

M.Sc. BIOTECHNOLOGY
SECOND SEMESTER
ENVIRONMENTAL BIOTECHNOLOGY
MBT-203

Duration: 3 Hrs.

Marks: 70

{ Part : A (Objective) = 20 }
{ Part : B (Descriptive) = 50 }

[PART-B : Descriptive]

Duration: 2 Hrs. 40 Mins.

Marks: 50

[Answer question no. One (1) & any four (4) from the rest]

1. Discuss in detail the biochemical aspects of biomethanation. (10)
2. What are the major objectives to be achieved in bioremediation? Discuss the importance of genetic engineering in bioremediation with special reference to heavy metals. (3+7=10)
3. What do you understand by *in-situ* and *ex-situ* MEOR? Discuss the role of biosurfactants in the enhanced recovery of oil using microorganisms. (3+7=10)
4. Mention the important factors affecting the remediation of oil spill. How microorganisms can be helpful in removing the petro-pollutants from marine or terrestrial environment? (3+7=10)
5. Mention the circumstances under which tertiary treatment is required in a waste water treatment plant. Write the principle of secondary treatment process. (4+7=10)
6. Define the process of sanitary landfilling. Give a diagrammatic representation of the process for management municipal solid waste. Mention the pros and cons of the process. (1+5+4=10)
7. Define biosensor. Discuss the important features the working model of a biosensor need to have. Give a diagrammatic representation of an amperometric biosensor used for detection of blood glucose level. (10)
8. Add brief explanatory notes on any two of the following: (5+5=10)
 - a) Survival strategy in alkaliphiles.
 - b) In-situ bioleaching.
 - c) Principle and application of DGGE.

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[PART-A : Objective]

Choose the correct answer from the following:

1X20=20

1. _____ is an in-situ bioremediation strategy that involves controlled stimulation of airflow by delivering oxygen to unsaturated zone in order to increase activities of indigenous microbes.
 - a. Bioventing
 - b. Biosparging
 - c. Bioaugmentation
 - d. Biostimulation

2. $\text{CuFeS}_2 + 4\text{O}_2 \rightarrow \text{Cu}^{2+} + \text{Fe}^{2+} + 2\text{SO}_4^{2-}$, represents the net reaction for bioleaching of copper from chalcopyrite, by _____ mechanism.
 - a. polysulfide
 - b. thiosulphate
 - c. cyanide
 - d. none of the above

3. _____, widely used in the medical industry, are linear polymers produced in nature by bacterial fermentation of sugar or lipids.
 - a. Polyhydroxyalkanoates
 - b. Poly-3-hydroxybutyrates
 - c. Polyhydroxyvalerates
 - d. Polyhydroxyhexanoates

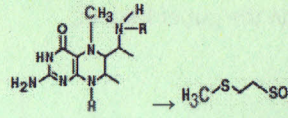
4. The biological component in a biosensor interacts specifically to the analyte which produces a physical change close to the transducer surface. If the physical change is in the form of change in mass of the biological component, it is the working principle of _____ biosensor.
 - a. conductimetric
 - b. potentiometric
 - c. amperometric
 - d. acoustic wave

5. In rhizofiltration, the hyperaccumulating plants are cultured hydroponically in solution containing the targeted toxicant to _____ them to the environment.
 - a. dispose
 - b. acclimatize
 - c. introduce
 - d. none of the above

6. Blastofiltration is an important process of phytofiltration in which the metals are absorbed or adsorbed by the use of _____.
 - a. seedlings
 - b. floral buds
 - c. excised plant shoots
 - d. plant roots

7. Nickel-resistant soil bacterium *Kluyvera ascorbata* SUD 165 promoted the growth of *Brassica campestris* in the presence of high concentration of nickel due to its ability to lower the level of ethylene stress in the seedlings. This is an example of _____.
 - a. rhizofiltration
 - b. phytodegradation
 - c. rhizodegradation
 - d. mycoremediation

8. Xanthan gum, an ideal biopolymer for use in EOR, is produced by fermentation of carbohydrates using _____.
 - a. *Xanthomonas citri*
 - b. *Xanthomonas tobacco*
 - c. *Xanthomonas brassicaei*
 - d. *Xanthomonas solanae*

9.  Enzyme initiating this reaction is _____.
 - a. Methyl CoM reductase I or II
 - b. Methyl Tetrahydromethanopterin Methyl Transferase
 - c. Methyl Tetrahydromethanopterin Cyclohydrolase
 - d. F420

10. Hyperkeratosis is a common problem associated with chronic or lower levels of exposure of _____.
 - a. Arsenic
 - b. Lead
 - c. Mercury
 - d. Cadmium

11. _____ used to dissipate oil slicks is either a non-surface active polymer or a surface active substance that improves the separation of particles and to prevent settling or clumping.
 - a. Dispersant
 - b. Solidifier
 - c. Skimmer
 - d. Boom or Barrier

12. The thermoalkaliphilic catalase which is extremely stable compared to other catalases at high temperatures and pH was isolated from the extremophilic organism _____.
 - a. *Thermus brockianus*
 - b. *Thermus barophilus*
 - c. *Thermus aquaticus*
 - d. *Thermus thermococcus*

13. Among the following bioremediation techniques, _____ is more effective for removal of volatile compounds from contaminated soil.
 - a. bioaugmentation
 - b. biosparging
 - c. bioventing
 - d. biopile



14. Ferrous and sulphur oxidizing bacterium *Leptospirillum ferrooxidans* is commonly used for bioleaching of _____.
- iron
 - gold
 - copper
 - all of the above
15. Halophiles survive in a saline environment by increasing _____ of the cell.
- proton pumping process
 - cytosolic acidity
 - internal osmolarity
 - both b) and c)
16. Among the following archaea, _____ has been traced in the gut of human.
- Methanococcus smithii*
 - Metallosphaera sedula*
 - Acidianus infernus*
 - Acidianus brierleyi*
17. _____ allows the direct scrutiny of microbial populations within their three-dimensional ecological niche.
- Fluorescence in situ hybridisation (FISH)
 - Single strand confirmation polymorphism (SSCP)
 - Amplified ribosomal DNA restriction analysis (ARDRA)
 - Denaturing gradient gel electrophoresis (DGGE)
18. The bulking agents used in composting enhance the activity of aerobic bacteria by increasing _____ of the organic material.
- porosity
 - alkalinity
 - moisture content
 - all of the above
19. In diagnostic nuclear medicine, the isotope _____ finds its application in treating thyroid cancer.
- I-131
 - Y-90
 - Cs-137
 - Sr-89
20. In soil bioremediation, the nutrients for inducing the indigenous microbes should in the molar ratio of C:N:P= _____.
- 100:20:10
 - 120:10:1
 - 100:10:1
 - 120:20:10

Course :

Semester : Roll No :

Enrollment No : Course code :

Course Title :

Session : 2016-17 Date :

Instructions / Guidelines

- > The paper contains twenty (20) / ten (10) questions.
- > The student shall write the answer in the box where it is provided.
- > The student shall not overwrite / erase any answer and no mark shall be given for such act.
- > Hand over the question paper cum answer sheet (Objective) within the allotted time (20 minutes / 10 minutes) to the invigilator.

Full Marks	Marks Obtained	Remarks
20		

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Scrutinizer's Signature

Examiner's Signature

Invigilator's Signature