Cell Biology: A Brief Overview This document provides a basic introduction to cell biology, focusing on the distinctions between prokaryotic and eukaryotic cells. It begins by defining the cell as the fundamental unit of life and highlighting its essential components: cell membrane, cytoplasm, and genetic material. The text then differentiates viruses from cells, stating that viruses are acellular, lacking the structures and functions of a cell. They depend on host cells for replication and lack their own metabolism. The majority of the text focuses on prokaryotes, the earliest life forms on Earth. They are single-celled organisms lacking a distinct nucleus and membrane-bound organelles. Prokaryotes are further classified into archaea and bacteria, differing at the molecular level. Prokaryotic cells come in various shapes and arrangements, and their structure is detailed through transmission electron microscopy. The text emphasizes the constant elements, including the cell wall (composed of peptidoglycan), plasma membrane, cytoplasm, nucleoid, ribosomes, and polyribosomes. Optional elements include a capsule, plasmids, flagella, pili, fimbriae, chromatophores, gas vesicles, and endospores. Prokaryotes primarily reproduce through binary fission, where a single cell divides into two identical daughter cells. This rapid division leads to significant population growth. The final portion of the text shifts to eukaryotes, defined by their possession of a true nucleus and membrane-bound organelles. Eukaryotic cells are found in both single-celled (protists) and multicellular organisms (animals, plants, and fungi). They are typically larger and more complex than prokaryotes. The document concludes by examining animal and plant cells, highlighting their key differences, such as the presence of a cell wall and chloroplasts in plant cells. The text also discusses the unique case of red blood cells (erythrocytes), which are eukaryotic but lose their nucleus upon maturation, allowing for greater oxygen transport.