

Appendices

Appendix 1: Fragment of the first scenario.

Learning activity 2

LA 2: Distinguishing the germ and the somatic cell line, and relating the cell division processes to these two lines.	Level: Transition from the organismic level to the cellular level
Teaching method: Group work	
Students activity <ol style="list-style-type: none"> Solving a biological problem (<i>Worksheet 1</i>) in groups of 4 students: discuss and reason how a mutation in the hereditary material of a gamete and a colon cell affects the next generation. Differentiate between the germ and somatic cell line and relate the cell division processes meiosis and mitosis to them. Discuss and explain their insights into the two lines in their own words to the other students in the group. Formulate an answer to the task (problem) they all agree upon. 	Teacher activity <ol style="list-style-type: none"> Guiding the students in their group work and discussion on request, but not giving the solution to the problem yet. Signalling where students get stuck in their genetic reasoning pattern and what difficulties they encounter, in order to prepare the subsequent plenary discussion and reflection on this activity.
Intended outcomes <ol style="list-style-type: none"> Preliminary insight into the differences between the somatic cell line in a person and the germ cell line, and the relationship of the two cell division processes (mitosis & meiosis) with these two lines. Most students will not be able yet to correctly connect the mitosis and meiosis with the somatic line and germ line. Students realise what they do and do not understand yet or where they get stuck in their reasoning pattern, and get motivated to get more insight into the two main cell lines and the related cell division processes. 	

Learning activity 3

LA 3: Whole class discussion and reflection on learning activity 2	Transition from organismic level to cellular level
Teaching method: whole class discussion	
Students activity <ol style="list-style-type: none"> Explaining their answer to the assignment to the rest of the class. Discussing the differences in answers and explanations of the groups. 	Teacher activity <ol style="list-style-type: none"> Noting the different group answers on the blackboard. Guiding the classical discussion aiming at one answer to the assignment, by asking questions like:

<p>3. Reasoning again, after getting new information and solutions of the other groups of students in the class, on the relationships between :</p> <ul style="list-style-type: none"> - The somatic line, somatic cells, genetic basis in somatic cells and cell division process of somatic cells. - The germ line, gametes, genetic basis in gametes and the cell division process that forms gametes. <p>4. Articulating what they do and do not understand yet; Asking questions.</p>	<ul style="list-style-type: none"> - Where in your body do you think this process take place? What is the function of that process? How do you picture that? - What is the difference between a gamete and a somatic cell? - How is a somatic cell resp. gamete formed? - To what extend are your somatic cells (resp. gametes) identical to one another? - What cells are involved in sexual reproduction (in producing offspring)? - What is passed on to the offspring? - What happens during fertilisation <p>3. Give a brief overview; present two drawings on the blackboard of the somatic and the germ cell line, the relationship with the cell division process, mitosis and meiosis, and the relationship wit the genetic basis of a next generation.</p> <p>4. Discussing the aim of meiosis, the formation of gametes which contain half of the chromosome number. Provide additional information and explanation on the two cell division processes. After fertilisation, the zygote contains a new genetic combination, which is a combination of half the chromosomes of father and half the chromosomes of mother.</p>
<p>Intended outcome:</p> <ol style="list-style-type: none"> 1. Students know and can explain the differences between the somatic and germ cell line in a life cycle, and can link the processes reproduction, meiosis, and mitosis to the cell lines. 2. Students realise that in a person all somatic cells contain the same hereditary basis. All chromosomes are copies of the first set of chromosomes in the zygote, by means of the cell division process mitosis. Any mutation in the somatic cell line will not affect the next generation, contrary to the germ cell line. 3. Students realise that all gametes in a person differ, they contain half the original number of chromosomes, one of every homologue pair. The cell division process responsible is meiosis. In sexual reproduction, the egg cell and sperm cell merge, and a new unique genetic combination (random recombination of homologue chromosomes from both parents) is formed. 	

Accompanying worksheet 1 of LA 2

Discuss and solve the next problem with your group members:

Anna is a healthy 28 year old woman.

A mutation occurs in the hereditary material of a gamete of Anna, and a mutation occurs in the hereditary material of a colon cell of Anna.

1. Will the mutation in the hereditary material of a) the colon cell, and b) the gamete be passed on to the children Anna will get?
2. Explain your answer.

Answer:

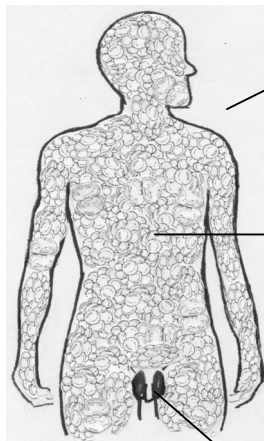
Appendix 2: Schematic representation to visualise the connection between the levels of organisation and the somatic and germ cell line.

Population humans. A population consists of organisms.

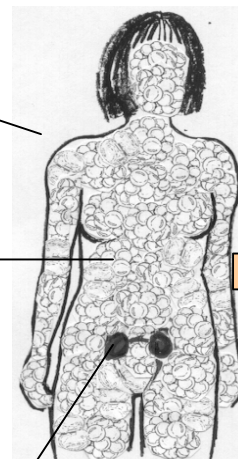


Organisms are built of cells.

Cellular level
The cells in our body are all specialised to fulfil a certain function. E.g. brain-kidney-, muscular-, bone-, colon cells.



Mitosis
(regular division). Chromosomes are copied. Consequently, every cell contains 46 chromosomes.

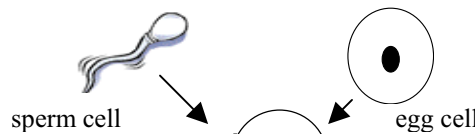


All cells in the body divide by **mitosis**: colon-, liver-, skin-, muscular cells. *Only*, gametes are produced by a special cell division process: meiosis.

Meiosis

Number of chromosomes halved (from 46 to 23). 1 chromosome of every pair in a reproduction cell.

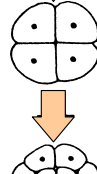
Cellular level
Reproduction on the cellular level.



Fertilisation

Chromosome-set of father in sperm cell melts with egg cell that contains chromosome set of mother. New nucleus is formed in which again 46 chromosomes are present, i.e. 23 homologue pairs. This is the new genetic combination (basis) of the offspring.

zygote



Mitosis

Offspring. **Organism.**
new genetic combination of father and mother.



