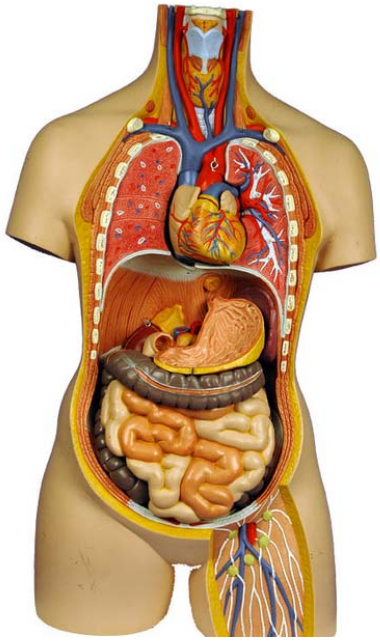
Grade 8 Science

Cells

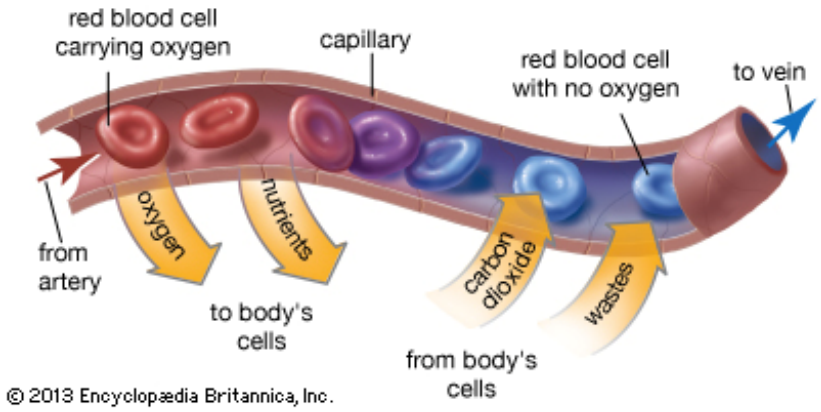
Class 4

Systems Working Together

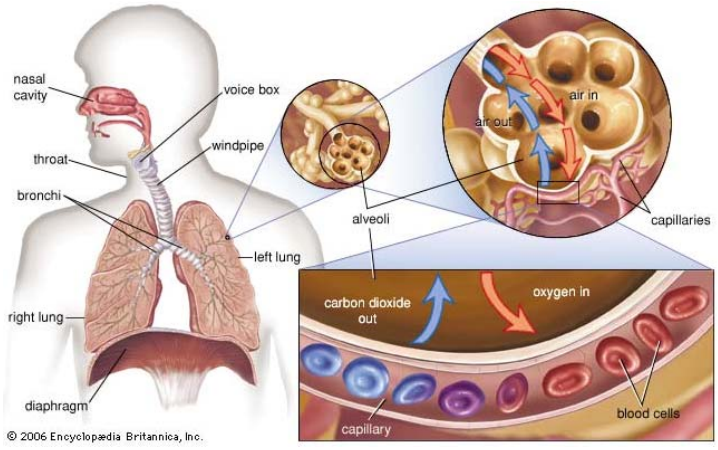


- All systems within a multicellular organism work together
- Multicellular organisms need respiratory, digestive and circulatory systems to bring oxygen and nutrients to the cells

- Respiratory system supplies oxygen to blood cells
- Digestive system supplies nutrients
- Circulatory system pumps the oxygen and nutrient-rich blood to the cells of the body

