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**BASIC MICROBIOLOGY**

# Mid term Assignment

## Subject: Basic Microbiology

### MLT 2nd ( summer semester)

### Instructor: M Sohail

#### Question No:1

**Explain prokaryotic and Eukaryotic cell. Write down some similar features of prokaryotic and eukaryotic cells?**

#### **Prokaryotic Cell:**

Prokaryotic cells are cells that don't have a real nucleus or membrane-bound organelles. Organisms within the domains Bacteria and Archaea have prokaryotic cells, while other sorts of life are eukaryotic. However, organisms with prokaryotic cells are abundant and structure much of Earth's biomass.

#### **Explanation:**

All of the reactions within a prokaryote, therefore, happen within the cytoplasm of the cell. While this makes the cells slightly less efficient, prokaryotic cells still have a remarkable reproductive capacity. A prokaryote replicates through binary fission, a process which basically splits duplicated DNA into separate cells. Without any organelles or complex chromosomes to breed, most prokaryotic cells can divide every 24 hours, or maybe faster with an adequate supply of food.

While many prokaryotic cells have adapted to free-living within the environment, more have adapted to measure within the gut of other organisms. These commensal organisms survive by breaking down molecules inside the gut and allow the organism they are living within the ability to digest a wider variety of foods. For example, the human gut contains 2-3 pounds of bacteria, which have evolved to assist us digest complex carbohydrates, proteins, and fats.

#### **Examples:**

Prokaryotes are blue-green algae, bacteria and mycoplasma. Among prokaryotes, bacteria are the foremost common and multiply in no time .

#### **Eukaryotic Cells:**

Eukaryotic cells are cells that contain a nucleus and organelles, and are enclosed by a cell wall . Organisms that have eukaryotic cells contain protozoa, fungi, plants and animals.

## **Explanation:**

A eukaryote is an organism whose cells contain complex structures walled within membranes. Eukaryotic cells have an organized nucleus with a nuclear envelope. They have a "brain" for the cell. They have a discreet area where they keep their DNA. It is also said that they have a "true nucleus." Although limited in size, eukaryotic cells can get very large. There are even some extreme examples called plasmodial slime molds which will be a meter wide. Eukaryotic cells have organelles and arranged DNA so, they're ready to create parts. One example is that the flagellum (a tail-like structure to assist it move).

## **STRUCTURE:**

### **1. External Structures :**

- Flagella
- Cilia
- Glycocalyx
- Cell – Wall
- Cytoplasmic Membrane

### **2. Internal Structure:**

- Nucleus Control Center
- Endoplasmic Reticulum:

### **A Passageway into the Cell:**

- Golgi Apparatus:

A Packaging and Distribution Machine:

- Lysosomes
- Vacuoles
- Mitochondria:

### **Energy Generators of the Cell:**

- Chloroplasts:

Photosynthesis Machines:

- Ribosome:

Protein Synthesizers:

- Cytoskeleton

### Similarities:

<u>Prokaryotic cell</u>	<u>Eukaryotic Cell</u>
Prokaryotic cells do not contain these membrane-bound organelles.	Eukaryotic cells contain many membrane-enclosed, large, complex organelles in the cytoplasm
Prokaryotes has no membrane-bound nucleus	Eukaryotes possess a membrane-bound nucleus
Prokaryotes has no membrane-bound organelle	Eukaryotes possess a membrane-bound organelles such as mitochondria, golgi apparatus, lysosomes, peroxisomes and endoplasmic reticulum.



### **Question No:2**

**What is the role of microscope ? Write down types of microscopes ?**

#### **Role Of Microscope:**

The microscope is one among the foremost important tools utilized in chemistry and biology. This instrument allows a scientist or doctor to magnify an object to seem at it intimately . Many types of microscopes exist, allowing different levels of magnification and producing different types of images.

#### **Type of microscope**

- 1) Simple Microscope
- 2) Compound Microscope
- 3) Electronic Microscope
- I) SEM (Scanning Electron Microscope)
- II) TEM (Transmission Electron Microscope)

#### **1) Simple Microscope:**

A simple microscope is one that uses one lens for magnification, like a hand glass while a light microscope uses several lenses to reinforce the magnification of an object.

