Questions related to the cell test your understanding of the differences between prokaryote and eukaryote cells as well as the various parts of a cell. You may be tested on your knowledge of cell reproduction, including the processes of mitosis and meiosis.

Let's get started in understanding how cells are important on the ATI TEAS.

**UNDERSTANDING CELLS AND LIFE**

Life takes many forms, from the simplicity of bacteria to the complexity of primates. According to cell theory, all living things are comprised of cells. Complex life forms have more cells and more complexity to their cell structure. Cell theory goes on to state that cells are the unit of function for organisms. They are responsible for life functions like digestion, circulation, reproduction, and immunity.
The life cycle depends on two different types of organisms, autotrophs and heterotrophs.

- **Autotroph** comes from the Greek language and means self-feeder. Autotrophs produce glucose through photosynthesis and feed themselves and other living beings. They are mainly plants.

- **Heterotrophs** get their nutrition from outside sources. The prefix *hetero-* means different. Animals eat plants and other animals to survive.

The cell structures of autotrophs and heterotrophs differ.

There are two basic types of cells that form the building blocks of all organisms, prokaryote and eukaryote cells.

- **Prokaryote cells** are simpler, having no nucleus and lacking some of the complex organelles of eukaryotes. Their DNA is not tightly contained as in a eukaryote nucleus. Prokaryote cells are represented in two types of organisms, bacteria and archaea. Most organisms in these two groups are just a single cell with a flagellum for movement. They replicate themselves through a process called binary fission in which they split apart, creating two exact copies of the same cell.

- **Eukaryote cells** are present in almost all of the abundance of life visible to the eye, from plants and animals to fungi and even some bacteria. They have membrane covered organelles, including a nucleus that holds the cell's DNA. They reproduce through either mitosis or meiosis.
A typical animal cell is filled with cytoplasm within a cell membrane. The cell membrane allows select substances (proteins, enzymes, and chemicals) to pass through while keeping others out. Resting in the cytoplasm are various organelles. Organelles serve to regulate the metabolic functions of the cell.

The nucleus is the control center of the cell and contains the nucleolus. The cell’s DNA is contained in the nucleus, and it delivers information to control the metabolic functions of the cell. The nucleus produces ribosomes. Ribosomes are found throughout the cell and synthesize proteins.

The mitochondrion is the energy center of the cell where glucose and oxygen are broken down into water and carbon dioxide. As a result of breaking these chemical bonds, energy in the form of adenosine triphosphate (ATP) is produced.
**UNDERSTANDING PARTS OF THE CELL**

The endoplasmic reticulum of a cell is a membrane where proteins, the building blocks of cellular life, are built and stored.

Rough endoplasmic reticulum has ribosomes attached, whereas smooth endoplasmic reticulum has none. Working with the Golgi complex, or Golgi apparatus, the endoplasmic reticulum assembles proteins and makes structures with those proteins.

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**UNDERSTANDING PARTS OF THE CELL**

Centrioles are organelles that assist in cell reproduction, either mitosis or meiosis.

Lysosomes capture the products of cellular function that the cell cannot use. They break down this cellular waste.

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**UNDERSTANDING PLANT CELLS**

Plant cells are similar to animal cells in the most respects. They have all the same organelles, but they also have a cell wall and contain chloroplasts. Chloroplasts are organelles that aid in photosynthesis, through which plants use water, carbon dioxide, and the sun's energy to create glucose and oxygen.

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Cells proliferate in two ways, through mitosis or meiosis. Mitosis is the way that cells proliferate through a sexual reproduction. In mitosis, cells reproduce an exact copy of themselves. Meiosis is how cells reproduce through sexual reproduction. In this case, each daughter cell has half of the DNA of the original cell. In sexual reproduction, the daughter cells combine with such cells from another individual to form offspring, leading to genetic variation.

**Understanding Mitosis**

Mitosis occurs when a cell duplicates itself. This can happen in single-cell organisms, like protozoa or bacteria, and is how they reproduce. It also happens in other living organisms when they grow or heal. New cells are created with the same DNA as the original cells. When more cells are needed or a sexual stimulus is introduced, chromosomes and centrioles are replicated.

**Prophase** is the first phase of mitosis. In this phase, the nuclear membrane dissolves, allowing the doubled chromosomes to float freely. Spindle fibers congregate around structures known as centrosomes to produce a spindle apparatus, which separates the floating DNA into separate poles.

**Metaphase** sees an orientation of the spindle apparatus, drawn by the centrosomes, to push the DNA to opposite ends of the cell. During **anaphase**, spindle fibers retract, again influenced by the centrosomes, pulling apart chromosomes into their v-shaped halves.
UNDERSTANDING MITOSIS

Telophase ushers in a reversal of previous processes, with spindle fibers dissolving and nuclear membranes forming around the new chromosome pairings. At this point mitotic division is all but complete.

After telophase, the two daughter cells undergo cytokinesis. This is a simple process in which the two nuclei are divided by cell membranes. There are now identical twin cells with the same DNA ready for interphase.

UNDERSTANDING MEIOSIS

Meiosis is a more complex process than mitosis. Cells in meiosis go through two rounds of prophase, metaphase, anaphase, and telophase. These two stages are called meiosis I and meiosis II.

Prophase I is similar to mitotic prophase in that the nuclear membrane disappears, allowing chromosomes from each parent to mingle. In this case, chromosomes perform a crossing-over in which similar chromosomes from each parent bundle together. An allele from one parent may replace an allele from another, causing genetic variation.

Metaphase I, anaphase I, and telophase I mimic their mitotic counterparts. The new chromosomal pairings, called tetrads, migrate, and cytokinesis begins creating two diploid cells containing a full, but unique, complement of mixed DNA (46 chromosomes in human). These two daughter cells then begin the process of meiosis II.
UNDERSTANDING MEIOSIS

Prophase II, metaphase II, anaphase II, and telophase II mirror the previous process. Centrosomes and spindle fibers push apart chromosomes. When the spindle fibers retract, chromosomes are pulled apart. When telophase II begins, each daughter nucleus has only one of each pair of chromosomes (23 chromosomes rather 46 in humans). The result is four haploid cells, or gametes.

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