UNIVERSITY OF OSLO

The Faculty of Mathematics and Natural Sciences

English

Exam in: MBV4270/9270, Advanced glycobiology.

Day of exam: May 6th, 2010 Exam hours: (3 hours).

This examination paper consists of pages: 3

Appendices: None. Permitted materials: None.

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

Question I (12 %)
Place the following events in the synthesis of N-glycans in the right order:

A) Transfer of glycan group from dolichol to asparagine in a protein by oligosaccharyl transferase.
B) Removal of one mannose unit by mannosidase I.
C) Activation of dolichol by phosphorylation.
D) Removal of one glucose unit from the glycan group by glucosidase I.
E) Flipping of dolichol carrying mannoses from the cytoplasmic membrane leaflet to the luminal leaflet of the endoplasmic reticulum.
F) Enzymatic transfer of N-acetylglucosamine to dolichol-phosphate.

Question II (12 %)
Describe how ABO antigens differ and explain why one has to be careful in matching blood donors and acceptors (who can receive blood from whom?).

Question III (10 %)
A) What is a lectin? Give precise definition.
B) Describe the biological function of selectins in the immune system.

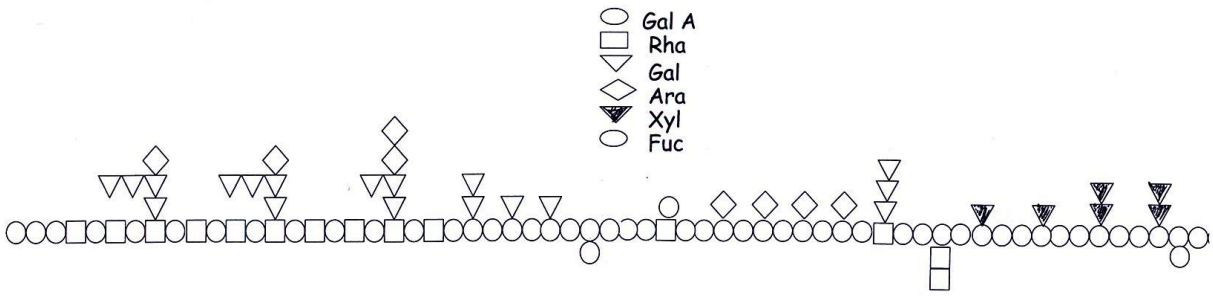
Question IV (7 %)
Name and draw the two anomers of D-Glucose.

Question V (12 %)
What features of the consensus eukaryotic N-linked glycosylation and bacterial (*Campylobacter jejuni*) N-linked protein glycosylation systems suggest that they are evolutionarily related (that is, diverged from a common ancestral system)?

Question VI (10 %)
The hexosamine signaling pathway is a nutrient responsive pathway in cells. Make a schematic drawing of this pathway including the enzymes and nutrients involved. What is the terminal step in this pathway and what are the functional consequences of this modification?

Question VII (7 %)
Mention one glycolipid-binding bacterial protein toxin and describe the entry mechanism into cells.

Question VIII (10 %)



A. A schematic representation of a plant polysaccharide is given above. What is the general name of this polysaccharide?
B. Show on the formula what parts this molecule consists of.
C. Why is this type of polysaccharide of interest, and what parts of the molecule are important?
D. Describe the strategy you would use for determination of the structure, describe the different methods and what you can achieve with them.

Question IX (10 %)
What is a mucin and what is a proteoglycan? How are these molecules synthesized?

Question X (10 %)
A) How do influenza spike proteins interact with cells?
B) Name a common influenza inhibitor and explain how it works.