidden by bracts

Daffodil – has an odd petal structure

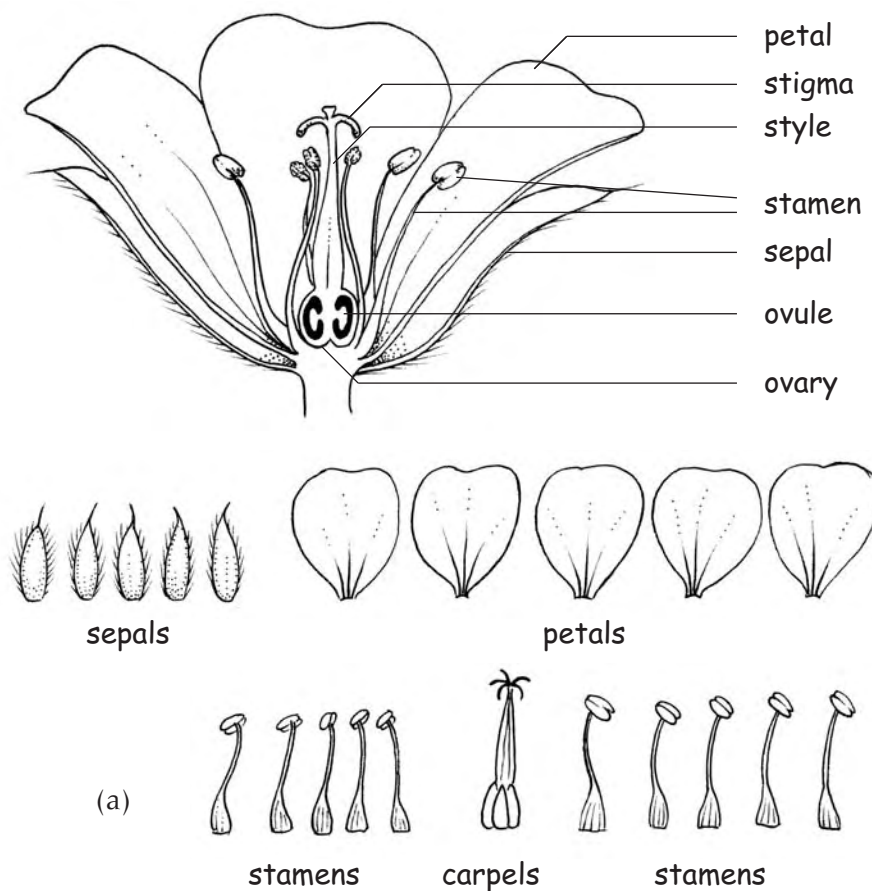
Iris – petal structure is difficult to sort out

Poppy – the sepals fall off as the flower opens and the latex could be a problem with young children

Rhododendron – the sepals are very small and difficult to see.

Examples of dissected flowers

1. The cultivated perennial geranium (Crane's-bill)



Flower structure

Sepals (5) Green

Petals (5) Brightly coloured, the actual colour depending on which species or cultivar you are looking at

Stamens (10) These are arranged in 2 whorls of 5. One whorl develops before the other so you may find only the filaments (stalks) left by the time the second whorl is fully developed

Carpels (5) The ovary is formed of 5 carpels fused together, which extend upwards to form a sterile beak, merging into the style. The 5 stigmas are not joined. When ripe, the ovary and the sterile beak split suddenly into 5 parts throwing out the seeds.

General information

The cultivated perennial geranium belongs to the Crane's-bill family (*Geraniaceae*), which also includes pelargoniums. There are a number of cultivated Crane's-bills that are suitable for study, for example, large blue flowered forms of *Geranium pratense* or the pink Bloody Crane's-bill *Geranium sanguineum*. Pelargoniums can also be used. Be careful in choosing your plant as many of the cultivated forms are hybrids and may be sterile, so this makes it more difficult to see the structure of the ovary. Flowers should not be collected from the wild where they are scarce. Plants in the Crane's-bill family (Family *Geraniaceae*) are mostly found in temperate and sub-tropical regions. The family is important for its cultivated ornamental plants. Many plants in this family have scented leaves and geranium oil is used in the perfume industry.

Figure 17

(a) Half-flower of the blue cultivated geranium with its parts after dissection.

(b) Blue cultivated perennial geranium in flower.

(b)



2. The star gazer lily

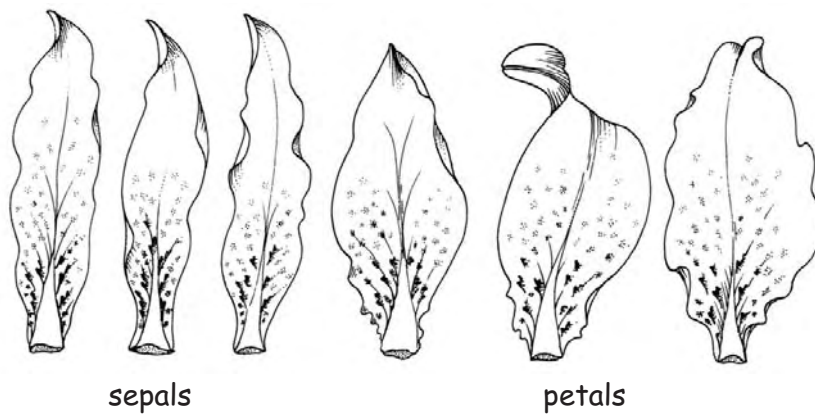
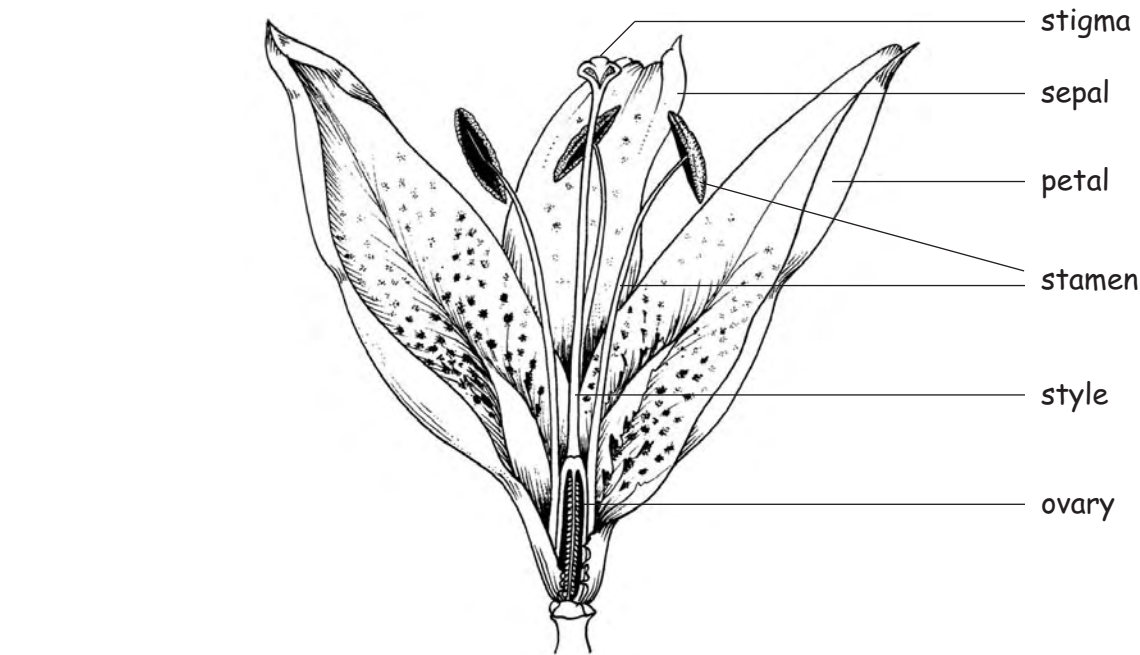
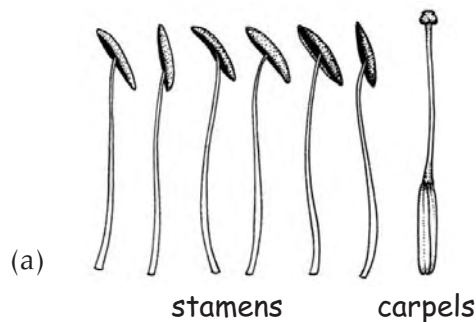


Figure 18

(a) Half-flower of the star gazer lily with its parts after dissection.

