Methods in Life Science - Protein Expression and Purification – Learning Outcomes
(What students should be able to explain, draw, calculate, predict, annotate etc. about the content presented in the lecture)

- The need for purified recombinant proteins arises from the fundamental nature of proteins in life sciences and medicine.
  - Proteins as a subject of life sciences
  - Proteins as targets and possible therapeutics in the treatment of various diseases
- General workflow of recombinant protein expression
  - Cloning of expression vectors; elements necessary for functional expression vectors
  - Choice of expression host(s); procaryotic host strains, yeast, insect cells, mammalian cells
    - The nature of the target protein and the demands towards the recombinant protein dictate the choice of a suitable expression host system.
    - Advantages and disadvantages / strengths and weaknesses of different expression host systems
- Principle of the CIPP purification strategy
  - Capture, intermediate purification and polishing
  - Parameters in protein purification: speed, capacity, recovery and resolution
- Use of protein characteristics for purification
  - Binding affinities → affinity purification; with or without affinity purification tags; examples for tags
  - Charges on protein surfaces → anion or cation exchange chromatography
  - Hydrophobic protein surfaces → hydrophobic interaction chromatography and salting-out / reversible precipitation
  - Size / shape → size-exclusion chromatography or gradient centrifugation
- General principle of column chromatography
  - Columns, solid phase, liquid phase, semi-automated chromatography systems
  - How are proteins bound to and eluted from different kinds of columns?