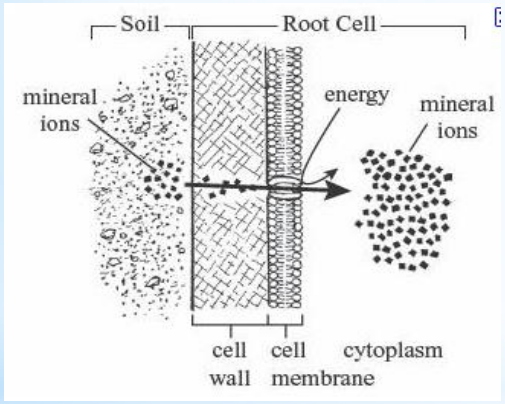
Transpiration and Xerophytes

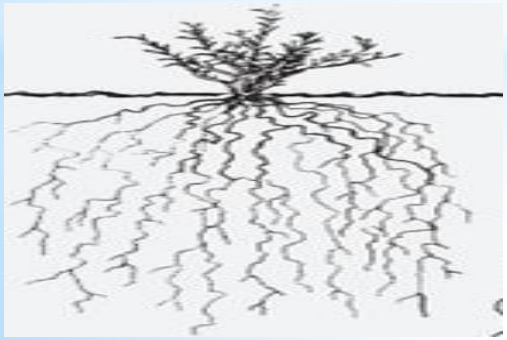
When the soil is dry or salty and the air has a high temperature and a low humidity.

Water uptake in roots

Root hair cells absorb water from the soil by osmosis



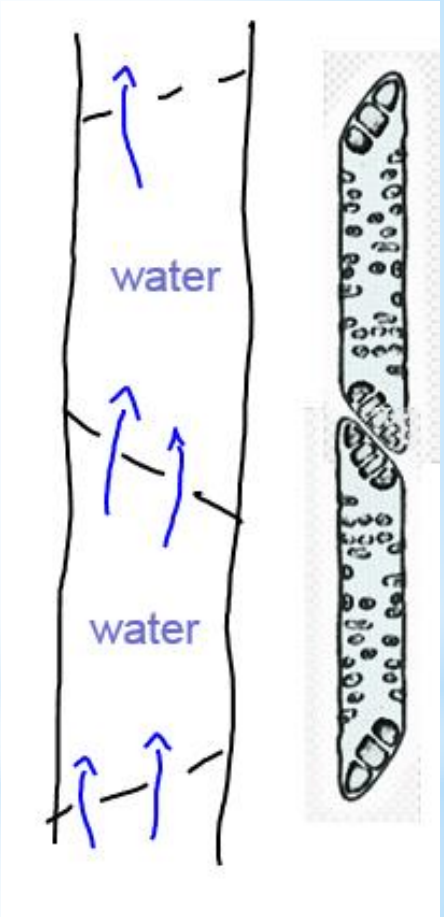
They use active transport to increase the concentration of mineral ions in their cells



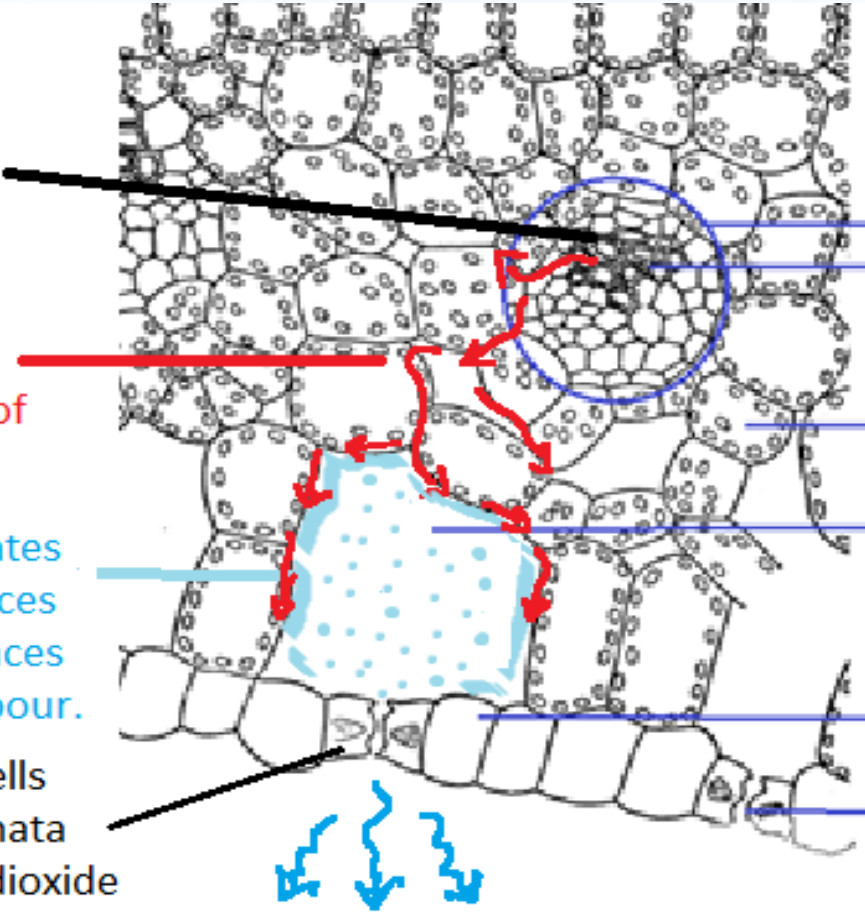
A large network of roots takes water from the soil

