Unit 7 · Bryophyta

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. amphibians
2. gametophyte
3. rhizoids
4. gemmae
5. antheridium
6. seta
7. elaters
8. protonema

K · 4

Each carries 0.5 mark.

2 Label the diagram

1. cover cells
2. neck canal cells
3. neck
4. venter
5. egg
6. venter canal cell

K · 3

Each carries 0.5 mark.

3 Multiple choice

i. **b.** Johann Hedwig — K · 1

Johann Hedwig (1730–1799) worked out how mosses reproduce; the scientific naming of mosses begins with his book of 1801.

ii. **b.** Anthocerotopsida — K · 1

The **hornworts** (Anthocerotopsida) have mucilage cavities in the thallus in which *Nostoc* lives.

iii. **b.** the stalk and capsule — U · 1

The leafy shoot and its rhizoids are the **gametophyte** (n). The stalk and capsule grew from the zygote: the **sporophyte** (2n).

iv. **a.** Hepaticopsida — U · 1

Ventral scales and **no columella** together point to a **liverwort**. Hornworts have no ventral scales and a columella; mosses are leafy, with multicellular rhizoids and a columella.

v. **c.** they take in water and dissolved substances through their whole surface — A · 1

Bryophytes have no roots, no xylem and no waxy cuticle, so they absorb water and whatever is dissolved in it **over their whole surface**; the metals they collect reflect what is in the air.

4 Short answers

a. MARKING SCHEME — K · 2

- ✓ Their body is adapted to life on land.
- ✓ Their antherozoids swim to the egg, so fertilization needs water.

b. MARKING SCHEME — U · 2

- ✓ One correct difference.
- ✓ A second correct difference.

c. MARKING SCHEME — U · 2

- ✓ Gametophores: branches of the gametophyte carrying the sex organs.
- ✓ Raised up, a raindrop's splash carries antherozoids to the female heads.

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d. MARKING SCHEME A · 3

- ✓ Gemmae are splashed out of the cup by rain.
- ✓ Rhizoids grow from the lower side, and each of the two notches grows into a new thallus.
- ✓ A gemma is a piece of the parent (vegetative), so it has the same sex.

5 Long answer

a. ANSWER U · 4

The zygote grows into a sporophyte that hangs under the female receptacle. It has a **foot**, sunk in the receptacle, which absorbs food and water from the gametophyte; a short **seta**, which lengthens to push the capsule out; and a **capsule** with a jacket one cell thick.
In the capsule, **spore mother cells** divide by meiosis into four haploid spores each; **elater mother cells** grow into elaters with spiral thickenings.
When ripe, the capsule wall splits into teeth and the elaters, twisting as they dry, flick the spores out.
It never leaves the gametophyte and depends on it **completely for food**, through its foot: so it is called parasitic on the gametophyte.

MARKING SCHEME

- ✓ Foot (absorbs from the gametophyte), seta and capsule.
- ✓ Spore mother cells divide by meiosis into spores; elaters form from elater mother cells.
- ✓ The capsule splits and the elaters disperse the spores.
- ✓ Wholly dependent on the gametophyte for food through its foot: parasitic.

b. ANSWER A · 4

Any four:

- **Soil formation:** with lichens they are pioneers on bare rock, trapping dust, holding water and breaking down rock.
- **Soil conservation:** moss mats bind soil and soak up rain, releasing it slowly.
- **Pollution indicators:** they die where sulphur dioxide is high and soak up heavy metals, so they are used to monitor air and water.
- **Peat:** dead *Sphagnum* forms peat, used as fuel and in potting soil.
- **Medicine:** antibacterial substances; *Sphagnum* as an absorbent, antiseptic dressing.
- **Packing:** dried moss for glassware and live plants.
- Bog succession, food and shelter for small animals, laboratory research.

MARKING SCHEME

- ✓ A first importance explained.
- ✓ A second importance explained.
- ✓ A third importance explained.
- ✓ A fourth importance explained.

6 Think

ANSWER HA · 3

No. *Marchantia* has **no true roots, stems or leaves**: its body is a flat **thallus**, fixed by rhizoids.
It has **no vascular tissue** (no xylem or phloem), and vascular tissue is what makes a real root, stem or leaf; its body is of simple parenchyma cells.
The stalks the student may see are **gametophores** carrying sex organs, and the plant body is the haploid gametophyte, not a sporophyte like a vascular plant's.

MARKING SCHEME

- ✓ No true roots, stems or leaves: a thallus with rhizoids.
- ✓ No xylem or phloem: not vascular.
- ✓ The stalks are gametophores; the plant is a haploid gametophyte.

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7 Activity: Splash cups

(not marked)

WHAT STUDENTS SHOULD FIND

Each drop splashes gemmae out of the cup, usually a few tens of centimeters, sometimes more: the cup's shape throws the drop outwards. On the soil, rhizoids grow from the side touching it, and the new lobes grow from the two **notches** on the sides of each gemma, where the growing points are.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	11	10	8	3	**32**

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