Lesson 2 Observation transcript

Teacher A Eliajh

**Teacher:** So Grade 10, yesterday we started the phases of mitosis, and we discussed the

one before cell division, which is interphase and we discussed prophase. So

now, you must understand this one thoroughly because it will have a bearing

on what we do in Grade 12. Because Grade 12 is where we are going to

discuss meiosis in detail, so if you understand mitosis it will be easy for you to

understand meiosis in Grade 12. So the next phase after the prophase is

metaphase. But just before we go to metaphase, let us have a recap. Can you

tell me some of the things that occur during prophase. One, is prophase, the

one we discussed yesterday.

**Learner 1:** The nuclear membrane disappears.

**Teacher:**  Yea, the nuclear membrane disappears, correct.

**Learner 2:** The centrioles move to opposite poles

**Teacher:**  Yes, the centrioles move to opposite poles, so at this stage, the centrioles move

to the opposite poles. Remember the chromosomes are scattered all over the

cytoplasm without any order. Now, during metaphase, they will organize

themselves and align themselves along the equator (the teacher draws a

structure of a cell on the board). They line themselves along the equatorial

region. The centrioles produce structures that look like strings. But we don’t

call them strings, we call them spindle fibres, so these are spindle fibres. That

attaches to the homologous chromosomes like that. (Teacher adds spindle

fibres to the chromosomes and show attachment to the chromosomes ). So

they align themselves along the equator or equatorial region if you like. So

spindle fibres are attached to them, and now that is metaphase. So the

characteristics of the metaphase are, homologous chromosomes are aligned at

the equator, then spindle fibres are produced that attach to them. From there

then the next phase is what? Which one is the next one?

**Learners:** Anaphase

**Teacher:** Anaphase! Now during anaphase (the teacher draws a cell in anaphase) what

happens in this phase is, spindle fibers start shortening. Rember, they are

connected to the centromere of the homologous chromosomes, right? So what

happens when they start shortening? What happens? They pull the chromatids

apart, taking the chromosomes away from each other. They pull them apart,

and the chromatids are now being separated, so that one goes to the other end

and the other goes to the other pole. So they are being pulled to the two poles

of the cell during anaphase. So here it doesn’t matter whether they are just

here or they have been pulled up to here (the teacher points at the diagram on

the board). As long as the chromosomes have been separated, that phase is

anaphase. Being pulled by the spindle fibres. Now, here, you can be asked to

label. Now let us try to look at these two diagrams and do a comparison of the

events/occurrences. All right, after anaphase, which is the next phase now?

**Learners:** Telophase **(chorus)**

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**Teacher:** Telophase, very good. I will draw that one on this side (the teacher draws the

structure of a cell on the board). Now during telophase, a number of things

happen. So now during telophase, homologous chromosomes have separated

and they have arrived at the opposite ends of the cell, the opposite poles. So

you are going to have chromosomes here and chromosomes here (the teacher

draws chromosomes at opposite poles). Now, from here you can see that the

chromosomes have separated into 2 giving you an impression that how many

cells will form.

**Learners:** (silence)

**Teacher:** Okay 6? 6 cells will form from there or 4 or 5 or 7?

**Learners:** (silence)

**Teacher:** What is the main aim of cell division, is it not to distribute chromosomes

evenly, so that the number is equal in the daughter cells? Isn’t that what we

said? So now here we have chromosomes being separated, homologous

chromosomes being separated. Remember there was replication first. So now

they are separated, they have arrived at opposite poles of the cell. We have a

set of chromosomes here and we have a set of chromosomes there. So my

question, therefore, is what impression does it tell you about the number of

cells that will form? How many cells do you think will form?

**Learners:** 2

**Teacher:** Huh? From there, how many cells do you think are going to form from this

cell division?

**Learners:** 2

**Teacher:** Raise up your hand, yes you want to answer? How many cells from what you

can see there and we are not going to move until you give me the answer.

**Learners:** 2

**Teacher:** Yes?

**Learner1:** Sir, 2

**Teacher:** Yes, 2. 2 cells will form, you can see because obviously, there is no, didn’t we

discuss that once you remove the nucleus from the cell, no cell division will

take place because you will have removed the genetic material, you will have

removed the chromosomes that are supposed to actually control cell division.

How the chromosomes are going to move and actually form the cell. So now

as you can see here that now we have 2 separate groups of chromosomes, so

this is the starting point in the formation of the 2 cells, then obviously now the

next step is the cell will start constricting (the teacher draws a structure of a

cell on the board, constricting on the sides). Okay, the cytoplasm, the

membranes start constricting until they constrict so much that each one

becomes a cell. Right? So then you have 2 cells. Next, the nuclear membrane

will start to form around each of the cells. With the nuclear pore, remember we

discussed the nuclear membrane that has openings called nucleopores. So then

we have the nuclear membrane forming, so this cell may not divide,

immediately or so. They may or they may not divide. Now I want us to take

the route of these cells not dividing. I want us to think together, I am saying

that now we are going to have 2 cells so these cells are now going to be fully

fleshed cells, so a number of things are going to happen to make each one of

those cells a cell. One of those things is that the nuclear membrane now

develops around the chromosomes. Remember the nuclear membrane had

disappeared, but now the cells are formed so now the nuclear membrane will

develop around nuclear material. Now I want you to think about it if this cell

is not going to immediately divide, each one of them, what is going to happen

in the chromosomes? Please don’t tell me that they will disappear. Because

they don’t, what, think about it what do you think will happen to the

chromosomes? What will happen to them? Okay, let me give you a bit of time

What do you think will happen to the chromosomes? The cells are not going to

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divide, let's take just 1 of them, it’s not going to divide, what will happen to

the chromosomes? Please don’t check the books.

