

# **Cell Biology and Metabolism – 9<sup>th</sup> grade**

## **1. Introduction to Cell Biology**

- . Definition of Cells: The fundamental unit of life.**
- . Prokaryotic vs. Eukaryotic Cells: Key differences in structure and function.**
- . Cell Theory: All living things are made of cells, cells arise from pre-existing cells.**

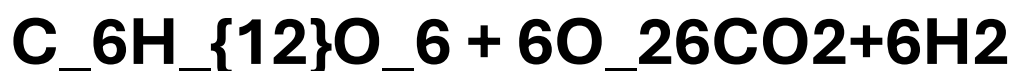
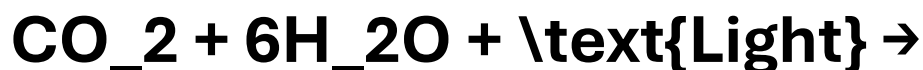
## **2. Advanced Cell Structure and Organelles**

- . Nucleus and Genetic Material: DNA storage and gene expression.**
- . Mitochondria and ATP Production: Role in cellular respiration.**
- . Endoplasmic Reticulum (Smooth & Rough): Protein and lipid synthesis.**
- . Golgi Apparatus: Modifies, sorts, and packages proteins.**
- . Lysosomes and Peroxisomes: Cellular digestion and detoxification.**
- . Chloroplasts in Plants: Structure and role in photosynthesis.**
- . Cell Membrane and Transport: Diffusion, osmosis, and active transport mechanisms.**

### **3. Photosynthesis and Energy Conversion**

- . Definition and Importance: How plants convert light into energy.**
- . Light-Dependent Reactions: Occurs in the thylakoid membrane, produces ATP & NADPH.**
- . Calvin Cycle (Light-Independent Reactions): Occurs in the stroma, forms glucose.**

- . Equation:**



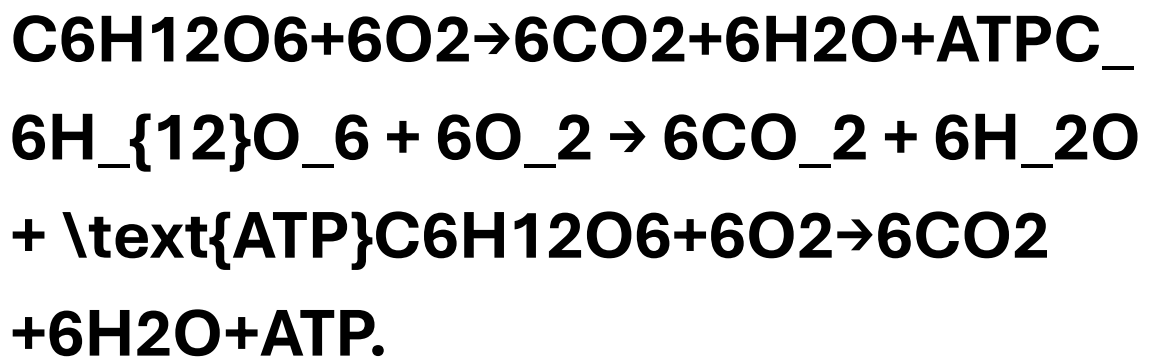
- . Factors Affecting Photosynthesis:  
Light intensity, CO<sub>2</sub> levels,  
temperature.**

#### **4. Cellular Respiration and ATP Production**

- . Definition: Process of breaking down  
glucose for energy.**
- . Glycolysis: Occurs in cytoplasm,  
glucose → pyruvate + ATP.**
- . Krebs Cycle: Occurs in  
mitochondria, produces energy  
carriers (NADH, FADH<sub>2</sub>).**
- . Electron Transport Chain: Uses  
oxygen to generate large amounts of  
ATP.**

- **Aerobic vs. Anaerobic Respiration: Differences in oxygen use and energy yield.**

- **Equation:**



## **5. Metabolism and Enzyme Regulation**

- **ATP: The Energy Currency: How cells store and use energy.**
- **Enzymes in Metabolism: Catalysts that speed up reactions.**
- **Feedback Inhibition: How cells regulate metabolic pathways.**

- . Fermentation: Lactic acid fermentation in muscle cells, alcoholic fermentation in yeast.**

## **6. Summary and Review**

- . Key Concept Recap: Cell structure, energy conversion, metabolic pathways.**
- . Q&A Session: Addressing student questions.**
- . Homework Assignment: Practice problems on photosynthesis, respiration, and metabolism.**

## **7. Assessment & Homework**

- . In-Class Quiz: Covering cell structure, metabolic pathways, and energy production.**

- . Homework Assignment: Solve problems on ATP synthesis, enzyme function, and cellular transport mechanisms.**