

Lesson Eight Solanaceae Flowers

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In this lesson we will study the flowers of the Solanaceae. Parts of the lesson are underlined. Younger members can ignore these parts. **Make sure you do everything in bold print, answer all the questions, do one of the projects, and do the laboratory at the end of the lesson.** WORDS PRINTED IN ALL CAPITAL LETTERS may be new vocabulary words. Pay special attention to their meaning. Definitions can be found in the Glossary. If you have a chance to visit a fun web site, visit http://www.backyardnature.net/fl_stand.htm

INTRODUCTION

FLOWERS are the sexual reproductive part of Solanaceae, seeds are the result. It is important to understand that plants can reproduce asexually as well. Many plants are propagated asexually. For example, many fruit trees, especially citrus trees, are grown from cuttings. Cuttings, pieces of stem, are allowed to develop roots. Eventually the cutting will grow into an entire plant, capable of producing fruit. The resulting plants are identical to the parent plant. The new plant is a clone. Cloning has been used in agriculture for centuries, if not longer.

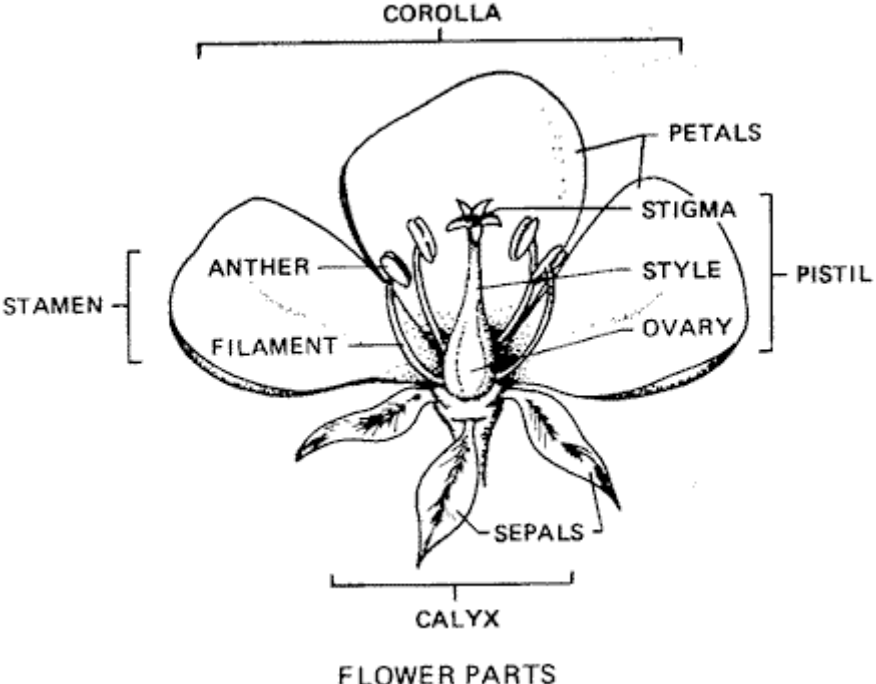
Question 1: What is the advantage of asexual reproduction for growing new plants?

Sexual reproduction in plants, as in animals, requires the combination of genetic material. In flowering plants, the male and female contributions can come from the same flower, different flowers from the same plant, or from flowers from different plants. Some species may accept pollen only from flowers on the same plant. In other cases, pollen must come from another plant.

Question 2: What is the advantage of sexual reproduction for growing new plants?

Question 3: What plant product have we been studying that is the result of asexual reproduction? _____

A. FLOWER MORPHOLOGY

	<p>Technical Report A-88-9.</p> <p>U.S. Army Corps of Engineers Waterways Experiment Station.</p>
<p>The flower is the reproductive part of a plant . Flowers may be male or female only (imperfect flowers), or both male and female (perfect flower).</p> <p>Petals: The inner ring of the flower leaves. Often white or brightly colored to attract pollinators.</p> <p>Pistil: The female flower organ, consisting of the seed-bearing ovary, stigma and style.</p> <p>Sepals: The outermost ring of the flower leaves; often green and leafy in structure.</p> <p>Stamen: The male part of a flower, usually consisting of the stalk-like filament and the pollen bearing anther.</p> <p>Stigma: The upper tip of the pistil of the flower, receives the pollen.</p> <p>Style: The stalk-like portion of the pistil between the stigma and the ovary.</p>	<p>Color pink</p> <p>Color blue</p> <p>Color green</p> <p>Color yellow</p>