(b) Star gazer lily in flower.



(b)



Flower structure

Sepals (3) Pink with darker pink spots

Petals (3) Pink with darker pink spots. A little wider than the sepals but the sepals and petals are both petal-like and sometimes referred to as tepals

Stamens (6) The stalks are attached to the middle of the back of the pollen bags (anthers). These produce masses of orange pollen

Carpels (3) The ovary is made of 3 carpels fused together. This is best seen by cutting a cross section of the ovary. The stigma is also 3-lobed.

General information

The star gazer lily, as its name suggests, belongs to the Lily family (the Liliaceae). This is a large family containing many beautiful garden plants, which have probably been cultivated since the middle of the 16th century. The star gazer is a cultivated oriental hybrid. Onions and chives also belong to this family.

The pollen can stain. If it gets onto skin or clothing dust it off whilst it is dry. Wiping with a damp cloth will lead to staining. Note that the pollen is very poisonous to cats.

Definitions *(which can be used to explain words to the children)*

carpel	<i>the female parts of a flower</i>
dispersal	<i>the spreading of seeds from a plant</i>
fertilisation	<i>joining of the male and female cells</i>
flower	<i>part of the plant where seeds are made</i>
fruit	<i>the part of the plant that contains the seeds</i>
germination	<i>when the seed starts to grow</i>
leaf	<i>usually green; the part where the plant makes its food</i>
ovary	<i>the part of the carpel that contains the ovules</i>
ovule	<i>found in the ovary and develops into a seed after fertilisation</i>
petal	<i>often brightly coloured and attracts insects and helps to protect the rest of the flower</i>
pollen	<i>dust-like powder made in the stamen</i>
pollination	<i>the transfer of pollen from the stamen to a stigma</i>
root	<i>takes up water and in many plants anchors or holds the plant in the soil</i>
seed	<i>develops from the ovule after fertilisation and may grow into a new plant</i>
sepal	<i>often green; protects the rest of the flower</i>
stamen	<i>the male part of the flower where pollen is made</i>
stem	<i>the part of the plant that the leaves and flowers are joined to</i>
stigma	<i>part of the carpel that pollen grains become attached to during pollination</i>



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Reproduction and life cycles

Part 1: Parts of a flower

Reproduction and life cycles: Parts of a flower is the second in a series of booklets being developed to cover the work that must be undertaken with plants as part of the Primary Curriculum. Part 1 introduces pupils to the basic part of a flower and their functions. The topic continues in Part 2 with the events that occur in pollination leading to fertilisation, followed by activities linked to fruits and seeds dispersal. Part 1 provides a range of activities (inside and outside the classroom), including dissection of a flower, ways of making simple models of flowers and card games that are fun but at the same time reinforce pupil learning and help them to be ready to move on to the next stage.



Science and Plants for Schools,
Homerton College, Cambridge CB2 2PH
Telephone: 01223 507168
www.saps.org.uk



Field Studies Council,
Preston Montford, Shrewsbury,
Shropshire SY4 1HW
Telephone: 0845 3454072
www.field-studies-council.org

Reproduction and life cycles: the flower, fruit and seeds

CD for Part 1: Parts of a flower



CD for Part 1: Parts of a flower

The items on this CD are related to and should be used in conjunction with certain of the activities described in the booklet *Reproduction and life cycles: the flower, fruits and seeds*, Part 1: Parts of a flower

The activities in the booklet and on the CD have been developed by SAPS (Science and Plants for Schools) in collaboration with FSC (Field Studies Council)

Introducing this CD

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The booklet *Reproduction and life cycles: the flower, fruits and seeds* is part of a series written to support work that must be undertaken with plants as part of the Primary Curriculum in England and Wales and in Scotland. The booklet is also available on the SAPS website (www.saps.org.uk) and can be downloaded freely for use by teachers with their classes.

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Paul Beaumont, Science and Plants for Schools, Homerton College, Cambridge CB2 2PH

email: saps@homerton.cam.ac.uk

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Acknowledgements

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The members of the writing group would like to thank Maggie Bolt for her skilful efforts in converting their work into a format suitable for design and printing.

SAPS would also like to thank the following people for reviewing the draft text and offering a variety of comments, many of which were then incorporated into the final published version of the booklet: Rosemary Boaz, Mary Howarth, Judy Vincent and Paul Warwick.

Members of the Writing Group: Anne Bebbington (FSC and SAPS), Colin Bielby (Manchester Metropolitan University), Janette Kean (Westfield Primary School, West Lothian), Ruth Thomas (Cavendish School) and edited by Erica Clark (SAPS).

Safety

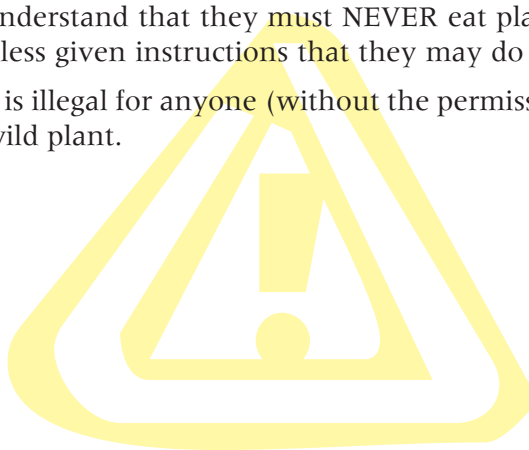
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Teachers using these activities with classes of Primary pupils are advised to refer to the SAPS Safety Notice on the SAPS website and to undertake their own risk assessment where appropriate.

Further information on safety may be found from the sources listed in the SAPS Safety Notice.

Please remember...

- When working with plants, pupils and teachers should ALWAYS wash their hands after handling plants (including seeds), soils, composts, manures, equipment and other related materials.
- Plants (or parts of plants) can be poisonous, cause allergic reactions in some people or may have been treated with chemicals (such as pesticides).
- It is particularly important that pupils understand that they **must NEVER** eat plants found in the wild or in the school grounds, unless given instructions that they may do so.
- Wild flowers should not be picked and it is illegal for anyone (without the permission of the landowner or occupier) to uproot any wild plant.



Contacts

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Science and Plants for Schools

Homerton College, Cambridge CB2 2PH

Telephone: 01223 507168

www.saps.org.uk

Science and Plants for Schools (SAPS) works with teachers to develop new resources that support the teaching of plant science and molecular biology in schools and colleges.



Field Studies Council

Preston Montford, Shrewsbury

Shropshire SY4 1HW

Telephone: 0845 3454072

www.field-studies-council.org

The Field Studies Council (FSC) is an independent educational charity formed in 1943 to help people discover, explore, understand and be inspired by the natural environment... 'bringing environmental understanding to all'.

