

Department of Biology

Examination in Bi3016 Cell and molecular biology

Contact person during exam:

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Date: 11. December 2014

Number of hours: 4

Permitted aids: none

All of the four main questions count as equal (25%).

Each question (1-4) must be started on a new page.

Language: English

Total number of pages: 3 (including cover page)

Attachments: 0

Kontrollert av:

Dato

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NOTICE THAT QUESTIONS 1, 2, 3, AND 4 ARE WEIGHTED EQUALLY, BUT SINGLE QUESTIONS MIGHT BE WEIGHTED DIFFERENTLY (INDICATED IN %). IF NO WEIGHTING IS GIVEN THE SUB-QUESTIONS ARE WEIGHED EQUALLY. PLEASE START ANSWERING EACH QUESTION (1, 2, 3, and 4) ON A NEW SHEET OF PAPER.

Question 1

Latent gene regulatory proteins are present in most animal cells and have crucial roles in many developmental processes, which are partly conserved from fruit flies to humans.

- a. What defines a latent gene regulatory protein? (20 %)
- b. Describe two ways which prevents latent gene regulatory proteins from entering the nucleus until the cell receives an appropriate signal. (40 %)
- c. Give an example of a latent gene regulatory protein and describe the signaling pathway to which it is connected. (40 %)

Question 2.

Most animal cells require continuous signaling from other cells to avoid apoptosis. The extracellular signaling molecules which mediate this signaling are collectively called survival factors.

- a. Members of the insulin growth factor family stimulate many types of animal cells to grow and survive. Describe how the changing levels of these growth factors can either result in apoptosis or continued growth and survival.
- b. Cancer cells sometimes have mutations in genes that control cell growth and enable them to grow in the absence of growth factors. Describe how a cancer cell can override this regulation / control point and continue to proliferate.

Question 3.

Ca^{2+} ions play an important role in cell signaling and have regulatory effects on many enzymes and proteins. This means that the intracellular Ca^{2+} concentration is strictly regulated.

- a. Explain and describe how intracellular Ca^{2+} levels are regulated in a eukaryotic cell.
- b. Describe how Ca^{2+} is released in muscle cells and explain how this regulates muscle contraction in striated muscle cells.
- c. What is the function of the protein calmodulin in animal cells?

Question 4.

Define / explain 4 of the 5 the following words and terminologies and give a short description of their function.

- a. MAP kinase
- b. Cyclin dependent kinase (Cdk)
- c. Prereplicative complex
- d. Integrin
- e. Maintenance DNA methyltransferase.

Use figures where appropriate to explain your answers, (questions 1-4).