

Grade 10 Science

Systems of Living Things

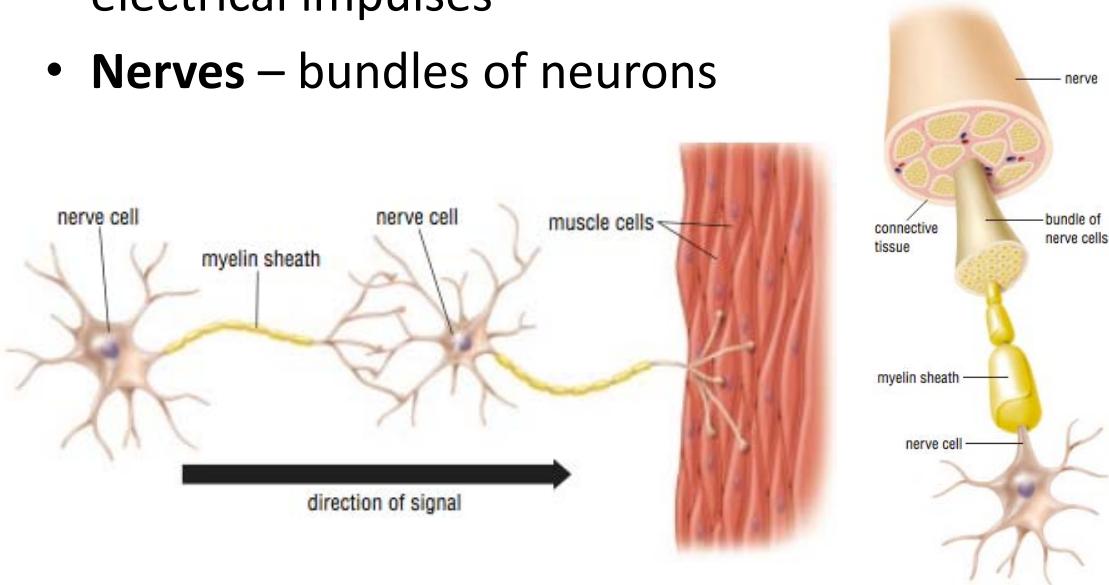
Class 6

The Nervous System



- **The Central Nervous System (CNS):**
 - Brain
 - Spinal Cord
- **The Peripheral Nervous System (PNS):**
 - The nerves in the rest of the body – relays information about the environment to the brain
 - 3 categories:
 1. Nerves for voluntary muscles
 2. Nerves for sensory organs
 3. Nerves for involuntary muscles

- **Neurons** – the specialized cell that makes up nerve tissue; communicate by sending electrical impulses
- **Nerves** – bundles of neurons



- **Sensory receptors** – specialized cells that receive input from the external environment
 - Sight, touch, temperature, taste, smell, sound, pressure, pain, balance, motion and position
- **Reflexes** – actions that do not require the involvement of the brain; occur without conscious thought
 - Moving your hand from a hot surface

