

2528/203  
2922/203  
ENVIRONMENTAL MICROBIOLOGY  
June/July 2017  
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL  
DIPLOMA IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY  
MODULE II

ENVIRONMENTAL MICROBIOLOGY

3 hours

INSTRUCTIONS TO CANDIDATES

*You should have the following for this examination:*

*answer booklet;*

*non-programmable scientific calculator.*

*This paper consists of TWO Sections: A and B.*

*Answer ALL questions in Section A and any THREE questions from Section B in the answer booklet provided.*

*Each question in section A carries 4 marks while each questions in section B carries 20 marks.*

*Maximum marks for each part of a question are as shown.*

*Candidates should answer the questions in English.*

**This paper consists of 3 printed pages.**

**Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

SECTION A (40 marks)

Answer ALL the questions in this section.

1. Outline the procedure for inoculating a nutrient agar slant from an agar plate. (4 marks)
2. State any four observable cytopathic effects on host cells resulting from virus damage. (4 marks)
3. Define the following terms:  
(a) microbes; (2 marks)  
(b) binary fission. (2 marks)
4. Draw a labelled general structure of a virus with envelope. (4 marks)
5. State four characteristics that show virus as a living rather than non-living microorganisms. (4 marks)
6. Name four methods of determining growth of bacteria in a culture media. (4 marks)
7. State four types of filters used to separate bacteria toxins from bacterial cultures. (4 marks)
8. State any four methods of classifying fungal disease based on primary site of infection. (4 marks)
9. State four disinfectants used in tertiary treatment of wastewater. (4 marks)
10. List four factors that limit growth rate in the death phase of microbial growth cycle. (4 marks)

11-35  
12-35  
13-35  
14-35

1. Bacteria  
2. Fungi  
3. Algae  
4. Protozoa  
5. Virus

2.6  
1.1  
4.5  
Absorption  
Penetration  
Replication  
Assembly  
Release





Minimal  
Involving  
Cards

25  
25  
50

SECTION B (60 marks)

Answer any THREE questions from this section.

15 ✓ (11)

(a) Explain five causes of poor gram staining of bacterial cells. (10 marks)

\* Failure to observe time \* Wrong procedure  
\* Heavy stains \* Contaminated sample

(b) (i) Define 'laboratory acquired infections'. (2 marks)

Inhalation  
Serum  
Oral  
Insect

(ii) Explain four potential routes of transmission of laboratory acquired infections. (8 marks)

(a) Draw a labelled diagram of Rhizopus fungi. (5 marks)



(b) State five constituents which make up Lactophenol cotton blue stain. (5 marks)

(c) Outline the procedure of preparing Lactophenol cotton blue stain solution. (4 marks)

(d) Outline the procedure of staining Rhizopus fungi using Lactophenol cotton blue stain. (6 marks)

12 ✓ (13)

(a) Name any four types of antimicrobial drugs. (4 marks)

\* Penicillins \* Fungal infection drugs \* Anticancer drugs  
\* Antibiotics \* Virus drugs \* Bactericidal drugs

(b) Explain three adverse effects of antimicrobial drugs. (6 marks)

\* Cause resistance to antibiotics  
\* Disrupt normal flora

(c) Explain five mechanisms of antimicrobial drugs on bacteria. (10 marks)

\* Inhibit protein synthesis \* Inhibit cell membrane synthesis  
\* Inhibit cell wall synthesis

18 ✓ (14)

(a) Describe three aerobic treatment processes used to treat municipal sewage. (9 marks)

(b) State five benefits of using anaerobic digester in waste treatment. (5 marks)

(c) Describe the following processes used in the treatment of drinking water:

(i) clarification; - Removal of large particles. *Coagulation* (2 marks)

(ii) filtration; - Sand filters. *Fine filter trap particles* (2 marks)

(iii) disinfection. - Adding of chlorine to kill pathogens. *Disinfection* (2 marks)

13 ✓ (15)

(a) Describe using diagrams the six elevations of bacterial colonies. (6 marks)

1. Coccus 2. Bacillus 3. Vibrio 4. Spirillum 5. Cocci-bacillus

(b) Outline seven steps used in wine making. (14 marks)

- 1) Harvesting
- 2) Mashing
- 3) Fermentation - Saccharomyces cerevisiae
- 4) Pressing
- 5) Aging
- 6) Bottling

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