CD (for Part 1)

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Contents

(note that the relevant page in the booklet for the activity is given in brackets)

Templates

- Flower parts for Building a flowering plant game (*page 14*)
- Card sets 1, 2 and 3 (*page 20*)
- Grids for bingo and splat (*pages 22 and 23*)
- Cards for taboo (*page 24*)

Additional Background information for teachers (*page 27*)

- Asexual or vegetative reproduction
- Examples of dissected flowers
- Wallflower, Garden Pea

Using the CD

Converting templates into cards and other items

On the CD, templates are provided for certain items required for several of the activities in the booklet. The teacher can then make these up into the required form for use with children in the class. These items are listed in the Contents (above). In the booklet, reduced versions are given so that you can see at a glance what is available. The full-sized templates (A4) provided on the CD are also available on the SAPS website, usually as both pdf and Word files. You can download the pdf files and use them as they are, or you may prefer to adapt the Word files to your particular version of the game or activity.

Usually it would be appropriate to make your sheets out of lightweight card. To do this, print out the template and photocopy onto appropriately coloured card or paper. Alternatively you may be able to print directly onto the card. You can then make good durable sets by laminating the pages. When you have your whole page, you then cut out the cards or parts for use with your class. For some items, it might be a good idea to photocopy onto OHTs (e.g. bee's wings in "Building a flowering plant game").

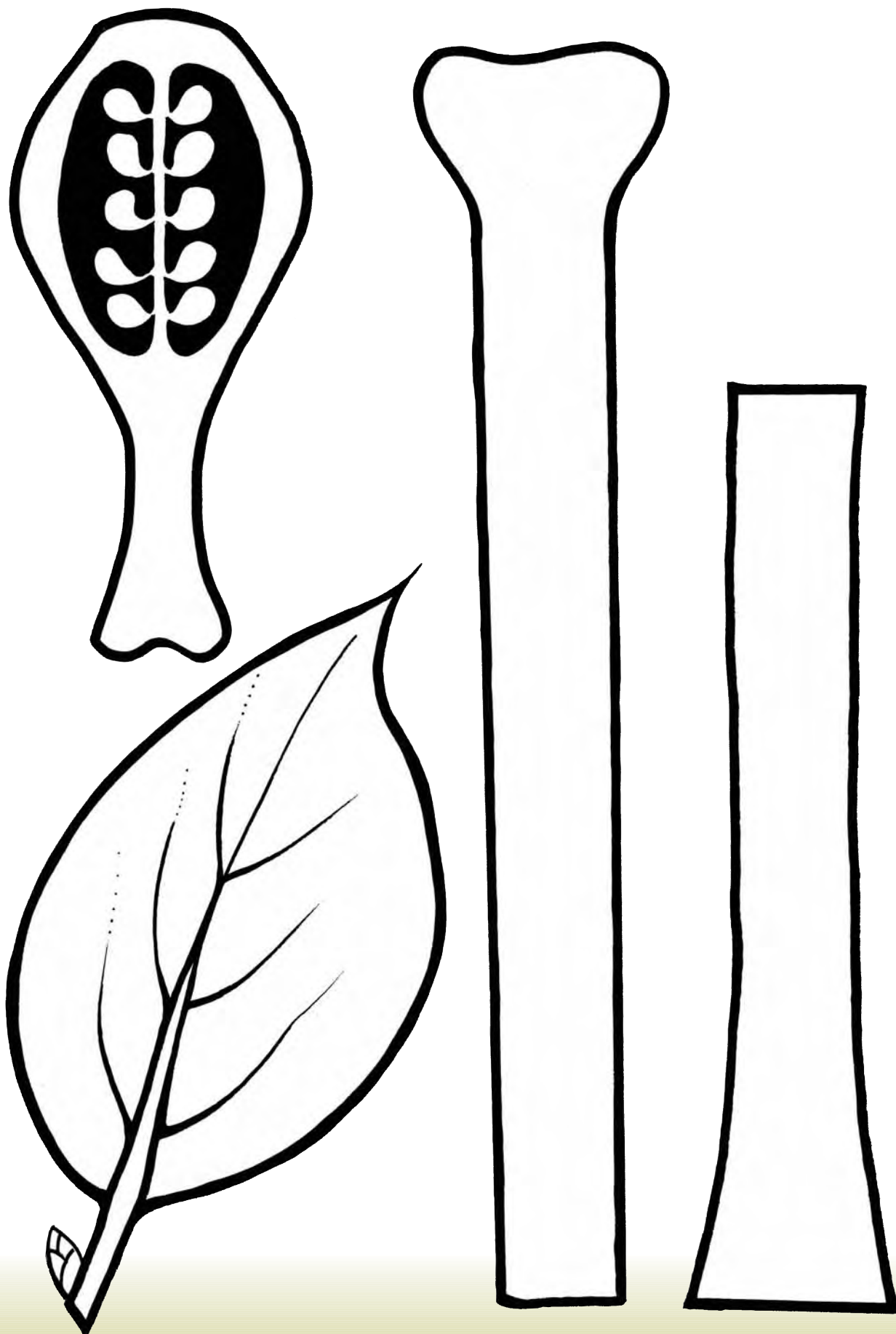
Additional Background information for teachers

The material on the CD (mainly drawings) supplements the background information given in the booklet. Further examples of dissected flowers are provided on the SAPS website, and teachers should refer to this as more are added in the future.

Flower parts for Building a flowering plant game

(page 1 of 3) (See booklet, page 15)

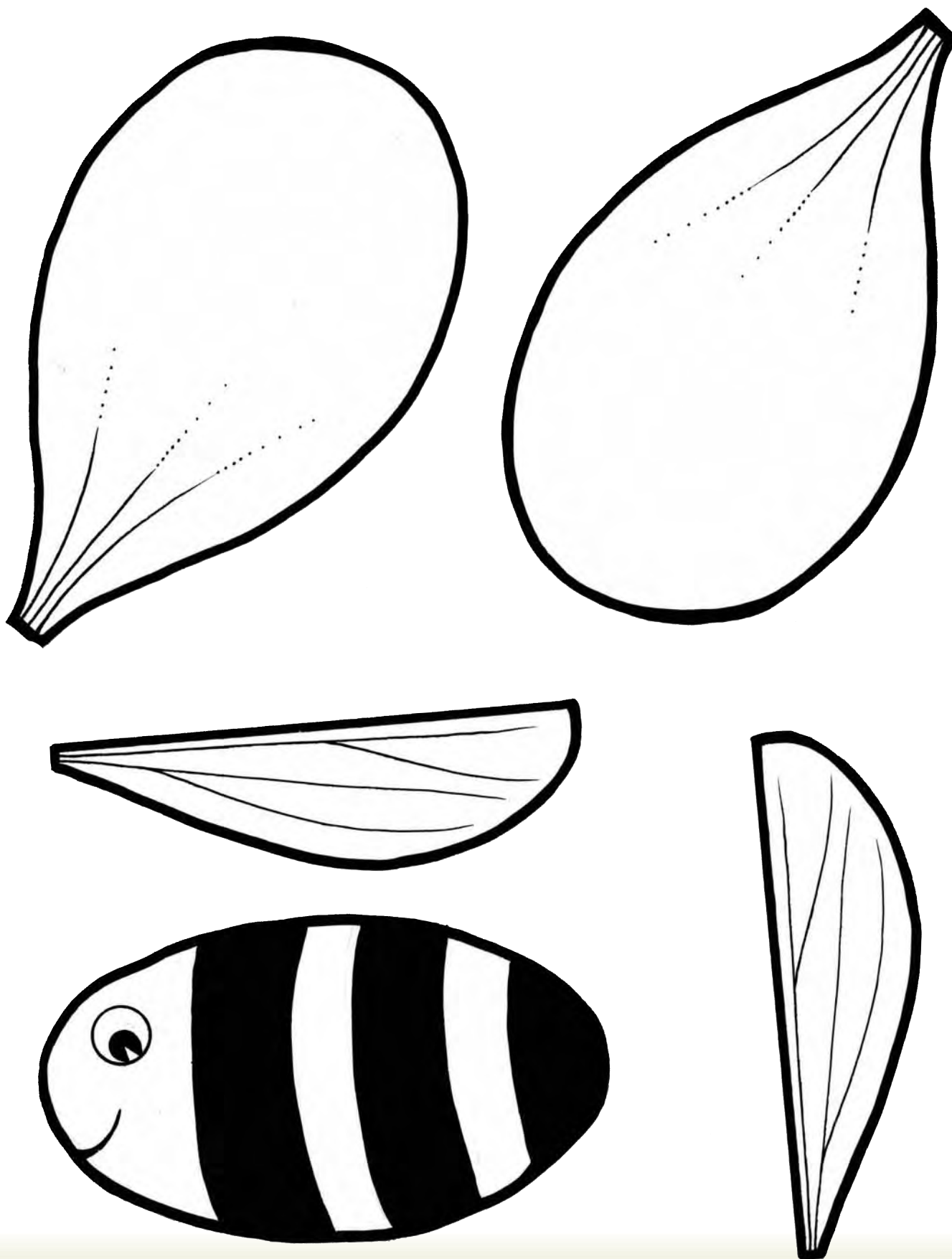
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Flower parts for Building a flowering plant game

