1st midterm test

1. Describe one selected method for quantitative determination of biomass (microorganism)!
2. Draw a growth curve of a bacterium (x – t), show the parts of the growth curve and discuss (explain) them.
3. Draw the time course (growth curve) of a bacterial growth (x – t) in a batch fermentation. Show the parts of the growth curve, give the specific growth rate in each phases and list the reasons of the declining phase!
4. Explain the notion of “induced fit” of enzyme and substrate!
5. Explain the structure and main biochemical functions of the mitochondrion!
6. Give 3 microscopic features of microbes used for taxonomic identification!
7. Give different classifications of biological membrane transport processes!
8. How change the enzymes: –the reaction rate; –the equilibrium concentration?
9. How could you eliminate of the effect of a competitive inhibitor?
10. How could you suppress the effect of a –competitive and an –noncompetitive inhibitor?
11. How depends the activity of enzymes on –pH and –temperature?
12. How does the dissolved oxygen concentration change during a batch cultivation? How can You interpret the equilibrium between the saturation and consumption of oxygen?
13. How much is the reaction rate of an enzyme reaction when the substrate concentration is ten times higher than KS?
14. How much is the reaction rate of an enzyme reaction when the substrate concentration equals the KS value?
15. In an enzyme reaction test you apply three times more enzyme than earlier. How changes – the reaction rate; – the equilibrium concentration; - KS value?
16. Introduce 3 different microbiological operations!
17. Shortly introduce 4 operations in industrial microbiology!
18. Show the basics of the Michaelis–Menten kinetic approach. Discuss the V – S relation using its characteristic plot!
19. Show the most important features of the enzymes (enzyme reactions)!
20. What are the 6 key-steps during (bio)technology developments? Indicate the appropriate equipment as well!
21. What are the advantages of using immobilized enzymes?
22. What are the differences between primary and secondary metabolites?
23. What are the most important features of the four reversible enzyme inhibitions?
24. What does “limiting substrate” mean? Show it on µ-S diagram and describe the Monod kinetic behavior! In which growth period is Monod kinetic valid?
25. What does C\* depend on?
26. What does KLa represent (name, unit)?
27. What is the difference between alternative substrates and dead end inhibitors?
28. What is the thermodynamic basis of the enzymatic catalysis?
29. What kind of specifities/selectivities may have the enzymes?
30. Which cell organoids are buildup of/covered by biological membranes? Shortly give their functions, too!
31. Which measurement method provide the amount of microbes in g/L dimension? Describe it shortly!
32. Why biotechnological production processes need stepwise scale up?
33. Why is it necessary to stepwise increase the scale before every production in fermentative biotechnological processes?
34. Draw the 3 characteristic plots of batch fermentations indicating the 4 growth phase on each plot!
35. Draw the Pg/P vs Na plot! Explain these variables, axis of the plot and flooding!
36. Which equation describe the changes in oxygen concentration versus time (saturation-consumption) Explain the used variables in the equation with dimensions!
37. How can be given the power uptake of mixing? Define the used variables!
38. Look at the following equation! Explain the meanings of **a**, **H0** and **db**. How could you increase the value of **a** with engineering tools?

2nd midterm test

1. Briefly describe the processes of biological nitrogen removal!
2. Briefly describe the technology of conventional activated sludge wastewater treatment and define the key parameter of the stable operation (technological scheme with short explanation, sludge age: expression, formules and its relationship with the specific growth rate, conclusions)
3. Compare the two extreme high pressure cell disruption operations ((homogenizer valve and X-press)!
4. Define and characterize the different activated sludge floc structures (figures and brief characterization)
5. Define Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD)!
6. Define requirements for aerobic, anoxic and anaerobic biodegradation!
7. Define sludge age (SRT) (full equations and definition of parameters)!
8. Define SRT (formula and explanations) and its relationship with the specific growth rate. What are the criteria of stable operation?
9. Define the terms of “biodegradation” and “mineralization”!
10. Draw the batchwise heat penetration plot! Indicate the sterilization periods on the plot.
11. Draw the scheme of a conventional activated sludge system (both water treatment line and sludge treatment technology)
12. Draw the scheme of a conventional activated sludge system (only biological step and clarifiers) and define HRT and SRT (formula and short explanation)!
13. Draw the technological flowsheet of a conventional activated sludge system!
14. Explain the functional principle, advantages and disadvantages of bead mills!
15. Explain the main mutational targets of metabolic engineering!
16. Explain the phases of penicillin fermentation!
17. Explain the role of auxotrophyic mutants in production of amino acids!
18. For production of a recombinant protein how will you choose a prokaryotic or eukaryotic host organism?
19. Give a short definition for biodegradation (general, primary, partial, full)!
20. Give the short explanation and describe the technological scheme of conventional activated sludge wastewater treatment. Define the parameter of sludge age and highlight its importance!
21. How can influence the type of microbe the operational costs in downstream process?
22. How could you define sludge age (formules) and its relationship with the specific growth rate (explanation)? Why is it key parameter determining the performance of activated sludge systems?
23. How could you determine the optimal treatment time of cell disruption?
24. How does the dissolved oxygen concentration change during a batch cultivation? How can You interpret the equilibrium between the saturation and consumption of oxygen?
25. In which phase of downstream technologies was mentioned: - the precipitation - the crystallisation (why?)
26. List and define concisely the main parameters for wastewater and activated sludge charac­terization!
27. List at least 6 components applied for characterizing wastewater quality!
28. List the main influencing factors of biodegradation!
29. What are „hot points?” Give three examples on them with explanation! (6p)
30. What are the 4 product-types that can be manufactured by microbes?
31. What are the precursor molecules? Give an example!
32. What does “limiting substrate” mean? Show it on -S diagram and describe the Monod kinetic behavior! In which growth period is Monod kinetic valid? What does it describe (kind of fermentation, state of the performance). What are the meanings of the letters?
33. What does the following expression mean: „the criterion of sterility is 10-4 ”? Give at least three different meanings of it!
34. What does the following expression mean: „the criterion of sterility is 10-3 ”? Give at least three different meanings of it!
35. What is the general sequence of unit operations during product isolation process?
36. What is the meaning of „subunit vaccine”? How is it produced?
37. What is thermal death rate constant (k) and what does it depend on? How?
38. Where is the position of crystallization in the downstream sequence? Why?
39. Which enzymes can be used for cell disruption?
40. Which floc structures should be taken into consideration regarding the settling charac­teri­zation of activated sludge? (figures and brief characterization)
41. What are the two opposite processes resulting the optimal treatment time in cell disrupt­tion?
42. How can influence the type of microbe the operational costs in downstream process?