Birla Institute of Technology & Science – Pilani, Hyderabad Campus
First Semester 2022-2023
Quiz 1 (Open book)
Bioprocess Technology, BIO F451

Date: 11.10.2022 **Duration: 30 minutes** **Total Marks: 30 M**

Answer ALL the questions in the given sequence ONLY.

1. Which of these is not a product of fermentation
   a) Oxygen b) Carbon dioxide
   c) Ethanol d) Lactate

2. Anaerobic respiration by yeast produces
   a) Wine and beer b) Carbon dioxide
   c) Alcohol d) All of the above

3. What is the degree of reduction of biomass for *Klebsiella aerogenes* ($CH_{1.63}O_{0.23}N_{0.14}$)
   a) 4.75 b) 2.0
   c) 4.5 d) 4.0

4. What is the thermodynamic efficiency for an anaerobic process
   a) 0.8 b) 0.5
   c) 0.6 d) 0.7

5. Which of the following is an upstream process
   a) Media formulation b) Product recovery
   c) Product purification d) Cell lysis

6. Downstream processing of a bioprocess includes
   a) Effluent treatment b) Product purification
   c) Both a and b d) None of the above

7. Which of these enzymes produced by microorganisms is used in the photography industry
   a) Streptokinase b) Protease
   c) Pectinase d) Amylase

8. Which of these products are categorized as anabolites during the growth of the microorganism
   a) Butyric acid b) Amino acids
   c) Lactic acid d) Acetic acid

9. What is true about secondary metabolites from the following statements
    a) Examples of secondary metabolites include ethanol, glutamic acid
    b) Secondary metabolites do not have a role in cell metabolism
    c) Secondary metabolites are produced during the tropophase
    d) Secondary metabolites are produced during the growth phase of the microorganism

10. What do you mean by biomass yield
    a) It is the concentration of biomass in the solution
    b) It is the ratio of mass of biomass produced to the mass of substrate consumed
    c) It is the ratio of amount of oxygen consumed to the amount of biomass produced
    d) It is the amount of product produced in the secondary phase of growth

11. Stationary phase is described as
    a) No further increase in the cell population after a maximum value
    b) Acceleration of growth and division rate after the growth rate reaches a maximum
    c) Deceleration of growth and division rate after the growth rate reaches a minimum
    d) Deceleration of growth and division rate after the growth rate reaches a maximum

12. Monod model is a type of ---------- model
    a) Structured and segregated
    b) Unstructured and Unsegregated
    c) Structured and Unsegregated
    d) Unstructured and segregated

13. Trophophase refers to the phase of growth in the life cycle of microorganisms where
    a) The death of cells is greater than the growth of cells
    b) The cells are actively growing
    c) The growth rate is similar to the death rate
    d) The cells are modified to spores

14. *Pseudomonas* sp. has a minimum doubling time of 2.5 h when grown on acetate in a chemostat that follows the Monod model. Given K_s = 1.2 g/L, $Y_{X/S}$ = 0.3 g cells/g acetate, S_0 = 25 g/L. Determine the value of $D_{washout}$
    a) 1.871 h^{-1}
    b) 1.258 h^{-1}
    c) 0.678 h^{-1}
    d) 0.278 h^{-1}

15. The growth of an organism on glucose followed the Monod model (μ_{max} = 0.1 h^{-1} and K_s = 0.5 g/L). The initial biomass concentration in the batch fermenter is 0.5 g/L. Estimate the minimum time required to double the biomass concentration.
    a) 7.2 h
    b) 5 h
    c) 6.93 h
    d) 1.4 h

16. Steady state cell biomass and substrate concentrations in a chemostat are 0.02 g/L and 0.04 g/L of phenol respectively. The feed (sterile) contains 0.06 g/L of phenol. Find out the biomass yield

a) 0.75 g/g
b) 0.05 g/g
c) 1.0 g/g
d) 0.25 g/g

17. The cell growth in glucose medium follows the Monod model. The following parameters are given: $\mu_{max} = 0.3\ h^{-1}$, $K_s = 0.05$ g/L, and $Y_{X/S} = 0.3$ g/g. This organism is grown in a 2 L chemostat on a medium containing 10 g/L of glucose added at a flow rate of 1 L/h. Determine the steady state concentration of biomass in the reactor

a) 0 g/L
b) 10 g/L
c) 5 g/L
d) 7.5 g/L

18. The dilution rate D is defined as (where F = volumetric flow rate, V = total volume of culture in the reactor, and μ = specific growth rate)

a) μ/F
b) F/μ
c) V/F
d) F/V

19. The maximum specific growth rate of an organism depends on

a) Medium composition
b) Temperature
c) pH
d) All of the above

20. Washout in steady state fermentation occurs when

a) Dilution rate is less than maximum specific growth rate
b) Specific growth rate is maximum
c) Dilution rate is higher than maximum specific growth rate
d) Cell concentration reaches the maximum

21. Which of the following is NOT a criterion for choice of an industrial organism

a) The optimum temperature of growth must be above 50 ℃
b) The organism must be able to grow in an easily available nutrient medium
c) The organism must be genetically stable
d) The organism must be able to produce a high yield of product

22. Which of the following shows the zone of inhibition when a particular organism is grown on a petri plate

a) Growth factor producers
b) Amino acid producers
c) Organic acid producers
d) Antibiotic producers

23. Which of the following is not a technique of preservation?
    a) Storage under liquid nitrogen
    b) Dried cultures
    c) Storage on agar slants
    d) Storage in water

24. The preservation of agar slopes has an expiration of 6 months and the agar needs to be changed every 6 months. Which of the following can be used to extend subculturing to 1 year?
    a) DMSO
    b) Paraffin oil
    c) Glycerol
    d) Loamy soil

25. Which of the following methods has great application in strain improvement?
    a) Conjugation
    b) Transduction
    c) rDNA Technology
    d) Transformation

26. The induced mutations result in ---------- formation
    a) T-T dimer
    b) G-G dimer
    c) A-A dimer
    d) C-C dimer

27. Which of the following organisms can be improved by parasexual cycle?
    a) *A. nidulans*
    b) *B. flavum*
    c) *A. niger*
    d) *P. chrysogenum*

28. In which of the following techniques the genome is transferred from one organism to another?
    a) Protoplast fusion
    b) UV mutation
    c) rDNA technology
    d) Chemotherapy

29. Which of the following can't induce mutations?
    a) Gamma rays
    b) Chlorine
    c) Bromine
    d) X-Rays

30. Which of the following is not true for a feedback system?
    a) It controls the production of primary metabolites
    b) It prevents product formation
    c) It blocks the allosteric site of the main enzyme pathway
    d) It inhibits the synthesis of the main enzyme of the pathway

**********BEST OF LUCK**********