(page 2 of 3)

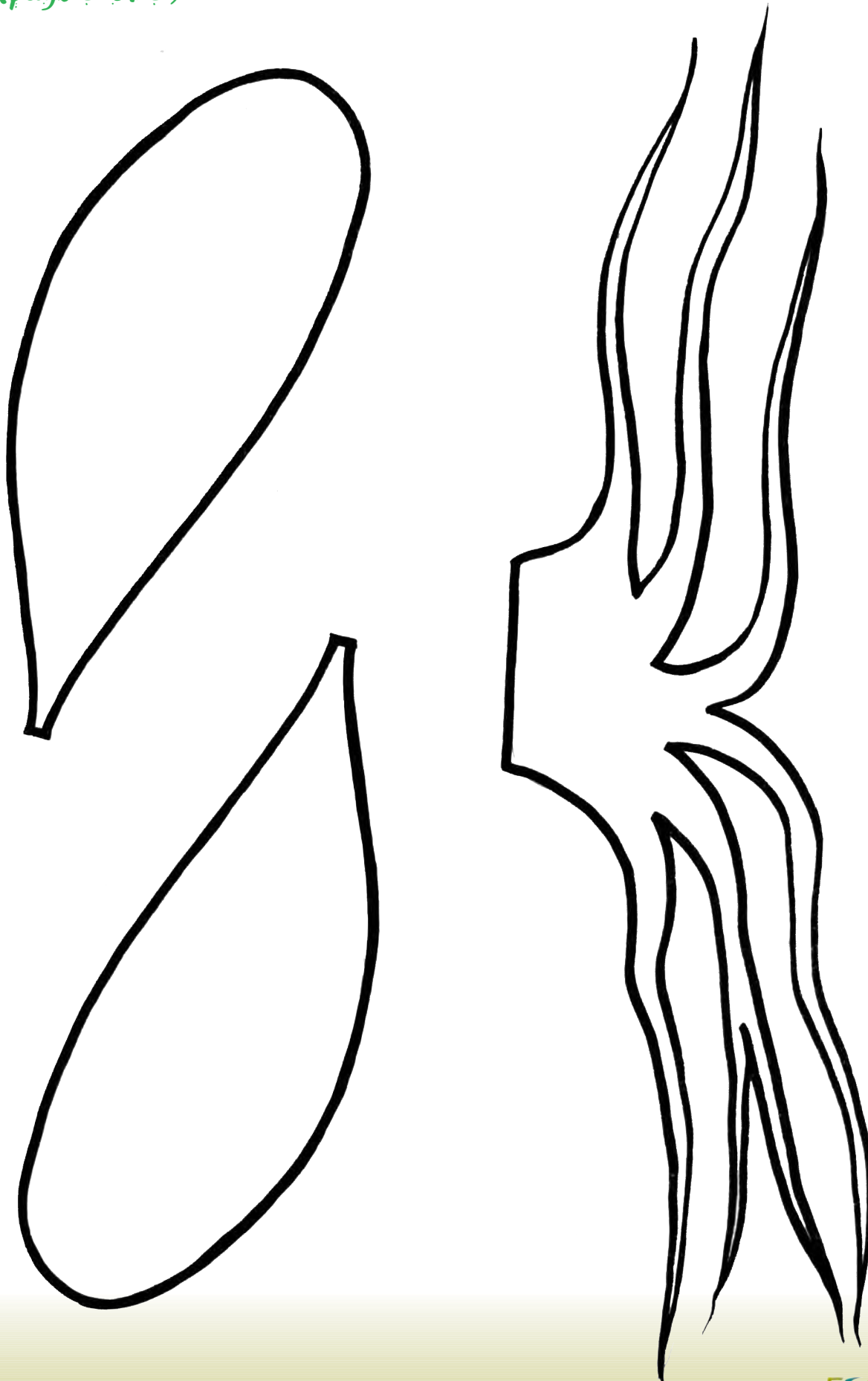
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Flower parts for Building a flowering plant game

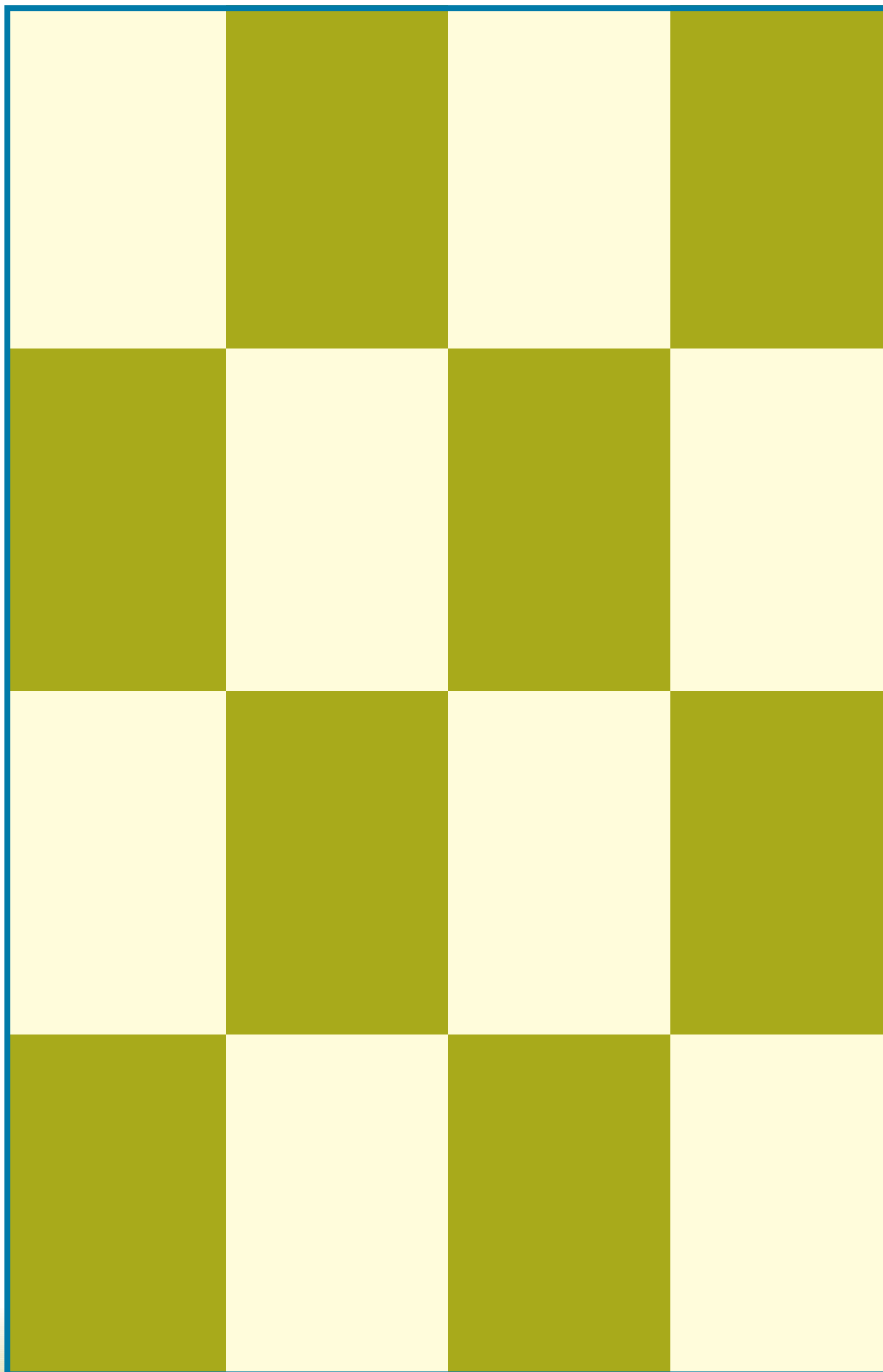
(page 3 of 3)

