**UNIVERSITY OF OSLO**

 **Faculty of Mathematics and Natural Sciences**

 **Exam in MBV4240/MBV9240 –**

 **Biochemical mechanisms in intracellular transport**

**Day of exam: Thursday December 10**

**Exam hours: 09.00 – 12.00**

**This examination paper consists of 2 pages.**

**Appendices: None**

**Permitted materials: None**

*Make sure that your copy of this examination paper is complete before answering.*

**1. Plasma membrane composition and structures:**

a) Make a schematic drawing of a glycerophospholipid.

b) Indicate where phospholipase A2 cleaves in this structure.

c) What is the type of bond that is cleaved?

d) After cleavage with PLA2 the lipid shape is changed. How may this change the membrane curvature?

e) Which other types of lipids do you find in the plasma membrane?

**2. Caveolae**:

a) Which lipids do you find enriched in caveolae?

b) Which cytosolic proteins are important for the structure and function of caveolae?

c) What is the fate of the vesicles formed after caveolae have pinched off from the plasma membrane?

d) What can the role of caveolae be, mention two possibilities.

**3. The size of cells and cellular structures**:

a) How large are the vesicles formed by clathrin-dependent endocytosis (diameter)?

b) How large is a macropinosome (diameter)?

d) What is the diameter of a typical cell?

**4**. **Motor proteins:**

a) Which motor proteins move vesicles along actin filaments?

b) Which motor proteins move vesicles in plus and minus direction along microtubules?

c) What is the energy source used for movement?

**5. Exosomes:**

a) What is meant by exosomes, and how are they created?

b) What do they contain in the lumen, and what can their function be?

**6. Autophagy:**

a) What is meant by the term autophagy?

b) What happens to an autophagosome?

**7. Intracellular and sorting degradation:**

a) Ubiquitinylation of a protein can result in two different fates of this protein. Which ones?

b) What is typical for sorting nexins (which domain is typical) and to which molecules in the membrane do they bind?

c) Give an example of a sorting nexin and where it acts.

8. **Endoplasmic reticulum:**

a) How does a newly synthesized molecule move from the ER to the Golgi apparatus? Which type of vesicle is involved?

b) What is meant by ERAD?

**9. Golgi apparatus**:

Describe the maturation model for transport through the Golgi apparatus. Specifically tell what happens to the Golgi enzymes in this model.