



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**14/16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS**  
**SCHOOL OF SCIENCE AND TECHNOLOGY**  
**MARCH/APRIL 2014 EXAMINATION**

**COURSE CODE: ESM 444**

**COURSE TITLE: INDUSTRIAL WASTES AND INDUSTRIAL WATER TREATMENT**

**TIME ALLOWED: 2 HOURS**

**INSTRUCTION: ANSWER ANY 4 QUESTIONS**

1. (a) List the three (3) types of Recirculation water systems.  
(3 mks)  
(b) In which of the Recirculation systems is make-up water needed and what role does it play?  
(2 ½ mks)  
(c) Briefly explain two (2) Recirculation water systems in which make-up water is not applicable.  
(8 mks)  
(d) Mention four (4) applications of the most popular method of controlled cooling of water treatment.  
(4 mks)
2. (a) What major problems are addressed by treatment of boiler water? (4 mks)  
(b) Industrial boiler water treatment involves what?  
(10 mks)  
(c) List the main sources of industrial waste waters.  
(3 ½ mks)
3. (a) Explain what each of the following involves:  
(i) Removal of solids (2 ½ mks)  
(ii) Removal of oil and grease (2 ½ mks)  
(iii) Treatment of acids and alkalis ( "mks)  
(iv) Treatment of toxic materials ( "mks)  
(b) Mention at least ten (10) industrial wastes.  
(5 mks)

(c) What effects does industrial waste have on the environment?  
Itemize. (2½mks)

4. (a) It is a fact that Waste management practice depends on the type of waste and varies from place to place but what does Waste management generally involve? (5 mks) (b) How can wastes be reduced? (6 mks)

(c) Explain the following Waste Management methods:

(i) Integrated method

(2 ½ mks) (ii) Incineration method  
(4 mks)

5. (a) List the main methods of waste collection.  
(3 mks) (b) What categories of wastes are recyclable? Mention seven (7) of them(7 mks ) (c) Mention and explain the method employed in managing organic wastes. (5 mks) (d) How would you define Recycling (2 ½ mks)

6. (a) State the merits of closed recirculation water system.  
(9 mks)  
(b) What is involved in Landfill method of waste disposal?  
(2 ½ mks)  
(c) List the advantages of Recycling.  
(6 mks)