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Q.P. Code: 53305

S.Y. B.Sc.in Biotechnology Semester III Examination

Model Answers: Set ~~I~~

Biotechnology, USBT306: Bioprocess Technology

Q 1. Do as directed (Any fifteen)

15

1. Sensitivity of different microorganism to antibiotics is shown by their inhibition of growth is known as antibiotic inhibition spectrum.
2. *Spirulina, Chlorella*
3. Wilkin's overlay.
 1. Wilkins overlay involve use of test organism
 2. Wilkins medium contain acid base indicator dye
4. Test organism used are generally auxotrophic for detection of growth factors and is sensitive strain or a pathogen for antimicrobial compounds thus it helps in screening for these compounds.
5. Cryoprotective agent
6.
 1. Chemical composition of media
 2. Access of oxygen and moisture to organisms after sealing
 3. Insufficient elimination of moisture and oxygen
 4. Storage temperature
7. Useful to screen growth factor producing microorganisms
8. CSL,soya meal,peanut meal,cotton seed meal
9. Stainless steel
10. Measure of fractional reduction in viable organism produced by a certain heat and time regimen.
11. In line sensor
12. False
13. Vinegar
14. Batch: 1) It is closed system. 2) Set up can't be changed from outside.
Continuous: It's is open system 2) Set can be changed from outside.
15. 1. Highly specific 2. Quantitatively detect minute amounts of fermentation product 3. Differentiate between biologically active & inactive forms of a compound.

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16. They are assays which measure the effect of fermentation product on some metabolic reaction that the test organism carries out during growth.
17. Acridine orange
18. True.
19. *Euglena gracilis*, *S. aureus* ATCC 6538
20. Bromothymol blue

Q 2 A. Discuss primary screening of amino acid producing microorganisms. 08

- Definition of primary screening 1Mark
- Method 1: 7Marks
 1. Serial dilution and plating. Use of suitable sample on suitable media 3Marks
 2. Identification of the isolate using test organism ³ Marks
 3. Interpretation of result 1Mark

Or

Method 2: Technique of Auxanography (7 Marks)

- Preparation of basal plate with filter papers and soil microorganisms (serially diluted) 3 Marks
 - Preparation of second plate of test organisms 2 Marks
 - Interpretation of the result 2 Marks
- Or above to methods in short (7 Marks)

Q 2 B. Describe process of lyophilisation for preservation of industrially important strains and state its advantages and disadvantages. 07

- Preparation of thick suspension of microorganism and freezing it in vials 2 Marks
- Freeze drying through lyophilizer and diagram. 3 Marks
- Description of sealed vial and process of sealing 1Mark
- Advantages 1Mark

Long time preservation, viability of microorganisms is more, easy to store, low risk of contamination as method cut down on number of transfer etc.

- Disadvantages 1Mark
- Expensive

OR

Q 2 C. Give a brief account on objectives of secondary screening. 08

Any 8 objectives: 8 Marks

Secondary screening determine

3

1. True potential of organisms screened from primary screening.
2. Novelty of product.
3. Economical ways to produce product.
4. Media optimization and process parameters.
5. Structure of the product.
6. Stability of product.
7. Different racemic forms of product.
8. Newer methods of strain improvement and development to increase yield of product.
9. Methods to recover product.
10. Give knowledge of byproduct.
11. Yield of product etc.

Q 2 D. Elaborate on cryopreservation; method, advantages and disadvantages.

07

1. Use of liquid nitrogen for storage at -196°C , -136°C , temperatures 1Mark
2. Use of cryoprotective agents such as DMSO and glycerol 1Mark
3. Preparation of culture for cryopreservation (steps) 3 Marks
4. Advantages (Any 2):1Mark
Long duration of preservation, easy to preserve and less volume is occupied for storage, effective method to preserve, don't change cultural characteristics of organisms, chances of contamination are less.
5. Disadvantages (Any 2): 1Mark
Damage or injury to cell due to fluctuations in storage temp and while recovery, availability of nitrogen essential, failure of which hinders storage process, chances of accidents are there, expensive etc.