B. SOLANACEAE FLOWERS

Solanaceae FLOWERS vary greatly in appearance. Flowers from the angel's trumpet can be as long as 24 inches, Jimsonweed flowers are 3-4 inches long, while tomato and climbing nightshade flowers are about ¼ of an inch. For many of the species we have studied, the flowers are purple to creamy or pure white. Decorative plants like the angel's trumpet, petunias, and nicotiana come in a wide variety of colors. Most modern tomatoes have yellow flowers.

A TAXONOMIST would describe Solanaceae flowers this way:

Flowers PERFECT, often showy

CALYX 5-lobed or parted

COROLLA sympetalous (at least at bottom), tubular to rotate, often plicate; typically 5-lobed

STAMENS, usually 5, are epipetalous, ANTHEAS 2-celled and connivent around the STYLE

One PISTIL, OVARY superior

What does this all mean? Let's go through the description, item by item.

Item #1 *Flowers PERFECT, often showy*

SEEDS develop in FLOWERS after FERTILIZATION. In plants, just as in animals, FERTILIZATION is the joining of an egg and a sperm. POLLENATION is an important step in SEED development, it leads to FERTILIZATION. During POLLINATION, POLLEN (which contains the sperms) is transferred from the STAMEN (male flower part) to the PISTIL (female flower part). The egg is found in the PISTIL. The PISTIL is made up of the STIGMA, STYLE and OVARY (future fruit). The STAMEN is made up of the ANTHAS (where the POLLEN is) and the FILAMENT.

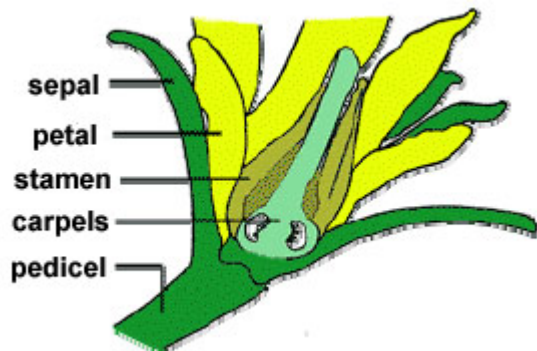
POLLINATION is often aided by animals, like bees, which fly from flower to flower collecting sweet NECTAR. As they visit flowers, bees spread POLLEN, depositing it on some PISTILS. After the POLLEN grains have landed on the STIGMA, POLLEN tubes develop within the STYLE, burrowing down to the OVARY, where the sperm, part of the POLLEN, fertilizes an OVUM (an egg cell), in the OVULE. After FERTILIZATION, the OVULE develops into a SEED in the OVARY.

Both the STAMEN and the PISTIL are necessary for SEEDS to develop. Most flowers have both the STAMEN and the PISTIL in one flower. PERFECT flowers have both the female and male parts in one flower.

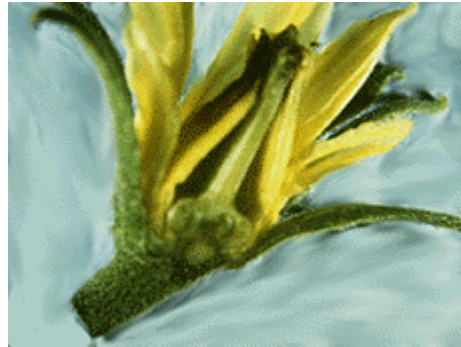
Below, there is a drawing and a photo of a tomato flower. (Please note, the word carpel is used in the diagram below. For the purposes of this lesson, we will use the word OVARY. The OVARY is the bottom part of the carpel or bottom parts of more than one carpel which are fused.)

Question 4: Are tomato flowers PERFECT? _____

Question 5: Why? _____



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Most flowers also have two other parts, SEPALS and PETALS. If flowers are PERFECT and also have both SEPALS and PETALS, they are COMPLETE. PETALS and SEPALS play a role in attracting POLLINATORS.

