Unit 6 · Plant Growth and Movement

ANSWER KEY · FOR TEACHERS

Full marks 32

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. imbibition
2. scarification
3. vivipary
4. photoperiodism
5. phytochrome
6. vernalization
7. senescence
8. abscission

Each carries 0.5 mark. **K · 4**

2 Label the diagram

1. first leaves
2. cotyledons
3. plumule
4. cotyledons, in the seed
5. hypocotyl: grows long
6. epicotyl: grows long

Each carries 0.5 mark. **K · 3**

3 Multiple choice

i. **b.** pectinase and cellulase **K · 1**

The cells of the abscission layer are held together by the **middle lamella** (mostly pectin) and their **cellulose** walls; **pectinase** and **cellulase** dissolve them.

ii. **b.** physical dormancy **U · 1**

A seed coat **impermeable to water** gives **physical** (seed coat) dormancy, common in legumes. Mechanical dormancy is a coat that lets water in but is too strong for the radicle to push through.

iii. **b.** in a tropic movement the direction of the stimulus decides the direction of the response **U · 1**

A **tropism** is **directional**: a shoot bends towards the side the light comes from. In a **nastic** movement the direction is fixed by the organ (a *Mimosa* leaf always folds the same way, wherever it is touched). Tropic movements are slow growth movements, so they are irreversible.

iv. **b.** it doesn't flower **A · 1**

A short-day plant needs a long **continuous** dark period. The flash splits its 14-hour night into two 7-hour nights, each too short, so it **doesn't flower**, even though its day is short.

v. **b.** the seeds were dry **A · 1**

Vernalization needs **hydrated**, living, respiring seeds: **dry seeds** don't respond. Soaking, a temperature near 2 °C and oxygen are all what it needs.

4 Short answers

a. **MARKING SCHEME** **K · 2**

- ✓ Epigeal: hypocotyl grows, cotyledons above ground, with an example (e.g. castor).
- ✓ Hypogeal: epicotyl grows, cotyledons below ground, with an example (e.g. pea).

b. **MARKING SCHEME** **U · 2**

- ✓ Germinating seeds respire fast and need much oxygen.
- ✓ Deep or waterlogged soil cuts off oxygen, so germination fails.

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c. MARKING SCHEME A · 2

- ✓ Rice is a short-day (long-night) plant needing a long unbroken night.
- ✓ The flash splits the night, so it doesn't flower.

d. MARKING SCHEME U · 3

- ✓ An abscission zone forms at the petiole base; pectinase and cellulase (ethylene) dissolve the separation layer's walls.
- ✓ Only the vascular strands hold the leaf, and they break.
- ✓ A corky protective layer seals the stem side, leaving a leaf scar.

5 Long answers

a. ANSWER U · 4

Seed dormancy is the failure of a **viable** seed to germinate even when given favorable conditions. Any three kinds:

- **Physical (seed coat) dormancy**: the coat is hard and **impermeable to water and gases** (legumes, drupes such as peach and plum).
- **Mechanical dormancy**: the covering lets water in but is **too strong** for the radicle to grow out (walnut shells, olive stones).
- **Chemical dormancy**: **inhibitors** in the fruit and seed coverings (phenols, coumarin, abscisic acid) stop germination (citrus, tomato, grapes).
- **Morphological dormancy**: the **embryo is underdeveloped** when the seed is shed and needs time to grow (celery).

Advantage (any one): survival through bad seasons; seed banks; synchronized germination; dispersal while dormant.

MARKING SCHEME

- ✓ Definition: a viable seed not germinating in favorable conditions.
- ✓ A first kind explained (e.g. physical: impermeable coat).
- ✓ A second and third kind explained (e.g. mechanical, chemical).
- ✓ One advantage (e.g. survival through bad conditions).

b. ANSWER U · 4

Tropic movements are **directional growth curvatures** caused by more growth on one side of an organ, induced by a stimulus from one side; they are irreversible, and **positive** (towards the stimulus) or **negative** (away).

- **Phototropism**: response to light from one side; shoots bend towards a window (positive), roots away.
- **Geotropism**: response to gravity; main roots grow down (positive), main shoots up (negative).
- **Hydrotropism**: response to water; roots grow towards leaking pipes and drains (positive).
- **Thigmotropism**: response to touch; tendrils of a climber coil round a support.

MARKING SCHEME

- ✓ Definition: directional, irreversible growth curvature, positive or negative.
- ✓ Phototropism with an example.
- ✓ Geotropism with an example.
- ✓ Hydrotropism and thigmotropism with examples.

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6 Think

ANSWER HA · 3

The **soaked** seeds' crop flowers on time. Winter wheat needs a cold period to flower: **vernalization**. Its cold works only on **hydrated**, living, respiring seeds (it is aerobic and needs water), at about **1–6 °C**, as here.

The **dry** seeds can't be vernalized, even in the same cold, so the neighbor's spring-sown wheat stays leafy and flowers late or not at all.

MARKING SCHEME

- ✓ The soaked seeds' crop flowers on time (vernalized).
- ✓ Vernalization needs water (and oxygen) and a temperature near 1–6 °C.
- ✓ Dry seeds don't respond, so that crop flowers late or not at all.

7 Activity: Roots and shoots find their way

(not marked)

WHAT STUDENTS SHOULD FIND

Whichever way each seed pointed, the root curves to grow **down** and the shoot **up**; after the jar is laid on its side both bend again within a day. This is **geotropism**: **positive** for the root, negative for the shoot. The bends are made by growth, so they stay.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	10	15	4	3	**32**

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