



The Plant Detective

Plants were the first multicellular organisms to colonise the land, changing the atmosphere of earth and paving the way for animals to move out of the seas. Land plants have existed for about 450 million years. In order to survive out of the water plants had to develop specialised structures and anatomy to enable them to absorb water, nutrients and energy so that they could grow and reproduce. Flowering plants first appeared about 180 million years ago. Today, 90% of the plant kingdom are flowering species, while algae, conifers, ferns, horsetails, mosses, liverworts, and their relatives, make up the remaining 10%.

Suitable for Key Stage:





Key Information

Teacher

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View online



Scan the QR Code.

Science topics

Age

Green plants, Reproduction, Photosynthesis, Adaptation



7-11 years old

Duration



50 minutes

Resources

- Flash Animation
- Student sheets
- PowerPoint presentation
- Parts of the Plant Poster

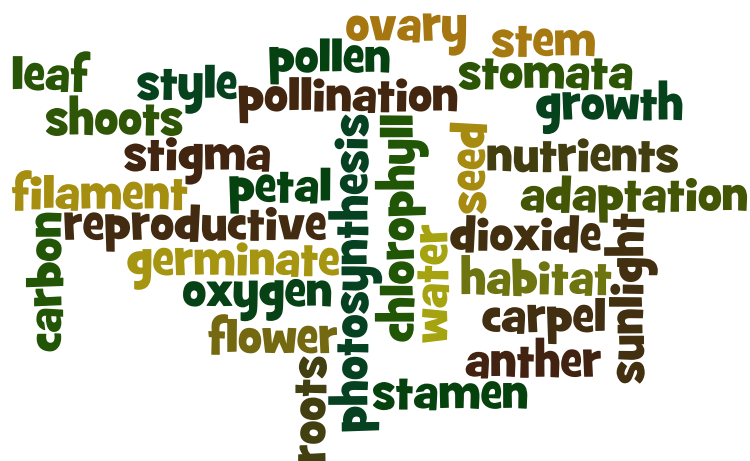
Cover Image © John Innes Centre

Key Information

Teacher

Keywords

Sunlight, water, carbon dioxide, oxygen, photosynthesis, chlorophyll, stomata, roots, stem, leaf, flower, reproductive, stamen, filament, anther, pollen, stigma, style, ovary, carpel, pollination, petal, germinate, seed, growth, shoots, habitat, adaptation, nutrients.




Learning outcomes

Students will be able to:

- State that the life processes common to plants include growth, nutrition and reproduction
- Describe the effect of light, air and water on plant growth
- Explain the role of the leaf in producing new material for growth
- Explain that the root anchors the plant, and that water and nutrients are taken in through the root and transported through the stem to other parts of the plant
- List the parts of the flower, for example, stigma, stamen, petal, and describe their role in the life cycle of flowering plants, including pollination, seed formation, seed dispersal and germination

Prior learning

What you will need

 Access to a computer and internet connection

 Student Worksheets

Students should recognise that plants need light and water to grow. They should be able to recognise plants and possibly name some simple features such as the leaf, flower, stem and root of flowering plants. They should be able to explain that seeds grow into flowering plants.

Teacher preparation

Plant detective is an interactive presentation, suitable for Key Stage 2 (7-11 year olds) describing the different parts of a plant and what they do. There are worksheets, to assess learning, as students progress through the animation. In order for students to progress at their own pace and direct their own learning they will need to be able to access the plant detective animation on a computer or similar device. Alternatively the animation can be displayed to the whole class with a projector or printed out as worksheets. The lesson could be enhanced by having actual plants available for students to identify the parts of the plant.

Research links

Researchers show how plants tell the time [Reference/webpage no longer available – January 2017]



Secret of plant geometry revealed [Reference/webpage no longer available – January 2017]



Plants do sums to get through the night [Reference/webpage no longer available – January 2017]



Cell 'scaffold' is the key to plant growth [Reference/webpage no longer available – January 2017]



The text and images featured on the animation are provided below so you can familiarise yourself with the content before the lesson.

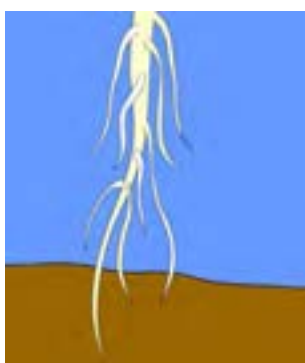


What the different parts of a plant do?
In this picture you can see the four main parts of a plant:
the flower head, the stem, leaves, and the roots.



Plants make food in their leaves. To make food plants need sunlight, water and a gas called carbon dioxide which they get from the air. This process is called photosynthesis. During photosynthesis the plant produces the gas oxygen.

Leaves are usually green because they contain a chemical pigment (or dye) called chlorophyll. Chlorophyll can absorb (or soak up) sunlight. Leaves also take in the gas carbon dioxide from the air around them through tiny holes called stomata.



