

# UNIVERSITY OF OSLO

## The Faculty of Mathematics and Natural Sciences

**Exam in: MBV 3010 – Advanced cell biology**

**Day of exam: Thursday, August 18th , 2011**

**Exam hours: 14: 30 – 17:30**

**The examination paper consists of 3 pages**

**Appendices: None**

**Permitted materials: None**

**Questions I – IX are multiple choice questions. Only one answer is correct for each question. Write down your answer on a blank answering paper. For example: Question XX, correct answer = A. Write each answer on a new line. Questions X to XII are traditional questions that require longer answers. Make sure that your copy of this examination paper is complete before answering.**

### **Question I (1 point)**

Which of the amino acid sequences contain an export signal for proteins that are transported out of the cell nucleus to the cytoplasm?

- A) KDEL (-lys-asp-glu-leu)
- B) FGFGFG (-phe-gly-phe-gly-phe-gly-)
- C) SKL (-ser-lys-leu)
- D) GKKKGKK (-gly-lys-lys-lys-gly-lys-lys-)
- E) LALKLAGLDI (-leu-ala-leu-lys-leu-ala-gly-leu-asp-ile-)

### **Question II (1 point)**

Which of these proteins/complexes is a sensor (receptor) for misfolded proteins in the endoplasmic reticulum (ER)?

- A) OXA
- B) IRE 1
- C) Dolichol
- D) SRP
- E) OST 1

### **Question III (2 points)**

An action potential is moving along an axon because:

- A) The pressure is higher in the cell body than in the nerve ending
- B) Sodium channels are opened by the after-hyperpolarization
- C) Sodium channels in the axon are opened by the depolarization
- D) The inside of the axon is very smooth because the membrane is made up mainly of lipids.
- E) There is a difference in the electric potential between the cell body and nerve endings.

**Question IV (1 point)**

Which protein is not part of the Wnt signalling pathway?

- A) Dishevelled
- B) Smoothened
- C) Frizzled
- D) Groucho
- E) Axin

**Question V (1 point)**

Which type of GTP-binding protein is involved in protein import into the nucleus?

- A) Rab
- B) Dynamin
- C) Ran
- D) Sar-1
- E) Tubulin

**Question VI (1 point)**

The process of gene rearrangement that is common to antibodies and T cell receptor genes is called:

- A) somatic hypermutation
- B) isotype switching
- C) somatic recombination
- D) apoptosis
- E) clonal selection

**Question VII (1 point)**

Phagocytosis allows specialized cells to take up potential pathogens. These cells include:

- A) Epithelial cells
- B) Macrophages
- C) Erythrocytes
- D) T-helper cells
- E) Fibroblasts

**Question VIII (1 point)**

Which of the following proteins is involved in generating specificity upon fusion of a vesicle with its target membrane?

- A) SNARE proteins
- B) Clathrin
- C) Dynamin
- D) COP I
- E) NSF (N-ethylmaleimide sensitive factor)

**Question IX (1 point)**

What is the main difference between bacteria and viruses?

- A) Bacteria contain DNA
- B) Bacteria can be pathogens
- C) Viruses are prokaryotes
- D) Bacteria have a membrane
- E) Viruses require a host cell to replicate

**Question X (3 points)**

- A) What is the molecular basis for the fact that a B-cell clone makes IgA, IgD, IgE or IgG with the same specificity as the receptor of IgM type on the naïve “mother cell?”
- B) What determines whether B cells differentiate into an IgE producing cell?
- C) What are the functions of IgE?

**Question XI (4 points)**

- A) Where in the cell are clathrin coats localized and what are their functions?
- B) Where in the cell are COP II coats localized and what are their functions?
- C) What is the role of ESCRT complexes in the endocytic pathway?

**Question XII (3 points)**

N-glycosylated proteins are subjected to a control system for protein folding.

- A) What is the role of the glycan portion of the protein?
- B) What proteins are involved in the folding control?
- C) What happens to a (misfolded) protein that does not pass the quality control?