**Learner1:** They will add up again

**Teacher:** They will replicate? meaning that they will double up?

**Learner 1:** Yes.

**Teacher:** They will only double up under what circumstance? Huh? Yea, he is saying

that. I am saying this cell is not going to divide, right? But he is saying that

one of the things that will happen to the chromosomes is that they will double

up in number. So in other words, replication will take place. Then I am saying,

Okay first of all let me ask like this, do you agree with him?

**Learners:** Yes **(chorus)**

**Teacher:** Okay, if you agree with him, we discussed the circumstance under which the

chromosomes replicate, under which they double up. What is that? What is the

condition under which the chromosomes double up? Where they become more

number, when the cell is what? You seem like you are thinking very hard, give

us the answer.

**Learners:**

**Teacher:** Okay, didn’t I say that replication takes place during interphase? Didn’t I tell

you that? And then I told you that the interphase is a preparatory stage before

the cell starts to divide. So a cell does not go into interphase unless it is going

to divide. So I am saying, okay fine, if it was going to divide it was going to

go through interphase… I am saying it is not going to divide it has reached its

destination. Oh, by the way, I must also mention this, specialized cells do not

divide, cells that are specialized to perform a specific function, generally, they

do not divide. But now I am not saying this is a specialized one, it is just a

cell. I am just saying it is not going to divide, what happens to the

chromosomes? And also remember there was only 1 centriole here and 1 here.

so obviously there is now going to be one here and one somewhere there. (The

teacher points at the structure of the centriole on the board). So what will

happen to the centriole? Yes!

**Learner 1:** The chromosomes will move away from the equator.

**Teacher:** You are talking about the centrioles or the chromosomes? Which ones are you

talking about?

**Learners:** The chromosomes.

**Teacher:** The chromosomes, you are saying they will move away from the equator?

**Learner 1:** Yes.

**Teacher:** Now, there are people here who have never answered even a single question.

Yes!

**Learner 2:** Will have, isn’t this thing the… er

**Teacher:** Yes the centriole

**Learner 2:** They will disappear.

**Teacher:** They will disappear? No please raise up your hand.

**Learner 3:** They will die

**Teacher:** They will die? Yes!

**Learner 4:** They will move to the equator.

**Teacher:** You see we start talking about the equator when the cell is dividing.

Basically, usually. Okay fair enough looking at it you can that is the south

pole this is the equator or whatever, but we usually refer to it, but however,

what is going to happen is they will replicate and be 2 because they’ll be

needed when it starts dividing to move to the opposite poles of the cell. but my

question still remains what happ.. no that one was an easy one, I was

expecting you to know because you are supposed to have 2. 1 will go on this

pole the other one will go on the other pole. But my question still remains

what do you think happens to the chromosomes? Yes!

**Learner 5:** Sir chromosomes will not be distributed evenly amongst the cells.

**Teacher:** No. They’ve already been distributed evenly amongst, if this is a human, then

remember we said during replication we said they became 92 so if this is a

human, each would have 46 chromosomes. So they have been distributed

equally. And we started with a mother cell which also had how many

chromosomes? 46. So that is maintained. Now what happens, they are already

46 inside there, what do you think will happen to them?

**Learner6:** Decrease

**Teacher:** They will decrease? I don’t understand that statement. Okay, I don’t you

discussing as long as you are sharing ideas about this, if you are talking about

something else then we will have a problem. Okay, let me give you… don’t

open the books. Okay, let me give you a clue x2, let me give you an idea.

What did we say chromosomes are like before the cell enters interphase to

prepare for cell division. That is how they will be. Huh? We said, we described

chromosomes before the cell starts dividing actually before it enters interphase

to prepare for cell division, so they go back to that. So they will be what?

**Learner 7:** They’ll be like a snake.

**Teacher:** They'll be like a snake?

**Learner8:** Chromatin network

**Teacher:** Yes, they are going now to turn into a chromatin network. Stop saying you

knew the answer, you didn’t. So they are going to do, remember during the

interphase when the cell is going to divide, they coil and become shorter and

thicker. So they uncoil now, become slim, if you, they become string-like. And

they form what is known as the what? The chromatin

**Learners:** Networks **(chorus)**

**Teacher:** So if you are looking at the cell which is not dividing, you can’t label

chromosomes. Youll label what, chromatin

**Learners:** Networks **(chorus)**

**Teacher:** Which then, if that cell now is going to divide, is going to undergo mitosis,

then it goes into interphase then the chromatin network now becomes what

chromosomes. The chromosomes are formed and then the process starts all

over again so that is what happens to the chromosomes after cell division.

Now if you add dye to the cell at that stage the chromosomes won’t easily be

seen. They can only easily be seen after they have changed from chromatin

network into chromosomes. Do we all understand?

**Learners:** Yes **(chorus)**

**Teacher:** So, the cell now. We have already identified and said that 2 cells will form

during mitosis. 2, not more than 2, from 1 mother cell 2 cells are formed.

Again, the number of chromosomes and genetic material is maintained. Is

maintained, As I said this mitosis is used by some unicellular organisms,

organisms that are 1 cell, they use it as a form of what? Reproduction. Where

you have 1 organism as a cell and it divides to form 2 cells and thus 2

organisms. But from, talking about humans we again discussed that human

beings. Human beings reproduce sexually, so there is a, there are 2 gametes,

the spermatozoa fertilizing the ovum, they form a what?

**Learners:** Zygote

**Teacher:** Zygote. Yes. And the zygote starts multiplying. The zygote is a cell so it starts

multiplying, 2, 4, and so on and so forth by mitosis. And once you have

enough cells, they start forming organs and all that, and then the organism

forms.