These are the roots. Roots take up water and nutrients from the soil. They also spread out in the soil and anchor the plant in one place.

Some plants store food in their roots. This helps them to produce new roots and shoots. These root 'stores' have names like tap root, tubers, corms and bulbs.



The stem supports the flower and the leaves, holding them up to the sunlight. Water travels from the roots through the stem to all the other parts of the plant.

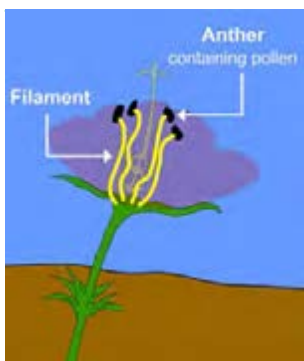


Some plants have special ways of protecting themselves from being eaten by animals. Thistles and roses have thorns on their stems.

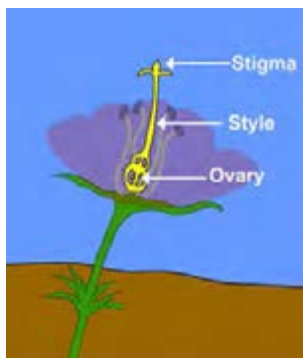
Many plants have developed special features to help them survive in their own particular home or habitat. These special features also help plants to compete with other species for water, sunlight and air.



This is what the flower centre looks like.



The plant's reproductive structures are here. The male part is the stamen – it is made up of an anther and a filament, and looks a bit like a lollipop. The anther contains pollen.



This is the female part of the flower, called the carpel. It is made up of a stigma, a style and an ovary. When 'male' pollen lands on the 'female' stigma pollination occurs. Sometime later a seed is produced.



Petals are usually brightly coloured and often scented. Bright colours and scent help to attract insects.



When insects feed on the nectar they are 'dusted' with pollen which they carry to the next flower they visit.



When seeds are dispersed (or moved away) from their parent plant they can start to germinate and grow, but only if water and air are present.

Extension activities

Providing a variety of actual plants and asking students to identify the parts of the plant will greatly enrich the lesson and assess the ability of students to apply their knowledge to real life examples.

This can be followed up further with practical activities investigating germination, seed and plant growth, and photosynthesis.

- **Easy PEAsy seed germination** (suitable for 7-11 year olds)
- **Seeds and plant growth discovery pack** (suitable for 5-12 year olds)
- **Photosynthesis explored** (suitable for 10-13 year olds)

Students can also test their understanding of plant growth with **Extinct - the plant survival game** in which players must devise plant survival strategies for growing and reproducing as the environment changes.

Plenary

Provide the students with the answers to the worksheets so they can check their own work and recap the learning outcomes.

Provide time for the students to ask any questions that may have arisen as they worked through the animation and worksheets.

You may want to introduce the students to some of the latest discoveries scientists are making in plant research to provide a context for their learning.

Key stage 1-2

Plants

Year 1

Pupils should be taught to:

- Identify and describe the basic structure of a variety of common flowering plants, including trees

Year 2

Pupils should be taught to:

- Observe and describe how seeds and bulbs grow into mature plants
- Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy

Year 3

Pupils should be taught to:

- Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers
- Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant
- Investigate the way in which water is transported within plants
- Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal

Living things and their habitats

Year 5

Pupils should be taught to:

- Describe the life process of reproduction in some plants and animals

Further reading

Be safe! 4th Edn. 2011. Association for Science Education.

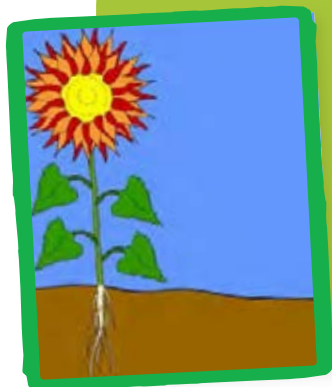
The Plant Detective

Student

1

What the different parts of a plant do?

In this picture you can see the four main parts of a plant: the **flowerhead**, the **stem**, the **leaves**, and the **roots**.



2

Plants make food in their leaves. To make food plants need **sunlight**, **water** and a gas called **carbon dioxide** which they get from the air. This process is called **photosynthesis**. During photosynthesis the plant produces the gas oxygen.

Leaves are usually green because they contain a chemical pigment (or dye) called **chlorophyll**. Chlorophyll can absorb (or soak up) sunlight. Leaves also take in the gas carbon dioxide from the air around them through tiny holes called **stomata**.

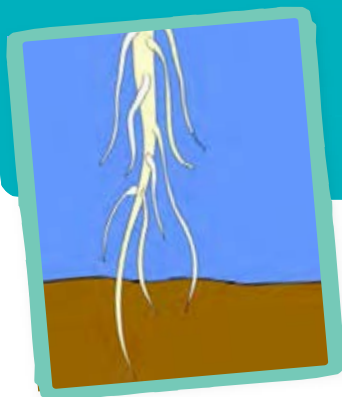


3

These are the **roots**. Roots take up **water** and **nutrients** from the soil.

