

25/01/2026

Industrial fermentations S1 Exam

Question 1

Complete with the appropriate missing words or phrases

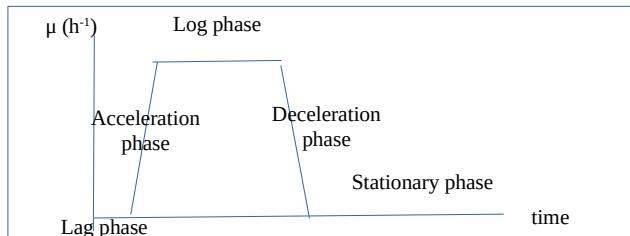
1. antibiotic/Streptomyces/shikimate-chorismate pathway (0,75pt)
2. anaerobe-aerotolerant/superoxide dismutase (0,5pt)
3. Lactic acid (0,25pt)
4. total weight measurement (0,25pt)
5. acceleration phase (0,25pt)
6. Actinobacteria/Gram positive bacteria (0,5pt)
7. mutagenesis (0,25pt)
8. metabolic engineering (0,25pt)
9. phenylacetic acid/phenoxyacetic acid (0,5pt)
10. Vinasse (0,25pt)
11. homoserine/methionine/threonine/soleucine (0,25pt)
12. modulated on-off action regulator (0,25pt)
13. 12,68 minutes (1pt)
14. 0.02 h^{-1} (1pt)

Question 2

1. It allows to determine the critical concentrations of nutrients and oxygen (limiting concentration) and to adjust the dilution rate in different types of bioreactors. (1,5pt)

2.

(1,5pt)



3. The glutamate dehydrogenase catalyses the conversion of α -ketoglutarate into glutamate, it is also sensitive to feed-back inhibition by the same amino acid. Using mutagenesis, an altered enzyme is obtained which lacks the attachment site for glutamate, the amino acid is overproduced in this case. (1,5pt)
4. Isolation and primary screening (soil/dilution/starch agar/incubation at high temperature/iodine test/clear zones indicate starch hydrolysis/compare zone diameter)
Secondary screening and selection (liquid cultures/identical conditions/incubation at high temperature/enzyme activity assay/compare enzyme activity) (1,5pt)

Question 3 (3pt)

$$\begin{array}{lll} \mu = \ln 2 / g & \text{so} & \mu = 0.38 \text{ h}^{-1} \\ Y_{X/S} = (X - X_0) / (S_0 - S) & \text{so} & X = 1.5 \text{ g/L} \\ T = d = (\ln X - \ln X_0) / \mu & \text{so} & t = 5.3 \text{ h} \end{array}$$

Question 4

The following flow chart is a schematic diagram of chlortetracycline fermentation process by *Streptomyces aureofaciens*. Complete the sentences and answer the questions.

- a. antibiotic/stationnary phase/secondary metabolism (0,75pt)

- b. carbon source/nitrogen source/antifoam **(0,75pt)**
- c. Foam breaker **(0,25pt)**
- d. Preparation of the inoculum/to increase the initial biomass (x_0) and to shorten the lag phase (activate cells) this leads to an increase in the production yield **(1pt)**
- e. Pump/adjust the flow of nutrients or antifoam **(0,5pt)**
- f. Principal fermentation **(0,25pt)**
- g. Precursor **(0,25pt)**
- h. Absolute microfilters (0,22micrometer) and fibrous pre-filters **(0,5pt)**
- i. Mechanical agitation **(0,25pt)**
- j. Double jacket or coil systems by injecting hot or cold water **(0,5pt)**
- k. Batch or fed batch/ Secondary metabolites are produced in the stationary phase (when nutrients are depleted) **(1pt)**