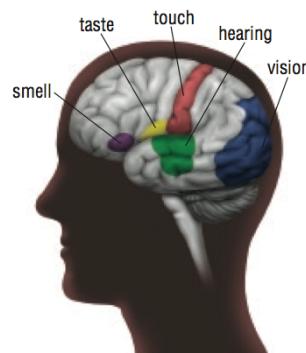
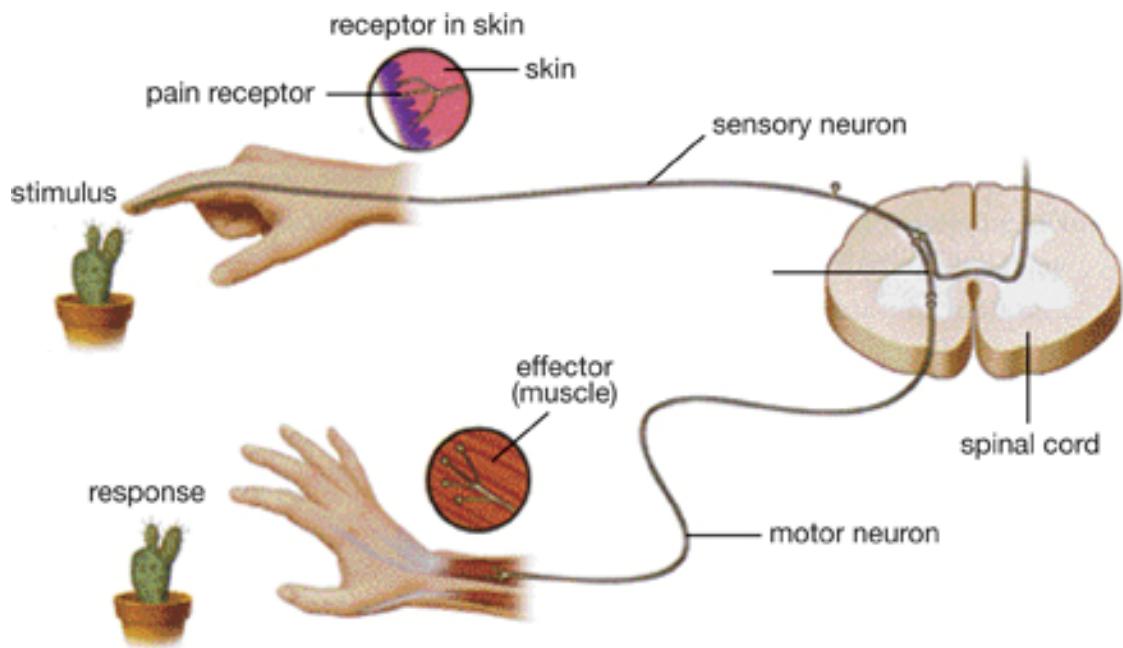
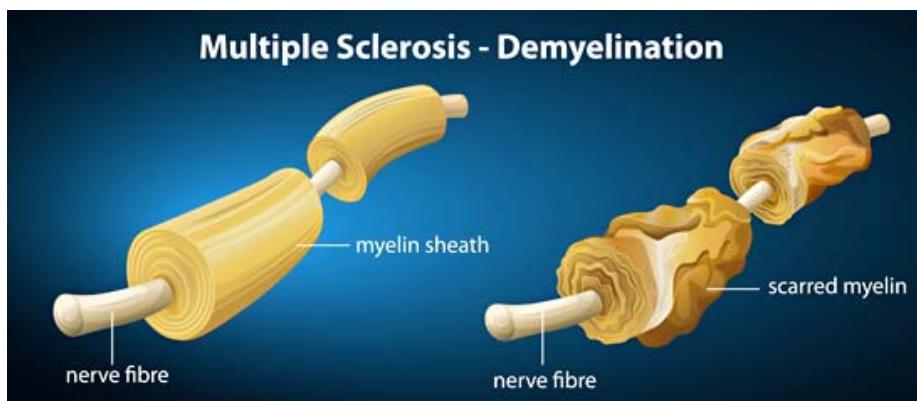


Figure 6 Different parts of the brain receive information from our various senses.



Diseases of the Nervous System

- Multiple Sclerosis – destroys myelin sheaths, which disrupts the electrical signals
- Concussions – physical impact to the brain



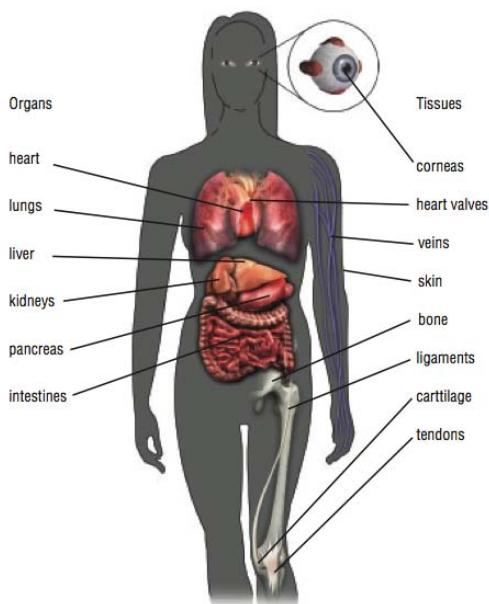


Checkpoint



After a car accident, Jill lost the hearing in one ear. Examinations indicate no damage to the eardrum. Suggest a reason for the loss of hearing.

Organ Transplants



- Common Organ Transplant Surgeries:
 - Cornea, skin, heart, liver, lungs, kidneys, pancreas
- Performed since early 1800s when blood transfusions were explored