Item #2 *CALYX 5-lobed or parted*

CALYX is the word for all the sepals. The Solanaceae usually have 5 SEPALS. In some, the sepals may be fused. A fused CALYX in the Solanaceae may have 5 lobes, often 4 or 6 lobes.

Item #3 *COROLLA sympetalous (at least at bottom), tubular to rotate, often plicate; typically 5-lobed*

COROLLA is the word for all the PETALS. Many of the SOLANACEAE flowers are tubes, bells or cups. These shapes are the result of PETALS which are fused or sympetalous. The PETALS are not FREE. The PETALS of petunias are fused all the way. The pepper PETALS are only fused at the very bottom.



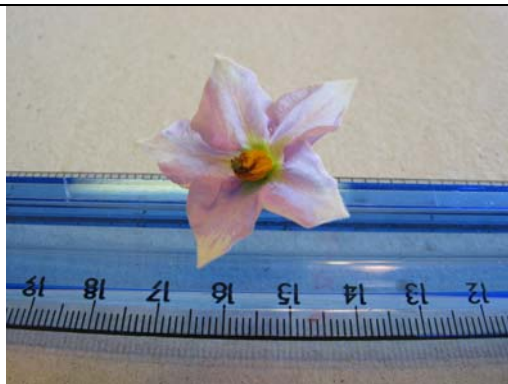
Pepper flower
Jeffrey La Favre



Petunia flower
Jeffrey La Favre

The PETALS are also pliate. Before the flower blooms, the PETALS are folded like a fan. This is especially easy to see in a petunia flower getting ready to open.

Both the potato and petunia flowers have 5 PETALS. The potato flower PETALS are fused about $\frac{1}{2}$ way. The petunia has PETALS fused all the way. However, 5 lobes are still present.



Potato flower
Jeffrey La Favre



Petunia flower
Jeffrey La Favre

Item #4 STAMENS, usually 5, are epipetalous, ANTHERS 2-celled and connivent around the STYLE

The ANTHERS in Solanaceae flowers form a tight circle around the STYLE. The ANTHERS are not fused, not even in the tomato. The STAMENS are also joined to the PETALS, or epipetalous. Sometimes they are only joined near the bottom of the PETALS for a short distance.



Potato flower
Jeffrey La Favre



Egg plant flower
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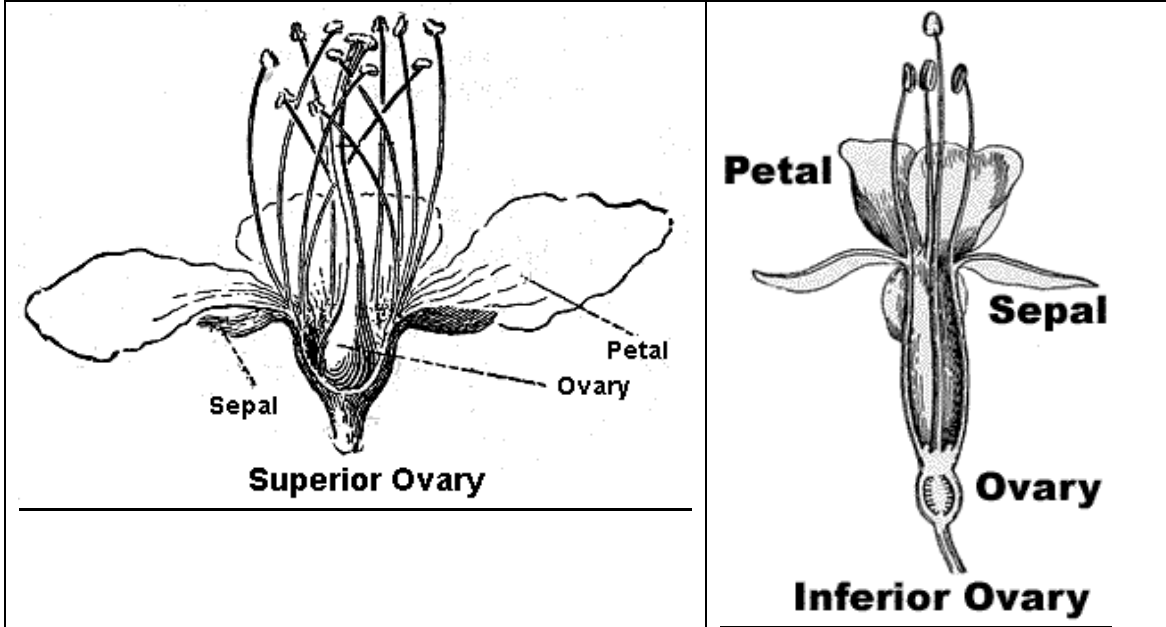
Pepper flower
Jeffrey La Favre



