Branching Sea Life

Use shared traits to trace primary-producer evolution

MAQ.5.3 "Recognize characteristics that are shared and derived using graphical representations of primary-producer evolution and develop cladograms/phylogenetic trees."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Circle the trait names in the passage. Then number the groups in the table from the earliest branch to the most recently branching group, using the traits as evidence.

Clues in the Shallows

1. At low tide, sheets of nori and sea lettuce cling to rocks, while eelgrass grows in shallow water. Chara, a freshwater green alga, offers another clue to the history of primary producers. These organisms make sugars by photosynthesis, but their closest shared ancestors lived at different times. A trait table can help sort their branches.

2. The table records traits that can be compared across these groups. A yes means the group has that trait; a no means it does not. Chlorophyll helps capture light for photosynthesis, while structures used in cell division and reproduction provide other clues. A trait shared by fewer groups may mark a later branch.

TRAITS OF FOUR PRIMARY-PRODUCER GROUPS

Group	Chlorophyll a	Chlorophyll b	Phragmoplast	Flowers
Nori	Yes	No	No	No
Sea lettuce	Yes	Yes	No	No
Chara	Yes	Yes	Yes	No
Eelgrass	Yes	Yes	Yes	Yes

3. To draw a cladogram, begin with a shared ancestral branch, then place each new trait where it first fits the evidence. Put groups that share a derived trait on the same side of that branch. A tip represents a living group, not an ancestor of another tip. This tree is a hypothesis based on the traits shown.

2 ANSWER WITH EVIDENCE

Use the passage

1. Which listed trait is shared by all four groups? Why can it not separate their branches in this table?

2. Which two groups share a phragmoplast? What does that suggest about their branches?

3. Which group branches off before the three groups with chlorophyll b? Give evidence from the table.

4. Where would you place flowers on a tree of these four groups? Explain using the table.

3 YOUR TURN

Your own words

In the box, draw a cladogram with all four groups at the tips. Label the branches where the four listed traits first appear, then write one sentence explaining how the table supports your tree.

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PART 1 · READ AND MARK

Circle the trait names in the passage. Then number the groups in the table from the earliest branch to the most recently branching group, using the traits as evidence. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Which listed trait is shared by all four groups? Why can it not separate their branches in this table?	**All four have chlorophyll a, so its presence does not distinguish one group from another.**
2	Which two groups share a phragmoplast? What does that suggest about their branches?	**Chara and eelgrass share a phragmoplast. They belong on a branch marked by that derived trait.**
3	Which group branches off before the three groups with chlorophyll b? Give evidence from the table.	**Nori. It lacks chlorophyll b, which the other three groups share.**
4	Where would you place flowers on a tree of these four groups? Explain using the table.	**Place flowers on the branch leading only to eelgrass because eelgrass is the only listed group with flowers.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The drawn tree places chlorophyll a before the first split, then branches to nori; its remaining branch gains chlorophyll b and splits to sea lettuce; the next branch gains a phragmoplast and splits to Chara; the branch leading to eelgrass gains flowers. Each trait appears before all the groups that have it, but not before any group that lacks it.

Accept any drawing with the same branching relationships and trait placements, regardless of which direction the branches face. Treat the tree as a hypothesis based on the listed traits, not a claim that one living group evolved from another.