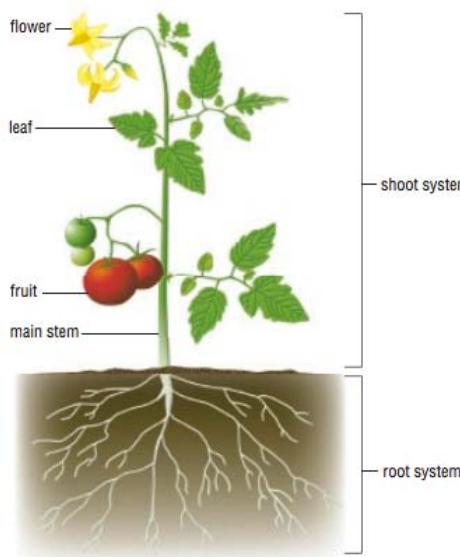
- Living Donor Organs – Organs that come from a living person
 - Donate a lobe of their lung, part of their liver or a kidney
 - Donors need to match with the recipients to avoid rejection by an immune response
- Deceased Donor Organs – Organs that come from a deceased person
- Xenotransplantation – transplanting of body parts from one species to another
 - Ex: Heart valves from pigs

Black Market Organs

- Citizens of impoverished nations may be tempted to sell their organs on the black market for \$800-\$10,000
- Organs can also be removed from bodies that are about to be cremated
- Organs can be harvested from people who were drugged or kidnapped



Systems in Plants



- Two main systems:
 - Shoot system
 - Root system
- Plants are similar to animals
 - Exchange gases
 - Circulatory system
 - Reproduce

The Root System

- Function:
 - Anchors the plant
 - Absorbs water and minerals
 - Stores food

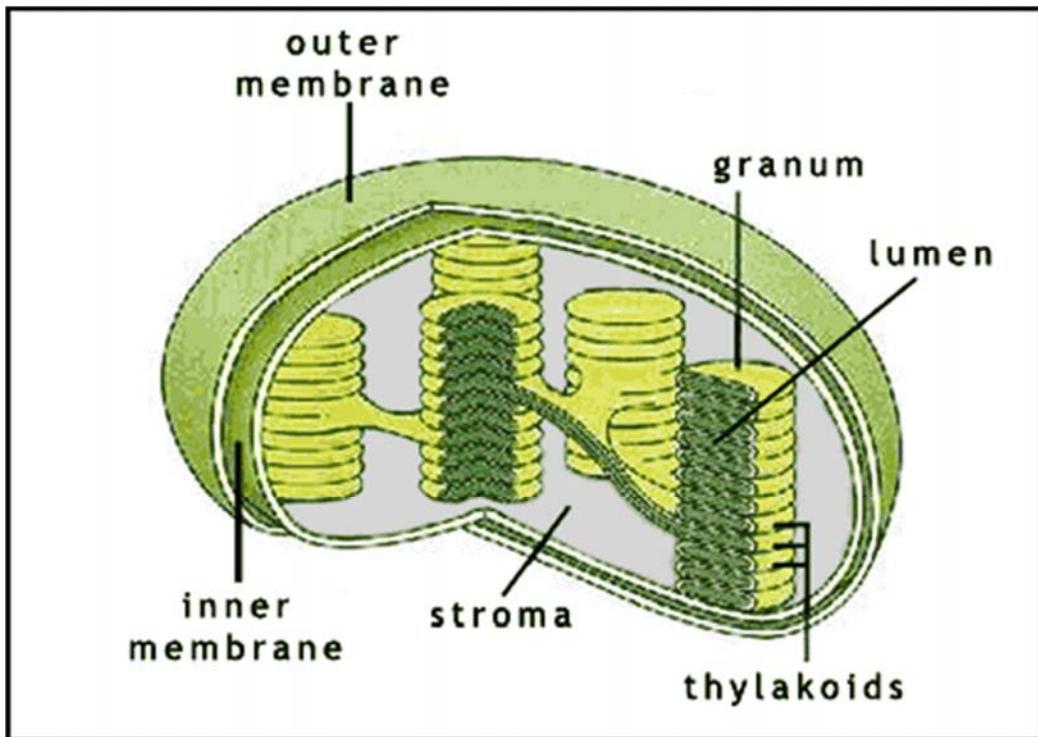


The Shoot System

- Function:
 - Conduct photosynthesis
 - Produce flowers for reproduction
- Structure:
 - Leaf – photosynthesis in the chloroplasts
 - Flower – reproduction
 - Male = pollen grains
 - Female = eggs → seed → fruit
 - Stem – support and transport

Leaf

- The main photosynthetic structure of the plant
- $$\text{light energy} + \text{carbon dioxide} + \text{water} \xrightarrow{\text{chlorophyll}} \text{glucose} + \text{oxygen}$$
- Photosynthesis occurs in the organelle called chloroplast
 - Contains thylakoids arranged in stacks called grana which act like solar panels
 - Large surface area of the leaf allows for more sunlight to be collected



