



***FACULTY OF SCIENCE***

**DEPARTMENT OF BIOTECHNOLOGY (DFC)  
MODULE: BTN03B2 BIOTECHNOLOGY 3B  
(NATIONAL DIPLOMA BIOTECHNOLOGY)  
November Examination**

**DATE: 9<sup>th</sup> November 2019**

**SESSION: 08:30 am – 11:30am**

**Examiner**

**Dr.Sudharshan Sekar**

**External Moderator**

**Dr. Tracy Masebe**

**Duration: 3 Hours**

**Marks 150**

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**INSTRUCTIONS** :

- 1 ANSWER ALL QUESTIONS
- 2 ANSWER **SECTION A** ON THE UJ MULTIPLE CHOICE ANSWER SHEET PROVIDED BY BLOCKING OUT THE APPROPRIATE CIRCLE ON THE ANSWER SHEET USING A PEN OR **PENCIL (DO NOT USE RED INK)**. THERE IS ONLY ONE CORRECT ANSWER FOR EACH QUESTION.
- 3 MAKE SURE THAT YOUR NAME OR STUDENT NUMBER IS CLEARLY WRITTEN ON THE UJ MULTIPLE CHOICE ANSWER SHEET AS WELL AS ON YOUR TEST ANSWER SCRIPT
- 4 ANSWER SECTION B IN YOUR TEST ANSWER SCRIPT
- 5 HAND THE UJ MULTIPLE CHOICE ANSWER SHEET IN TOGETHER WITH YOUR TEST ANSWER SCRIPT AS WELL AS YOUR QUESTION PAPER.

**SECTION A (ANSWER ON ANSWER SHEET)**

1. Tannin from Hops:

- A play a role in foam characteristic of beer
- B adds to the bitter flavour
- C has an antibiotic effect
- D helps to coagulate protein degradation products in wort
- E none of the options above

2 If malt contains a high ratio of proteins compared to carbohydrate, the result will be a beer that is:

- A rich
- B dark coloured
- C unstable
- D all of the option above
- E none of the options above

3 Higher temperatures used to stop barley germination results in:

- A rich beer
- B dark coloured beer
- C unstable beer
- D all of the option above
- E none of the options above

4 Mashing allows:

- A barley to germinate
- B malt enzymes to act on barley substrates
- C yeast enzymes to act on wort nutrients
- D all of the option above
- E none of the options above

5 To separate husks and other grain residues from wort, a ..... is used:

- A wort strainer
- B mash strainer
- C lauter tub
- D wort kettle
- E none of the options above

6 Beer is normally fermented at:

- A 12-13°C
- B 18-22°C
- C 25-30°C
- D 36-38°C
- E none of the options above

- 7 “Pitching” is a term used in beer industry to indicate:  
A inoculation  
B adjusting pH  
C adjusting Temperature  
D harvesting  
E none of the options above
- 8 Cold storage maturation of beer results in:  
A coagulation of nitrogenous substances  
B coagulation of resins  
C chillproofing  
D all of the options above  
E none of the options above
- 9 The final dissolved CO<sub>2</sub> content of beer is:  
A 20%  
B 15%  
C 10%  
D 5%  
E none of the options above
- 10 The greatest contamination threat in beer brewing is from:  
A *Acetobacter*  
B wild yeast  
C *Lactobacillus*  
D *Pediococcus*  
E none of the options above
- 11 Eutrophication results from excessive:  
A phosphates in the water  
B nitrates in the water  
C Algae in the water  
D all of the options above  
E none of the options above
- 12 Water with a high Biological Oxygen Demand (BOD):  
A has lots of nitrates in the water  
B has lots of phosphates in the water  
C has lots of organics in the water  
D all of the options above  
E none of the options above
- 13 Primary treatment of sewage implies:  
A the destruction of primary pathogens in the water  
B removal of large solids from the water  
C aerobic microbial growth in the water  
D all of the options above  
E none of the options above

