UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY (DFC)
MODULE: BTN03B2 BIOTECHNOLOGY 3B/BTN2BBP / BIOPROCESSING
(NATIONAL DIPLOMA BIOTECHNOLOGY*)*
Supplementary Examination

DATE: 8th January 2020 **SESSION: 08:00 am – 11:00am**

Examiner **Dr.Sudharshan Sekar**

External Moderator **Dr. Tracy Masebe**

Duration: 3 Hours **Marks 120**

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_2 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 gluteraldehyde 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 L-glutamic acid is:

A used for the treatment of bronchitis
B used for flavouring of food
C increases arginine activity in the liver
D used for treatment of gastric ulcers
E used for the manufacture of cosmetics

33 L-cysteine is:
A also called Konbu
B is naturally present in cereals
C is used to improve bread quality
D used to increase efficiency of protein utilization of animal feeds
E used for the treatment of nasal catarrh

34 $_{L}$-histidine is:
A used for the treatment of bronchitis
B used for flavouring of food
C increases arginine activity in the liver
D used for treatment of gastric ulcers
E none of the options above

35 L-alanine is:
A used for the treatment of bronchitis
B used for flavouring of food
C increases arginine activity in the liver
D used for treatment of gastric ulcers
E none of the options above

36 Amino acids can be produced using:
A wild strains
B regulatory mutants
C auxotroph mutant
D cheap carbon sources
E all of the options above

37 The secretion of $_{L}$-glutamic acid by wild strain bacteria is enhanced by:
A excess Biotin
B presence of Penicillin
C addition of $_{DL}$-methionine
D none of the options above
E all of the options above.

38 The secretion of $_{L}$-lysine by auxotroph mutant of Corynebacterium glutamicum is enhanced by:
A excess Biotin
B presence of Penicillin
C addition of $_{DL}$-methionine
D none of the options above
E all of the options above

39 A cell that has lost a specific enzyme in its metabolic pathway is called a:
A wild strain
B a regulatory mutant
C a precursor
D an auxotroph mutant
E none of the options above

40 Penicillin:
A is readily hydrolysed by enzymes from gram negative bacteria
B can not be influenced by precursors
C can make use of Phenoxyacetic acid as precursor
D is usually produced from molasses
E is subject to actinophage attack

41 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

42 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

43 When the volume of medium to be sterilized increases, ….
A the "holding time" at maximum Tº should be increased
B the "holding time" at maximum Tº should be decreased
C the "holding time" at maximum Tº should not be changed
D none of the options above

44 When the size of the Bioreactor increases, the agitation speed should be ….
A decreased
B icreased
C kept unchanged
D none of the options above

45 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

46 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

47 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

48 The maximum Tº that can be maintained by the Bioreactor during growth is ….
A 45ºC
B 55 ºC
C 75 ºC
D 85 ºC
E 105 ºC

49 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

50 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

[50]

SECTION B

QUESTION 1

(a) Define amino acids? Give any two examples? **[2]**
(b) Provide a detailed explanation on the production of amino acids by Bioprocessing? **[18]**

QUESTION 2

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

QUESTION 3

(a) What are the antibiotic targets? **[2]**
(b) How do you classify antibiotics? **[6]**

QUESTION 4

What are the health benefits of vinegar? **[10]**

QUESTION 5

Explain secondary sewage wastewater treatment? **[10]**

Total: 120