Tomato flower
Jeffrey La Favre

ITEM #5 One PISTIL, OVARY superior

Some flowers have a SUPERIOR OVARY. The OVARY is above the junction point of the petals. Below you can see the difference between SUPERIOR and INFERIOR OVARIES.



L. H. Bailey *Botany An Elementary Text for Schools* 1917



C. Pollination of Solanaceae

Transfer of pollen from the STAMENS to the PISTIL occurs in many ways. POLLEN can drop onto the STIGMA or it can be blown onto the STIGMA.

Insects are very important in POLLENATION. How are the Solanaceae pollinated?

Eggplant flowers remain open for 2 to 3 days, even at night. There is not much information on their pollination. The ANTHEMERS form a close ring around the STYLE. The POLLEN from the ANTHEMERS is very close to the STIGMA at first because the STIGMA is below the ANTHEMERS. However, the STYLE eventually grows to be longer than the ANTHEMERS, perfect for insect POLLINATION.

Pepper flowers open very soon after sunrise. They stay open for only one day. The ANTHEMERS open from one hour to 10 hours after the flower opens. Although pepper flowers produce NECTAR, they are not visited by bees very often. Some people think that ants may be important in pepper pollination.

Tomato flowers have six stamens. The ANTHEMERS form a tube around the PISTIL. The slightest touch causes them to vibrate and pollen rains down on the PISTIL. There is hardly any NECTAR secreted from the tomato flowers. Bees do not spend much time at tomato flowers.

It is known that the Solanaceae are not attractive to bees. How they are POLLINATED still needs to be studied.

GLOSSARY

anther - part of the stamen (male reproductive part of the flower); is at the end of the filament and produces pollen

fertilization - a sperm and an ovum (an egg cell) unit

filament - part of the stamen (male reproductive part of the flower) looks like a stalk; anther at the end

flower - the reproductive unit of some plants (angiosperms). Parts of the flower include petals, sepals, ovary (the female reproductive organs), and stamens (the male reproductive organs).

free - petals which are separate

fused - petals which are joined together

imperfect flower - flower with only female or male reproductive parts, not both

inferior ovary - ovary which is below the petals and sepals

leaf axil - place where the leaf attaches to the stem

nectar - sugar rich liquid secreted by nectaries

node - place on a stem where a leaf or flower can be found

ovary - part of the pistil, female part of the flower

ovule - located in the ovary, where the egg cell is

peduncle - stem like structure which attaches the flower to the stem

perfect flower - flower with both female and male reproductive parts

petal - part of a flower

pistil - female part of the flower made up of the ovary, stigma and style

pollen - made in the anther, contains sperm

pollination - process of transferring pollen from the stamen to the

pollinator - agent which transfers the pollen from the stamen to the
seed – contains the plant embryo
sepal - part of a flower, usually green
stamen - male part of the flower made up of filament and anther; pollen
produced in the anther
stigma – part of the pistil, the female part of the flower
style - part of the pistil, the female part of the flower; looks like a stalk

PROJECT

Follow the directions and color the drawings of the Solanaceae flowers on the last pages.

LABORATORY

Complete the chart on the next page.

Laboratory Sheet for Flowers of the Solanaceae

Complete the table below using a flower from a plant you are growing.

What type of Solanaceae you are growing? _____

What variety are you growing? _____

What is its scientific name? _____

What color are the flowers? _____

How large are the flowers? (Inches in diameter) Are there different sized flowers?