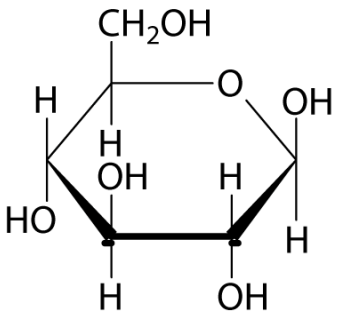


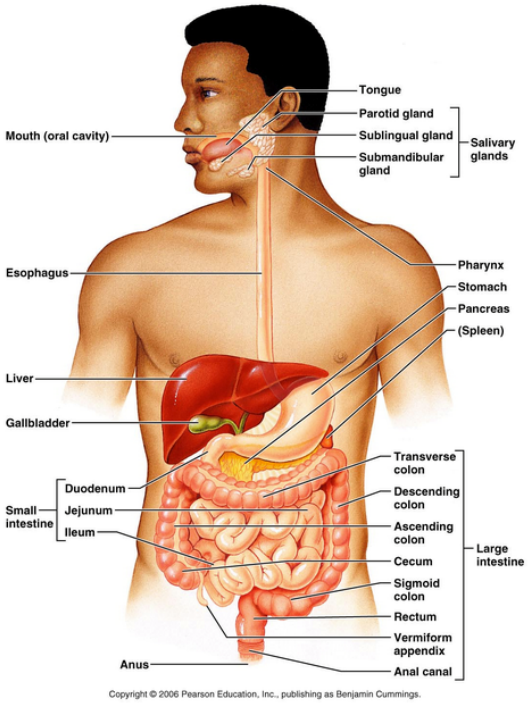
- Cells release carbon dioxide as a waste product which diffuses out of the cell into the blood cells
- Blood cells are transported to the lungs by the circulatory system and exhaled out



Nutrition

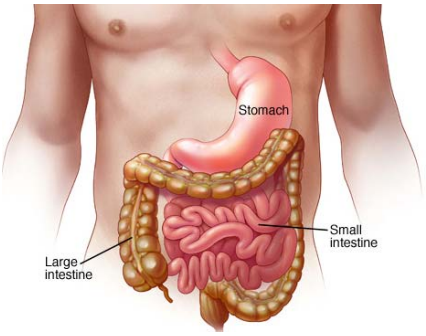
- Animals are unable to make their own food
- Consumes living things (fruits, vegetables, meat) or products that come from living things (eggs, honey)
- Food is broken down into nutrients that the body can absorb

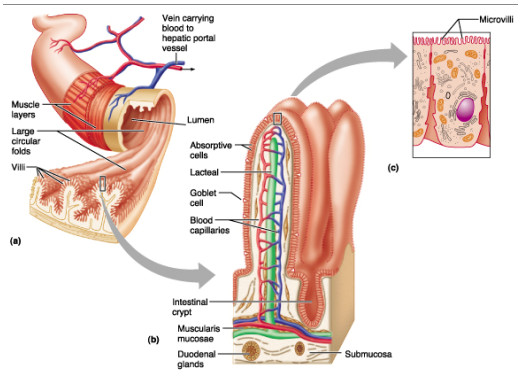


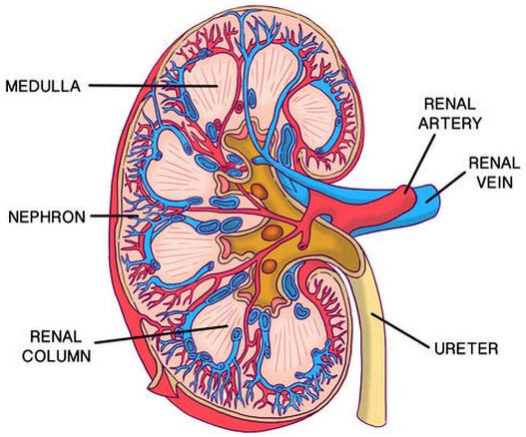


- Food enters the mouth where it undergoes mechanical digestion; broken down into smaller pieces by teeth
- Swallowing moves the food into the esophagus
- Muscle cells in the esophagus push food down into the stomach

- Cells in the stomach release acid and chemicals that further break down the food
- Stomach muscles contract and relax, moving food into the intestines
- Nutrients are absorbed into the blood vessels and then transported to other parts of the body

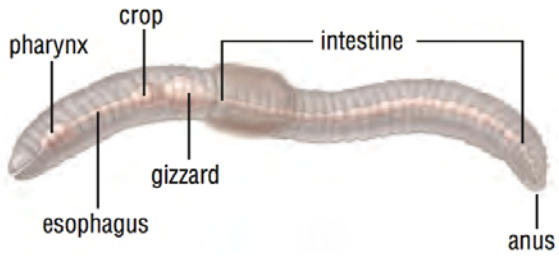






- Large intestine absorbs water and vitamins
- Undigested food is passed out of the anus as waste
- Waste in the cells pass through the kidneys and is eliminated as urine