They also spread out in the soil and anchor the plant in one place.

Some plants store food in their roots. This helps them to produce new roots and shoots. These root 'stores' have names like tap root, tubers, corms and bulbs.



4

The **stem** supports the flower and the leaves, holding them up to the sunlight.

Water travels from the roots through the stem to all the other parts of the plant.



MORE ON THE NEXT PAGE!

The Plant Detective

Student

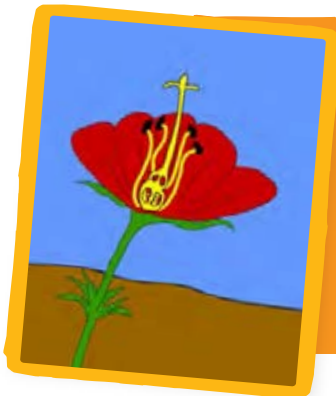
5

Some plants have special ways of protecting themselves from being eaten by animals. Thistles and roses have thorns on their stems. Many plants have developed special features to help them survive in their own particular home or habitat. These special features also help plants to compete with other species for water, sunlight and air.



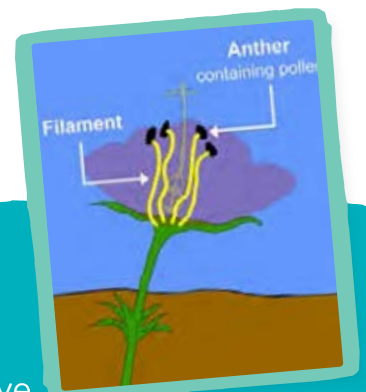
6

This is what the flower centre looks like.



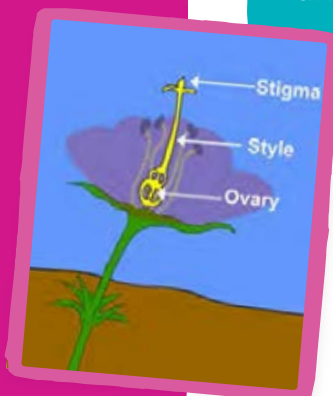
7

The plant's reproductive structures are here. The male part is the **stamen** – it is made up of an anther and a filament, and looks a bit like a lollipop. The anther contains pollen.



8

This is the female part of the flower, called the **carpel**. It is made up of a stigma, a style and an ovary. When 'male' pollen lands on the 'female' stigma pollination occurs. Sometime later a seed is produced.



MORE ON THE NEXT PAGE!



The Plant Detective

Student**9**

Petals are usually brightly coloured and often scented. Bright colours and scent help to attract insects.

10

When insects feed on the nectar they are 'dusted' with **pollen** which they carry to the next flower they visit.

**11**

When seeds are dispersed (or moved away) from their parent plant they can start to **germinate** and grow, but only if water and air are present.





Do you know what the different parts of a plant do?

Student

See how many of these questions you can answer (playing “The Plant Detective” will help you).