Are the petals fused or free? _____

How far are the petals fused? What is their shape? _____

How many petals does the flower have? _____

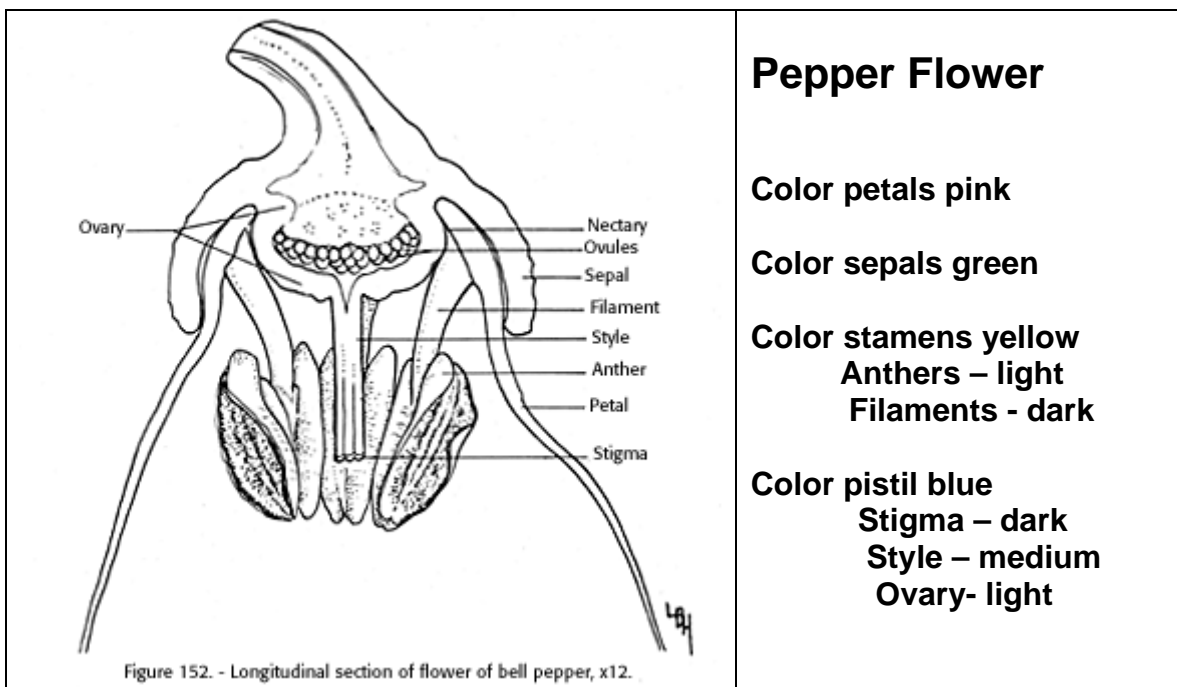
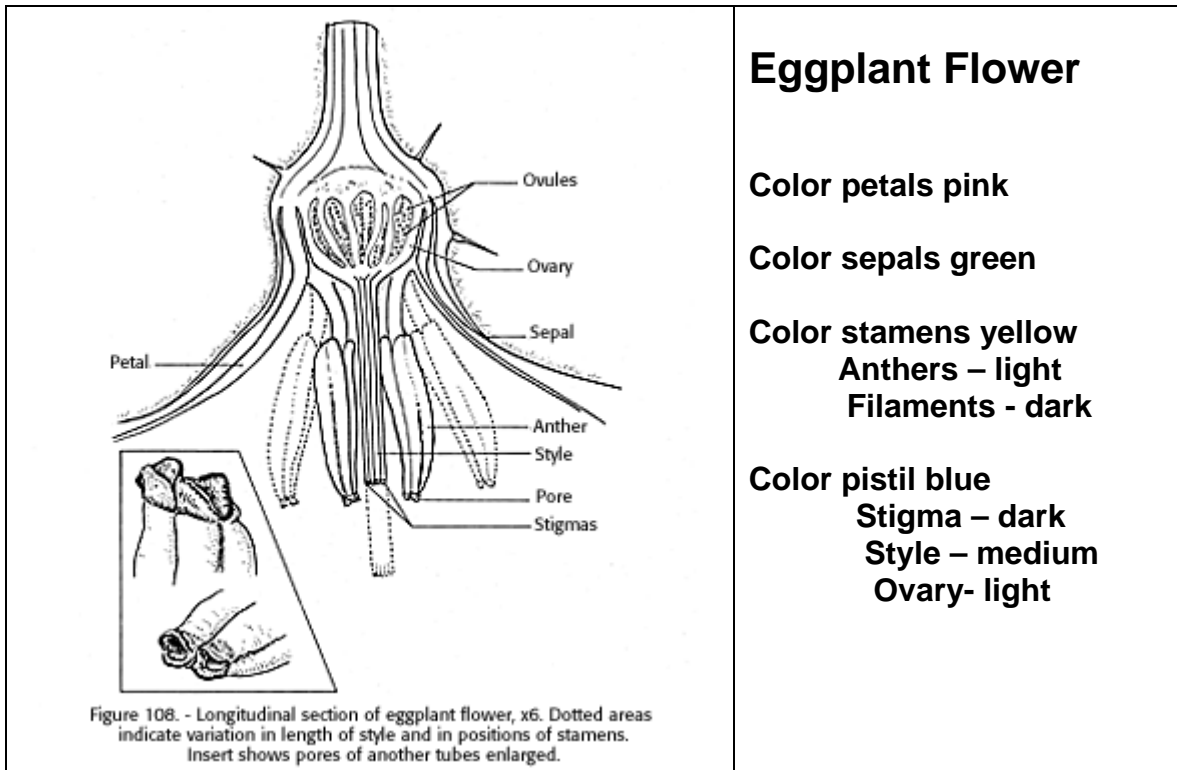
How many sepals does the flower have? _____

