

Exam Concept Course „Cell Biology“ – August 2009

EXAM CONCEPT COURSE „CELL BIOLOGY“ FALL 2009

Each student gets a set of 9 questions which all have to be answered.

The lecturer who prepared the question will evaluate each answer on a scale from 0 to 6 points.

Each question has to be answered on the respective answer sheet (no extra sheets allowed!).

As the Concept Course has been taught in English, this written test will also be in English. If you encounter difficulties in answering the questions in English, it is allowed to use also the German language if necessary.

Question 1 (U. Suter)

Describe the various cellular events that are associated with Multiple Sclerosis and their consequences. Which types of treatment strategies have been or could be developed for this disease based on the available knowledge about the cell biology of the disease? (6 points)

Question 2 (U. Suter)

Summarize the functions of neuregulin-1 (NRG1) in peripheral nerve development. Describe experimental approaches that have been done / could have been done to determine these functions once the gene encoding NRG1 had been identified? Describe the available experimental possibilities with their advantages and disadvantages. (6 points)

Question 3 (S. Jessberger)

New neurons are generated throughout life.

- a) Name the two cardinal features of neural stem cells that continuously generate new neurons.

The number of neurons born in the adult brain and specifically in the adult hippocampus is not constant but dynamically regulated.

- b) Name three instances in which either more or less neurons are born compared to standard conditions.
- c) Name two neuro-psychiatric diseases in which neurogenesis has been implicated in the disease process.

(6 points)

Question 4 (S. Werner)

- a) How can you detect proliferating cells in a mouse tissue? Please describe the method and the underlying principle. (3 points)
- b) How can you detect apoptotic cells in a mouse tissue? Please describe the method and the underlying principle. (3 points)

Question 5 (S. Werner)

- a) Please list two different angiogenesis inhibitors (2 points)

- b) Please list two diseases where angiogenesis inhibitors are used therapeutically. (2 points)
- c) Please describe the in vivo Matrigel plug assay that is used to study angiogenesis. (2 points)

Questions 6 (S. Werner)

- a) What are the three phases of cutaneous wound healing? (1.5 points)
- b) Which types of inflammatory cells invade the wound tissue? (1.5 points)
- c) What is the function of myofibroblasts in the wound healing process? (1 point)
- d) Which growth factor is important for myofibroblast differentiation? (1 point)
- e) What is the major difference between wound healing in embryos and in the adult mammals? (1 point)

Question 7 (C. Frei)

- a) Describe the process of macroautophagy in eukaryotic cell? (1.5 points)
- b) Describe the underlying principles of macroautophagy during *Drosophila* development: How is macroautophagy regulated in different tissues, and at different developmental stages? (4.5 points)

Question 8 (R. Ricci)

Which systemic and local cellular as well as molecular mechanisms in lipid metabolism do you know that are important in atherogenesis? (6 points)

Question 9 (W. Krek)

- a) Define the terms: metabolism, catabolism and anabolism. (1 point)
- b) Explain the biochemical basis of AMPK activation in response to energy depletion and describe the mechanism by which AMPK activation affects the cell growth machinery. (2 points)
- c) Several anti-angiogenic drugs have been developed that inhibit the blood supply that nurtures the tumour. Describe the expected changes in tumour cell metabolism that would occur upon administration of such drugs and the factors involved in mediating these effects. (3 points)