**Topic 9.1 (AHL) – Xylem Transport**

**Understandings, Applications and Skills** (This is what you will be assessed on)

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| --- | --- | --- |
|  | **Statement** | **Guidance** |
| 9.1.U1 | Transpiration is the inevitable consequence of gas exchange in the leaf. |  |
| 9.1.U2 | Plants transport water from the roots to the leaves to replace losses from transpiration. |  |
| 9.1.U3 | The cohesive property of water and the structure of the xylem vessels allow transport under tension. |  |
| 9.1.U4 | The adhesive property of water and evaporation generate tension forces in leaf cell walls. |  |
| 9.1.U5 | Active uptake of mineral ions in the roots causes absorption of water by osmosis. |  |
| 9.1.A1 | Adaptations of plants in deserts and in saline soils for water conservation. |  |
| 9.1.A2 | Models of water transport in xylem using simple apparatus including blotting or filter paper, porous pots and capillary tubing. |  |
| 9.1.S1 | Drawing the structure of primary xylem vessels in sections of stems based on microscope images. |  |
| 9.1.S2 | Measurement of transpiration rates using potometers. (Practical 7) |  |
| 9.1.S3 | Design of an experiment to test hypotheses about the effect of temperature or humidity on transpiration rates. |  |

**Recommended resources:**

Mrs. Tyler’s Website

Bioninja

Allott, Andrew. *Biology: Course Companion.* S.l.: Oxford UP, 2014. Print.

1. Define transpiration.
2. Explain how the action of guard cells allows the plant to balance CO2 uptake with control over water loss. What environmental conditions will cause them to open/close?
3. Outline how turgor pressure plays a role in whether or not a stoma is open or shut.
4. What does the hormone abscisic acid do?
5. Complete the table to explain how the following **abiotic factors** affect the rate of transpiration:

|  |  |  |
| --- | --- | --- |
|  | **Effect** | **Reason** |
| Temperature |  |  |
| Light |  |  |
| Wind |  |  |
| Humidity |  |  |

1. Which part of the vascular tissue transports water from the roots to the leaves?
2. Define transpiration stream.
3. Outline the two properties of water that allow the transpiration stream (“pull”) to be generated.
4. Explain the role of tension in the leaf in making transpiration and water transport up the stem possible.
5. Annotate the diagram to explain how the structure of primary xylem facilitates transpiration.



1. Describe how lignified xylem helps support a plant.
2. Compare and contrast active and passive transport.
3. Outline the process of osmosis. Does this require energy? How does solute concentration affect the direction of water flow?
4. What is the advantage that a plant gains by having a highly branched structure and/or roots hairs?
5. Explain why mineral ions need to be taken up by **active transport** in the roots. Why is this necessary for the uptake of water?
6. Summarize how water leaves the leaves (the process of transpiration).
7. What is a xerophyte and how is it adapted for dry conditions?
8. Describe how CAM plant metabolism is an adaptation to preventing water loss.
9. What is a halophyte and how is it adapted for salty conditions?