UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

COURSE NO: MR 379
COURSE NAME: MICROBIAL TECHNOLOGY
CLASS: MR III **TIME:** 3 HOURS

Name**:** _____Index Number: _____

Attempt All Questions. Indicate the Correctness of each of the statements by writing True or False, and submit your answer.

1.	Biotechnology can be described as the use of microorganisms, typically grown on a large scale, to yield products or carry out chemical transformation.	
2.	Aerobic microorganisms require molecular O_2 for life and reproduction.	
3.	Microbiology can be grouped into medical, food and industrial microbiology.	
4.	Microorganisms that thrive in near neutral pH environments are referred to as alkalinophiles.	
5.	The application of microorganisms in biotechnology is referred to as metallurgical biotechnology.	
6.	Bamboo plants, bacteria, fungi and algae are examples of microorganisms.	
7.	Biosorption processes can be accomplished by microbial biomass and/or plants.	
8.	Major microorganisms of industrial interest are viruses, fungi and archaea.	
9.	Algae uses photosynthesis to capture sunlight energy and carbon dioxide to produce oxygen and carbohydrates.	
10.	Archaea are typically extremophiles.	
11.	The microorganisms used for the biooxidation of sulphidic gold ores are those responsible for acid mine drainage.	
12.	Fungi can be used in the production of some drugs and food.	
13.	A virus can reproduce both outside and within the living cells of a host.	
14.	Among microorganisms, bacteria have been studied the most.	
15.	Bacteria are estimated to comprise over 50% of the earth's living matter.	
16.	Gold can be bioleached by direct microbial attach.	
17.	A wet microbial cell consist of 50% carbon and 50% water.	
18.	*Escherichia coli* is an example of bacteria.	
19.	*Mycobacterium ulcerans* is an example of fungi.	
20.	The application of fungi in hydrometallurgy is referred to as mycohydrometallurgy.	
21.	Bacillus describes bacteria with rounded morphology.	
22.	Thermophilic organisms can survive within a temperature range of 20 ^{0}C to 75 ^{0}C	
23.	Obligate anaerobes can tolerate oxygen in their reproduction.	

24.	Osmophiles are microorganisms adapted to environments with high osmotic pressures, such as high sugar concentrations.	
25.	The principle of bioleaching of sulphides can be applied to the microbial beneficiation of copper.	
26.	Primary metabolism gives birth to antibiotics.	
27.	Secondary metabolites occur during the exponential phase of microbial growth.	
28.	Stationary cultures are always better than shake cultures.	
29.	Biofilms are extracellular polymeric substances (EPSs) within which microbial cells adhere to one another or to a surface.	
30.	Chemolithotrophs are responsible for uncontrollable dissolution of sulphides in the environment.	
31.	Poor performance in biooxidation reactors occur as a result of biofilm formation.	
32.	Bioremediation is more efficient than abiotic remediation methods when the concentration of contaminants are very high > 20000 ppm.	
33.	Phytoremedation is a type of biological methods which makes use of plants.	
34.	The formation of ferrous iron is very important for a successful neutralization of BIOX liquor.	
35.	Formation of iron (III) from iron (II) can be used to measure the performance of a BIOX system.	
36.	*In vitro* bioprocess make use of cell-free components of an organism.	
37.	Dissolution of uranium can be achieved by direct attack by microorganism.	
38.	AMD/ARD can lead to respiratory challenges for aquatic lives.	
39.	Genetic engineering deals with the genetic manipulation of microorganisms for specific applications.	
40.	Biooxidation of gold ores can be described under bioprocessing of precious metals.	
41.	Microorganisms serve to improve upon the nutrient make-up of soils.	
42.	The phosphorus cycle is basically the same as the carbon cycle.	
43.	Metabolism can be grouped into anabolism and catabolism.	
44.	Gram-negative bacterial are difficult to treat due to the very thick peptidoglycan layer.	
45.	Detoxification of cyanide can be achieved by using white rot fungi.	
46.	The malaria parasite belongs to the protozoan group of microorganisms.	
47.	Biosorption is the same as bioleaching.	
48.	Bioventing is a type of *in situ* process which occurs on the surface of the earth.	
49.	The use of bioreactors assist in controlling and managing bioprocesses.	
50.	Mineral Engineering III students took a course called Microbial Technology.	

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Section B: Attempt Only Two Questions (50 marks)

Question One (25 marks)

1a. Microorganisms require energy and carbon sources to complete their metabolism, and depending on these sources, the microbes are placed under different nutritional classes. As a good student of Microbial Technology, provide the sources of carbon and energy for the classes shown in the table below by copying and completing the table. **(10 marks)**

Nutritional classification	**Source of energy**	**Source of carbon**
Photo-autotrophs		
Photo-organotrophs		
Chemo-autotrophs		
Chemo-lithotrophs		
Chemo-heterotrophs		

1b. The same microorganisms can be used for the biological beneficiation of copper and gold. However, in the case of copper, the process is referred to as bioleaching whereas gold process is biooxidation. Clearly explain the major differences between the biological recovery of gold and copper. **(15 marks)**

Question Two (25 marks)

2a. Bioremediation can be accomplished using *in situ* and *ex situ* processes. Describe how *ex situ* bioremediation can be accomplished. **(10 marks)**

2b. when microorganisms are grown in a batch culture, their growth follow a general pattern represented as microbial growth curve. With the aid of a well-labeled diagram, explain the different stages in a microbial growth curve when bacteria are grown in a batch culture. **(15 marks)**

Question Three (25 marks)

3a. Biogeochemical cycle refers to a pathway that describes how chemical substances move through living organisms and the nonliving environment. By using a simple diagram to describe the four systems of the earth (- sphere), explain how substances turn over in these systems to bring about a biogeochemical balance. **(15 marks)**

3b. Explain how carbonaceous matter in refractory gold ores can be biotransformed to decrease its preg-robbing ability. **(10 marks)**

Good luck!

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