#### **2) Compound Microscope:**

A light microscope is an upright microscope that uses two sets of lenses (a lens system) to get higher magnification than a stereo microscope. A light microscope provides a two-dimensional image, while a stereo microscope provides a three-dimensional image

### 3) **Electron Microscope:**

An electron microscope may be a microscope that uses a beam of accelerated electrons as a source of illumination. As the wavelength of an electron is often up to 100,000 times shorter than that of light photons, electron microscopes have a better resolution than light microscopes and can reveal the structure of smaller objects. A scanning transmission microscope has achieved better than 50 pm resolution in annular dark-field imaging mode and magnifications of up to about 10,000,000× whereas most light microscopes are limited by diffraction to about 200 nm resolution and useful magnifications below 2000×.

#### i) **SEM (Scanning Electron Microscope)**

The SEM produces images by probing the specimen with a focused beam that's scanned across an oblong area of the specimen (raster scanning). When the beam interacts with the specimen, it loses energy by a spread of mechanisms. The lost energy is converted into alternative forms like heat, emission of low-energy secondary electrons and high-energy backscattered electrons, light emission (cathodoluminescence) or X-ray emission, all of which provide signals carrying information about the properties of the specimen surface, like its topography and composition. The image displayed by an SEM maps the varying intensity of any of those signals into the image during a position like the position of the beam on the specimen when the signal was generated. In the SEM image of an ant shown below and to the proper, the image was constructed from signals produced by a secondary electron detector, the traditional or conventional imaging mode in most SEMs.

#### ii) **TEM (Transmission Electron Microscope)**

The original sort of the microscope, the transmission microscope (TEM), uses a high voltage beam to illuminate the specimen and make a picture. The beam is produced by an electrode, commonly fitted with a tungsten filament cathode because the electron source. The beam is accelerated by an anode typically at +100 keV (40 to 400 keV) with reference to the cathode, focused by electrostatic and electromagnetic lenses, and transmitted through the specimen that's partially transparent to electrons and partially scatters them out of the beam. When it emerges from the specimen, the beam carries information about the structure of the specimen that's magnified by the target lens of the microscope. The spatial variation during this information (the "image") could also be viewed by projecting the magnified electron image onto a fluorescent viewing screen coated with a phosphor or scintillator material such as zinc sulfide. Alternatively, the image are often photographically recorded by exposing a film or plate on to the beam, or a high-resolution phosphor could also be coupled by means of a lens optical system or a fibre optic light-guide to the sensor of a camera. The image detected by the camera could also be displayed on a monitor or computer.



### **Question No:3**

**Explain the differences in prokaryotic and eukaryotic cell in detail ?**

<b>Prokaryotes</b>	<b>Eukaryotes</b>
Most of them are very small size . some are larger than 50um.	Most are large cell (10-100um). Some are larger than 1mm.
All are microbes. Unicellular or colonial. The nucleoid is not membrane bound.	Some are microbes, most are large organism. All posses a membrane bound nucleus.
No mitosis or meiosis. Manly by binary fusion or budding.	Mitosis and meiosis types of cell division occur.
Sexual system is absent in most forms, when present in unidirectional transfer of genetic material from donor to recipient.	Sexual system is present in most forms, equal male and female participation in fertilization.
No Multi cellular development from diploid zygotes. No extensive tissue differentiation.	Haploid forms are produced by meiosis and diploid from zygotes. Multicellular organism show extensive tissue differentiation.
Some have simple bacterial flagella composed of only one fibril.	Flagella are of 9+2 types.
Cell wall made up of peptidoglycan (mucopeptide) cellulose is absent	Cell wall is made up of cellulose in plants and chitin in fungi.
Membrane bound organelle such as ER golgi complex, mitochondria, chloroplast and vacuoles are absent.	Membrane bound organelle such as ER golgi complex, mitochondria, chloroplast and vacuoles are present.
Ribosomes are smaller made of 70s unit (s refer to Svedberg unit, the sedimentation coefficient of a particle in an ultracentrifuge).	Ribosomes are larger made of 80s unit
Genetic material (DNA) in not found in well-organized chromosomes.	Genetic material (DNA) is found in well-organized chromosomes.