Transport in xylem

- To help the flow of water xylem cells have:
  - no cytoplasm
  - holes in their cell walls
- Water movement in xylem is caused by transpiration pull - the evaporation of water in the leaves causes tension in the cells of the leaf and tension in the xylem tubes
- Cohesion sticks water together and creates tension in xylem.
- Adhesion to the xylem cell walls tends to pull water up the xylem vessel.
- Water uptake through osmosis in the roots pushes water into xylem

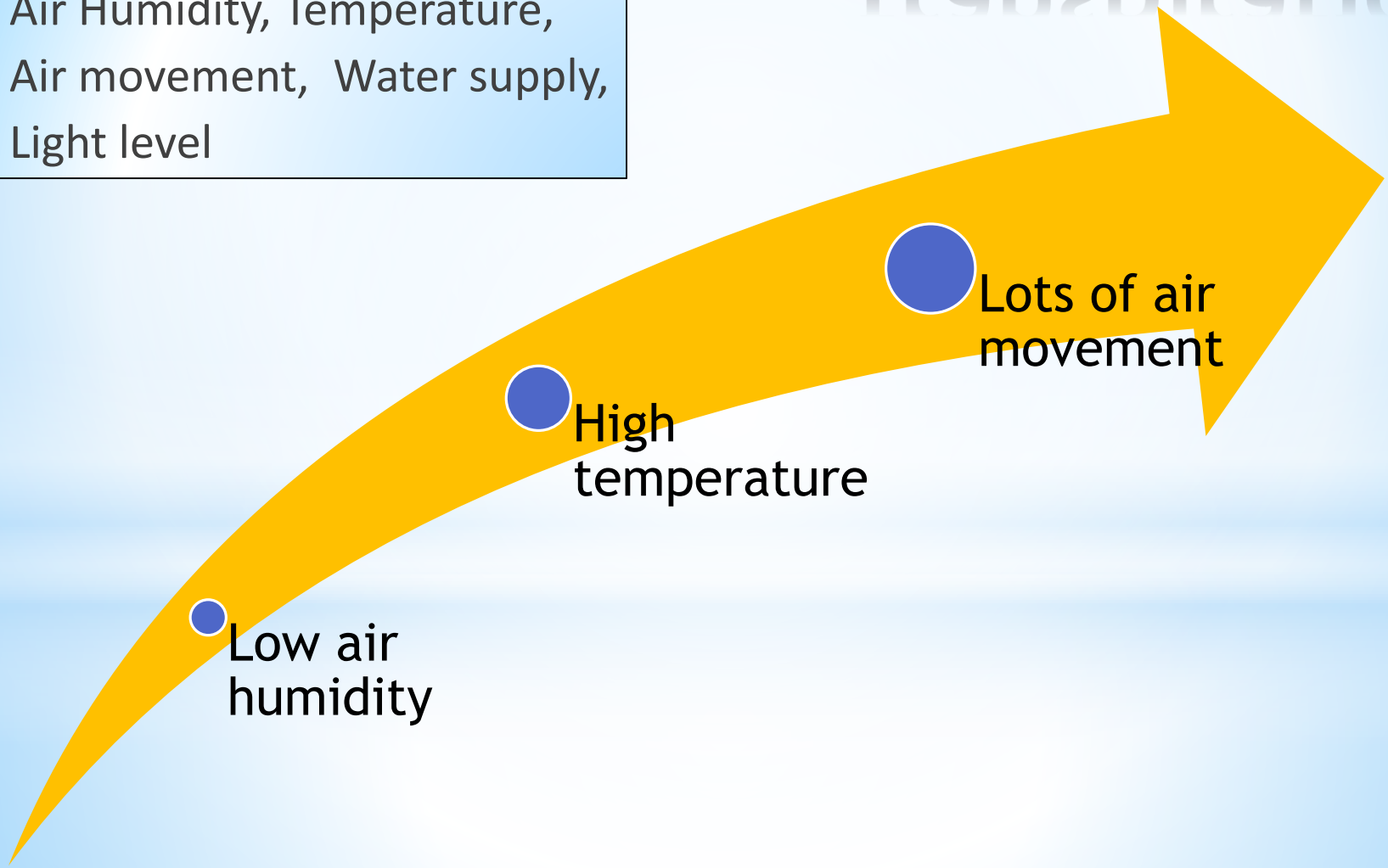


Transpiration in leaves

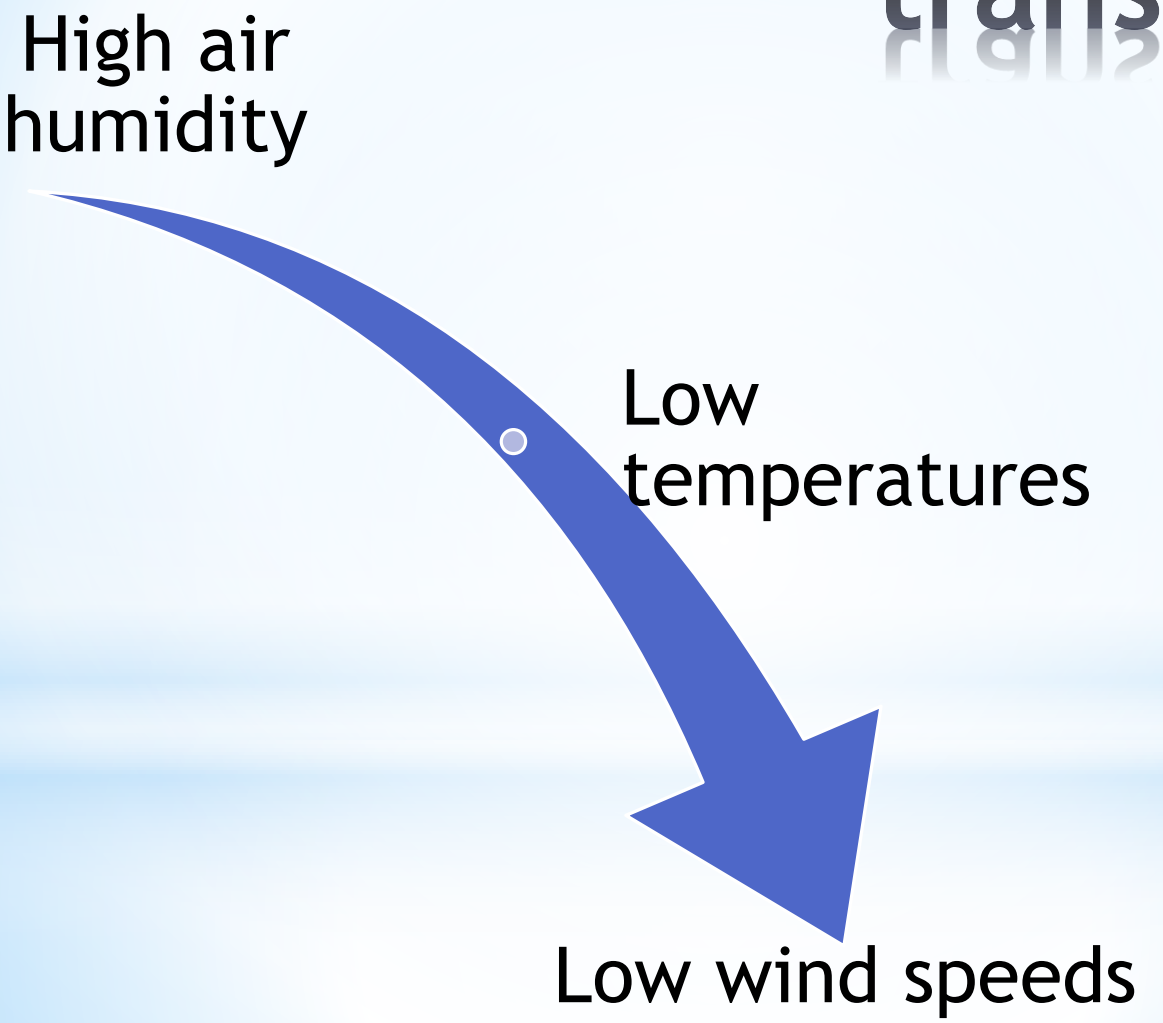


Abiotic factors increase transpiration

Air Humidity, Temperature, Air movement, Water supply, Light level



Abiotic factors decrease transpiration



Humidity,

Temperature,

Air movement,

Water supply,

Light level

Features of xerophytes

Marram grass leaves growing on sand dunes

These adaptations all reduce water loss from the plant

1. Smaller leaves (often needle shaped)
2. Hairs on leaf (decrease air currents by stomata)
3. Thick waxy cuticle (makes leaf impermeable)
4. Fewer stomata (decreases transpiration)
5. Stomata sunken in pits (reduces exposure to air currents)
6. Rolled up leaf (creates high humidity inside the rolled leaf and decreases water vapour evaporation.)
7. Fleshy leaves or stems with water storage cells
8. Deep root system (to get below water table)
9. Extensive surface root system (to absorb night time humidity)

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Marram grass leaves growing on sand dunes

IB style Questions

Describe the harsh environment found in deserts or on beaches with reference to light, temperature, wind and humidity.

Explain how the abiotic factors in deserts or on beaches affect the rate of transpiration in a typical terrestrial plant.

Name two adaptations of xerophytes and explain how they reduce transpiration rates?