



HLT54115 Diploma of Nursing (C5365)  
HLTAAP002 - Confirm Physical Health Status  
(NURS5362C/5369C)

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Lesson 2  
The Human Body: An Orientation



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**Session Objectives**

- Define the composition of matter
- Identify common elements from the periodic table
- Define subatomic particles and their charges
- Define the four forms of energy
- Define pH and values of common solutions
- Define what is a cell and its chemical components

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**Composition of Matter**

Atoms; Building blocks of elements

Elements—fundamental units of matter

- 96 percent of the body is made from four elements:
  1. Oxygen (O)
  2. Carbon (C)
  3. Hydrogen (H)
  4. Nitrogen (N)

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The Periodic Table of the Elements

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**Subatomic Particles**

In the Nucleus

- Protons +ve
- Neutrons neutral

Orbiting the nucleus

- Electrons -ve

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**Subatomic Particles**

Atoms are electrically neutral

- Number of protons = numbers of electrons

Ions are atoms that have lost or gained electrons

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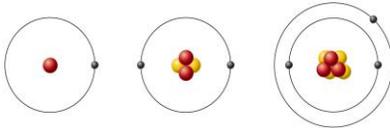
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**Atomic structure of the three smallest atoms.**



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**Ionic bonds**

Electrons are transferred from one atom to another

- Anions: negative charge - gain of electron(s)
- Cations: positive charge - loss of electron(s)
- Electrolytes that enable impulses to occur in the body

- Ca            K
- Mg           Na
- Cl

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### Matter and Energy

Forms of energy

- Chemical energy
- Electrical energy
- Mechanical energy
- Radiant energy

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### pH

Concentration of hydrogen ions

pH 7 = neutral

pH below 7 = acidic

pH above 7 = basic/ alkaline

Buffers—chemicals that can regulate pH change

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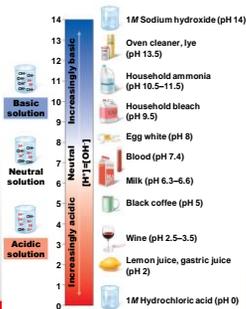
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**Cells**

Cells are the structural units of all living things

Most cells are composed of four elements:

1. Carbon
2. Hydrogen
3. Oxygen
4. Nitrogen

Cells are about 60% water

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**Time for a Video**

Introduction to Cells: The Grand Cell Tour

<https://www.youtube.com/watch?v=8IizKri08kk>

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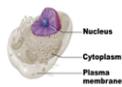
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**Anatomy of a Generalised Cell**

A cell has three main regions :

1. Nucleus
2. Cytoplasm
3. Plasma membrane

Figure 1.10: A generalised animal cell.



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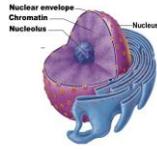
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### The Nucleus

- Nuclear envelope (membrane)
- Double membrane
- Encloses the nucleoplasm



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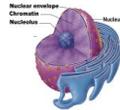
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### The Nucleus

#### Nucleoli

- Nucleus contains one or more nucleoli
- #### Chromatin
- Contains DNA
  - Forms *chromosomes* when the cell divides



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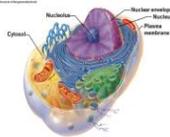
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### Plasma Membrane

Separates cell contents from surrounding environment



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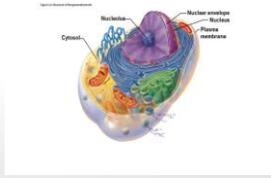
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**Cytoplasm**

Contains major elements

- 1. Cytosol
- 2. Organelles
- 3. Inclusions




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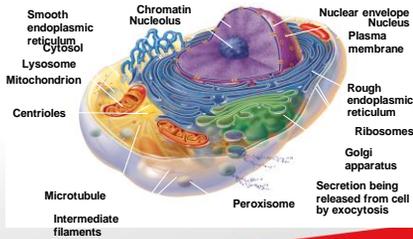
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**Cytoplasmic Organelles**




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**Cytoplasmic Organelles**

Mitochondria

- "Powerhouses" of the cell
- Carry out reactions where oxygen is used to break down food
- Provides ATP for cellular energy




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**Cytoplasmic Organelles**

Ribosomes

- Made of protein and RNA
- Sites of protein synthesis
- Found at two locations:
  - Free in the cytoplasm
  - As part of the rough endoplasmic reticulum



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**Cytoplasmic Organelles**

Endoplasmic reticulum (ER)

- Fluid-filled cisterns for carrying substances within the cell
- Two types:
  - Rough ER
  - Smooth ER



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**Cytoplasmic Organelles**

Endoplasmic reticulum (ER)

- Rough endoplasmic reticulum
  - Studded with ribosomes
  - Transport proteins within cell



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**Cytoplasmic Organelles**

Endoplasmic reticulum (ER)

- Smooth endoplasmic reticulum
  - Functions in lipid metabolism
  - Detoxification of drugs and pesticides



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**Cytoplasmic Organelles**

Golgi apparatus

- Modifies and packages proteins arriving from the rough ER via transport vesicles; Lysosomes



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**Cytoplasmic Organelles**

Lysosomes

- Membranous "bags" packaged by the Golgi apparatus
- Contain enzymes produced by ribosomes
- Enzymes can digest worn-out cell structures and have phagocytes



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**Cytoplasmic Organelles**

Peroxisomes

- sacs of enzymes
  - Detoxify harmful substances
  - Break down free radicals



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**Cytoplasmic Organelles**

Cytoskeleton

- protein structures
- Provides an internal framework



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**Cytoplasmic Organelles**

Centrioles

- Direct the formation of mitotic spindle during cell division



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**Time for Video**

Biology: Cell Structure

<https://www.youtube.com/watch?v=URUJDSNEXC8>



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**Cell Extensions**

Surface extensions in some cells

- Cilia
  - respiratory system
- Flagella
  - sperm
- Microvilli
  - Small intestines



