

PENANG SANGAM HIGH SCHOOL
P.O.BOX 44, RAKIRAKI
LESSON NOTES

Year/Level: 12C/D

Week 10

Subject: Biology

Strand	1 structure & life processes
Sub Strand	1.4 comparative form and function in plants and animals
Content Learning Outcome	Identify the minerals and its role in plants

Mineral needs in Plants

In addition sunlight, CO₂ and water, plants also need specific minerals:

- Minerals absorbed by plants have to be first dissolved in water, in which minerals form ions.
- Charged ions cannot diffuse through the cell membrane due to mineral concentration often being higher inside a plant than outside. Therefore, plants actively transport minerals into their roots

Mineral	Function/ role in Plants	When deficient and/ excess in Plants
Nitrogen	Taken up by plants as NO ³⁻ and NH ⁴⁺ Used in larger quantities than any other mineral nutrient. Component of proteins, nucleic acids, cofactors. Part of chlorophyll molecule.	Most frequently deficient for normal growth of non-legumes. Plants become stunted (become yellow) on the older leaves. Nitrogen is mobile in the plant so new leaves may remain green. Excess nitrogen may delay maturity. Cause excess growth and little fruiting in melons and tomatoes.
Potassium	Taken up by plants as K ⁺ Especially important in water/solute balance; involved in plant enzyme action. It is a catalyst in many reactions; carbohydrate, starch and nitrogen metabolism. Activates enzymes involved in photosynthesis, protein and carbohydrate metabolism. Adjusts stomata movement and water relations. Helps disease resistance. Increases quality of fruits and vegetables.	Tips and margins of leaves turn brown. Potassium is mobile so this occurs first on lower leaves. Weakening of straw in grain crops (lodging). Important in preventing non-protein nitrogen from accumulating in plants.
Phosphorous	Taken up by plants as H ₂ PO ⁴⁻ and H ₂ PO ⁴⁻²⁻ Part of the protein molecule (phospholipids). Necessary for transfer of energy during metabolic processes (ATP). Speeds up maturity, promotes good root development, improves drought and cold tolerance, improves seedling vigour Important in seed and fruit formation.	Overall reduction in growth, causes stunting. Dark green colour - purple cast in corn on lower leaves first because phosphorous is mobile. Delay in maturity. Failure of seed to form

Calcium	<p>Taken up by plants as Ca^{2+}.</p> <p>Important in cell walls and in forming the spindle during cell division.</p> <p>Calcium pectate gives strength to cell walls.</p> <p>Needed for peg development in peanuts.</p> <p>Plant root and tip elongation.</p>	<p>When calcium is immobile, new growth is affected.</p> <p>Failure of terminal buds to develop</p> <p>Symptoms are not usually seen under field conditions because other problems caused by acidity of soil will generally become limiting factors.</p> <p>Liming prevents Calcium deficiency from occurring.</p>
Magnesium	<p>Taken up by plants as Mg^{2+}</p> <p>Component of chlorophyll; involved in plant enzyme action.</p> <p>Related to phosphorus metabolism.</p> <p>Large quantities found in seed.</p>	<p>Mg is mobile so symptoms occur first in old leaves</p> <p>Causes interveinal chlorosis (whitish or yellowish striping effect on grasses).</p>
Sulfur	<p>Taken up by plants as SO_4^{2-}.</p> <p>Constituent of 3 of the 21 amino acids which form protein cysteine and methionine.</p> <p>Present in the organic compounds that give the characteristic odours of onion, garlic, and mustard.</p>	<p>Similar to N deficiency symptoms.</p> <p>It is less mobile than nitrogen so deficiency may be more apparent on younger leaves.</p>
Manganese	<p>Taken up by plants as Mn^{2+} and Mn^{3+}.</p> <p>Can be absorbed through the leaves</p> <p>Required in small quantities - large amounts are toxic (acid soils). Activation of enzyme systems.</p> <p>Chlorophyll synthesis.</p>	<p>Mn becomes immobile upper leaves develop yellow streaks.</p>
Iron	<p>Taken up by plants as Fe^{2+} or Fe^{3+}.</p> <p>Acts as a catalyst in the production of chlorophyll.</p>	<p>Occur on high pH soils or certain plants.</p> <p>Immobile so deficiency symptoms occur on young leaves.</p> <p>Inter-veinal chlorosis may turn leaves completely white.</p>
Copper	<p>Taken up by plants as Cu^{2+} (can be absorbed through leaves)</p> <p>Very toxic if too much applied.</p> <p>Copper is a catalyst in chlorophyll formation.</p>	<p>Immobile so upper leaves affected; youngest leaves are yellow and stunted</p> <p>Vegetables - plants wilt and develop a bluish green cast.</p>

1. The element that is an important constituent of chlorophyll and an activator of several enzymes is

A. sulphur. B. calcium. C. nitrogen. D. magnesium.

2. What is the role of the mineral calcium in plants?

A. forms part of proteins B. forms part of chlorophyll C. regulates membrane permeability D. acts as an enzyme activator

3. Why do plants need magnesium?