1. Why are the petals of a flower often brightly coloured and scented? Is it...



(A)
to attract
humans

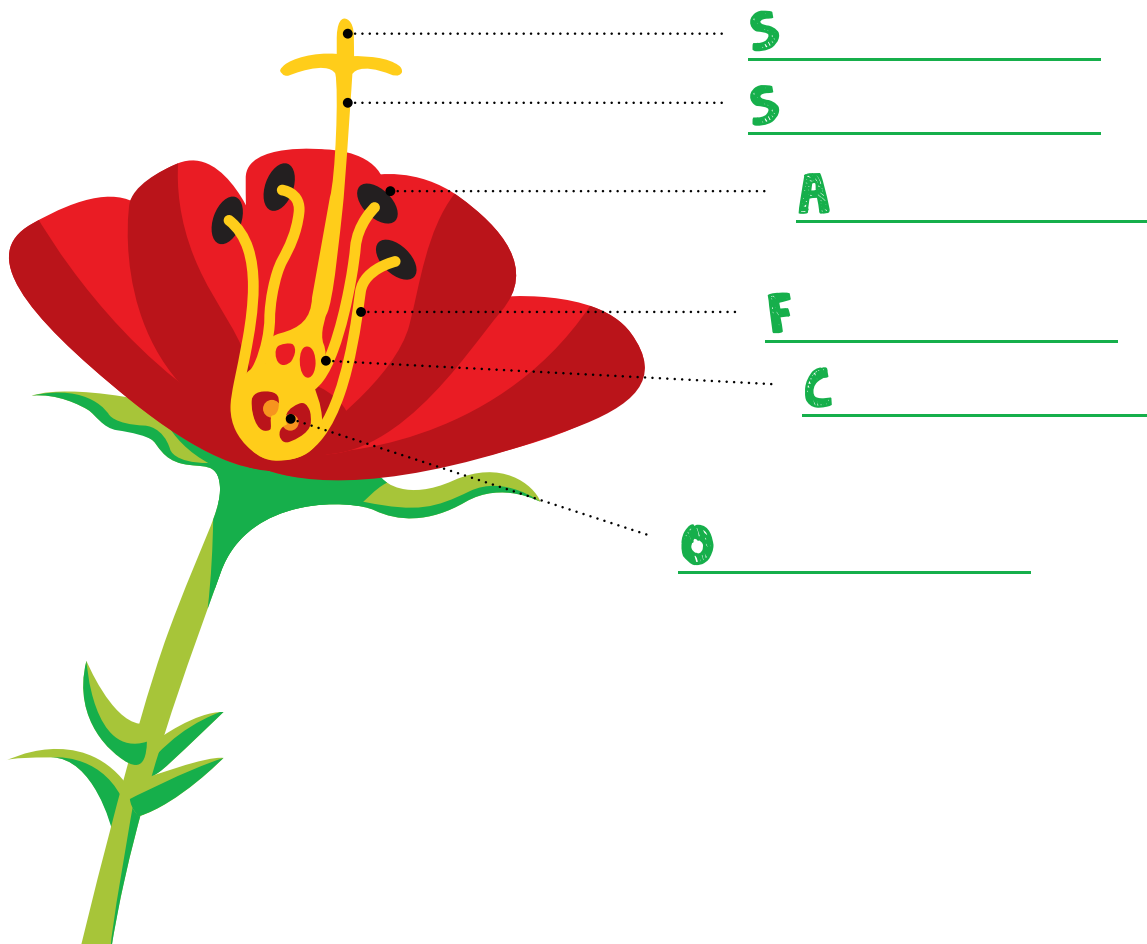
OR



(B)
to attract
insects

Tick the correct answer

2. Complete the diagram below by filling in the names of the male and female parts of the plant.





Do you know what the different parts of a plant do?

Student

WORDSEARCH

3. There are three words which describe the male reproductive parts of a flower hidden in this word jumble. Can you find them?

They are: **FILAMENT, ANTHOR, POLLEN**

P	I	C	R	S	E	R	Q	T	I
O	O	A	I	Q	R	E	W	R	T
I	I	L	P	W	E	H	A	Y	S
P	K	Q	L	T	H	T	J	U	B
S	P	D	V	E	T	N	K	M	N
G	I	E	S	Y	N	A	L	O	M
F	I	L	A	M	E	N	T	F	O

There are four words which describe the female reproductive parts of a flower hidden in this word jumble. Can you find them?

They are: **STIGMA, STYLE, OVARY, CARPEL**

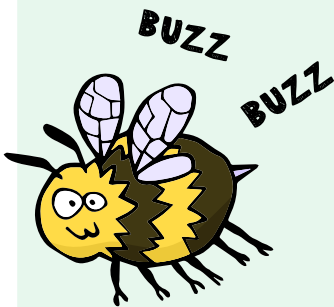
A	B	R	C	E	I	H	L	T	I
M	V	O	A	W	C	N	M	R	T
G	R	V	R	Q	Z	B	C	Y	S
I	T	A	P	B	X	R	G	U	B
T	H	R	E	M	T	R	N	M	N
S	T	Y	L	E	J	T	S	O	M



Do you know what the different parts of a plant do?

Student

4. What happens when the pollen from one flower reaches the stigma of another flower of the same species?



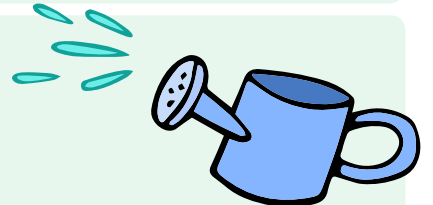
5. What happens after fertilisation? (Tick the right answer)

- (A) a new plant develops ☐
- (B) a seed develops ☐
- (C) the plant dies ☐

6. What two things do seeds need to germinate?

(1) _____

(2) _____



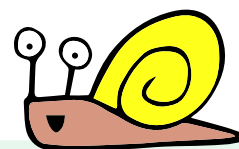
7. Is the green pigment in the leaf called (Tick the right answer)

- (A) colourful ☐
- (B) chlorophyll ☐



Do you know what the different parts of a plant do?

Student



8. Which of these statements is correct? (Tick the right answer)

- (A) During photosynthesis leaves take in carbon dioxide and give out oxygen ☐
- (B) During photosynthesis leaves take in oxygen and give out carbon dioxide ☐



9. Some leaves are big, some are small, some are hairy, some can sting, some are poisonous.

Why do you think this is?

10. What is carried up the stem from the roots?





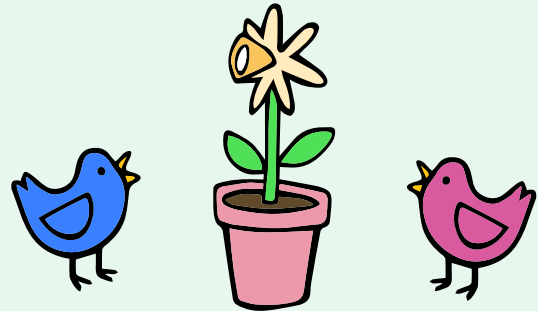
Do you know what the different parts of a plant do?