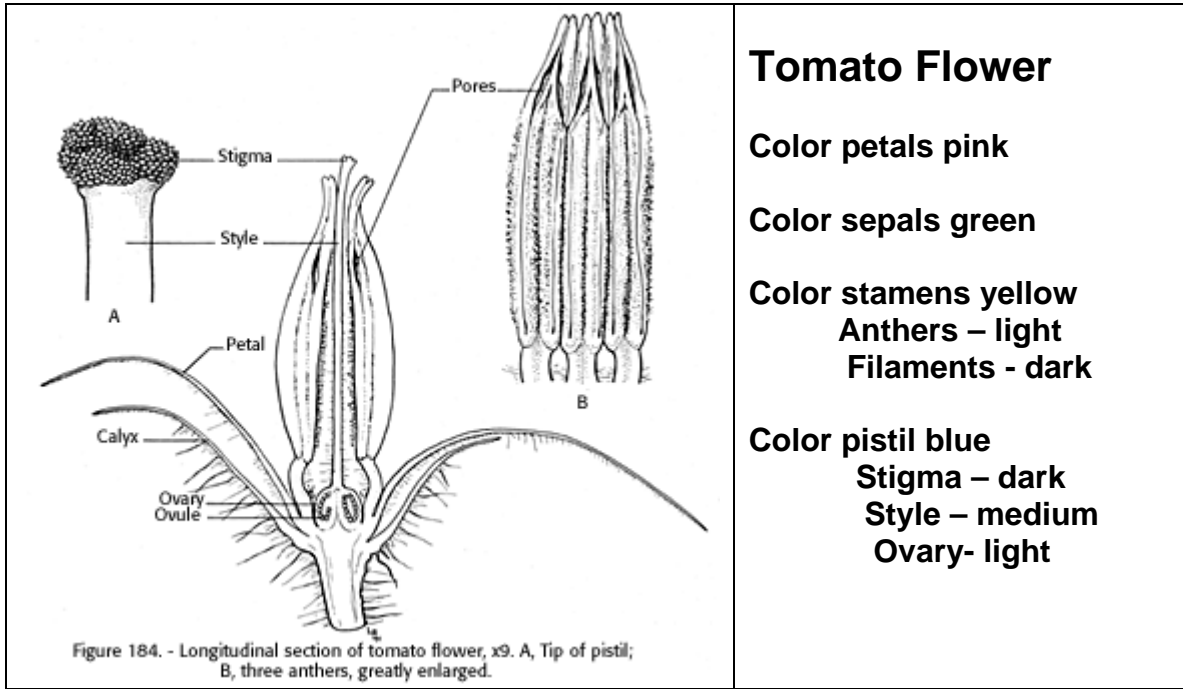
How many stamens does the flower have? _____

Are the stamens epipetalous? _____

Are the stamens connivent? _____

Draw each type of flower.





Tomato Flower

Color petals pink

Color sepals green

Color stamens yellow

Anthers – light

Filaments - dark

Color pistil blue

Stigma – dark

Style – medium

Ovary- light