

Hello students, my name is Doctor Sapna
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Today we are going to continue
with Unit 4 that is cell cycle.

Under this we are going to
study today the meiosis process.

Now what are you going to learn
in this particular module?

Is the significance of meiosis the
Different stages of this particular
Process and its applications.

At the end of this particular module,
each one of you will be able to

Explain the significance, importance,
or the purpose of meiosis and
also elaborate on the different
stages in this process.

Now, let us first understand what is meiosis.

It is nothing but.

A type of cell division in sexually

Producing eukaryotes which finally

gives you four daughter cells

which we also called us gametes.

Each one of this daughter cell will

Have half the number of chromosomes

as compared to the original parent.

The parent will always be

diploid form and the daughter

cell will have the haploid form.

So if the parent is $2N$,

the daughter cell will be

N number of chromosomes.

The different features which are very

important of meiosis process, are that.

These haploid gametes or cells.

They become gametes by the Union with

another haploid cell during fertilization,

which defines sexual reproduction,

and it will form a new generation

of diploid organisms.

It also occurs in germ cells of

sexually reproducing organisms,

and you will find this reproduction

process in plants as well as animals.

Now coming to the importance of meiosis.

Is that it helps to maintain a

constant number of chromosomes in

sexually reproducing organisms because

of the formation of these gametes,

since there will be crossing over

taking place in this particular process,

the genes will be exchanged and

therefore there will be a lot of genetic

Variations in the newly formed Organism.

This will therefore also help

In the evolutionary process.

Now let us see one by one the

Different stages of meiosis.

Now let us first try and understand

that meiosis is the process which is

composed of two rounds of cell division.

So that is meiosis one and

that is meiosis two.

In each of these round of division

there will be a process wherein there

will be nuclear division taking

place which is also called as karyokinesis

and there will be cytoplasmic

division taking place and also labeled

as cytokinesis in the slide.

You can see this in meiosis one

as well as meiosis 2.

All the diagrams for the same.

Now let us see each of the stage in detail,

starting with the interface we

have discussed about interphase

in your last module of mitosis,

will just quickly revise this.

There is G1 phase or the gap one phase,

the G2 phase,

or the second gap phase and there

is synthesis phase in interphase,

so the G1 phase,

which is also known as the growth phase

where the cell prepares itself for.

Cell division the synthesis phase

is the phase where the DNA starts

getting synthesized and the G2

phase is seen just before mitosis.

But this is totally absent

in case of meiosis,

the meiotic prophase stage will

correspond more closely to the G2

phase of the mitosis cell cycle.

Now let us see the first stage of meiosis,

that is, meiosis one under that the 1st.

Say this prophase one.

This is regarded as the longest

stage of meiotic division,

and it is made up of different sub stages,

like leptotene, zygotene, pachytene,

Diplotene and diakinesis is,

in prophase one,

you will find that the chromosomes condense,

even the nuclear envelope will breakdown,

and the crossing over will occur.

The second phase is the metaphase one.

Metaphase one basically contains

spindle fibers to which the

chromosomes will attach and they

will align themselves at the equator.

As you can see also in the diagram.

That plate is also called as the metaphase plate

during this phase one the

spindle fibers are attached with the

centromeres of the Homologous chromosomes,

and these are directed

towards the opposite poles.

Next is the anaphase one.

In this particular phase,

you will find that the

Homologous chromosomes.

They moved to the opposite

poles of the cell's.

This happens due to shortening

of the chromosomal fibers.

Each of the Homologous chromosome

with its two chromatids,

an undivided centromere,

will start moving towards

opposite poles of the cell,

and these are not genetically identical.

Also, the next phase is the telophase one.

you will see the movement

of the haploid chromosomes at each of the pole.

It's very much evident even in the

diagram that you can see on the slide.

The nuclear envelope is formed around

the chromosomes and the chromosomes

will uncoil themselves.

Also the nucleolus will reappear,

and the two daughter nuclei will be formed.

The cytokinesis.

In case of animals will occur due

to the formation of a constriction

of the cell membrane.

But in case of plants,

The formation of a cell plate will

take place wherein there will be

division of both the daughter cells.

Now let us move to the second round

of cell division of meiosis process.

That is meiosis two.

So the first stage in meiosis

two is the prophase two.

Here each centriole will divide,

resulting in two pairs of centrioles,

which will move in the opposite direction.

To the opposite poles and the nuclear

envelope membrane and nucleolus.

Everything will disappear.

Next is a metaphase two,

where the chromosomes will get

Arranged on the equator of the

cell through the spindle fibers.

The centromere also will divide over

here such that each chromosome has

got two daughter chromosomes and the spindle apparatus is attached to the centromere of each of the chromosome.

As you can see in the diagram also.

Next is your anaphase 2 and telophase two happening little simultaneously.

The daughter chromosomes they move towards the opposite poles as you can see because

The chromosomal microtubules will start shortening and there will be stretching also taking place towards the spindle.

The Chromatids will migrate to the opposite poles now which you can call as the chromosomes and the endoplasmic reticulum will form the nuclear envelope.

Around that chromosome.

Now your nucleolus will also reappear because there will be synthesis of RNA or the ribosomal RNA.

This was all about meiosis process.

Now let us see some of the

applications of this process.

You can find its application in tissue culture because you need to generate variation using different AIDS and studying the evolutionary process.

There will be also invitro gamete

Formation that is invariant,

Gamete failure, direct infertility issues.

The embryonic stem cells are

differentiated into germ like

cells through the meiotic division,

and these gametes are formed in

with true via meiosis process.

These can be inserted into the individuals

with different types of disorders.

All this matter was taken

from these references.

I want all of you to go through all of this.

Read more and update yourself.

Thank you.