**ENVIRONMENTAL MICROBIAL BIOTECHNOLOGY (MICR 307) 2014 TUTORIAL 6**

1. Industrial activities have led to large-scale contamination of the environment with toxic heavy metals. Microorganisms have been shown to play important roles in the biogeochemical cycling of these contaminants.
2. Briefly discuss the problems associated with metal contamination of the environment.
3. What are the factors that may contribute to the bioavailability and toxicity of metals in the environment?

(iii) Describe the various mechanisms of microbial metal resistance and detoxification, providing specific examples in each case.

1. Discuss the benefits and adverse effects of microbial-metal interactions.
2. Discuss the various innovative microbial approaches in the remediation of metal-contaminated soils and aquatic systems.

2. Bacterial biosensors uniquely measure the interaction of specific compounds through highly sensitive bio-recognition processes and offer great sensitivity and selectivity for the detection of contaminants in the environment.

1. Describe the principle and application of bacterial biosensors for detecting environmental pollutants.
2. Describe how bacterial biosensors can be constructed and used to specifically detect arsenic in contaminated water, indicating all the major components involved.
3. Outline five beneficial features that a biosensor must have if its going to be uccessful.
4. List the advantages and disadvantages of a bacterial biosensors over other conventional methods available for detecting environment pollutants.

3. Soil bacteria and fungi play pivotal roles in various biogeochemical cycles and are responsible for the cycling of organic compounds.

(i) Briefly describe the applications of nucleic acid reassociation and hybridization, and DNA microarrays in the study of microbial diversity in soil or water.

(ii) Outline three advantages of and two limitations to the application of nucleic acid reassociation and hybridization, and DNA microarrays in microbial ecology and diversity studies.

(iii) Briefly describe the applications of denaturing gradient gel electrophoresis (DGGE) and terminal restriction fragment length polymorphism (T-RFLP) in the study of microbial diversity in soil or water.

(iv) Outline three advantages of and two limitations to the applications of DGGE and

T-RFLP in microbial diversity studies.