BB1120 Cultivation Technology 6.0 credits

Odlingsteknologi

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for BB1120 valid from Spring 2010

Grading scale

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

Education cycle

First cycle

Main field of study

Biotechnology, Technology

Specific prerequisites

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After the course the students should,

- understand why and how growth occurs for different types of cells.
- know how macromolecular synthesis and accumulation and cell morphology is affected by growth.
- give examples for different types of production cells.
- understand and exemplify why growth ceases in batch cultivation due to lack of substrate, accumulation of toxic byproducts or metabolic shifts.
- know the common media components including the price level.
- know the concepts and understand the difference between minimal and complex media.
- understand why specific substrates are chosen for specific processes.
- know how to calculate a simple minimal medium.
- understand the common kinetic expressions of: growth, sugar uptake and product formation and how they are derived.
- outline simple structured models.
- understand and derive the concept of maintenance.
- understand the concept of overflow metabolism and when it might occur.
- calculate and in a meaningful way use the concepts of: yield and total-, volumetric and specific productivity.
- understand and derive mathematical expressions (mass balances for cells, substrate, byproducts, products, oxygen and carbon dioxide) for batch & continuously operated processes.
- know the basic requirements when to use each concept.
- be able to draw the progress of process variables.
- understand how variations in feed, stirring, airflow and volume affects the performance for common cell types.
- understand and derive the mathematical expression (mass balances) for fedbatch-operated processes.
- know when to use this concept and why.
- be able to draw the progress of process variables.
- understand how variations in feed, stirring, airflow and volume affects the performance for common cell types.
- know the pro´s and con´s of the different cultivation techniques and thus when to use each technique.
- know the bioreactor design principles including auxillary equipment, and the basic economy in these.
- know of common measurement and control techniques for bioprocesses and how they principally work.
- understand how mixing takes place in bioreactors.
- understand and derive the model for aeration on reactor and on molecular level.
- know the interdependence between mixing and aeration.

- calculate the respiration quotient and understand the metabolic meaning of its changes.

Course contents

Principles of cell growth. Metabolic organisation and important cellular processes. Kinetics models describing important cell processes with relate to good process performance. Media. The concepts of productivity, yield and product quality. Production organisms. Cultivation techniques. Oxygen transfer and mixing. Mass balances. Examples of common biotech processes used in the industry/by society today.

Course literature

S.-O. Enfors and L. Häggström: Bioprocess technology - Fundamentals and applications, KTH 2001

Examination

- ÖVN1 - Simulation Task, 1.0 credits, grading scale: P, F
- TEN1 - Examination, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 1.0 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

Approved simulation report (ÖVN1;1,0 hp, grading scale: pass/fail)
Approved lab report (LAB1; 1,0 hp, grading scale Pass/Fail)
Approved examination (TEN1; 4,0 hp, grading scale: A-F)

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.