Student

11. Write down two ways that plants can protect themselves against animals

(1) _____

(2) _____



12. Cactus and water lily look very different from one another because they have developed ways to survive in their own special environments. Can you make two lists from the jumble of words and sentences below? One list will describe a cactus or its habitat, the other will describe a water lily or its habitat.

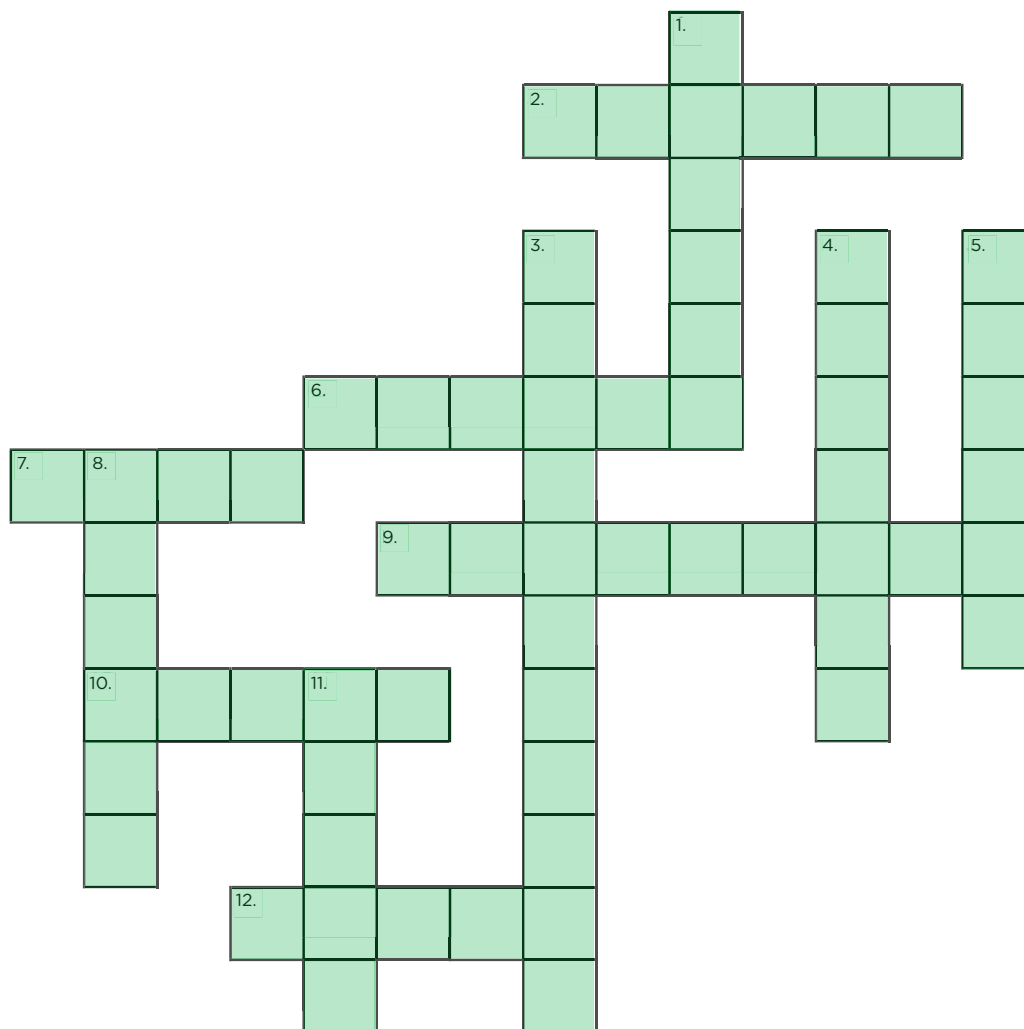
SPIKY WAXY THICK COAT WATER STORES WATER IN THE STEM
 DRY NO THORNS SMALL, THORNY LEAVES FLOATS NO SOIL
 THIN, LARGE LEAVES HOT POOR SOIL POND STREAM HUMID