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Bingo grid *to be adapted by teacher (See booklet, page 26)*

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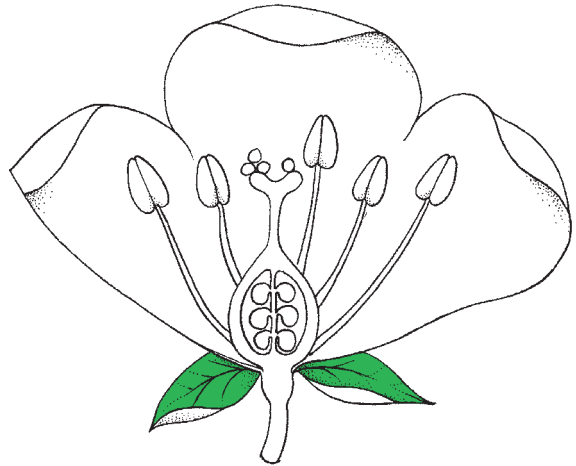
SPLAT Parts of a flower grid (See booklet, page 26) © SAPS/FSC 2006.

carpel		sepal	
	ovary		ovule
pollen		petal	
	stigma		stamen

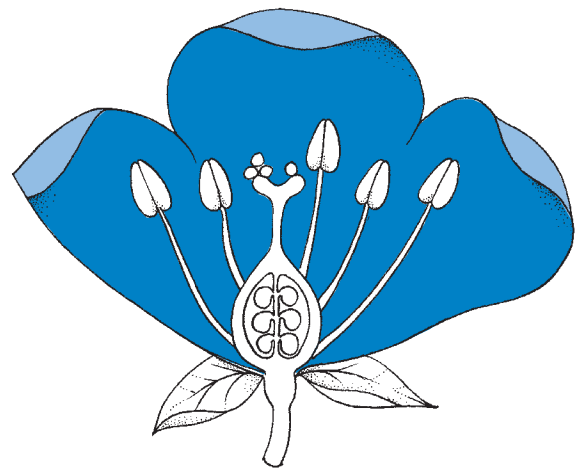
Card set 1 (page 1 of 3) *(See booklet, page 25)*

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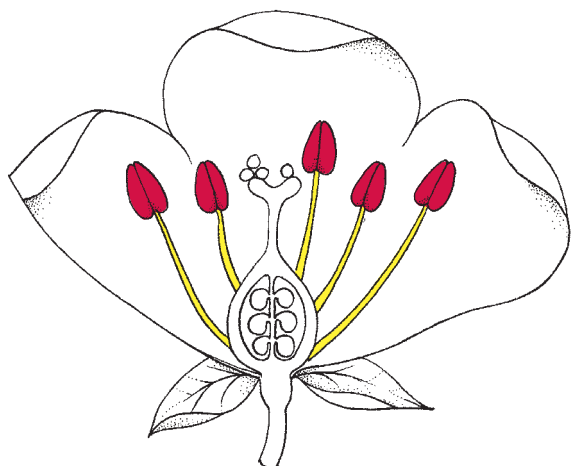
sepal



petal



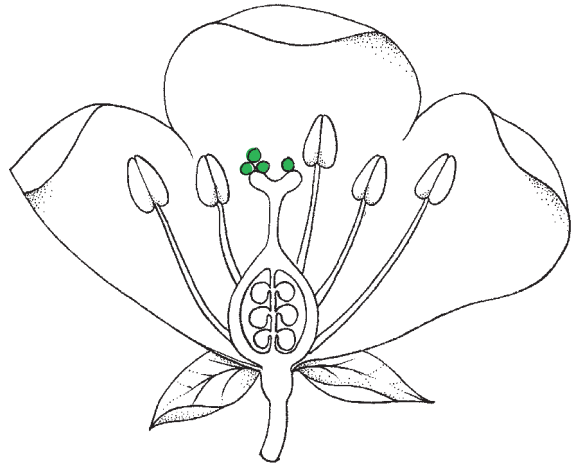
stamen



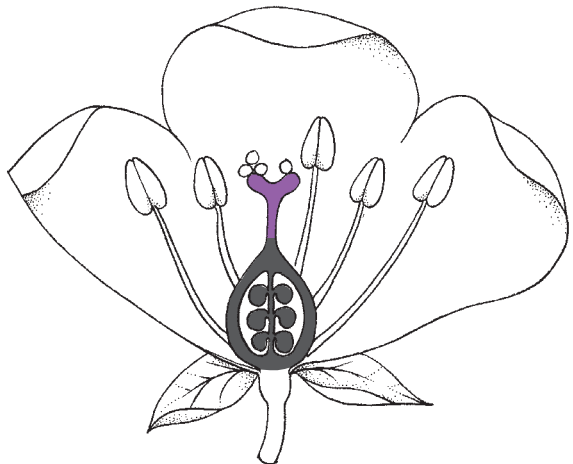
Card set 1 (page 2 of 3)

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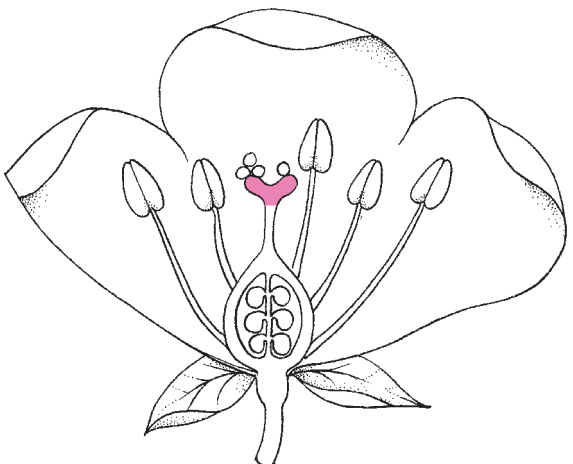
pollen



carpel



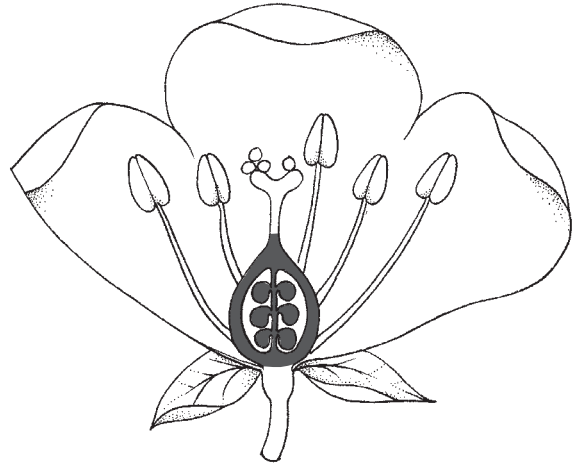
stigma



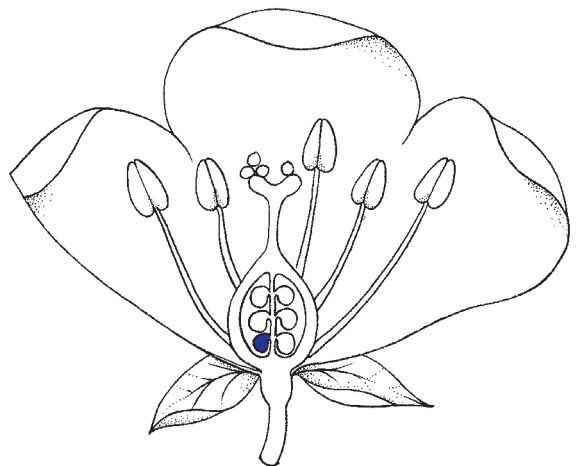
Card set 1 (page 3 of 3)

