Questions for Class 16 SO_x, NO_x, Pollution Control Strategies Chemical Engineering 733

Reading: <u>Red Book p. 472-484</u>, <u>Jenkins-Baxter paper</u>, <u>Biomass Handbook Ch. 8a</u>, <u>Biomass Handbook Ch. 8b</u>

- 1. Describe the environmental problems associated with emission of the following chemicals (at both ground level and in the upper atmosphere):
 - NO
 - NO₂
 - NH₃
 - HCN
 - N₂O
- 2. Please discuss the different potential mechanisms of NO_x formation and destruction, including:
 - Thermal NO_x
 - Prompt NO_x
 - Fuel NO_x
- 3. Please discuss how nitrogen is released from coal during (a) devolatilization and (b) char oxidation. (You may have to look earlier in the NO_x chapter in the red book Pages 450-456).
- 4. Describe the following process NO_x control strategies:
 - Low excess air
 - Low NO_x burners
 - Overfire air
 - Reburning
 - SNCR (selective non-catalytic reduction)
 - SCR (selective catalytic reduction)
- 5. Describe the costs (relative to each other) of each of the NO_x control strategies in question 4. Which strategies are generally used for retrofits on old boilers, rather than on new boilers?