Teacher C: Observation transcript

Lesson 1

**Teacher:** Today we are starting a new topic, we will talk about the cell cycle and

mitosis. There is a term that you are used to, cells, what into your mind when

you see the word cells? We have just done cells, right? how did we define

cells? Or how would you define cells?

(initiation move, open-ended question)

**Learner 1:**  They are the basic unit of life (lengthy)

**Teacher:** Okay, another one, thank you

**Learner 2:** The tiny building blocks of living organisms (lengthy)

**Teacher:** He says, he defines cells as the tiny building blocks of living organisms. Is

there anyone with a different definition? None! Okay, but we already know

that every living organism is made up of cells and we also drew structures of

both plant and animal cells. So, when we say every living organism is made up

of cells, like you for example, since you are a living organism, you are

made up of cells, but now, you’re a large organism, you we not born large…

now we will establish what happened in order for you to be big or grown. You

started as a small and young organism and cell division occurred, then you

grew tall and big. So this is what we will be trying to unpack, “How do cells

divide so that organisms can grow”. Since you were formed from the sperm

and the ovum, once the fusion occurred, one cell was formed, and that cell

underwent mitosis until you became this grown. So that means we are here to

Looking at the cycle of a cell, defining this we would say; it is a series of

events that take place in the cell and it leads to the division and duplication of

a cell. Now when they say cycle, it means that this process will keep

occurring. Right so let us look at a basic structure of a cell, you tell me what to

expect on a basic structure of a cell. The basic structure of the cell reminds me

before we get into the cell division process.

**Learner 1:** Cell membrane (short/limited)

**Teacher:** Cell membrane

**Learner 2:** Nucleus (short/limited)

**Teacher:** She says nucleus (eliciting and acknowledging rejoinder move- affirming)1,

someone remind me, what do we call the membrane that surrounds the

nucleus? (extending rejoinder move- asking an extended question3)

**Learner 3:** Nuclear membrane (short/limited)

**Teacher:** Nuclear membrane (eliciting and acknowledging rejoinder move- affirming)1,

right? What do you expect to find inside the nucleus?

(extending rejoinder move- asking an extended question3)

**Learner 4:** Cytoplasm (short/limited)

**Teacher:** Cytoplasm? (clarifying rejoinder move- requesting clarification)2

What do others say?

**Learner 5:** Nucleoplasm (short/limited)

**Teacher:** Nucleoplasm (eliciting and acknowledging rejoinder move- affirming)1,

which one is the nucleoplasm again?

(extending rejoinder move- asking an extended question3)

**Learner 6:** Nucleopores (short/limited)

**Teacher:** Right, what is the membrane of the nucleus called?

(extending rejoinder move- asking an extended question3)

**Learners:** Nuclear membrane (short/limited)

**Teacher:** Right, with nucleopores,

(eliciting and acknowledging rejoinder move- affirming)1okay,

what else do we find in the nucleus?

(extending rejoinder move- asking an extended question3)

**Learner 7:** Chromatin network (short/limited)

**Teacher:** Yes, chromatin network,

(eliciting and acknowledging rejoinder move- affirming)1what else?

**Learners:** Nucleolus (short/limited)

**Teacher:** Nucleolus, (eliciting and acknowledging rejoinder move- affirming)1

and then the fluid, what do we call the fluid?

(extending rejoinder move- asking an extended question3)

**Learner 8:** Nucleopores (short/limited)

**Teacher:** Nucleopores? (eliciting and acknowledging rejoinder move- affirming)1

**Learners:** Nucleoplasm (short/limited)

**Teacher:** Nucleoplasm, and then my question initial was, what do you expect to find in

a basic structure of a cell? You have mentioned the cell membrane, the

nucleus, what else are you expecting?

(extending rejoinder move- asking an extended question3)

**Learner 1:** Chromatin network (short/limited)

**Teacher:** No!, I’m talking about a basic structure of a cell, not inside a nucleus.

**Learner 2:**  Mitochondrion (short/limited)

**Teacher:** Mitochondrion, and what else

**Learners:** Cytoplasm (short/limited)

**Teacher:** Cytoplasm, right? We will stop here with the basic structure of a cell. When

you are asked to draw a basic structure of a cell, you will be expected to draw

such a diagram. But our main focus today will be on this organelle (teacher

points at the structure of the nucleus on the board), what is this organelle

called again?

