



UNIVERSITY OF GHANA  
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**SCHOOL OF ENGINEERING SCIENCES**  
**BSc (ENG) MATERIALS SCIENCE AND ENGINEERING**  
**END OF SECOND SEMESTER EXAMINATIONS: 2014/2015**  
**MTEN 414: Environmental Engineering & Waste Management (3 CREDITS)**

**TIME ALLOWED: 2 HRS 30 mins**

**Answer all Questions**

1.

a) Solid waste from a city is going to be disposed off in an incinerator. The major elements in the waste are; carbon, hydrogen and sulphur. Write down the combustion equation for each element. *(6 marks)*

b) From (a) above, calculate the amount of air required for the total oxidation of 1 Kg of each element. (The percentage of oxygen in air is 23.15 % by mass, molecular weights of oxygen, hydrogen, carbon and sulphur are 16, 1, 12 and 32 respectively). *(6 marks)*

c) After extensive analysis of a solid waste, the waste was found to have the chemical formula;  $C_{40}H_{100}O_{40}S$ . If the molecular mass of the waste is 1252, determine the percentage by mass of each element. *(8 marks)*

2.

a) In an environmental impact assessment plan, explain four (4) factors that must be considered for evaluating a landfill site. *(5 marks)*

b) An engineer in a Waste Management Department in a city was tasked to monitor a landfill site. Explain how the engineer was able to determine the groundwater quality and the ambient air quality. *(5 marks)*

c) State and explain briefly the processes that occur in the decomposition of biodegradable waste. *(5 marks)*

d) List five (5) factors that can affect the environment as a result of improper handling of waste management. *(5 marks)*

a) Briefly explain the three (3) definitions of “waste” under the Environmental Public Health Act (EPHA) passed in 1968 in Singapore? *(6 marks)*

b) Solid waste sources could be urban or rural area. Explain how six (6) sources of municipal waste are generated. *(6 marks)*

c) Draw the Tripod model of interdependency of the Legislative, Executive and Judiciary wings/arms of government in protecting the environment and explain the role of each wing. *(5 marks)*

d) There are many International laws banning the movement of hazardous waste from one country to another. Name three (3) of such International Conventions. *(3 marks)*

4.

a) A variety of thermal processes such as thermal plasma, pyrolysis and gassification have been used to dispose of solid waste. Explain the working mechanism of each underlined process and state one (1) disadvantage each process. *(10 marks)*

b) Explain the term Greenhouse Gas (GHG) Emission and explain how GHG emission can affect global warming. *(4 marks)*

c) State four (4) procedures that can be used to control exhaust emission from automobiles. *(4 marks)*

d) List two (2) consequences of climate change. *(4 marks)*