

Department of Biology

Examination in Bi3016

Cell and molecular biology

Contact person during exam:

Assistant professor Per Winge

Tlf.: 99369359

Date: 2. June 2014

Number of hours: 4

Permitted aids: dictionary

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

Sign

Question 1.

Regulation of gene expression in eukaryotes is controlled by a number of DNA binding proteins. We often want to identify these proteins and determine where in the genome and which DNA sites they bind.

- a. Describe two methods that can be used to isolate DNA binding proteins.
- b. You have isolated a transcription factor and want to find out whether it has binding sites in a promoter you have cloned. How would you proceed to determine if the transcription factor binds the promoter and how would you identify the DNA binding sites?
- c. Transcription factors do not have the same expression in all cell types and each of them can bind several places in the genome. Describe a method that can be used to identify the various binding sites for a specific transcription factor in a living cell (*in-vivo*).

Question 2.

The cell cycle in a eukaryotic cell is tightly regulated and ensures that the mother cell DNA is correctly replicated and DNA is equally distributed between the daughter cells.

- a. Describe shortly the four phases of the eukaryotic cell cycle and what processes that takes place in the various phases.
- b. What is a cell cycle checkpoint?
- c. Explain shortly how the various cell cycle checkpoints are regulated and what function they have.

Question 3.

Cells in a multicellular organism may be associated / bound to each other through direct cell-cell junctions or via the extracellular matrix that surrounds them.

- a. Describe shortly the various junctions that bind cells together in an animal organism and what functions they have.
- b. Cadherins have an important function in cell-cell adhesion. Describe the structure and function of cadherins and mention what cell-cell junctions they participate in. Why are cadherins particularly important during embryo development?

Question 4.

Most cells in animal organisms, except the sperm cells, move by cell crawling. This type of cell locomotion is actin dependent and is important for cell types such as macrophages, osteoclasts and fibroblasts.

- a. Explain how structures as filopodia, lamellipodia and pseudopodia are formed and describe the function of the ARP complex.
- b. The small GTPases Rho, Rac and Cdc42 have important functions during cell locomotion. Explain how they are regulated and what function they have as regulators of the actin cytoskeleton and cell locomotion.