Forside

Department of physics

Examination paper for TFY4260 Cell biology and cellular biophysics

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Examination date: 23.05.2019

Examination time (from-to): 9.00-13.00

Permitted examination support material: None

Other information: Read the questions carefully

Students will find the examination results in Studentweb. Please contact the department if you have questions about your results. The Examinations Office will not be able to answer this.

1 Oppgave1 TFY4260Mai2019

The plasma membrane is asymmetric with respect to the composition of phospholipids and carbohydrates. The carbohydrates will always face extracellularly. Explain how:

- The carbohydrate groups are attached to proteins
- How the glycoprotein is transported to the plasma membrane and
- Taken into account the transport of glycoproteins to the plasma mebrane, explain that the carbohydrates always will face extracellularly

It will be helpful drawing a figure using scantron paper

Fill in your answer here

Format

Words: 0

Maximum marks: 15

2 Oppgave2 TFY4260Mai2019

Protein synthesis and ribosomes

Proteins are synthesized either on free ribosomes in cytosol or ribosomes on the surface of rough endoplasmic reticulum (ER).

Fill in your answer here

Format

Words: 0

Maximum marks: 5

3 Oppgave3 TFY4260 Mai2019

The cytoskeleton

The cytoskeleton consists of 3 different filaments. Indicate which filament is responsible for the various functions listed below.

Please match the values:

	actin filament	microtubulus	intermediate filament
Movement of cilia	○	○	○
cytokinesis	○	○	○
Formation of microvilli to increase cell surface	○	○	○
muscle contraction	○	○	○
cell crawling	○	○	○
contribute most to mechanical strength of the cell	○	○	○
mechanical strength and shape of the plasma membrane	○	○	○
movement of chromosomes	○	○	○
binds ATP	○	○	○
mechanical strength of the nucelar envelope	○	○	○

Maximum marks: 5

4 Oppgave4 TFY4260Mai2019

Synapse

Two neurons communicate through a chemical synapse.

Describe the events that occur from the action potential reaches the axon terminal, to the neurotransmitters are released and a new action potential is formed on the postsynaptic neuron.

You should **not** explain the formation of the action potential

It will be helpful drawing a figure using scantron paper

Fill in your answer here

Format

Σ

Words: 0

Maximum marks: 10

5 Oppgave5 TFY4260Mai2019

Cell cycle regulation

Several checkpoints ensure that the cell cycle and cell division are correct. An important checkpoint is within mitosis.

Explain what is checked and describe a hypothesis for how this control is done, and the role of the anaphase-promoting complex.

Proteins involved in the checkpoint and are no longer needed, will be degraded through the Ubiquitin-pathway. Describe briefly this degradation.

It will be helpful drawing a figure, use scantron paper.

Fill in your answer here

Format

Words: 0

Maximum marks: 15

6 Oppgave6 TFY4260Mai2019

Cell growth and intracellular signal transduction.

Assume that a growth factor is binding to its receptor which is a tyrosine kinase receptor.

- Explain how the receptor is activated and
- how the Ras pathway is initiated
- What kind of protein is Ras and
- how does Ras promote cell growth?

It will be helpful drawing a figure, use scantron paper.

Fill in your answer here

Format

Words: 0

Maximum marks: 10

7 Oppgave7 TFY4260Mai2019

Immunology

Cytotoxic T cells attack virus infected cells.

- Explain briefly how cytotoxic T cells recognize virus infected cells
- How cytotoxic cells are activated by T helper cells and
- How virus infected cells are eliminated by apoptosis.

Fill in your answer here

Format

Σ

Words: 0

Maximum marks: 10

8 Oppgave8 TFY4260Mai2019

Angiogenesis

If a tumour is going to grow, it needs nutrition from the blood vessels. Cancer cells will therefore stimulate the formation of new blood vessels in a process called angiogenesis.

Explain the steps in the angiogenesis.

Fill in your answer here

Format

Words: 0

Maximum marks: 10

9 Oppgave9 TFY4260Mai2019

Epithlium

The epithelium forms aphysical barrier between two chemical different compartments in the body, for example between intestine and blood. The epithelium must often also withstand mechanical forces.

Tight junction and adherens junction are two types of junctions often found between the epithelial cells in the epithelium.

- Describe the structure and composition of thigh junction and
- Adherens junction
- How can oxygen (O_2)cross the epithelium?

Fill in your answer here

Format

Σ

Words: 0

Maximum marks: 10

10 Oppgave10 TFY4260Mai1

Multiple choice with 3 possible answers. Make the corrctect answer

Fluidity of membranes depends on:
Select one alternative:

- Phospholipids
- Cholesterol
- Transmembrane proteins

Phosphatidylserine is a negative charged plasma membrane lipid which:
Select one alternative:

- is present in both monolayers
- faces only cytosol
- faces only extracellular

How can a transmembrane protein change its orientation in the plasma membrane:
Select one alternative:

- By flipase
- By increasing the fluidity of the membrane
- The orientation can not be changed

Proteins are passing the membranes of mitochondria:
Select one alternative:

- in a foldet state
- unfoldet by cotranslation
- unfolded after translation

Transmembrane proteins responsible for cell-cell contact, are called:

Select one alternative:

- Cadherin
- Lectin
- Integrin

What is the most common gene regulation in both prokaryote and eukaryote cells?

Select one alternative:

- Translation control
- Post-translation control
- Transcription control

What have all motor proteins in common:

Select one alternative:

- Are used in muscle contraction
- Convert chemical energy to mechanical energy
- Bind to vesicles

How does Ca^{2+} regulate muscle contraction? It introduces a conformational change in:

Select one alternative:

- myosin
- actin filament
- the protein tropomyosin

Epithelial cells must continously be formed. In which phase of the cell cycle will you seldomly find these cells:

Select one alternative:

- GO
- G1
- S-phase

Histones cross the nuclear pore by:

Select one alternative:

- Passive diffusion
- Use of ATP
- Use of G-binding proteins

The function of the tumor suppressor gene Rb is:

Select one alternative:

- Induce apoptosis if DNA is damaged
- Block the cell in the restriction point if the cell is too small
- Block the cell from entering mitosis if all DNA have not been replicated

The function of oncogenes is:

Select one alternative:

- stimulate cell growth
- repair DNA damage
- inhibit cell growth

The organelle which probably originates from another organism is:

Select one alternative:

- Lysosomes
- Golgi apparatus
- Mitochondria

The synthesis of phospholipids takes place in:

Select one alternative:

- cytosol
- endoplasmic reticulum
- Golgi appartus

The main function of lysosomes is:

Select one alternative:

- synthesis of proteins
- modify proteins
- degrade proteins

A nucleosome consists of:

Select one alternative:

- rRNA
- Histones
- lipoproteins

The main function of collagen is:

Select one alternative:

- Anchor cells to extracellular matrix
- Regulate transport of nutrient through extracellular matrix
- Provide mechanical strength to the tissue

Phospholipase C activates:
Select one alternative:

- Inositol phosphate
- Inositol triphosphate
- Phosphatidylinositol-3 kinase

A cell has a defect in COPII. In which organelle will proteins accumulate:
Select one alternative:

- Endoplasmic reticulum
- Golgi
- Lysosomes

v-SNARE participates directly in:
Select one alternative:

- formation of transport vesicles
- the transport of the vesicles
- binding between the vesicle and target organelle

Maximum marks: 10