



# BB2425 Glykobioteknik 7,5 hp

## Glycobiotechnology

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

## Fastställande

Kursplan för BB2425 gäller från och med VT19

## Betygsskala

A, B, C, D, E, FX, F

## Utbildningsnivå

Avancerad nivå

## Huvudområden

Bioteknik

## Särskild behörighet

20 ECTS in biochemistry, microbiology and gene technology/molecular biology; 20 ECTS in chemistry; 20 ECTS in mathematics/numerical analysis/computer science

## Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

## Lärandemål

Upon completion of the course, the student will be able to:

- describe carbohydrate structure on the mono-, oligo-, and polysaccharide organizational levels and discuss the interaction of carbohydrates with other biopolymers as structural components in various cell types
- describe the importance of the pool of sugar phosphates as precursors in carbohydrate biosynthesis
- describe the molecular mechanisms of key enzymes involved in the biosynthesis and biodegradation of carbohydrates across diverse kingdoms
- discuss the structural diversity of carbohydrate-active enzymes and carbohydrate binding proteins in terms of their biological functions, and outline how these biocatalysts can be used in enzyme technology to develop environmentally-friendly sustainable processes in vitro or increase plant biomass in planta
- describe and use the CAZy database, and identify candidate genes encoding enzymes potentially relevant for bioconversion
- describe the biosyntheses of glycoproteins and glycolipids and discuss their diverse biological functions including disease states
- understand and discuss the importance of carbohydrates as raw material for sustainable development and describe molecular details of selected examples of “carbohydrate biotechnology” in biorefinery (biofuels and biofiber), food, and medical application
- understand and critically evaluate contemporary research literature dealing with various aspects of carbohydrate structure, biochemistry, enzymology, and applications thereof
- explain and discuss influenza pandemics and understand the risk and threat of a new pandemic as well as discuss ethical and social aspects of bioethanol production, enzymatic HFCS conversion, production of gum arabic, use of phytases, GMOs, and lab-modified influenza viruses

## Kursinnehåll

The course will provide the student with an overview of carbohydrates (glycans, saccharides or sugars), a for life essential class of biomolecules involved in many crucial biological functions and industrial applications. Students will learn about how every living cell is covered by an array of glycans, and how these sugars play a central role in inter- and intracellular communication. Knowledge of carbohydrate and glycoconjugate functions, structures, modifications and biosynthesis will prepare the students for problem solving in the areas of food, feed, health, energy and materials. Especially possibilities and challenges related to sustainable development using renewable carbohydrate raw materials will be emphasized. A main theme of the course is glycogenomics and the enzymes responsible for carbohydrate biosynthesis, modification and biodegradation: carbohydrate-active enzymes (CAZymes). In addition, sugar-binding non-catalytic proteins (lectins and carbohydrate-binding modules) will be covered, and carbohydrate structure-function relationships will be highlighted using numerous examples from plant, animal, and microbial systems. The course will address diverse and important applications such as glycoprotein pharmaceutical development, biofuel production, modification of wood and textile fibers, food production and human nutrition, brewing, treatment of inherited metabolic disorders, and treatment/prevention of pathogen infection, including influenza.

## Kurslitteratur

Course book(s), if any, will be posted on the course web site at least four weeks prior to course start. For course content not covered by the book additional course literature consists of current research articles, web resources and lecture handouts that will be available online in the learning platform Canvas.

## Examination

- LAB1 - Laborationskurs, 2,0 hp, betygsskala: P, F
- TEN1 - Skriftlig tentamen, 5,5 hp, betygsskala: A, B, C, D, E, FX, F

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

## Etiskt förhållningsätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.