



UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA
FIRST SEMESTER EXAMINATIONS, NOV. – DEC. 2018

COURSE NO: ES 369

COURSE NAME: AIR POLLUTION CONTROL

CLASS: ES III

TIME: 3 HOURS

Name: _____ Index Number: _____

Read the instructions carefully. Answer Question ONE and any other TWO questions

Question One [Total of 40 Marks]

- a. Distinguish between the following based on their definitions;
- Respirable and inhalable dust
 - Contaminant and pollutant
 - Fume and smoke
 - Thoracic fraction and inhalable fraction
 - Primary and secondary pollutant **[15 marks]**
- b. Describe briefly the mechanism employed by real-time remote systems to measure the concentration of a given gas **[6 marks]**
- c. What are the needed ingredients for photochemical smog formation **[2 marks]**
- d. Air pollutants may be classified in three ways; name these and give two sub-classifications under each **[6 marks]**
- e. Give two (2) effects each of sulphur oxides on;
- Plants
 - Materials **[4 marks]**
- f. Aside sulphur oxides, nitrogen oxides, VOC and carbon monoxide, name two gaseous pollutants and state the impact they have on human health **[4 marks]**
- g. In what unit of measurement might you expect to see the following pollutants listed in an air pollution survey report? **[3 marks]**
- SO₂
 - Suspended particulate
 - NO₂ **[3 marks]**

Question Two [Total of 30 Marks]

- a. A scrubber is a system used to remove harmful substances from industrial exhaust gas before they are released into the environment. With the aid of a diagram describe how a wet scrubber can be used to remove oxides of sulphur from industrial exhaust gas **[10 marks]**
- b. State one advantage and two disadvantages of a scrubber used in treating flue gases **[3 marks]**
- c. i. Define adsorption as applied to gaseous pollutant control **[2 marks]**
ii. Briefly discuss the two types of adsorption processes **[10 marks]**
- d. Differentiate between the mode of operation of surface and contact condensers **[5 marks]**

Question Three [Total of 30 Marks]

- a. Define the following terms as applied to particulates;
- i. Ultrafine particles
 - ii. Grit
 - iii. PM_{10}
 - iv. $PM_{2.5}$ **[4 marks]**
- b. Identify 4 factors that affect the collection efficiency of an electrostatic precipitator **[4 marks]**
- c. An electrostatic precipitator is used in the control of mainly particulate. Describe the mechanism of operation of an electrostatic precipitator **[10 marks]**
- d. HNO_3 which is the principal sink of NO_x is highly soluble and easily removed from the atmosphere. However, NO_x occurrence has been observed in regions remote from anthropogenic sources. Explain what accounts for this observation. **[6 marks]**
- e. Give three merits and three demerits of sedimentation and gravitation as methods of controlling particulates **[6 marks]**

Question Four [Total of 30 Marks]

- a. Distinguish between superadiabatic and subadiabatic lapse rates, and with the aid of a diagram describe the type of plumbs formed under such conditions **[8 marks]**
- b. List three particle measurement methods. Briefly describe any one of the above **[13 marks]**
- c. Give three global environmental problems caused by air pollution and discuss the negative effects of one them. **[9 marks]**

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