

**M Sc. Biotechnology
Second Semester
Environmental Biotechnology
(MBT-08)**

Duration: 3Hrs.

Full Marks: 70

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins.

Marks: 50

**(Answer any four questions from Question No. 1 to 5.
Question No. 6 and 7 are compulsory)**

1. Define co-metabolism and gratuitous metabolism. Explain with reactions how different microbes can together degrade 4-chlorobiphenyl? **2+3=5**
2. Explain briefly why mixed populations of microbes is desirable for degradation of xenobiotic compounds. **5**
3. What do you understand by MEOR? Mention some of the important microbes used in MEOR. **3+2=5**
4. Discuss briefly the active mechanism of cytosolic acidification developed by alkaliphiles to survive in an extreme alkaline condition. **5**
5. Discuss in brief the biochemical process of biomethanation. **5**
6. Describe the aerobic and anaerobic approaches in the secondary treatment of industrial waste water. What is the ultimate fate of this treated water. **7+3=10**

or

Add a brief note on health effects of heavy metals. Explain briefly the bioremediation strategies to clean up the heavy metal pollutants. **4+6=10**

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7. Give brief explanation on (Any Four):

4x5=20

- a) Mycoremediation
- b) ARDRA
- c) G+C Analysis
- d) Biosensor
- e) Sources of radioactive waste
- f) Environmental effect of oil-spill

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(The figures in the margin indicate full marks for the questions)

Duration: 20 minutes

Marks – 20

(PART A- Objective)

1. Choose the correct option for the following questions:

1x20=20

- i. Among the following archaea, _____ has been traced in the gut of human.
a) Methanococcus smithii b) Acidianus brierleyi
c) Metallosphaera sedula d) Acidianus infernus
- ii. The oleophilic, hydrophobic chemicals which chemically and physically bond to both soluble and insoluble hydrocarbons, forming gel-like agglomerations during oil-spill remediation, are known as _____.
a) bioremediation accelerators b) dispersants
c) solidifiers d) none of the above
- iii. Halophiles survive in a saline environment by increasing _____ of the cell.
a) proton pumping process b) internal osmolarity
c) cytosolic acidity d) both b) and c)
- iv. Osteoporosis in man results from _____.
a) acute cadmium exposure b) chronic arsenic exposure
c) acute mercury exposure d) chronic cadmium exposure
- v. Ferrous and sulphur oxidizing bacterium *Leptospirillum ferrooxidans* is commonly used for bioleaching of _____.
a) copper b) gold
c) iron d) none of the above
- vi. How and how quickly the body processes a radioactive element is known as _____.
a) pharmacokinetics b) pharmacognosy
c) radiostability d) chemotherapy
- vii. Long-term storage of radioactive waste requires the stabilization of the waste into a form which will neither react nor degrade for extended periods of time. This can be achieved through the process of _____.
a) vitrification b) calcination
c) ion-exchange d) both a) and b)
- viii. Trench method is a part of _____ process.
a) sanitary landfill b) composting
c) bioremediation d) none of the above

- ix. In the Trickling Filter method, the filter bed is coated with dense, slimy bacterial growth mainly composed of _____.
- a) Zooglea remigera
b) Staphylococcus aureus
c) Streptococcus mutans
d) Beggiatoa alba
- x. The genetically engineered strain of *Pseudomonas fluorescens* HK44 contain both **nah** and **lux** genes which code for _____ and _____ respectively.
- a) degradation of naphthalene, bioluminescence
b) bioluminescence, degradation of naphthalene
c) degradation of hexanes, bioluminescence
d) bioluminescence, degradation of hexanes
- xi. Methanogens are obligate anaerobes, except _____ that can thrive under aerobic condition.
- a) *Methanosarcina barkeri*
b) *Methanococcus vannielii*
c) *Methanobacterium formicum*
d) *Methanosprillum hungatei*
- xii. _____ is an example of halophilic eukaryote.
- a) *Salinibacter ruber*
b) *Chromohalobacter beijerinckii*
c) *Dunaliella salina*
d) *Tetragenococcus halophilus*
- xiii. The tertiary recovery of petroleum (MEOR) finds the application of the immobilized product of _____.
- a) *Xanthomonas campestris*
b) *Pseudomonas putida*
c) *Pseudomonas fluorescens*
d) *Bacillus subtilis*
- xiv. An organism that qualifies as an extremophile under more than one category is known as _____.
- a) polyextremophile
b) endolith
c) cryptophile
d) all of the above
- xv. The thermoalkaliphilic catalase, which initiates the breakdown of hydrogen peroxide into oxygen and water, was isolated from the extremophile, _____.
- a) *Thermus brockianus*
b) *Cupriavidus metallidurans*
c) *Thermococcus barophilus*
d) *Paracoccus denitrificans*
- xvi. The penultimate phase of waste water treatment is _____.
- a) chlorination
b) flocculation
c) sludge digestion
d) sedimentation
- xvii. The biochemistry of methanogenesis is relatively complex, involving the following coenzymes and cofactors except _____.
- a) methanethiol
b) methanoprotein
c) coenzyme B
d) methanofuran
- xviii. The molecules in biodiesel are primarily FAMES, usually obtained from vegetable oils by _____.
- a) transesterification
b) methylation
c) distillation
d) saponification
- xix. _____ is a molecular fingerprinting method used to separate PCR-generated DNA products.
- a) DGGE
b) G+C Analysis
c) ARDRA
d) all of the above
- xx. _____ is known as "sewage fungi".
- a) *Sphaerotilus natans*
b) *Streptococcus mutans*
c) *Staphylococcus aureus*
d) *Zooglea remigera*