**Learners:** Nucleus

**Teacher:** Yes, we are going to focus on the nucleus, so what we find inside the nucleus

is the chromatin network as you have mentioned. The Chromatin network is a

coiled-up structure, but, chromatin networks are made up of chromosomes that

are coiled together, so in order for a cell to be able to divide, the cell cannot

divide if the chromatin network is still coiled, okay? So, since we are going to

look at the cell cycle, we want to see the events that take place inside the cell

that leads to the division of this cell and duplication. Right, moving on, in

order for the cell to generate new cells, the new cells will be generated from

the existing cells, they don’t come from anywhere. There must be an existing

cell, that existing cell will form new cells, and that process is known as cell

division. As it is, cell division means the cell divides. Now, why are the

cells dividing? To form new cells, and remember that the new cells are formed

from the existing cell, then the existing cell is called, a parent cell. So in order

for the cell to make new cells, the has to be an existing cell so that it divides

and forms new cells, and the new cells formed are called daughter cells. So,

when the cell divides, it divides by the process known as mitosis, right? Now

let us try to define mitosis. This is a type of cell division where one cell

divides to form 2 daughter cells that are identical to each other as well as the

parent cell. Right, so we said in order for our cells to divide we need to have

an existing cell or a parent cell, so the cell is going to divide by a process

known as mitosis, defining mitosis we said it is a “type of cell division”

meaning there is another cell division that occurs in the cells, however, we are

only going to focus on mitosis. Let us just mention the other one and maybe

differentiate between the two cell divisions. The one we are doing now is

mitosis and the second one is meiosis, we will elaborate further when we get

to Grade 12. Starting with the one we are focusing on, mitosis, 2 daughter

cells are produced which are identical to each other and also to the parent cell.

Meaning from 1 cell, which was already existing, which we called?

(initiation move, closed-ended question)

**Learners:** Parent cell (short/limited)

**Teacher:** Will form 2 cells we called? (initiation move, closed-ended question)

**Learners:** Daughter cells (short/limited)

**Teacher:** Which will be identical to each other and the parent cell, identical means the

same, they are exactly the same. So that one is called mitosis. However, in

meiosis, one cell divides and gi us 4 daughter cells that are not identical to

each other and even to the parent cell. Now let us take a closer look at how the

cells divide, the cell needs to prepare itself for cell division, it can’t just

divide. Let’s see how it prepares itself. Going back to our basic structure of a

cell and we look at the nucleus closer, inside it we said we find the

chromatin network. We also said that chromatin networks are made up of

chromosomes that are tangled or coiled and the cell can’t divide with tangled

chromosomes, hence the necessity of preparation by going through the phase

we call interphase. In this phase or during this phase, an important process

known as DNA replication occurs, where do we find the DNA?

**Learners:** In the nucleus (short/limited)

**Teacher:** In the nucleus, right? In the nucleus, it is carried by the chromosomes or by

the chromatin network. Then our process is DNA replication. What does this

mean? (initiation move, closed-ended question)

if something is replicating itself, what is it doing?

**Learner 1:** Making a copy. (short/limited)

**Teacher:** It is making a copy. She is saying if something is replicating it is making a

copy of itself. That means DNA here is making a copy of itself. Right? So if

you made a copy of yourself a human being exactly like you will be produced.

So that means when DNA is replicating the chromosome or the chromatin

the network will replicate. That process occurs during the phase called, the

interphase. In your notes it is written preparing for mitosis, that then means the

cell is preparing to divide, it has not started dividing just yet. That means

interphase does not fall under mitosis. During this entire process, we put

emphasis on the chromosomes, remember the DNA is inside the chromosomes

or the chromatin network, right? So this is what happens, the chromatin

network unwinds or uncoils since they are tangled, this occurs so that a cell

can be able to divide, and the number of chromosomes must be the same. If

then the chromosomes are tangled, then the chromosomes won’t be divided

amongst the cells, therefore, must unwind. After unwinding, this is how they

are going to look (the teacher draws a single-stranded chromosome on the

board). After that, the single-stranded chromosome is going to undergo DNA

replication, meaning the single-stranded chromosome is going to make a copy

of itself. After DNA replication this is how the chromosome is going to look

(teacher draws a structure of a double-stranded chromosome on the board), we

call this one a double-stranded chromosome. Both these are chromosomes, the

first one has not undergone DNA replication, which is why it appears single

stranded and the second one is double-stranded because it has undergone DNA

replication. The double-stranded chromosome, we say is made up of 2 sister

chromatids and these sister chromatids are joined together by a centromere

(teacher labels the structure of a double-stranded chromosome). This is the

chromosome we are going to deal with mostly moving forward, even when

you get to Grade 12. When it is double-stranded you will know that it has just

undergone DNA replication to prepare for, mitosis. When the chromosome

looks like this, we can now say the cell is ready to divide. All right, let us go