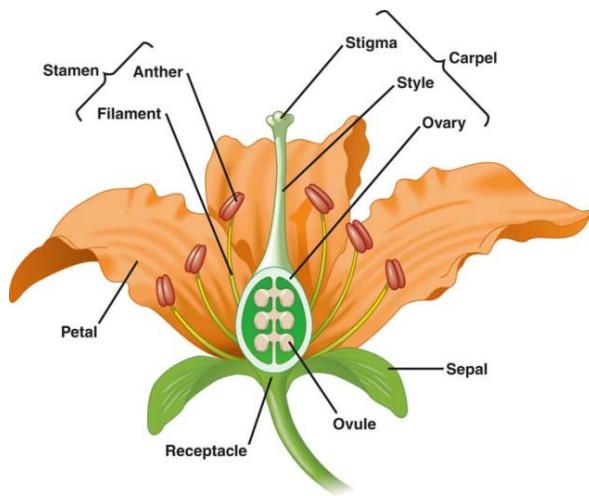
- Leaves are also adapted for support, protection, reproduction and attraction



- Tendrils in cucumber plant for support
- Spines in cacti for protection
- Colour and pattern of leaves attract organisms for pollination

Flower – for sexual reproduction of the plant

- Male – Stamen includes the anther which contains the pollen grains (sperm) held up by a filament
- Female – Carpel includes the stigma, style and ovary
- Eggs are fertilized by the pollen to form a fruit which contains the seeds

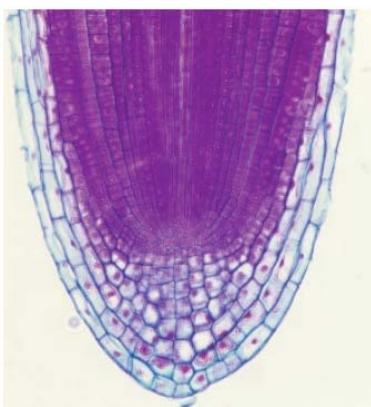


- Pollination occurs with the help of wind or animals
 - Wind-pollinated: flowers are often small and drab but they produce large amount of pollen
 - Animal-pollinated: flowers are large, colourful and may have nectar to attract the pollinators
- Mosses, ferns and coniferous trees are not flowering plants and have different reproductive systems

- **Stem** – supports the branches, leaves and flowers and transports materials
 - Trunk – support the trees
- Some stems are specialized for food storage, protection, photosynthesis and reproduction
 - Ex: Sugar cane, wood and paper products, linen and medicines
- Some stems have hair (trichomes) or thorns used for insulation, evaporation prevention and protection from predators

Plant Tissue Systems

- Meristematic cells – an undifferentiated plant cell that can divide and differentiate to form specialized cells



- Differentiate into 3 different types of plant tissue
 - Dermal Tissue
 - Vascular Tissue
 - Ground Tissue

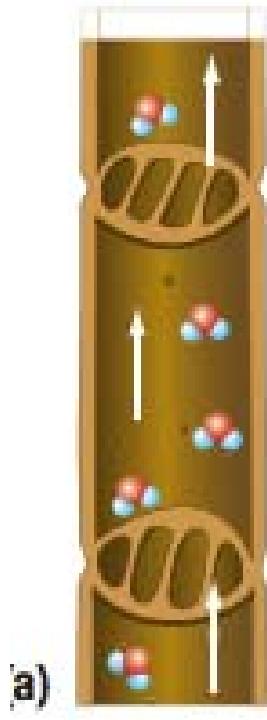
Dermal Tissue

- Outer surface of the plant
 - Epidermal Tissue – thin layer of cells that cover the surface of leaves, stems and roots; in woody plants, this layer is replaced by periderm tissue
- Function:
 - Root Hairs absorb water and minerals
 - Waxy cuticle keeps the leaves waterproof
 - Defense – chemical irritants



Vascular Tissue System

- Transportation system that moves water, minerals and other chemicals throughout the plant
- 2 Types:
 - Xylem – elongated cells that transport water and dissolved minerals; becomes a hollow tube
 - Carries material from root to shoot
 - Phloem – transports sugars and nutrients
 - Carries material back and forth