- 14 The purpose of a balancing dam in sewage purification is:  
A to prevent the development of maximum stationary phase in the activated sludge tank  
B to prevent dilution of the culture in the activated sludge tank  
C to control the flow rate into the activated sludge tank  
D all of the options above  
E none of the options above
- 15 Anaerobic digesters receive sludge from:  
A primary settling tanks  
B secondary settling tanks  
C activated sludge tanks  
D all of the options above  
E none of the options above
- 16 Biomass sludge from secondary settling tanks can be used:  
A as inoculum for the activated sludge tank  
B as inoculum for the Imhoff tank  
C as inoculum for the anaerobic digester  
D all of the options above  
E none of the options above
- 17 *Zoogloea ramigera* is of prime importance in:  
A floc formation during activated sludge processes  
B production of extracellular slime  
C formation of Biofilms in biological filters  
D all of the options above  
E none of the options above
- 18 Which of the following microbes are found in Bulking Sludge?  
A Methanococcus  
B Sphaerotilus  
C Zoogloea  
D all of the options above  
E none of the options above
- 19 Which of the following microbes are active in the activated sludge floc?  
A Vibrio  
B Flavobacterium  
C Pseudomonas  
D all of the options above  
E none of the options above
- 20 Which is the recommended sewage treatment system for small rural communities?  
A Bayer Biotower  
B ICI Pressure Cycle Fermenter  
C Biodisc  
D Imhoff tank  
E Oxidation Pond

- 21 Introduction of an axial hydroxyl group into the steroid nucleus at the point of saturation is called:
- A dehydrogenation
  - B hydroxylation
  - C reduction
  - D epoxidation
  - E none of the options above
- 22 *Fusarium graminearum* can be used:
- A to oxidize alkanes
  - B as a source of protein
  - C to purify sewage
  - D for epoxidation
  - E none of the options above
- 23 When the conversion of a substrate to a product is a simple, specific, chemically defined reaction, it is referred to as:
- A a bioreaction
  - B a fermentation
  - C carrier-binding
  - D immobilization
  - E a biotransformation
- 24 When microbial cells are immobilized with the help of bi- or multifunctional reagents such as glutaraldehyde and toluenediisocyanate, the method is called:
- A entrapment
  - B cross-linking
  - C carrier binding
  - D gel-enclosure
  - E solvent stabilization
- 25 The active site of an enzyme can be stabilized during immobilization by:
- A addition of the substrate
  - B addition of solvents
  - C addition of salt
  - D all of the options above
  - E none of the options above
- 26 Which of the following are characteristics of immobilized microbial cells?
- A optimum pH can be different
  - B do not require maintenance
  - C optimum temp is different
  - D all of the options above
  - E none of the options above

- 27 When microbial cells are ionically bound to water-insoluble carriers containing ion-exchange residues, the method is called:
- A cross-linking
  - B entrapment
  - C transformation
  - D all of the options above
  - E none of the options above
- 28 For the production of L-alanine, *Pseudomonas dacunhae* is usually immobilized by means of:
- A polyacrylamide gel
  - B cross linking with albumin or gluteraldehyde
  - C cross linking with collagen and dialdehyde starch
  - D collagen membrane
  - E calcium alginate gel
- 29 The type of enzyme reaction resulting in the production of NADP by immobilized *Achromobacter aceris* cells, is a:
- A oxidoreductase reaction
  - B transferase reaction
  - C Hydrolase reaction
  - D Isomerase reaction
  - E multi-enzyme reaction
- 30 The culture required for the production of urocanic acid from histidene is:
- A *Erwinia herbicola*
  - B *Pseudomonas dacunhae*
  - C *Achromobacter aceris*
  - D *Aspergillus ochraceus*
  - E *Achromobacter liquidum*
- 31 The substrate required for the production of L-citrulline by immobilized *Pseudomonas putida*, is:
- A L-arginine
  - B L-aspartic acid
  - C acyl-DL-amino acids
  - D D-glucose
  - E histidene
- 32 For sterilization of the medium in the bioreactor vessel, steam is generated by ....
- A cartridge heaters inside the jacket
  - B cartridge heaters inside the vessel.
  - C a built-in boiler
  - D all of the options above
  - E none of the options above