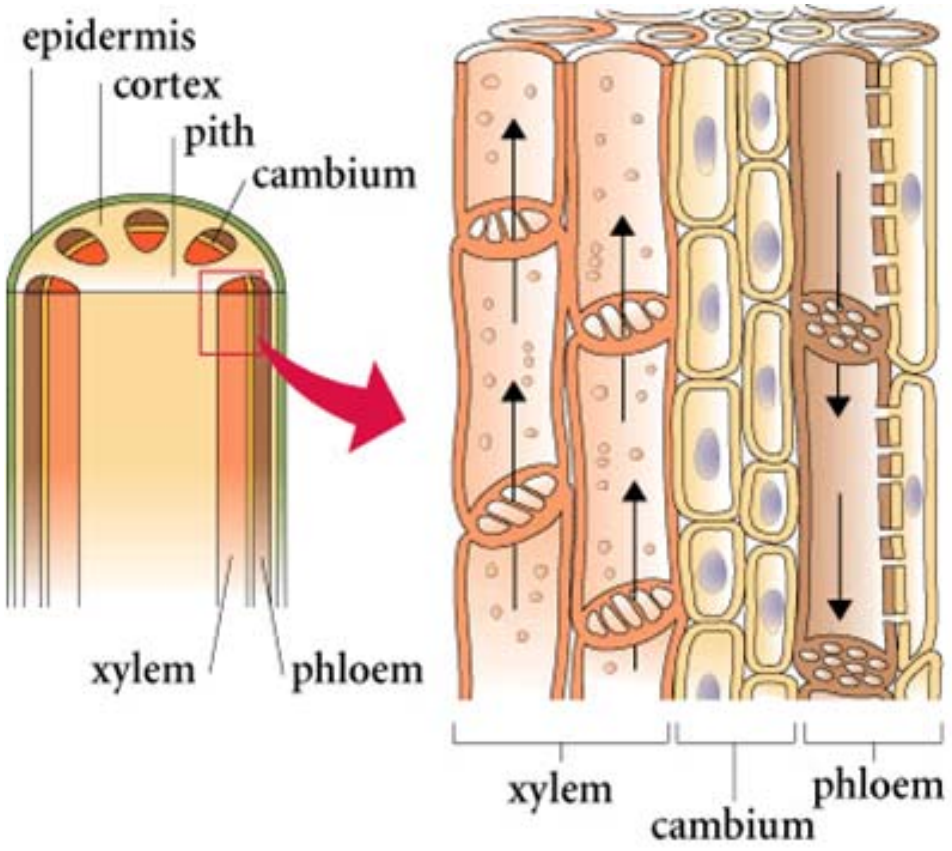
Nutrition in the Earthworm



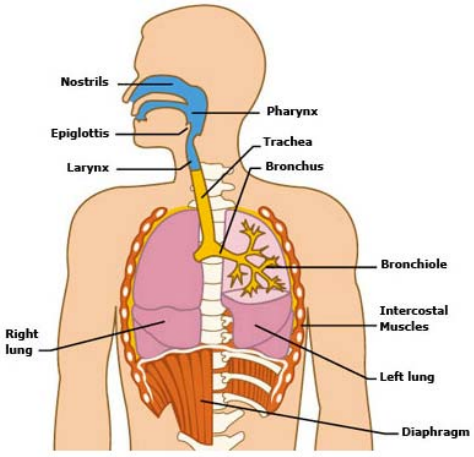
- Earthworms suck in food through the pharynx
- Esophagus pushes food into the crop, an organ that moistens and stores food
- Gizzard contains particles of sand and gravel to break down tough foods

Nutrition in Plants

- Plants use roots to absorb water and nutrients from the soil
- Xylem Vessels – transport water and mineral from root to shoot to leaves for photosynthesis
- Phloem Vessels – located outside the xylem, transports nutrients from the leaves to the rest of the plant
- Excess sugars are transported to the stems and roots for storage