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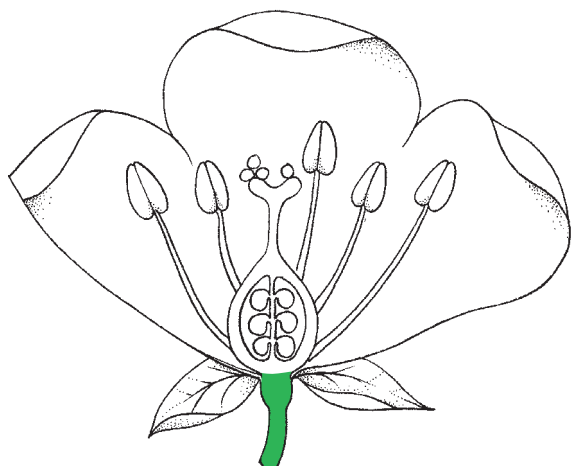
ovary



ovule



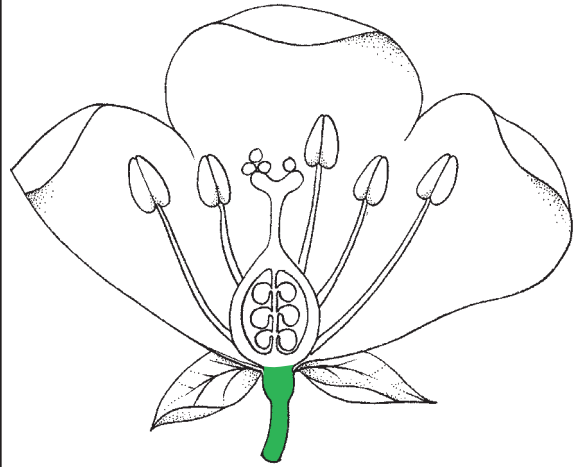
stem



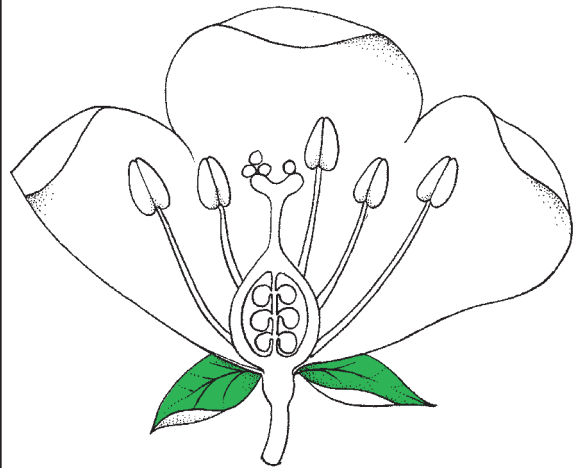
Card set 2 (page 1 of 3) (See booklet, page 25)

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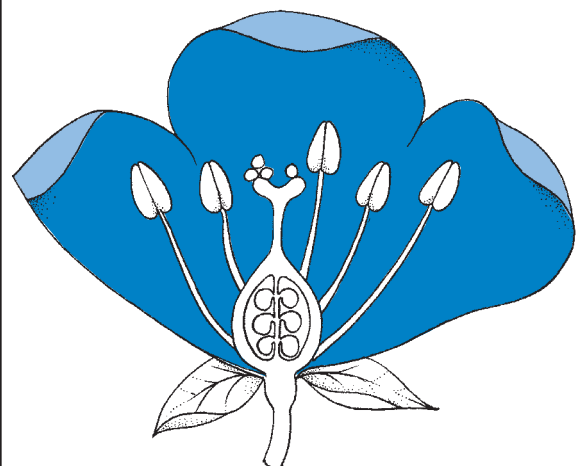
sepal



petal



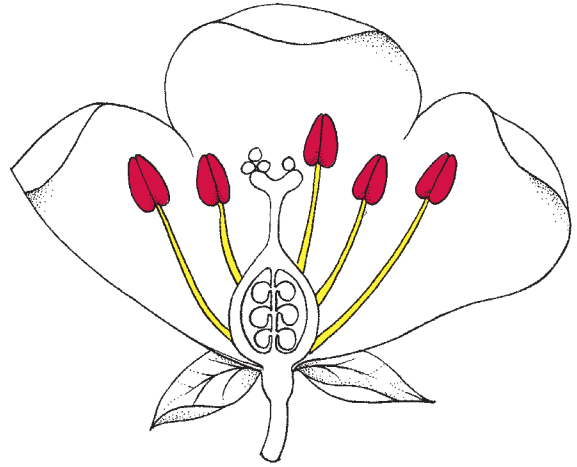
stamen



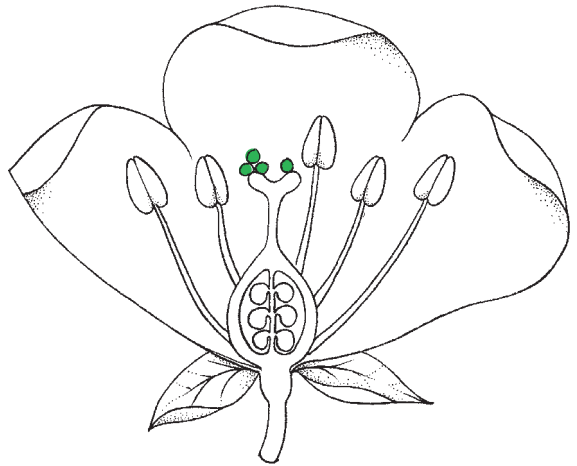
Card set 2 (page 2 of 3)

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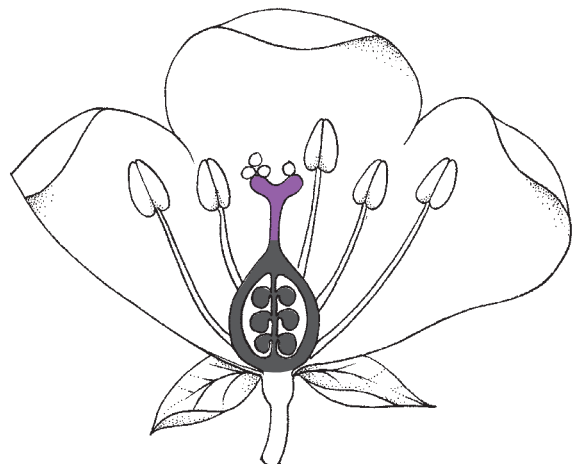
pollen