 WATER LILY LIST	CACTUS LIST
	



Crossword

Student



DOWN ↓

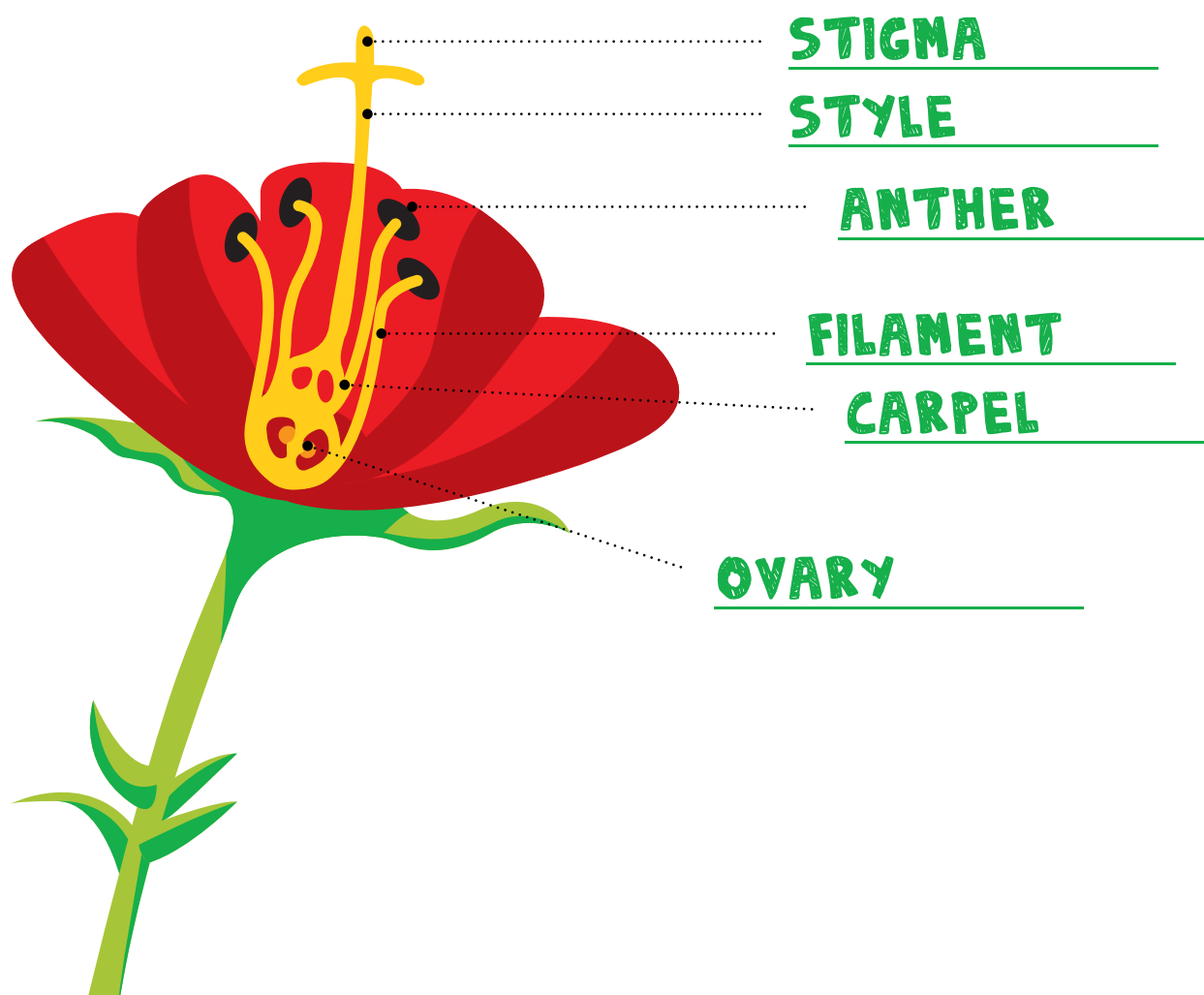
1. Male part of the flower
3. Pigment found in leaves
4. Tiny holes in leaves
5. Gas produced by photosynthesis
8. Protects roses
11. Root store of food

ACROSS →

2. Where the pollen is
6. Carried by insects
7. Transports water up the plant
9. Seeds can do this if they have water and air
10. Anchor the plant in one place
12. Brightly coloured

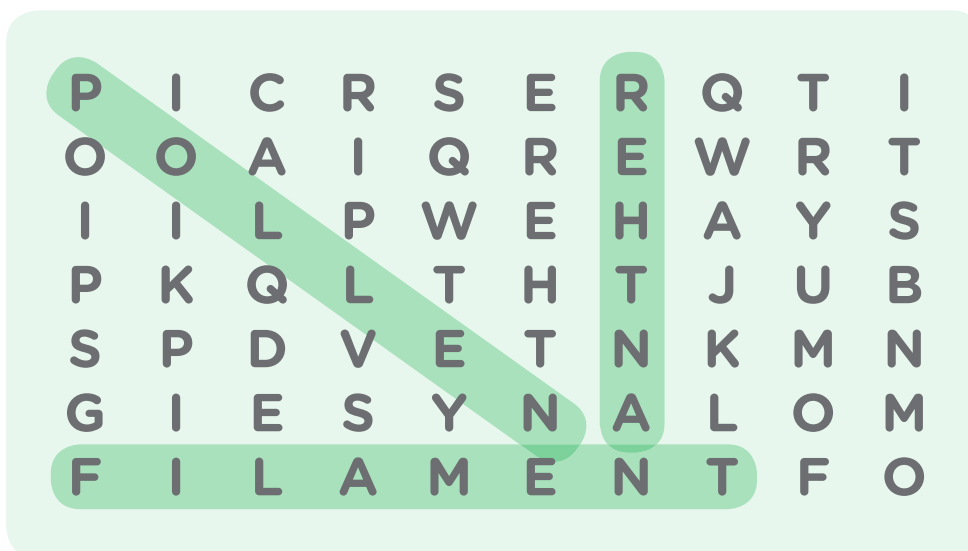
See how much of this sheet you can complete (playing “The Plant Detective” will help you)

