

## **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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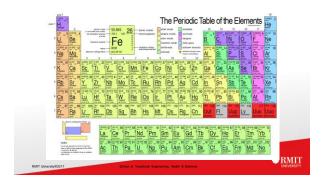
## Composition of Matter

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)





## **Subatomic Particles**

In the Nucleus

- Protons +ve
- Neutrons neutral

Orbiting the nucleus

• Electrons -ve

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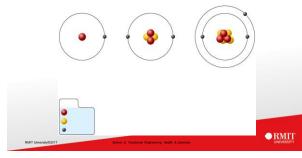
## **Subatomic Particles**

Atoms are electrically neutral

• Number of protons = numbers of electrons lons are atoms that have lost or gained electrons



## Atomic structure of the three smallest atoms.



## 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 th	hat enat	ole impulses t	to occur in th	ne body	
•Ca	K				
•Mg	Na				
•Cl					PMIT
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## Matter and Energy Forms of energy Chemical energy • Electrical energy Mechanical energy Radiant energy RMIT pН Concentration of hydrogen ions pH below 7 = acidic pH above 7 = basic/ alkaline Buffers—chemicals that can regulate pH change RMIT RMIT

Cells	
Cells are the structural units of all living things	
Most cells are composed of four elements:	
Carbon	
Hydrogen	
3. Oxygen	
4. Nitrogen	
Cells are about 60% water	
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Time for a Video	
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Introduction to Cells: The Grand Cell Tour  https://www.youtube.com/watch?v=8lizKii08kk	
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Anatomy of a Generalised Cell	
A cell has three main regions:	
1. Nucleus	
2. Cytoplasm	
3. Plasma membrane	
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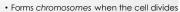
The	Nucleus



## The Nucleus

## Nucleoli

Nucleus contains one or more nucleoli
 Chromatin
 Contains DNA





## Plasma Membrane

Separates cell contents from surrounding environment

The state of the

## Cytoplasm



# Smooth endoplasmic Chromatin Nucleous Plasma nembrane Lysosome Mitochondrion Centrioles Microtubule Peroxisome Peroxisome Intermediate filaments Nucleous Plasma nembrane Rough endoplasmic reticulum Ribosomes Golgi apparatus Secretion being released from cell by exceptosis

## Cytoplasmic Organelles

## Mitochondria

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



## 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

## **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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## Endoplasmic reticulum (ER) • Smooth endoplasmic reticulum • Functions in lipid metabolism • Detoxification of drugs and pesticides

## **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



## Cytoplasmic Organelles



## 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=URUJD5NEXC8		
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Cell Extensions		
Surface extensions in some cells		
• Cilia		
- respiratory system		
• Flagella		
- sperm		
Microvilli		
- Small intestines	• RMIT	
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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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Calle the extra accordant has also as and	
Cells that connect body parts  • Fibroblast Photology Read Blad Gray	
Erythrocyte (red blood cell)	
-Nation Exploresyles (a) Calls that connect body parts	
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Epithelial cells	
Cells that cover and line body organs	
Epithelial cell	
Fyrithetial cells cells cells (Instruction Control of C	
(k) Call's that cover and time body organs	
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Skeletal and smooth muscle cells	
Cells that move organs and body parts ——	
Skeletal muscle	
and smooth muscle cells	
(c) Cells that more urgans and body parts	
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## Fat cells Cell that stores nutrients • Fat cells RMIT Macrophages Cell that fights disease • Macrophage RMIT Nerve cells Cell that gathers information and controls body functions • Nerve cell

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Reproductive cells	
Cells of reproduction	
Oocyte (female)	
• Sperm (male)	
• Sperm (male)	
Historia	
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Cell physiology	
Cen physiology	
Cells have the ability to:  Metabolize	
Digest food	
Dispose of wastes	
Reproduce	
• Grow	
Move     Respond to a stimulus	
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Membrane trasnport	
<u>Intracellular fluid</u>	
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)	
- common provide merapolic energy (Am)	
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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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Passive transport mechanisms	
Composis	
Osmosis—	
Isotonic solutions	· · · · · · · · · · · · · · · · · · ·
Hypertonic solutions     Hypertonic 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=la78MtF3C6M	
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to the state of th	
Passive processes	
Filtration	
Water and solutes are forced through a membrane by pressure      Mentional and the state of	
High to low pressure  Physical Processing  Company	
Gionentis	
Stores Art	
EMIT University COST State of Transport Index States 1	
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Active transport mechanisms	
Active transport	
transported by protein carriers     ATP energizes solute pumps	
<ul> <li>ATP energizes solute pumps</li> <li>In most cases, substances are moved against concentration (or</li> </ul>	
In most cases, substances are moved against concentration (or electrical) gradients	
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## Time for Video Cell Membranes and Cell Transport: Molecules like to Move it, Move it RMIT Active transport mechanisms • sodium-potassium pump • Sodium is transported out of the cell • Potassium is transported into the cell Active transport mechanisms Vesicular transport: substances are moved without actually crossing the plasma membrane • Exocytosis • Endocytosis • Phagocytosis Pinocytosis RMIT

## 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=i5tR3csCWYo&index=2&list=PL8dPuuaLjXtOAKed\_MxxW\_BNaPno5h3Zs8

## Tissues part 2 Epithelial Tissues #3

Vg&list=PL8dPuuaLjXtOAKed\_MxxWBNaPno5h3Zs8&index=3

Tissues, Part 3 - Connective Tissues #3

https://www.youtube.com/watch?v=DzmURNBH0&list=PL8dPuuaLjXtOAKed\_MxxWBNaPno5h3Zs8&index

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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)	
посое керия (мони печнид)	
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 fissue 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 eplaced largely with scar tissue	
Cardiac muscle	
Nervous tissue within the brain and spinal cord	
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Developmental Aspects of Cells and Tissues	
leoplasms, both benign and cancerous, abnormal cell masses in which normal controls on	
cell division are not working	
typerplasia (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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