



1. Define the following terms: Air pollution, terminal settling velocity, desulfurization process, Particulate matters, Smog, and fumigation. (5)
2. For certain Natural Gas (NG) mixture that consists of 80 % CH_4 , 10 % C_3H_8 , 5 % C_4H_{10} , and 5 % H_2 by volume is used to operate a boiler that emits an exhaust gaseous of the following dry volumetric composition 12.5 % CO_2 , 0.5% CO , 5 % O_2 . Determine the mass analysis of this mixture. Determine the following: (i) stoichiometric air-to-fuel ration, (ii) Equivalence ratio, (iii) the water vapor partial pressure in the exhaust gaseous at 1.2 bar , and (iv) the dry mass analysis of the exhaust gaseous. (10)
3. What are the forms and composition of the following pollutants (with schematic representation about their formation pathways and transformation into atmosphere): (5)
 - a. Nitrogen oxides
 - b. Sulfur oxides
 - c. Particulate matters
4. What are: (5)
 - a. the major principles for particulate removing,
 - b. the combustion techniques to reduce NO_x emissions,
 - c. the main approaches for pollution control.
5. State with details a comparison between (5)
 - a. long-term and short-term air pollution control strategies,
 - b. atmospheric layers.
 - c. physisorption and chemisorption.

Best wishes, Ali M.A. Attia