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

**TUTORIAL 5**

1. Microbial enhanced oil recovery-participating microorganisms produce a variety of fermentation products, including polymers and biosurfactants.
2. Discuss the various ways by which microorganisms and/or their products can be exploited to enhance the recovery of crude oil from reservoirs.
3. Outline the desirable properties of polymers for microbial enhanced oil recovery.
4. Why are only bacteria considered promising candidates for microbial

enhanced oil recovery?

1. Sulfur is usually the third most abundant element in crude oil and costing the refiners a lot of money to remove using physicochemical methods.
	1. Describe the problem(s) associated with the presence of sulfur in crude oil.
	2. Describe the use of microorganisms in the removal of this element from crude oil, using the sulfur-specific pathway for dibenzothiophene desulfurization by *Rhodococcus erythropolis* as an example.
2. Discuss microbial deemulsification processes involved in fuel upgrading.
3. Describe the problem(s) associated with the presence of nitrogen in crude oil and the role of microorganisms in their removal, using the nitrogen-specific pathway for carbazole by *Pseudomonas stutzeri* OM1 as an example.
4. Describe briefly the use of microbial demetallationprocess in fuel upgrading, giving specific examples of organisms and enzymes involved.
5. Biomining is a new approach to the extraction of desired minerals from ores being explored by the mining industry in the past few years.
6. Describe the importance of microorganisms, especially *Thiobacillus ferrooxidans* in the bioleaching of metal from low grade ores.
7. Outline the general features of metal-leaching microorganisms and factors that can influence the efficiency of the bioleaching processes.

1. Microorganisms may be used to convert waste products, plants, or microbial biomass into liquid or gaseous fuels. Discuss the use of microorganisms in the production of the following;
	1. Ethanol
	2. Methane
2. Hydrogen is generally believed to be an ideal fuel since it produces water during combustion. Schematically illustrate the various processes involved in the microbial production of hydrogen.