1. Why are the petals of a flower often brightly coloured and scented?
(b) to attract insects
2. Complete the diagram below by filling in the names of the male and female parts of the plant.

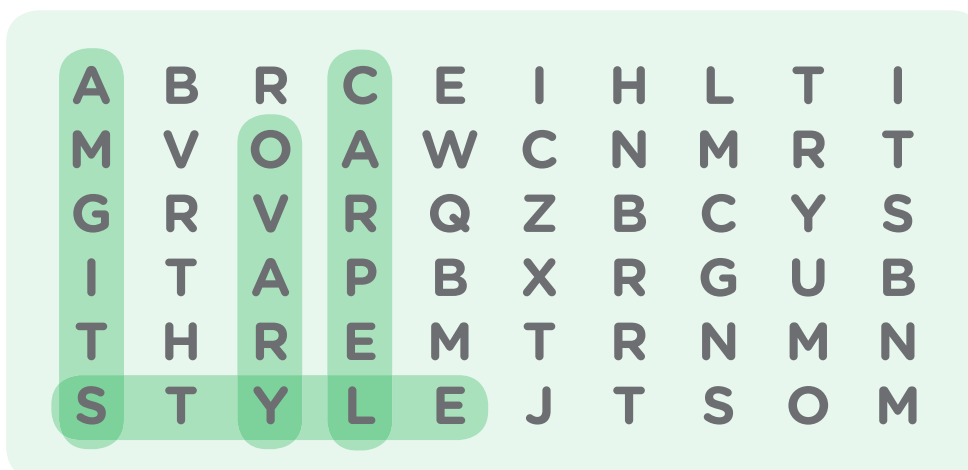




3. There are three words which describe the male reproductive parts of a flower hidden in this word jumble. Can you find them? They are: **FILAMENT, ANTHOR, POLLEN**



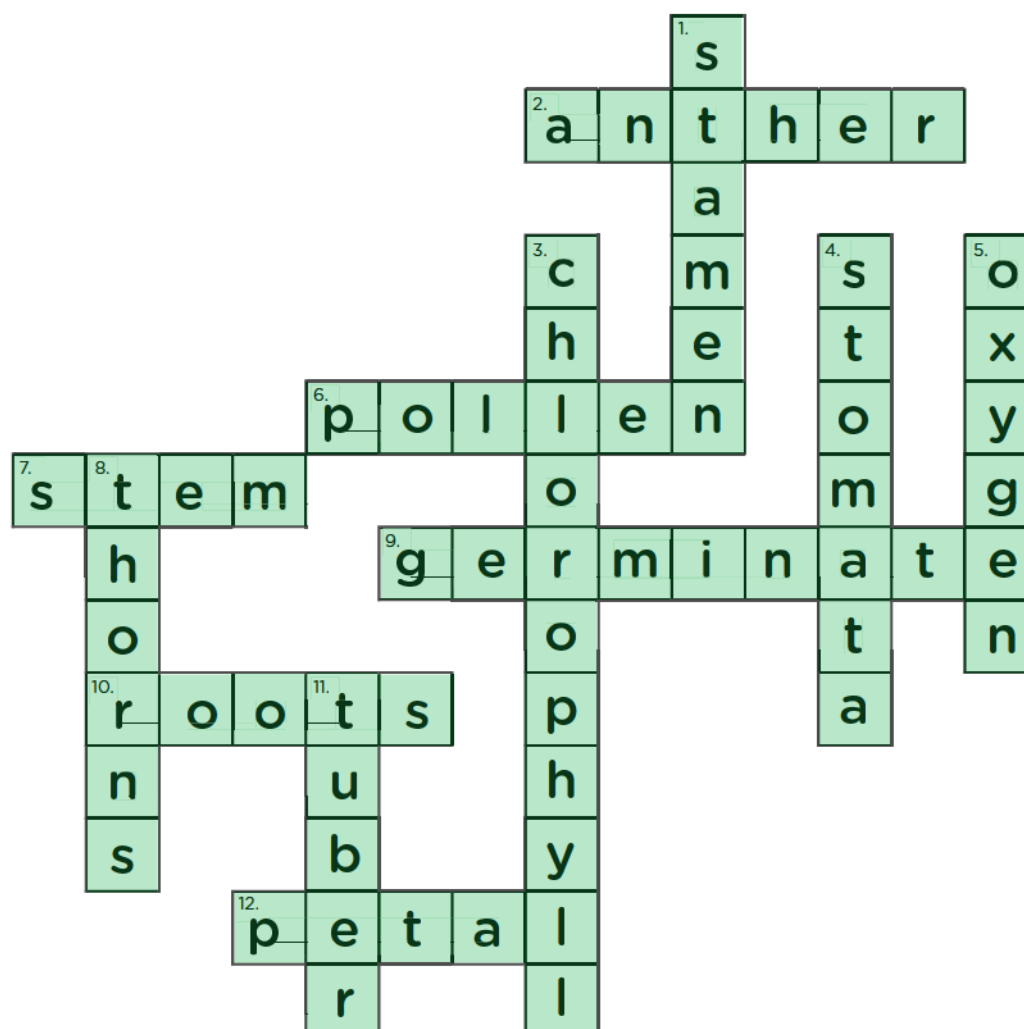
There are four words which describe the female reproductive parts of a flower hidden in this word jumble. Can you find them? They are: **STIGMA, STYLE, OVARY, CARPEL**