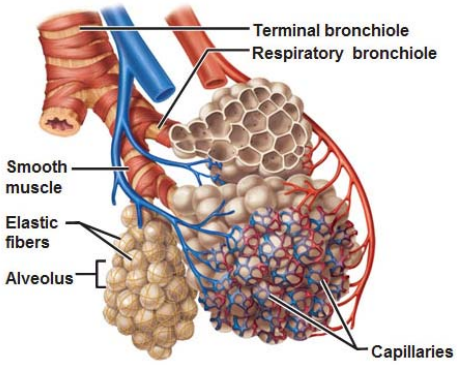
Respiratory System

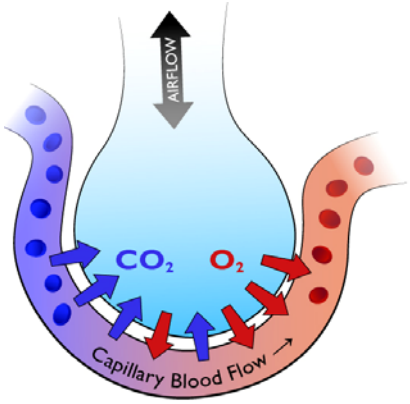


Vertebrates

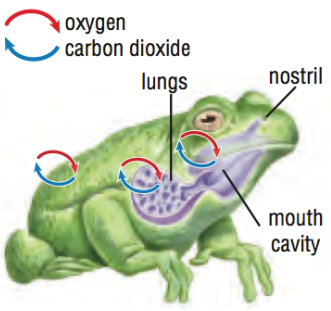
- Air is inhaled through the mouth and nose and passes into the trachea
- Epiglottis in the trachea prevents food from entering the trachea
- Air from trachea enters bronchi

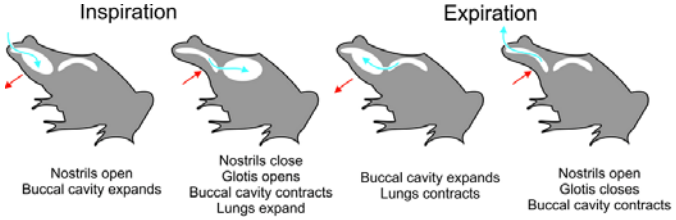
- Bronchi branches off into bronchioles
- Bronchioles terminate at round sacs called alveoli where gas exchange occurs
- Alveoli walls are one-cell thick to allow diffusion of oxygen out of the cell and carbon dioxide into the cell





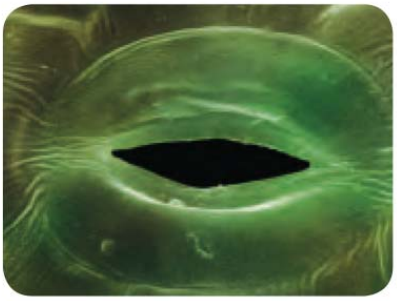
- Underwater, the skin of frogs is permeable to water and gases
- Blood vessels in the cells of the moist outer skin allow the diffusion of oxygen
- On land, a frog uses lungs similar to humans for gas exchange





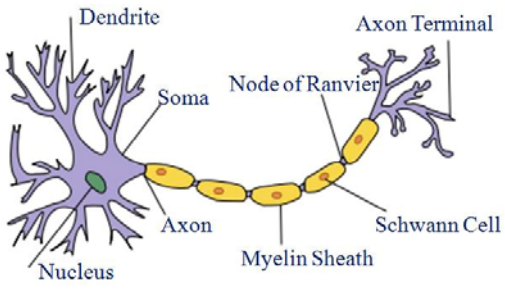
Gas Exchange in Plants

- Plants have stomates on the underside of the leaf and the stem
- Stomates are microscopic pores that control the movement of gases and water vapour into and out of the plant



Nervous System

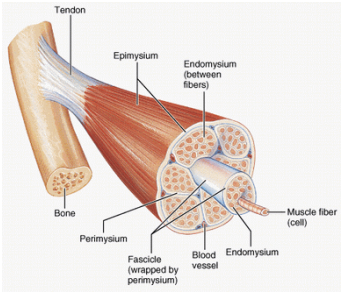
- Nerve cells process and transmit information by responding to factors in the environment
- Signals are transmitted through nerve cells to the brain where a response is coordinated to the organs

