KATHMANDU UNIVERSITY
End Semester Examination [C]
December, 2024

Level : B.Tech.
Year : II
Time : 2 hrs. 30mins.

19 DEC 2024

Course : BIOT 209
Semester : I
F. M. : 55

SECTION "C"
[3Q. × 8 = 24 marks]

Attempt *ANY THREE* questions.

1. Production of single-cell protein from hexadecane is described by the following reaction equation: $C_{16}H_{34} + a\ O_2 + b\ NH_3 \rightarrow CH_{1.66}O_{0.27}N_{0.20} + d\ CO_2 + e\ H_2O$, where $CH_{1.66}O_{0.27}N_{0.20}$ represents the biomass. If RQ= 0.43, determine the stoichiometric coefficient

2. Explain the general mass balance equation with an example.

3. Explain the mechanism of mixing with a well labelled diagram.

4. Explain the different types of reaction yield with respect to bioprocess technology.

SECTION "D"
[31 marks]

Attempt *ANY SIX* questions. **(Question N.O 5 is compulsory)**

5. Write short notes on (***ANY TWO***) [3+3=6]
   a. Enthalpy
   b. Batch process
   c. Mixing time

6. The overall reaction for microbial conversion of glucose to L-glutamic acid is:
   C6H12O6 + NH3 + 1. 5O2 - C5H9NO4 + CO2 + 3H2O
   What mass of oxygen is required to produce 15 g glutamic acid? [5]

7. What is the enthalpy of 200 g formic acid at 80°C and 1 atm relative to 25°C and 1 atm? (Cp for formic acid in the temperature range = 0.524 cal g^{-1} $°C^{-1}$)? [5]

8. Define batch process. Draw a diagram for typical batch growth of a bacterium. [5]

9. What are the different applications of mixing in bioprocessing? [5]

10. Explain briefly on the general energy balance equation for cell culture. [5]

11. Write the stoichiometric equation for cell growth. What is the value of respiratory coefficient (RQ) in terms of stoichiometric coefficient? [5]