4. What happens when the pollen from one flower reaches the stigma of another flower of the same species? **Pollination**
5. What happens after fertilisation? **(B) a seed develops**
6. What two things do seeds need to germinate? **(A) Water (B) Oxygen**
7. Is the green pigment in the leaf called? **(B) chlorophyll**
8. Which of these statements is correct?
(A) During photosynthesis leaves take in carbon dioxide and give out oxygen
9. Some leaves are big, some are small, some are hairy, some can sting, some are poisonous. Why do you think this is? **Adaptation**
10. What is carried up the stem from the roots? **Water and nutrients**
11. Write down two ways that plants can protect themselves against animals?
(A) Thorns (B) Stinging Hairs
12. Cactus and water lily look very different from one another because they have developed ways to survive in their own special environments. Can you make two lists from the jumble of words and sentences below?

WATER LILY LIST	CACTUS LIST
NO THORNS NO SOIL THIN, LARGE LEAVES WATER HUMID STREAM POND FLOATS	SPIKY POOR SOIL SMALL THORNY LEAVES] DRY HOT STORES WATER IN THE STEM WAXY THICK COAT



Down

1. Male part of the flower
3. Pigment found in leaves
4. Tiny holes in leaves
5. Gas produced by photosynthesis
8. Protects roses
11. Root store of food

Across

2. Where the pollen is
6. Carried by insects
7. Transports water up the plant
9. Seeds can do this if they have water and air
10. Anchor the plant in one place
12. Brightly coloured

Adaptation

The adjustment or changes in behaviour, physiology, and structure of an organism to become more suited to an environment.

Anther

Plant structure containing the pollen.

Carbon Dioxide

A gas produced by cell respiration. Used by plants for photosynthesis.

Carpel

An organ at the centre of a flower, bearing one or more ovules enclosed in an ovary, and consisting also of a stigma and usually a style.

Chlorophyll

The green chemical in plants that absorbs light energy and converts it into chemical energy through photosynthesis.

Filament

The stalk of a stamen of a flower, supporting the anther.

Flower

The sexual reproductive structure of the angiosperms.

Germination

The process by which a dormant seed begins to sprout and grow into a seedling under the right growing conditions.

Habitat

The home to a particular organism where the species will attempt to be as adaptive as possible to that particular environment.

Leaf

A coloured, usually green, expansion growing from the side of a stem.

Nutrient

Food, or any nourishing substance assimilated by an organism, and required for growth, repair, and normal metabolism.

Ovary

The ovule-bearing lower part of a pistil that ripens into a fruit.

Oxygen

A colourless, odourless, gaseous element, abundant in the atmosphere, that is essential for plant and animal respiration.

Petal

One of the often brightly coloured parts of a flower immediately surrounding the reproductive organs.

Photosynthesis

A process carried out in green plants that uses light energy captured by chlorophyll to convert carbon dioxide and water to carbohydrates and oxygen.

Pollen

The powdery mass of microspores shed from the anthers of seed plants.

Roots

The water- and mineral-absorbing part of a plant which is usually underground, does not bear leaves, tends to grow downwards and is typically derived from the radicle of the embryo.

Seed

A ripened plant ovule containing an embryo.

Shoots

The aerial portions of a plant, including stem, branches, and leaves and also, new immature growth on a plant.

Stamen

One of the male organs of a flower, consisting typically of a stalk (filament) and a pollen-bearing portion (anther).

Stem

A slender or elongated structure that supports a plant or a plant part or organ above ground level that gives rise to the presence of leaves.

Stigma

The area of a plant where pollen is deposited for fertilisation.

Style

An elongated part of a carpel, or group of fused carpels, between the ovary and the stigma.

Stomata

A tiny pore in a plant leaf surrounded by a pair of guard cells that regulate its opening and closure, and serves as the site for gas exchange.



The Plant Detective

Teacher

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