

UNIVERSITY OF OSLO

Faculty of Mathematics and Natural Sciences

Exam in MBV 3010 Advanced Cell Biology

Day of exam: June 15th, 2012

Exam hours: 9.00 – 12.00

This 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 VII, 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)

Glycoproteins that are modified by mannose-6-phosphate in their glycans are:

- A) Receptors at the cell surface for growth factors.
- B) Chaperones in the endoplasmic reticulum (ER).
- C) Lysosomal enzymes (hydrolases).
- D) Transcription factors.
- E) Proteins involved in phagocytosis of bacteria.

Question II (1 point)

Which of the amino acid sequences contains an import signal for proteins that are transported into peroxisomes?

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

Question III (1 point)

Which of the following is **not** a protein coat on intracellular vesicles?

- A) COP-I.
- B) Dynamin.
- C) Caveolin.
- D) Clathrin.
- E) COP-II.

Question IV (1 point)

Which of the proteins below is **not** a GTP-ase?

- A) Rab 5.
- B) Dynamin.
- C) Ran.
- D) Clathrin.
- E) Sar-1.

Question V (1 point)

Which of the following receptors and ligands will normally **not** be observed in late endosomes?

- A) EGFR (Epidermal Growth Factor Receptor).
- B) LDL (Low Density Lipoprotein).
- C) Opioid receptor.
- D) LDLR (Low Density Lipoprotein Receptor).
- E) EGF (Epidermal Growth Factor).

Question VI (1 point)

Which of the proteins is involved in the PI 3-kinase signaling pathway?

- A) STAT.
- B) mTOR.
- C) NEMO.
- D) Sos.
- E) SARA.

Question VII (1 point)

Which of the following is **not** a part of the body's unspecific defense system?

- A) NK cells.
- B) Inflammation.
- C) Phagocytosis by neutrophils.
- D) Phagocytosis by macrophages.
- E) Antibodies.

Question VIII (1 point)

An action potential in a nerve cell is:

- A) A depolarization caused by downregulation of the sodium-potassium pump.
- B) A depolarization caused by the opening of potassium channels.
- C) A hyperpolarization caused by the opening of sodium channels.
- D) A depolarization caused by the opening of sodium channels.
- E) Caused by the opening of water channels.

Question IX (1 point)

Which of the statements is **not** correct?

- A) Motor proteins hydrolyse ATP to move along the cytoskeleton.
- B) Tubulin binds and hydrolyses GTP, while actin binds and hydrolyses ATP.
- C) Most kinesins move towards the plus-end of microtubules.
- D) Dyneins move towards the minus-end of microtubules.
- E) Dynamain is an important part of the cytoskeleton.

Question X (3 points)

Describe the signalling pathway used by transforming growth factor beta (TGF- β), and explain how it can be regulated (use text only, not figures).

Question XI (3 points)

Describe the mechanisms for induction and maintenance of immunological tolerance, both

- a) central tolerance and
- b) peripheral tolerance

Question XII (3 points)

Describe transport of proteins from the cytoplasm and into the nucleus (import) and transport of proteins out of the cell nucleus into the cytoplasm (export). Include a description of import and export signals in the proteins, nucleotide binding proteins and their recirculation, and other central elements.