see how our cell divides. Our mitosis occurs in four phases, or others might

say stages of mitosis. The first one is the prophase The second one is

metaphase, the third one is anaphase, and the last is telophase. The

abbreviation IPMAT is what we use to help you understand the

the sequence of the phases. I- for interphase, P- prophase, M-metaphase, A-

anaphase, and T- telophase. But remember the cell does not start dividing on

the interphase, that phase is just for preparation, and DNA replication occurs.

At the end of these phases, you can add the C. Let us look at the structure of

the cell dividing (the teacher draws the structure of the cell) this is the basic

structure of a cell. I’m going to draw the nuclear membrane with unsolid

lines, representing the nucleopores. This is the structure of a cell. We I,2,3

chromosomes. Let us make an example with 3 chromosomes. How do we refer

to this chromosome as? It is single-stranded, right?

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

**Teacher:** Right, we have this structure that is referred to as a centrosome, you remember

when we were labeling right? Let us move on. Remember in this cell the other

organelles are going to be part of our lesson but it does not mean that they are

not there. The one we mentioned. The cytoplasm is there, the mitochondrion is

there, and all the organelles we were expecting to find in the structure of the

cell are there but our focus is on the nucleus. But it does not mean that our cell

is abnormal. Then when our cell looks like this, it is now going to undergo

DNA replication. It is preparing itself, meaning these chromosomes will make

copies of themselves. Then, how is it going to look? It will appear double-

stranded. here is the structure of the nucleus. This is how our chromosomes

will appear. And also the size of the chromosomes are not the same. And when

the phase looks like this, we call it prophase. What is the description of a

prophase? The description for this phase is that chromosomes become more

visible during the prophase. Secondly, the nuclear membrane, which is the

membrane that surrounds the nucleus, starts to disappear. Thirdly, the

centrioles start to move to opposite end poles. So this is what our cell looks

like during prophase. Our cell is now starting to divide, the mitosis is starting.

So during mitosis, the prophase becomes more visible, the nuclear membrane

starts to disappear and then centrioles move to opposite end poles. So because

they said the nuclear membrane disappears here, which means it will not be

part of our next phase. Which is?

**Learner 1:** Metaphase. (short/limited)

**Teacher:** Meta means middle, all right? In the previous phase, we said centrioles move

to opposite poles. The function of the centriole is to form structures known as

spindle fibers other textbooks use spindle threads, you can use these terms

interchangeably. So now, since we said meta means middle, what is going to

be in the middle? It is the chromosomes, right? So whenever you see

chromosomes at the center of the cell just know that it is metaphase. Then, the

centriole will form what we call spindle fibers. These are our spindle fibres

(the teacher draws a cell on metaphase with spindle fibre attached to the

centromere). Remember we no longer have the nuclear membrane at this

point, the nuclear membrane has already disappeared, right? We are here now,

these are our spindle fibres. Then at the equator, we are expecting to see our

chromosomes. We say the chromosomes are arranged or aligned at the center, you can use those terms interchangeably. This is metaphase, during metaphase

chromosomes are arranged at the equator, and spindle fibres are formed and

attached to the centromere of the chromosomes. Let us move on, which phase

is the next phase?

**Learner1:** Anaphase (short/limited)

**Teacher:** Anaphase. Okay, if you were to be asked about the description of metaphase, it

is not much. But what is important is chromosomes are arranged at the

equator. And then spindle fibres are formed and attached to the centromere of

the chromosomes. Then from there, we are moving on. Anaphase, ana means

apart. This is the phase where separation occurs. What happens during

anaphase is spindle fibres contract, pulling chromosomes or separating

chromosomes to opposite poles. (The teacher draws a structure of a cell on

anaphase). What is our chromosome made up of? Two sister chromatids. So

when the chromosome is separated, it's these chromatids that are separating,

one chromosome goes to the other side and another chromosome goes to the

other side. So you can this is a chromatid, and this is also a chromatid. We say

spindle fibres contract and pull, which is a description of anaphase. We say

spindle fibres contract and pull the chromatids toward the opposite end called

poles. So the spindle fibres are trying to separate the chromatids. Remember

the chromosome is made up of two sister chromatids joined together by a

centromere at the center. So those are the chromatids that separate. So when

these chromosomes are pulled to opposite poles, I can say that the cell is

starting to divide. We have chromatids on this side and the other side as well.

