Cell Biology and Metabolism – 8th grade

1. Introduction to Cell Biology

- **Definition of a cell: The basic unit of life.**
- **Prokaryotic vs. Eukaryotic cells.**
- **Importance of cells in living organisms.**

2. Cell Structure and Organelles

- **Nucleus: Contains DNA, controls cell functions.**
- **Mitochondria: The powerhouse of the cell, produces ATP.**
- **Ribosomes: Help in protein synthesis.**

- **Chloroplasts: Found in plant cells, perform photosynthesis.**
- **Cell Membrane: Regulates what enters and leaves the cell.**
- **Cytoplasm: The fluid inside the cell that contains organelles.**
- **Cell Wall: Provides protection and structure in plant cells.**

3. Photosynthesis

- **Definition: Process by which plants make food using sunlight.**
- **Location: Occurs in chloroplasts.**
- **Reactants: Water, carbon dioxide, and light.**
- **Products: Glucose and oxygen.**
- **Equation: $6CO_2 + 6H_2O + \text{Light} \rightarrow C_6H_{12}O_6 + 6O_2$.**

4. Cellular Respiration

- **Definition: Process of breaking down glucose to produce energy (ATP).**
- **Location: Occurs in mitochondria.**
- **Reactants: Oxygen and glucose.**
- **Products: ATP, water, and carbon dioxide.**
- **Equation: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + ATP.**
- **Aerobic vs. Anaerobic Respiration: Oxygen required vs. no oxygen required.**

5. Metabolic Processes

- **Glycolysis: Breakdown of glucose into pyruvate (occurs in cytoplasm).**
- **Krebs Cycle: Occurs in mitochondria, generates energy carriers.**

- **Electron Transport Chain: Uses oxygen to generate ATP.**
- **Fermentation: Produces ATP without oxygen (e.g., in muscle cells).**
- **ATP (Adenosine Triphosphate): Energy currency of the cell.**
- **Role of Enzymes: Speed up metabolic reactions.**

6. Summary and Review

- **Recap of key concepts.**
- **Q&A session.**
- **Homework assignment: Practice problems covering cell biology and metabolism.**

Assessment & Homework

In-Class Quiz: Covering basic, medium, and advanced questions related to cell biology and metabolism. Homework: Solve practice problems on organelles, photosynthesis, respiration, and metabolic pathways.