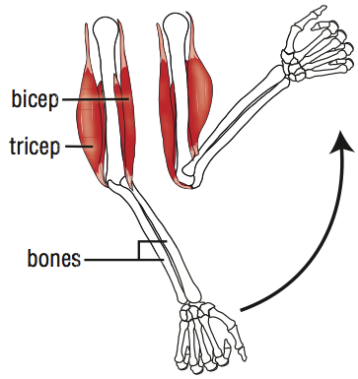


LEAF COLOR					
PIGMENT	CHLOROPHYLL	CAROTENE	LOW ANTHOCYANIN	HIGH ANTHOCYANIN	HIGH ANTHOCYANIN
WEATHER CONDITIONS					
SOIL ACIDITY				pH↓	pH↑

- Plants can also respond to the environment
- Specialized cells in the leaves of tree detect a decrease in sunlight during autumn
- Chloroplasts reduce the production of green chlorophyll
- Other coloured pigments are revealed

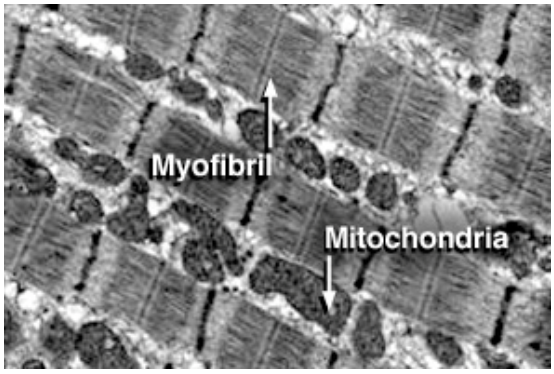
Musculoskeletal System

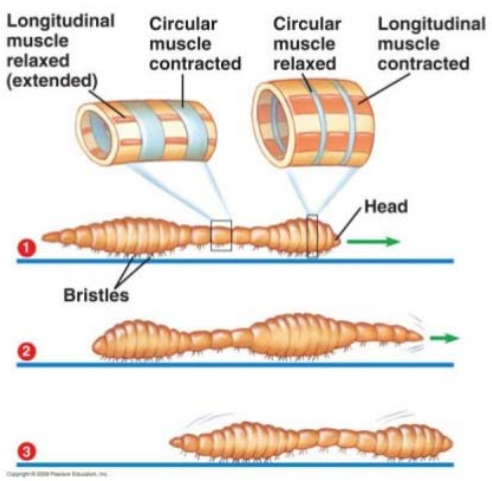




- Muscles and bones work together to allow vertebrates to move around
- Human skeleton consists of over 200 bones to support the muscles
- Muscle contractions are controlled by the nervous system

- Muscle cells in the heart contract to pump blood out of the heart
- Muscles use energy and contain many mitochondria to convert food energy into motion





- Invertebrates use muscles to achieve locomotion
- Earthworm anchors itself to the soil with tiny hair-like projections and their muscles contract and expand to pull the body through the soil

Importance of Unicellular Organisms

- Fungi and bacteria are decomposers that break down dead plant and animal material
  - Release nutrients and carbon dioxide back into the environment
  - Nitrogen-fixing bacteria convert nitrogen in the air to nitrates and nitrites for the soil

- Yeast is used to produce breads and pastries
- Bacteria in milk produces yogurt
- Penicillin, an antibiotic is made from a fungus
- Micro-organisms live in the digestive system of multicellular organisms to produce vitamins and help break down foods that are indigestible

Figure 2 Yeast convert sugars in bread dough into carbon dioxide. This creates bubbles in the dough, which helps the bread rise.

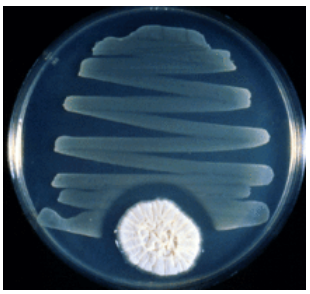


Figure 3 *Bifidobacteria* in the colon of humans aid in digestion.