carpel



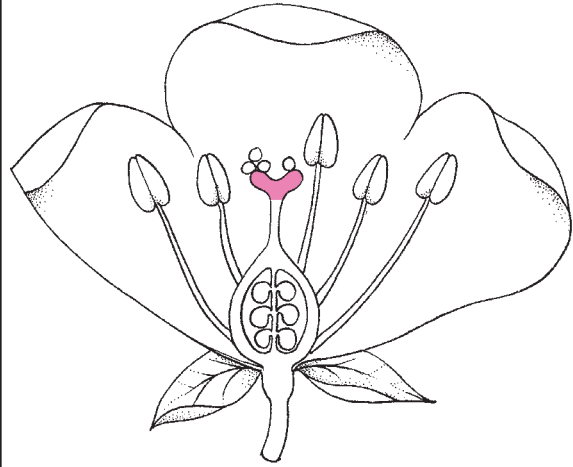
stigma



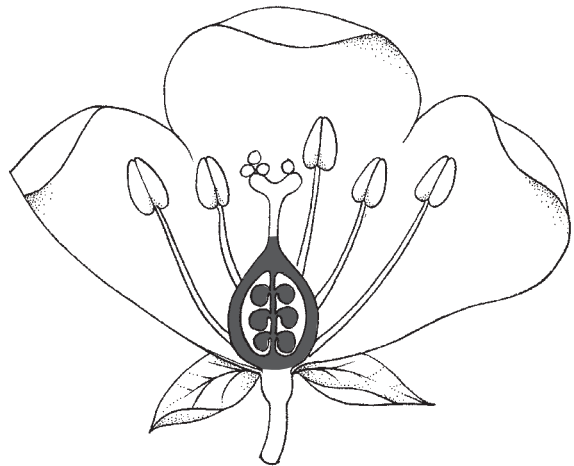
Card set 2 (page 3 of 3)

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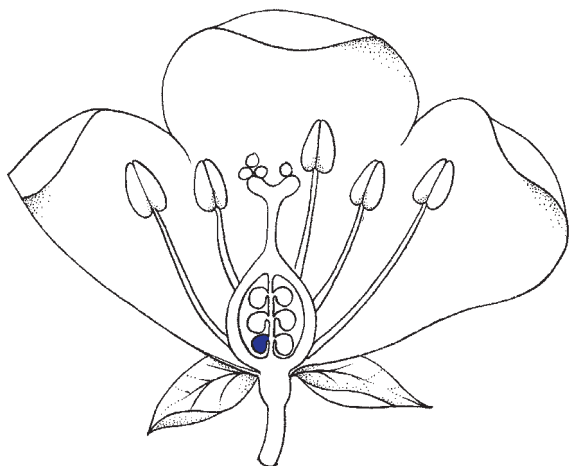
ovary



ovule



stem



sepal

*supports the
flower*

petal

*often green
and protects
the rest of
the flower*

stamen

*often brightly
coloured to
attract insects*

pollen

*the male part
of the flower,
where pollen
is made*

carpel

*dust-like
powder made
in the stamens*

stigma

*the female
parts of the
flower*

Card set 3 (page 3 of 3)

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ovary

*the part of
the carpel
that the pollen
sticks to*

ovule

*the part of
the carpel
that contains
the ovules*

stem

*develops into
the seed*

Additional background information for teachers

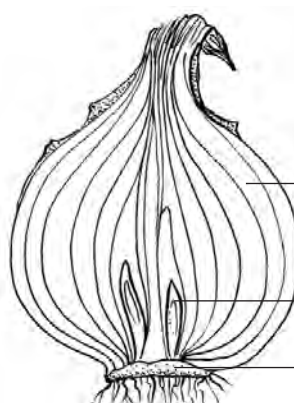
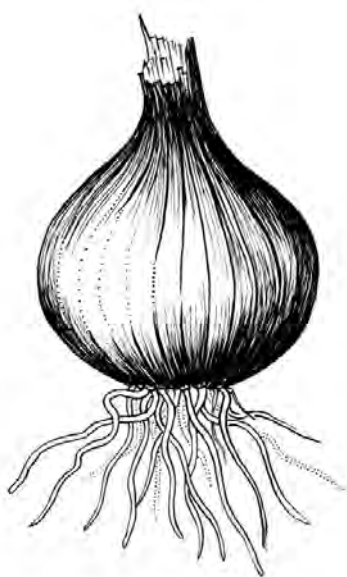
(see *Background information for teachers* in booklet, page 27)

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Asexual or vegetative reproduction

Many plants are able to reproduce by detaching bits of themselves, which then grow into new plants. Here are some examples.

1. An onion is a specialised underground shoot. Its swollen leaf bases are full of stored food and this helps the new shoot to develop in the spring. It also contains one or more buds, which form new bulbs at the end of the growing season.



swollen leaf base

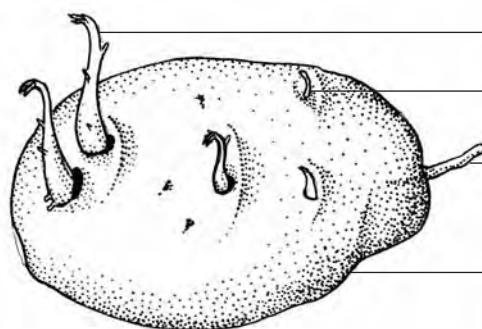
bud will form new bulb

flattened stem

Whole onion (left) and section through an onion (right)

2. The potato is a swollen stem tip, known as a tuber. The potato plant produces a large number of potatoes each with several buds. These buds can form new shoots.

A potato, showing new shoots growing from buds



new shoot

bud

underground stem

tuber



3. The Slender Speedwell, a common plant on lawns, grows readily from fragments of shoot spread around when the lawn is being cut.

The Slender Speedwell

Examples of dissected flowers

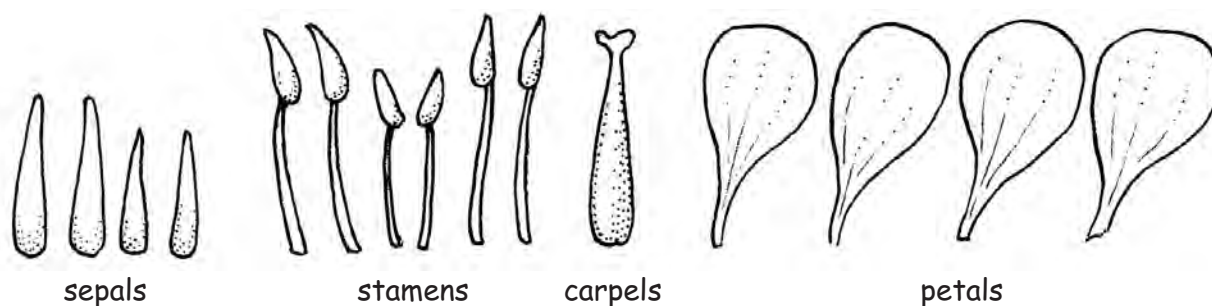
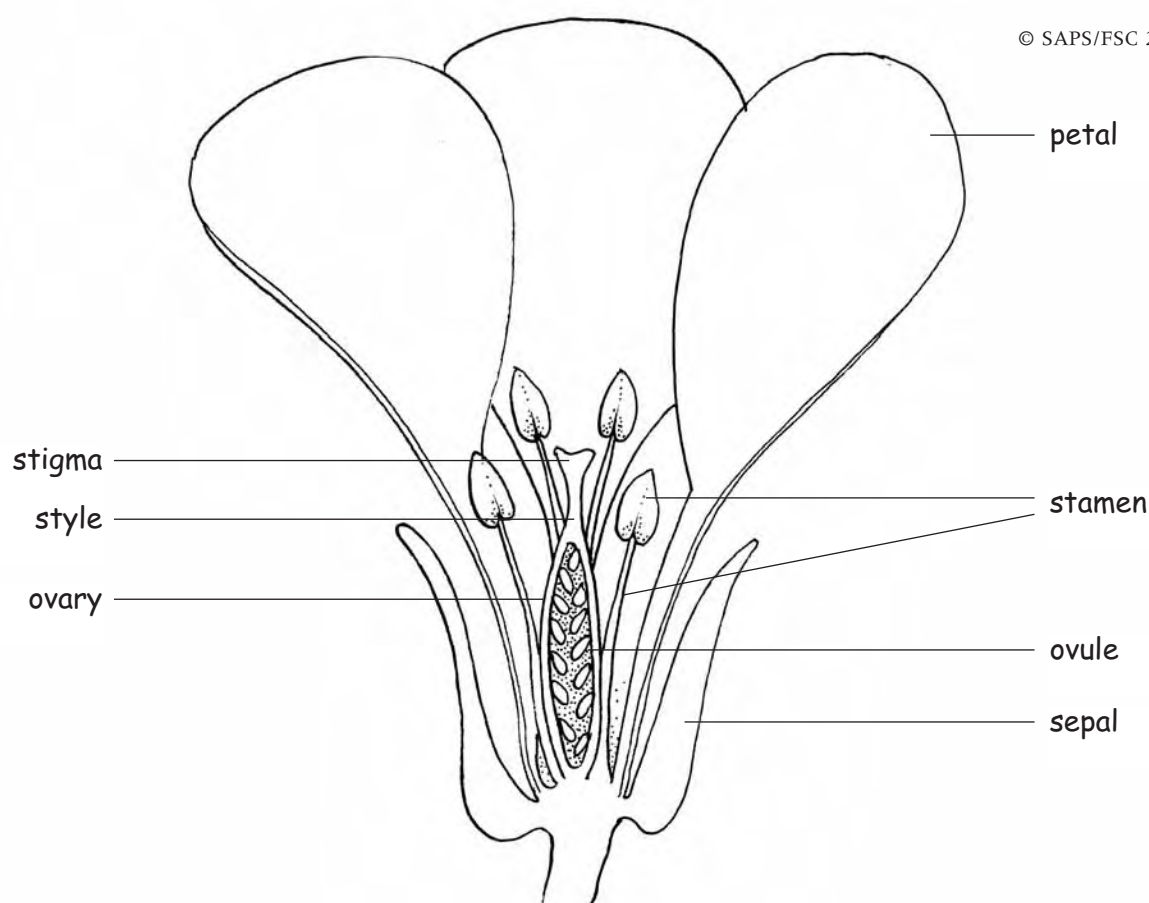
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1. Wallflower



