Unit 10 · Angiosperms

ANSWER KEY · FOR TEACHERS

Full marks 39

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. phyllotaxy → **h.** the arrangement of leaves on a stem or branch
2. aestivation → **g.** the arrangement of sepals or petals in the bud
3. placentation → **b.** the arrangement of ovules inside the ovary
4. tetradynamous → **i.** six stamens, two short and four long
5. diadelphous → **j.** stamens joined by their filaments into two bundles
6. epipetalous → **d.** stamens attached to the petals
7. etaerio → **e.** a cluster of fruitlets from one flower's free carpels
8. replum → **f.** the false septum of a mustard ovary

K · 4

Each carries 0.5 mark.

2 Label the diagram

1. anther
2. filament
3. stigma
4. style
5. ovary
6. ovule

K · 3

Each carries 0.5 mark.

3 Multiple choice

i. **c.** class — K · 1

Related orders form a **class**; related classes form a phylum (division). Families are grouped into orders, not the other way round.

ii. **a.** axile — K · 1

The ovary of Solanaceae has two chambers, and the ovules are on large, swollen placentas on the central axis: **axile**. Cut a tomato or brinjal across to see it.

iii. **c.** it has "eyes", buds in the axils of tiny scale leaves, at its nodes — U · 1

Roots never have nodes, leaves or buds. A potato's **eyes** are nodes, each with buds in the axil of a small scale leaf, and each can sprout into a new shoot. Growing underground, storing food and lacking chlorophyll are all true of roots too, so they don't tell the two apart.

iv. **d.** imparipinnately compound — U · 1

The leaflets are on a **rachis** (pinnate, not palmate), and their number is odd, with one at the tip: **imparipinnate** (*impar*, unequal or odd). Paripinnate leaves end in a pair.

v. **c.** inferior: the flower is epigynous — A · 1

The remains of the sepals sit on the **top** of the fruit, so in the flower they were attached **above** the ovary: the flower is **epigynous** and the ovary **inferior**. (In a tomato, from a hypogynous flower, the sepals stay at the **bottom** of the fruit, round its stalk.)

4 Very short answers

a. MARKING SCHEME — K · 1

✓ Carolus Linnaeus.

b. MARKING SCHEME — K · 1

✓ A ripened ovary after fertilization.

c. MARKING SCHEME — U · 1

✓ Only a whole leaf has an axillary bud.

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking

5 Short answers

a. MARKING SCHEME — U · 2

- ✓ Racemose: axis keeps growing, oldest at the base, with an example.
- ✓ Cymose: axis ends in a flower, oldest at the tip, with an example.

b. MARKING SCHEME — U · 2

- ✓ True fruit: from the ovary only (mango's pericarp from the ovary wall).
- ✓ Strawberry's fleshy part is the thalamus: a false fruit.

c. MARKING SCHEME — A · 2

- ✓ The flower read correctly (sepals, petals, stamens, carpels, superior ovary).
- ✓ Brassicaceae.

d. MARKING SCHEME — U · 3

- ✓ Root cap: protects the tip.
- ✓ Meristematic zone divides; elongation zone lengthens the root.
- ✓ Maturation zone: mature tissues and root hairs that absorb.

6 Numerical problems

ANSWER — A · 4

i. 620 km = 62,000,000 cm; 62,000,000 ÷ 13,000,000 ≈ **4.8 cm**.
ii. 10,000 km = 10,000,000,000 mm; 10,000,000,000 ÷ 14,000,000,000 ≈ **0.7 mm**.
iii. 10,000 ÷ 620 ≈ **16 times**.
iv. In the **region of maturation**; they give a huge surface for **absorbing water and minerals** from the soil.

MARKING SCHEME

- ✓ About 4.8 cm.
- ✓ About 0.7 mm.
- ✓ About 16 times.
- ✓ Region of maturation; absorption of water and minerals.

7 Long answers

a. ANSWER — U · 4

Inflorescence: a raceme, or a single axillary flower. **Flower**: bracteate or not, pedicellate, **zygomorphic**, bisexual, complete, hypogynous.
Calyx: 5 sepals, joined (gamosepalous), the odd one anterior. **Corolla**: 5 free, unequal petals, **papilionaceous**: a large posterior **standard**, two **wings** and two front petals joined into a **keel**; **vexillary** aestivation.
Androecium: 10 stamens, **diadelphous (9) + 1**. **Gynoecium**: **monocarpellary**, ovary superior, one-chambered, **marginal** placentation. **Fruit**: a **legume** (pod).
Floral formula: % ♂ K$_{5}$A$_{1+2+2}$A$_{9+1}$ G$_{1}$

MARKING SCHEME

- ✓ Zygomorphic, bisexual, hypogynous flower; calyx of 5 joined sepals.
- ✓ Papilionaceous corolla (standard, wings, keel), vexillary aestivation.
- ✓ Diadelphous (9) + 1 stamens; one carpel, superior, marginal placentation; legume.
- ✓ Floral formula correct.

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking

b. ANSWER A · 4

Tomato: **axile**: the ovary is divided by septa into chambers, with the seeds on swollen placentas at the **central axis**.
Pea: **marginal**: one chamber, the seeds in a row along **one seam** of the pod.
Cucumber: **parietal**: one chamber, the seeds on ridges of the **inner wall**.
The **cucumber** came from an **inferior ovary** (an epigynous flower): the remains of its flower are at the **far end** of the fruit, opposite the stalk, while the tomato and pea keep their sepals at the **stalk end** (superior ovary).

MARKING SCHEME

- ✓ Tomato: axile, seeds on the central axis in chambers.
- ✓ Pea: marginal, a row along one seam.
- ✓ Cucumber: parietal, seeds on the wall.
- ✓ Cucumber from an inferior ovary: flower remains at the far end, not the stalk end.

8 Think

ANSWER HA · 3

Their flowers are **alike**: six tepals in two whorls, six stamens and a three-chambered superior ovary, so a **natural system** based on overall likeness grouped them.
A **phylogenetic system** (the **APG system**, from **DNA**) groups plants by **common descent**; it showed that these plants come from separate lines: onion and garlic in Amaryllidaceae, asparagus in Asparagaceae, aloe in Asphodelaceae.
Botanists prefer it because its groups show **real relationships**, so they **predict** shared features (chemistry, crop relatives), which likeness alone can't guarantee.

MARKING SCHEME

- ✓ Grouped by alike flowers (6 tepals, 6 stamens, 3-chambered ovary): natural system.
- ✓ Moved by a phylogenetic system using DNA (APG).
- ✓ Preferred because its groups show real relationships and predict shared features.

9 Activity: Open a fruit

(not marked)

WHAT STUDENTS SHOULD FIND

Tomato and orange: **axile** (several chambers, seeds on the central axis); pea: **marginal** (one chamber, a row along one seam); cucumber: **parietal** (one chamber, seeds on ridges of the wall). Tomato, orange and pea keep their sepals at the stalk end (superior ovary); the cucumber has them at the far end (inferior ovary). The tomato's pericarp is fleshy all through; in an orange you eat the juice-filled hairs of the endocarp.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	11	14	11	3	**39**

Science Playground, Katunje, Bhaktapur
Book a class visit: https://science-playground.com/booking