Unicellular Organisms and Disease

- Some microorganisms can cause acne, strep throat, diarrhea and other serious illness
- 1300s, the Black Plague caused by the bacterium *Yersinia pestis* killed 75 million people

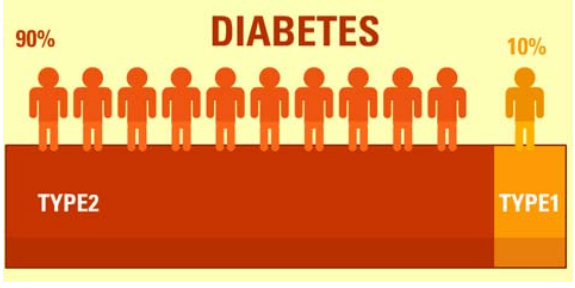
- Malaria is caused by a unicellular protist called *Plasmodium falciparum*
- Mosquito transmits the protist from person to person
- Protists grow inside the red blood cells and destroy them, preventing the uptake of oxygen

Figure 4 This coloured SEM shows *Plasmodium falciparum* (yellowish cells on top right) among red blood cells in the bloodstream.

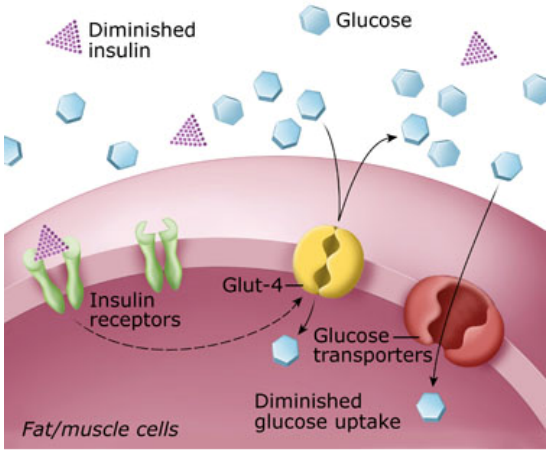
Diabetes

- Pancreas normally produces insulin
- Insulin helps other cells in the body to absorb sugars from the blood
- Type 1 Diabetes
  - Cells in the pancreas do not produce enough insulin
- Type 2 Diabetes
  - Cells in the body do not respond to insulin

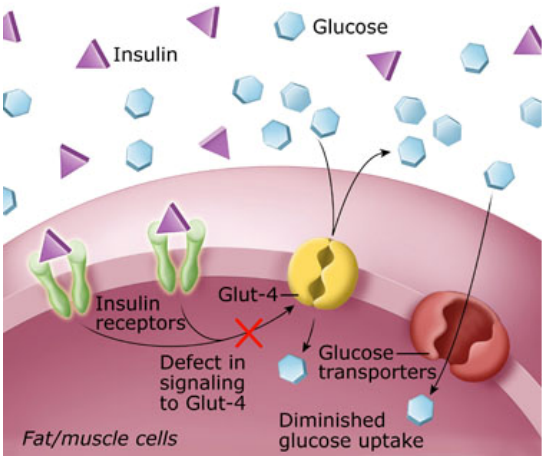
- Growing number of Type 2 Diabetes reported in teens and children in Canada due to obesity and lack of physical activity
- Prevented by eating a healthy diet and an active lifestyle
- If uncontrolled, diabetes can lead to heart disease, blindness and kidney failure



Type 1 Diabetes: Insufficient Insulin



Type 2 Diabetes: Insulin Resistance



Cancer

- Cancerous cells divide quickly and uncontrollably
- Forms masses called tumours
- Benign tumours stay in one place and do not normally affect function of tissues and organs
- Malignant tumours break away and enter the bloodstream to move to other parts of the body

- Cancer can be caused by chemicals (smoking), infectious diseases (HPV, hepatitis)
- Cancer can be inherited (colon cancer, breast cancer)

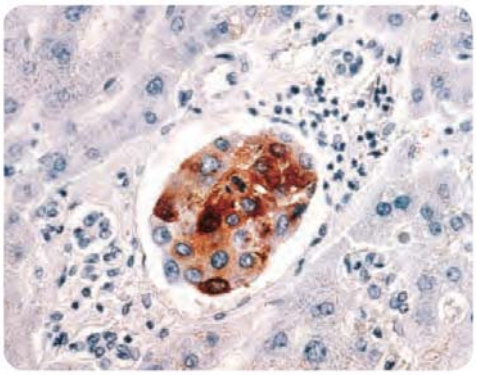


Figure 5 This light micrograph shows cancer cells (stained brown) forming among healthy liver cells (light-coloured).