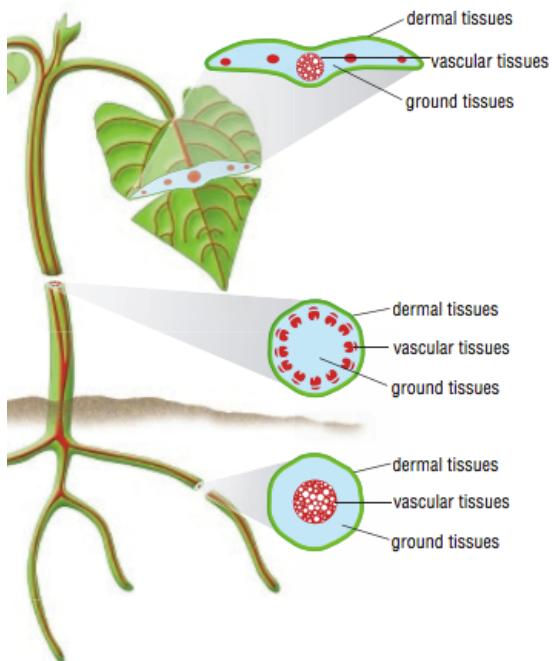


Xylem



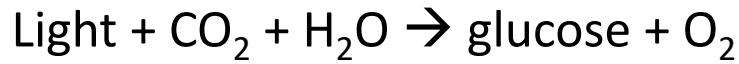
Phloem

Ground Tissue System



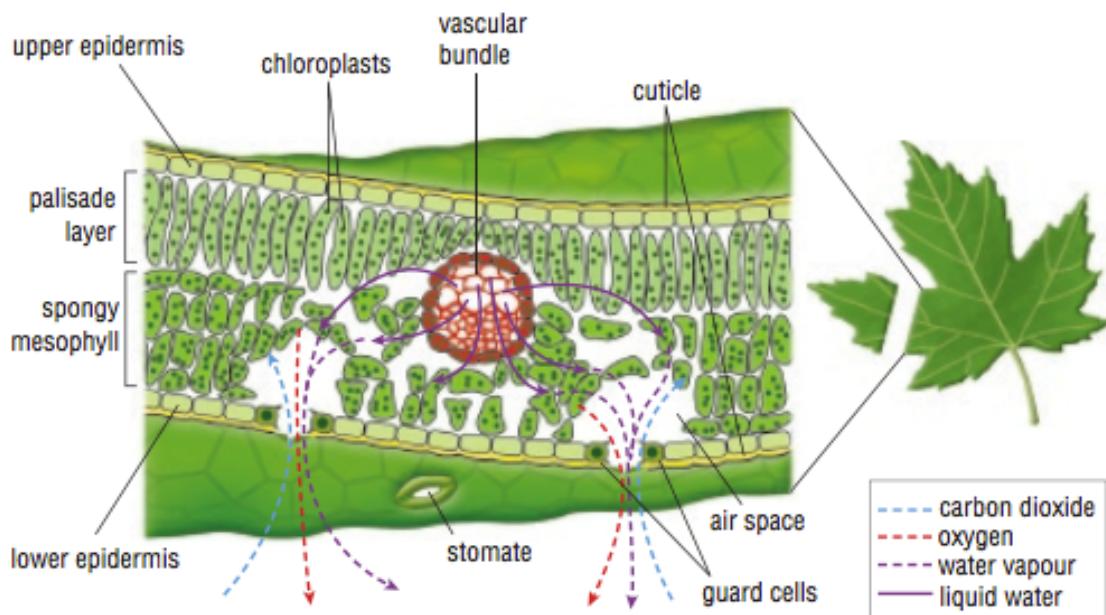
- The filler between vascular and dermal tissue
- Function:
 - Leaves – photosynthesis
 - Root – store carbohydrates
 - Stem – storage and support

Photosynthesis



Absorbing light

- Wide, thin leaves have a large surface area to absorb light
- Chlorophyll is found in the palisade layer and the spongy mesophyll layer



Obtaining Carbon Dioxide

- Gases enter through openings called the stomata in the lower surface of the leaf
- Once gas enters the stomata, it can move around the air spaces in the spongy mesophyll

Obtaining Water

- Leaves close their stomata when water levels are low and have waxy coatings to prevent water loss
- Water moves into the roots through osmosis and distributes through the stem



Transgenic Plant Products

- Selective farming – choosing the strongest, most drought-resistant plants to grow
- Genetic engineering can use plants to produce substances that are normally found in different organisms
 - Takes genetic material from one organism and inserts it into the DNA of another organism
 - Called “Transgenic Plant” or “Genetically Modified Foods”

- Transgenic modifications:
 - Pest- and disease-resistant plants
 - Manufacturing vaccines and other medicines
 - Greater nutritional value
 - Longer shelf-life
 - Absorb more CO₂ from the air
 - Manufacture biological materials



Figure 1 By selecting and growing seeds from the best plants, humans have gradually changed how the plants grow. Corn has been bred selectively for thousands of years.