33. To obtain efficient heat transfer during sterilization .....
- A the impeller agitates from 150 to 500rpm for mixing medium.
  - B the surface to volume ratio must be sufficiently large
  - C the transfer medium must be a good conductor of heat
  - D all of the options above
  - E none of the options above
34. When the volume of medium to be sterilized increases, ....
- A the “holding time” at maximum  $T^{\circ}$  should be increased
  - B the “holding time” at maximum  $T^{\circ}$  should be decreased
  - C the “holding time” at maximum  $T^{\circ}$  should not be changed
  - D none of the options above
35. When the size of the Bioreactor increases, the agitation speed should be ....
- A decreased
  - B increased
  - C kept unchanged
  - D none of the options above
36. The growth parameters are set ...
- A as soon as sterilization is complete
  - B after inoculation
  - C just before inoculation
  - D any of the options above
  - E none of the options above
37. Steam-sterilizable replaceable cartridge filters cannot be found .....
- A in the air inlet
  - B in the exhaust line
  - C in the inoculation port
  - D all of the options above
  - E none of the options above
38. When the high foam condition in the vessel is detected by the high foam sensor and persists for at least 5 or 7 seconds, the microprocessor will
- A shut off the air flow
  - B reduce the agitation speed
  - C activate the antifoam pump
  - D sound an alarm
  - E all of the options above
39. The maximum  $T^{\circ}$  that can be maintained by the Bioreactor during growth is .....
- A 45°C
  - B 55 °C
  - C 75 °C
  - D 85 °C
  - E 105 °C

- 40 When D.O. is in the .....?..... mode, and the Agitation is in the D.O. mode, the agitation of the vessel is cascaded from the D.O., so that the agitation speed is varied to maintain the set percentage of the D.O.
- A SPAN
  - B ZERO
  - C PID
  - D GROWTH
- 41 The agitation set-point selected by the operator after engaging D.O. control determines the maximum agitation speed while in D.O. mode.
- A optimum
  - B minimum
  - C maximum
  - D none of the options above
42. Certain types of mycelia can grow on the liquid junction of the pH probe. These growths can be prevented from forming by .....
- A the addition of a few drops of formaldehyde.
  - B the 3-Molar KCl solution.
  - C storing the probe under dry conditions
  - D all of the options above
  - E none of the options above
43. During sterilization it is essential to pressurize ..
- A the DO probe
  - B the foam sensor
  - C the Temperature probe
  - D the inoculum port
  - E none of the options above
- 44 When sterilizing the ports, it essential to .....
- A open the port steam ball valve
  - B open the steam entry valve
  - C open the steam exit valve
  - D all of the options above
  - E none of the options above
- 45 Sauerkraut fermentation is initiated by:
- A *Lactobacillus brevis*
  - B *Achromobacter*
  - C *Pediococcus cerevisiae*
  - D *Lactobacillus plantarum*
  - E *Leuconostoc mesenteroides*
- 46 Pickle fermentation involves:
- A *Chlostridium aceto-butylicum*
  - B *Achromobacter*
  - C *Pediococcus cerevisiae*

- D *Lactobacillus delbruckii*  
E *Streptococcus cremoris*
- 47 Spoilage of olive fermentation involves:  
A *Propionibacterium*  
B *Saccharomyces oliaginosas*  
C *Pichia membranaefaciens*  
D *Candida diddensii*  
E *Lactobacillus lantarum*
- 48 A starter culture for cheese production includes:  
A *Propionibacterium*  
B *Streptococcus thermophilus*  
C *Streptococcus lactis*  
D none of the option above  
E all of the options above
- 49 The fermentation temperature for yoghurt production is:  
A 40%  
B 30%  
C 20%  
D 10%  
E none of the options above
- 50 Alkanes can be oxidized by:  
A *Chlostridium perfringens*  
B *Acetobacter*  
C *Candida*  
D *Pasteurella*  
E none of the options above.

[50]

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## **SECTION B**

### **QUESTION 1**

Provide a detailed explanation on the production of amino acids by bioprocessing?

[18]

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### **QUESTION 2**

Explain the production of SCP from yeast and its advantages and disadvantages?

[12]

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**QUESTION 3**

- (a) Explain vinegar production by the Orleans method and its disadvantages? [8]  
(b) Highlight the characteristics of acetic acid strains used in industry for vinegar production? [2]
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**QUESTION 4**

Explain the chemical methods for immobilization and its advantages and disadvantages? [10]

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**QUESTION 5**

Using the aid of a diagram, describe the various roles that enzymes and microorganisms play in the production of beer? [22]

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**QUESTION 6**

What is sewage treatment? [2]  
Explain preliminary sewage wastewater treatment? [8]

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**QUESTION 7**

Define antibiotics? [1]  
What is primary and secondary metabolism? [2]  
What are the Antibiotic targets? [5]

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**QUESTION 8**

Explain the olive types and its process of fermentation? [10]

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**Total: 150**