Q 3 A. Discuss various agitation and aeration devices used in fermenter.
Function of: 1) impeller 2) stirrer glands and bearing 3) Baffles 4) Sparger (2Mark each)

08

Q 3 B. Give a brief account on submerged fermentation using suitable examples. State its advantages and disadvantages.

07

- Definition: submerged Fermentation process involving submersion of microorganism in an aqueous media containing nutrients for growth 1Marks
- Fermentation requirement: Large closed vessel, more depth of the fermentor vessel, Rheology of the medium (02 marks)

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- Example Citric acid production by *Aspergillus niger* or any other in short (02 marks)
advantages and disadvantages (2Marks)

OR

Q 3 C. Describe methods to measure temperature and dissolved oxygen in fermentation process.

08

- Methods used to measure temperature :
 - a) Mercury in glass thermometer/ Electrical resistance/Thermistor (4marks)
 - b) Measurement of dissolved oxygen: Galvanic electrode/ Polarographic electrode/ phase fluorometric sensor 4Marks.

Q 3 D. Discuss industrial production of penicillin.

07

- **Strain used** : *Penicillium chrysogenum* (01 marks)
- **Preservation** : Spore suspension stored in inert support/lyophilization/use of liquid nitrogen (01 marks)
- **Innoculum preparation** : Lyophilised stock culture to seed Stage. (01marks)
- **Raw materials**: Carbon source , Nitrogen source ,Mineral source, Precursor/fermentation conditions (01 marks)
- **Extraction** :a) Removal of mycellium b) Contercurrent solvent extraction (02 marks)
- **Purification**: Acidification and re-extraction (01 marks)

Q 4 A. Discuss principle & applications of paper chromatography in fermentation product analysis.

08

Principle- Stationary phase, mobile phase, role of paper, solvents
concept of Rf value , how employed for fermentation broth – 4 marks

Steps- 2 marks

Advantages / application – 2 marks

Q 4 B. Give an account on Blood concentration-time profile for a theoretical drug given intravenously.

07

1. Concept of pharmacokinetics, Routes of administration – 4 marks
2. Discussion – 3 marks

OR

Q 4 C. Elaborate on Diffusion assays.

08

1. What are they? (They are types of biological assays) , Types (4 marks)
2. How they are done? (3 marks), Advantages/ applications (1 mark)

Q 4 D. Describe cell yield determination as a method of analysis of fermentation broth.

07

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1. Principle /How it is done? – 2marks
2. Packed cell volume , Petroff hausser counting chambers etc
Use of dyes, examples discussion - 5 marks

Q 5. Write Short notes on **any three** of the following

15

- A.** Giant colony technique.
1. Method of secondary screening of antibiotic producers which helps in determining spectrum of antibiotics. 1Mark
 2. Techniques of making gaint colony and application of test organism 2 Marks
 3. Interpretation of spectrum through detection of zone of inhibition 2 Marks
- B.** Importance of fungi in industrial production processes.
Example of any 2 fungi and their products in details or examples of any 5 fungi and product one product each 5 Marks.
- C.** Properties of ideal antifoam agent used in fermentation media.
Property of Ideal Antifoam agent (Any 5). 5 marks
easily dispersible, active at low concentration, long lasting action on foam, heat sterilizable, cheap, non-toxic
- D.** Spectrophotometric methods for analysis of fermentation broth.
- Principle of spectrophotometry- (2marks)
 - How it is employed for fermentation product , Measurement of colored fermentation products of color other than fermentation medium +
 - Measurement of products without color (2 marks)
 - Applications – (1 mark)
- E.** Bioavailability.
- Bioavailability – explanation & definition, various forms of drugs – 2 mark
 - Significance/ need to know bioavailability – 2 mark
 - Factors influencing bioavailability – 1 mark
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