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**Cell Diversity**

The human body has over 200 different cell types

Cells vary in length from 1/12,000 of an inch to over 1 metre

Cell shape reflects its specialized function



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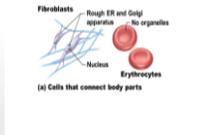
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Cells that connect body parts

- Fibroblast
- Erythrocyte (red blood cell)



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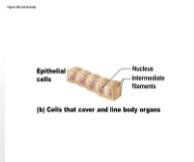
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### Epithelial cells

Cells that cover and line body organs

- Epithelial cell



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### Skeletal and smooth muscle cells

Cells that move organs and body parts

- Skeletal muscle and smooth muscle cells



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**Fat cells**

Cell that stores nutrients

- Fat cells



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**Macrophages**

Cell that fights disease

- Macrophage



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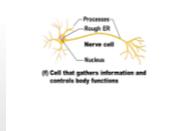
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**Nerve cells**

Cell that gathers information and controls body functions

- Nerve cell



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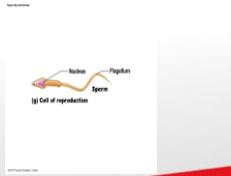
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**Reproductive cells**

Cells of reproduction

- Oocyte (female)
- Sperm (male)



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**Cell physiology**

Cells have the ability to:

- Metabolize
- Digest food
- Dispose of wastes
- Reproduce
- Grow
- Move
- Respond to a stimulus

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**Membrane transport**

Intracellular fluid

Nucleoplasm and cytosol

Interstitial fluid

Fluid on the exterior of the cell

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Two basic methods of transport

- Passive processes
  - No energy (ATP) is required
- Active processes
  - Cell must provide metabolic energy (ATP)

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**Passive transport mechanisms**

Diffusion

Molecule movement is from high concentration to low concentration, or down a concentration gradient



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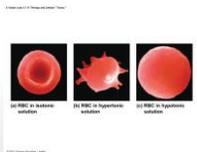
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**Passive transport mechanisms**

Osmosis—

- Isotonic solutions
- Hypertonic solutions
- Hypotonic solutions



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**Time for Video**

Osmosis: A Solute and Solvent Love Story

<https://www.youtube.com/watch?v=lgz8MF3C6M>



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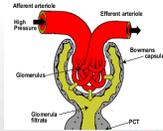
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**Passive processes**

Filtration

- Water and solutes are forced through a membrane by pressure
- High to low pressure



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**Active transport mechanisms**

Active transport

- transported by protein carriers
- ATP energizes solute pumps
- In most cases, substances are moved against concentration (or electrical) gradients



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Body Tissues

Tissues

- Four primary types:
  1. Epithelial tissue (epithelium)
  2. Connective tissue
  3. Muscle tissue
  4. Nervous tissue

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Time for a video

You tube Crash Course A&P Tissues part 1 #2

[https://www.youtube.com/watch?v=i5R3c3CWYo&index=2&list=PL8dPuuaLjXlOAKed\\_MxwBNpNoSh3z8&index=2](https://www.youtube.com/watch?v=i5R3c3CWYo&index=2&list=PL8dPuuaLjXlOAKed_MxwBNpNoSh3z8&index=2)

Tissues part 2 Epithelial Tissues #3

[https://www.youtube.com/watch?v=IUe\\_Rl\\_m-Vg&list=PL8dPuuaLjXlOAKed\\_MxwBNpNoSh3z8&index=3](https://www.youtube.com/watch?v=IUe_Rl_m-Vg&list=PL8dPuuaLjXlOAKed_MxwBNpNoSh3z8&index=3)

Tissues, Part 3 - Connective Tissues #3

[https://www.youtube.com/watch?v=DzmURNBH0&list=PL8dPuuaLjXlOAKed\\_MxwBNpNoSh3z8&index=3](https://www.youtube.com/watch?v=DzmURNBH0&list=PL8dPuuaLjXlOAKed_MxwBNpNoSh3z8&index=3)

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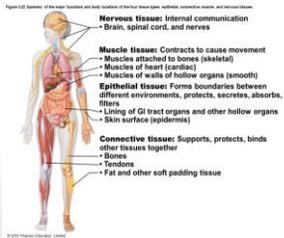
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**Tissue repair (wound healing)**

Tissue repair (wound healing) occurs in two ways:

- 1. Regeneration
- 2. Fibrosis

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**Tissue Repair (Wound Healing)**

Whether regeneration or fibrosis occurs depends on:

- 1. Type of tissue damaged
- 2. Severity of the injury

Clean cuts (incisions) heal more successfully than ragged tears of the tissue

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**Events in Tissue Repair**

Inflammation

Granulation tissue forms

Regeneration of surface epithelium

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**Regeneration of tissues**

- regenerate easily
- Epithelial tissue (skin and mucous membranes)
- Fibrous connective tissues and bone
- regenerate poorly
- Skeletal muscle
- replaced largely with scar tissue
- Cardiac muscle
- Nervous tissue within the brain and spinal cord

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**Developmental Aspects of Cells and Tissues**

Neoplasms, both benign and cancerous, abnormal cell masses in which normal controls on cell division are not working

Hyperplasia (increase in size) of a tissue or organ may occur when tissue is strongly stimulated or irritated

Atrophy (decrease in size) of a tissue or organ occurs when the organ is no longer stimulated normally

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**Any questions?**



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