General information

The Wallflower (*Erysimum cheiri*) belongs to the cabbage Family (Brassicaceae). This large family occurs in most parts of the world and is economically very important. It supplies us with a wide variety of familiar food plants e.g. mustard, cress, radish, turnip, swede, cabbage, Brussels sprouts, broccoli and cauliflower. Oil seed rape is also in this family.



The structure of the flower

- Sepals (4)** These drop off readily after the flower has opened and you might miss them. In the cultivated red and purple varieties they are often similar in colour to the petals. The yellow form usually has green sepals.
- Petals (4)** Red, orange, yellow or purple, or a mixture of these colours.
- Stamens (6)** 4 long ones and 2 short ones.
- Carpels (2)** The ovary is made from 2 fused carpels. The stigma is shallowly 2-lobed and joined to the ovary by a very short style.

Examples of dissected flowers

2. Garden Pea (sugar snap variety)

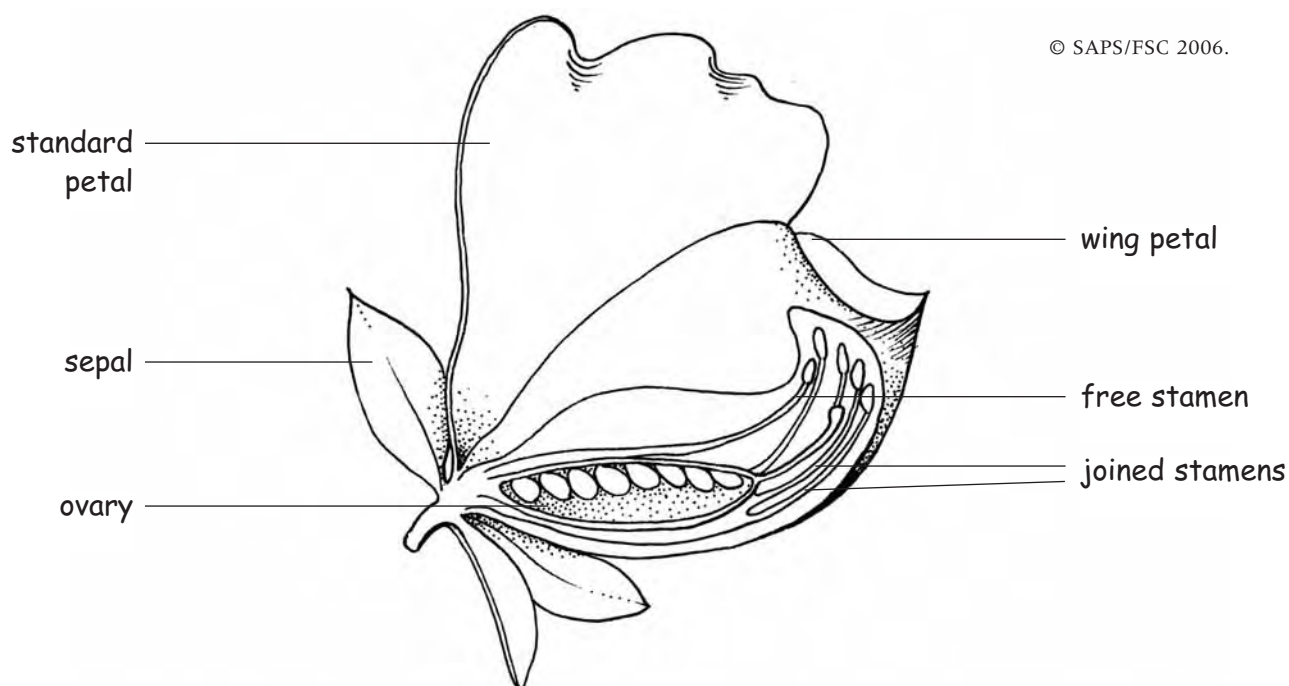
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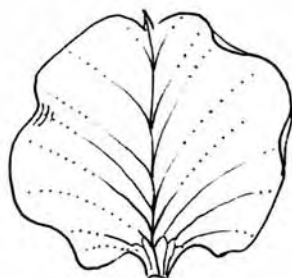
General information

The Garden Pea (*Pisum sativum*), particularly the sugar snap variety, is very easy to grow both in the classroom and out of doors and flowers and fruits readily. (See booklet 1, *The parts of a plant and their functions*). Other members of this family with flowers that are easy to study include the sweet pea and runner bean.

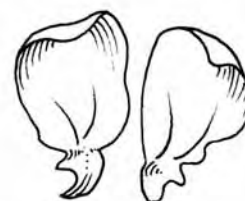
The Pea family is of great economic importance because it provides many sources of food for both livestock and humans e.g. beans, peas, lentils and peanuts. These foods are rich in protein and therefore particularly important to people whose diet is poor in animal protein. The roots of members of this family are able to fix nitrogen from the air and are therefore important in maintaining good crop growing conditions.



5 joined sepals



large standard petal



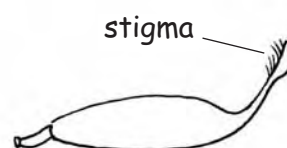
2 wing petals



2 petals joined to form keel



1 free stamen,
9 joined stamens



stigma

carpel

The structure of the flower

Sepals (5) These are joined together.

Petals (5) 1 large standard.

2 wings.

2 petals joined together to form the keel which encloses the stamens and carpel.

Stamens (10) 9 with their stalks joined below to form a tube and 1 which is free.

Carpel (1) The stigma is joined to the ovary by a short style. The elongated ovary forms the pea pod after fertilisation.