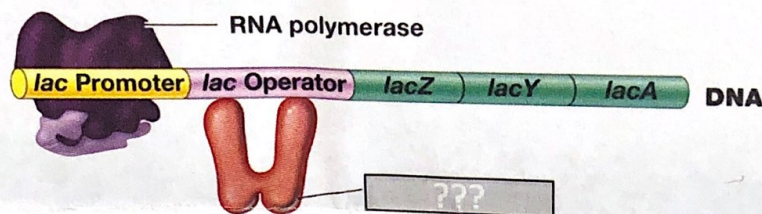


CHEM-E3121 Microbial Physiology

Please, answer to all the following five questions and be concise (i.e. brief but comprehensive).

1. You have in total 40 yeast strains (10 strains of each of four species). You aim at selecting potential strains for single cell protein production (i.e. cell biomass is the product) using an industrial side stream as the growth medium. How would you evaluate and rank the strains for suitability? What are the relevant growth parameters you would use for ranking and why? All the strains are safe to be used in the application. You have received a large batch of the industrial side stream to your laboratory to be used for experiments.
2. Microbial species' genomes encode numerous capabilities. Why do microbial cells need to adapt the use of those capabilities according to their extracellular environment? Name two examples of environmental factors microbial cells adapt to, and how the adaptation takes place (name for instance cellular processes involved). How fast, approximately, does the adaptation take place in these cases? How are the adapted cellular states? If the cells grow in the same extracellular environment for long periods of time, what happens and why?
3. Name and explain briefly the regulatory process described in the figure. What is the name of the component marked with question marks?



4. Cell envelope provides important structures and functionalities for microbial cells. Please, answer briefly to all the following questions a, b, and c on the cell envelope.
  - a. What kind of mechanisms are involved in the transport of compounds across the cytoplasmic membrane?
  - b. How is the cell envelope involved in tolerance and robustness of microbial cells? Describe briefly at least two forms of involvement.
  - c. Why do weak organic acids in the extracellular environment cause an energetic burden for microbial cells?
5. Please, describe briefly how can a species composition of a microbial community be determined?