The nucleus will start forming on both sides. Let us move to the last phase, the

one we referred to as telophase. So our cell has already divided. Remember,

when we defined mitosis, we said this is a type of cell where one cell gives us

two daughter cells. So already we have two daughter cells, which we said are

identical to each other as well as the parent cell. So what happens now, the

nuclear membrane starts to form again. So this cell will be similar to the cell

we started with. (The teacher draws two daughter cells on the board).

Remember, the chromosome number should be the same. So that is what we

mean by identical. So remember we said this is a cycle, and that means these

newly formed cells are also going to divide. So when start to divide again,

they will have to undergo DNA replication. Yes!

**Learner 1:** What happens when the cells do not divide?

**Teacher:** We will get to that part, Victor is asking what would happen if the cells don’t

divide. That does happen, but also cell division can go wrong, the abnormal

division of a cell. It results in what we call cancer. Let us move on. So these

newly formed cells will continuously divide that is why we call it a cell cycle.

So they divide forming other cells. We said a group of cells forms what?

Group of tissues. And then the group of tissues forms what?

**Learner2:** Organs (short/limited)

**Teacher:** And then from organs?

**Learners:** Systems (short/limited) **(chorus)**

**Teacher:** Systems! And then systems?

**Learners:** Organism (short/limited) **(chorus)**

**Teacher:** As you are now an organism. Let us continue. So we are saying now we have

two daughter cells that are identical to each other and also identical to the

parent cell and we said both these cells will continue to divide and which

means it will undergo replication right? And it will appear similar to the one

we drew on prophase. Where the single-stranded chromosomes will make a

copy of themselves then they will appear double-stranded. Let us continue.

There is a part that I said we add at the end, the C. What is the C for?

Cytokinesis. What is cytokinesis? It is the division of the cytoplasm. Doesn't

the cytoplasm divide? It will also divide because each cell should have its own

cytoplasm. So when the cytoplasm of the original cell divides, we call it

cytokinesis. Is there anyone who has a question?

**Learner 1:** Why are the cells dividing?

**Teacher:** Here is a question, she is asking why are the cells dividing.

**Learner2:** To prevent cancer (short/limited)

**Teacher:** But we said cancer is caused by the abnormal division of the cells, cells are

dividing but uncontrolled mitosis then results in, cancer. So who can answer

this one, why do these cells need to divide?

**Learners 3:** So that we can grow. (short/limited)

**Teacher:** So that we can grow. Is she correct?

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

**Teacher:** Yes, I did say when we started with this topic, as we grow, it is because our

cells are dividing. Now you are going to do structures on the board. So if

started with these chromosomes (the teacher pastes chromosomes, creating a

cell that is in interphase). One is going to stand up and do prophase,

metaphase, and so forth. We will use a set of chromosomes that I have

prepared to create these phases. What did we call these chromosomes again?

**Learners:** Single-stranded(short/limited) **(chorus)**

**Teacher:** Single-stranded, so they now need to undergo what?

**Learner1:** Mitosis (short/limited)

**Teacher:** Mitosis?

**Learners:** DNA! (short/limited)

**Teacher:** DNA repli?

**Learners:** cation… (short/limited)

**Teacher:** Where they will be making a copy?

**Learners:** Of itself. (short/limited)

**Teacher:** Okay let us continue. Let us start now, we have these different structures of

chromosomes, anyone who can help us complete these diagrams on the board?

**Learners:** (The learners use the chromosomes to create different phases of mitosis on the

board with the teacher facilitating).

**Teacher:** Guys, we can’t keep having answers from one learner. I need new hands.

Anything that you think you learned.

**Learner 1:** I learned that, during mitosis, cells divide into two, and a process called DNA

replication occurs…

**Teacher:** All right, thank you Thandosi. Another one.

**Learner 2:** I learned that during mitosis one cell divides to form two identical cells

**Teacher:**