## Quadrant II – Transcript and Related Materials

**Programme: Bachelor of Science (First Year)**

**Subject: Zoology**

**Paper Code: ZOC 101**

**Paper Title: Diversity of Non-Chordates and Cell Biology**

**Unit: 13**

**Module Name: Nuclear envelope and Nucleoplasm**

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# NUCLEUS

It is the characteristic feature of eukaryotic cells. The nucleus has genetic material and controls the various activities of the cell. It is found in the cells of fungi, plants and animals.

The nucleus comprises of the following components:

1. Nuclear envelope
2. Nucleoplasm
3. Chromatin fibres
4. Nucleolus

## NUCLEAR ENVELOPE

The nuclear envelope separates the nucleus and its components from the surrounding cytoplasm. It is made up of two membranes – the inner nuclear membrane and the outer nuclear membrane. The two membranes are separated by a space called the perinuclear space which is filled with fluid and is continuous with the lumen of the endoplasmic reticulum.

- ***Inner nuclear membrane***
  This membrane contains special proteins that act as binding sites for nuclear lamina. The nuclear lamina is a fibrous sheath of intermediate filaments that provide support to the nuclear membrane. The nuclear lamina is in contact with the chromosomes and nuclear RNAs.

- ***Outer nuclear membrane***
  This membrane surrounds the inner nuclear membrane and is continuous with the lumen of the endoplasmic reticulum. It is studded with numerous ribosomes that are involved in protein synthesis.

The nuclear envelope is perforated by numerous pores called the nuclear pores. Each nuclear pore is made up of a nuclear pore complex (NPC) that acts as a channel for transport of substances. The nuclear pores are responsible for the import of proteins and export of mRNA, rRNA and tRNA.

## NUCLEOPLASM

The space between the nuclear envelope and the nucleolus is filled a fluid called the nucleoplasm. It is also known as nuclear sap or karyolymph (karyon-nucleus; lymph - fluid). The fluid is transparent, semi-solid and granular.

Chemical composition of nucleoplasm:

1. Nucleic acids- the nucleic acids may be in the monomeric form (nucleotides) or macromolecular (DNA and RNA) form.

2. Proteins- the nuclear proteins are of two types-basic proteins and acidic proteins.

- *Basic proteins*: absorb the basic stains.
  Example -nucleoprotamines, nucleohistones

- *Acidic or Non-histone proteins*: they absorb the acidic stains and are found in the nucleoplasm or in the chromatin.
  Example – phosphoproteins

3. Enzymes- the nucleoplasm contains many enzymes that are required in the synthesis of DNA and RNA.
   Example – DNA polymerase, RNA polymerase, pyruvate kinase

4. Lipids- a small amount of lipid is present in the nucleoplasm.

5. Minerals- many inorganic substances like phosphorus, sodium, potassium, calcium and magnesium are present in the nucleoplasm.