Unit 11 · Asexual Reproduction

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. asexual
2. clone
3. agamospermy
4. rhizome
5. offset
6. scion
7. stock
8. explant

K · 4

Each carries 0.5 mark.

2 Label the diagram

1. rhizome: ginger
2. bulb: garlic
3. eyes (buds)
4. tuber: potato
5. cormel
6. corm: taro

K · 3

Each carries 0.5 mark.

3 Multiple choice

i. **c.** a diploid cell of the nucellus or integument — K · 1

In **adventive embryony** the embryo grows from an ordinary **body cell of the nucellus or integument**, outside the embryo sac, as in *Citrus*. A diploid egg in an unreduced embryo sac is **recurrent** agamospermy; a haploid egg is **non-recurrent**; the zygote is normal sexual reproduction.

ii. **b.** only pieces with at least one eye — U · 1

Each **eye** is a **node with a bud**, and only a bud can grow into a shoot. A piece without an eye has food but no bud, so it rots. Farmers cut seed potatoes so that each piece has one or two eyes.

iii. **c.** to cut the phloem, so food and auxin collect at the wound and roots form there — U · 1

The **phloem** lies in the bark. Removing a ring of it stops sugars and auxin moving down past the ring, so they collect above the wound, where they feed and start **adventitious roots**. The xylem, deeper in, is left whole, so water still reaches the leaves and the branch stays alive.

iv. **b.** the scion, because the fruit grows on it from its own buds — A · 1

The fruits grow on the **scion**, from its buds, with its genes, so they are its variety. The **stock** supplies roots, water and minerals and can affect the tree's size, hardiness and yield, but it doesn't change the scion's genes or its kind of fruit.

v. **b.** it can give thousands of plants from a few small pieces, quickly and free of disease — A · 1

From a few **explants**, cycles of multiplication give thousands of plantlets in months, all **healthy** and the same as the parent. Orchid seeds are tiny, carry almost no food, and seldom germinate without a special fungus; cuttings give only a few plants. Micropropagation doesn't change genes, and it does need a sterile laboratory.

4 Short answers

a. MARKING SCHEME — K · 2

- ✓ Bulb: food in fleshy scale leaves on a small disc of stem, with an example.
- ✓ Corm: food in the solid swollen stem, with an example.

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b. MARKING SCHEME U · 2

✓ Sweet potato a root: no nodes or scale leaves, buds anywhere.
✓ Potato a stem tuber: eyes are nodes with buds.

c. MARKING SCHEME A · 2

✓ Grafting keeps the variety's characters (genetically identical); seedlings vary.
✓ Grafted trees fruit years sooner.

d. MARKING SCHEME U · 3

✓ Adventive embryony: from a nucellus or integument cell.
✓ Recurrent: from a diploid egg (diplospory or apospory).
✓ Non-recurrent: from a haploid egg, giving a sterile haploid.

5 Long answers

a. ANSWER U · 4

Layering is making a branch grow **roots while still attached** to the parent, which feeds it; it is cut off once it has rooted. The branch is usually wounded where roots are wanted.

- **Simple layering**: a low, flexible branch is bent down, cut, and buried at one place, its tip above the soil (jasmine, rose).
- **Serpentine layering**: a long branch is buried at **several places** like a snake, giving a new plant at each.
- **Mound (stool) layering**: the parent is cut back, and **soil is heaped** round its many new shoots, which root inside the mound (apple rootstocks).
- **Air layering (gootee)**: a **ring of bark** is removed from a high branch, wrapped in moist rooting material and plastic; roots form there (litchi, guava).

MARKING SCHEME

✓ Definition: rooting a branch while it is still on the parent.
✓ Simple and serpentine layering.
✓ Mound layering.
✓ Air layering (gootee), with the ring of bark.

b. ANSWER U · 4

Advantages (any four): faster than seeds, fruiting years sooner; offspring **genetically identical**, so a variety is kept; plants without good seeds can be grown (banana, sugarcane, garlic); **uniform** growth and yield; **disease-free** plants by micropropagation; efficient for large-scale growing.
Disadvantages (any four): far fewer, bulkier pieces than seeds, hard to store; **no variation**, so all plants are open to the same diseases and pests; **diseases spread** with the pieces (viruses); no taproot, so less well anchored; not possible for every species; large clones lower farmland's **genetic diversity**.

MARKING SCHEME

✓ Two advantages.
✓ Two more advantages.
✓ Two disadvantages.
✓ Two more disadvantages.

6 Think

ANSWER HA · 3

Convenient: every plant has the same genes, so the fruit has the same size, taste and ripening time; it has no seeds; suckers and tissue culture give millions of uniform, healthy plantlets.
Worrying: with **no genetic variation**, no plant has a resistance the others lack, so one disease can kill them all; Panama disease (Tropical Race 4), a soil fungus, is now spreading through Cavendish plantations.

MARKING SCHEME

✓ Uniform fruit and easy propagation because every plant is identical.
✓ No variation, so no plant resists a disease the others can't.
✓ One disease (e.g. Panama disease TR4) can wipe out the whole crop.

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7 Activity: A leaf that makes plants

(not marked)

WHAT STUDENTS SHOULD FIND

After one to two weeks tiny roots and pairs of leaves appear at several **notches** of the leaf margin, each a new plant from an **adventitious bud** there; the old leaf shrivels as they use its food. This is **natural vegetative propagation by leaves**.

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

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