

2528/203
2922/203
ENVIRONMENTAL MICROBIOLOGY
June/July 2016
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;

A non-programmable scientific calculator.

This paper consists of TWO sections; A and B.

Answer ALL the 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 question in section B carries 20 marks.

Maximum marks for each part of a question are indicated.

Candidates should answer the questions in English.

This paper consists of 4 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 questions in this section.

1. Explain the importance of the capsule on a bacterial cell. (4 marks)
It helps the bacterial cell to avoid the immune system and other antibiotics
2. State four methods of measuring bacterial growth. (4 marks)
cell division, cell multiplication, cell aggregation, cell motility
3. Outline the procedure for sterilizing petri dishes using an oven. (4 marks)
1- place the dish in an oven, 2- close the door, 3- set time & temp, 4- sterilizing without a container
4. State any four desired properties of *saccharomyces cerevisiae* in the production of beer. (4 marks)
convert starch to sugar, ability to ferment, readily available, easy to grow
5. (a) Define the term brewing. (2 marks)
process of converting starch to sugar and then to alcohol
5. (b) Name the two types of brewery yeast strains. (2 marks)
ale yeast, lager yeast
6. List any four classes of cocci bacteria. (4 marks)
saccharomyces, streptococcus, staphylococcus, bacillus
7. Distinguish between a common pili and a sex pili in bacterial cells. (4 marks)
common pili: for attachment, sex pili: for reproduction
8. Outline the process of cultivating bacteria using stab culture method. (4 marks)
9. Differentiate between an ocular lens and an objective lens in a compound microscope. (4 marks)
10. Sketch the normal bacterial growth curve indicating the growth phases. (4 marks)

a - lag phase
b - log phase
c - stationary
d - decline



SECTION B (60 marks)

Answer any **THREE** questions from this section.

11. (a) Draw a labelled diagram of a capsulated bacterial cell. (8 marks)
- (b) With the aid of a labelled diagram, outline the steps of clostridium bacterial multiplication by binary fission. (12 marks)
12. (a) Differentiate between white wine and red wine. *raising out grapes & fermenting of fruit juice* *fermentation of juice* (4 marks)
- (b) Figure 1 represents the process of production of wine.

Processing step

Biological changes

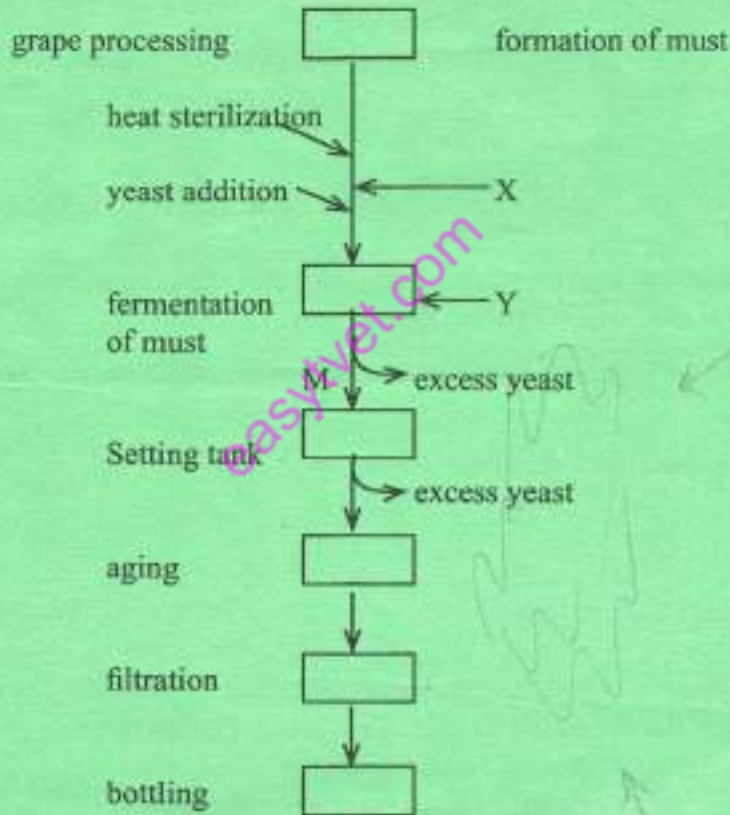


Figure 1.

- (i) State **two** functions of process X. *convert starch - starch enzymes helps in fermentation process* (2 marks)
- (ii) Name the species of yeast used in process X. *Saccharomyces* (1 mark)
- (iii) Name **three** products in step Y. *ethanol, CO₂, water* (3 marks)
- (iv) Name the chemical that can be used to sterilize must instead of heating. (1 mark)
- (v) State **two** reasons for removing excess yeast in step M. *to stop fermentation* (2 marks)
- (vi) State **three** conditions that must be met before filtration of the wine. *fully fermented, flavoured, CO₂ present* (3 marks)
- (vii) Describe **four** steps used in bottling of wine. *aging, filtration, pasteurizing, carbonating* (4 marks)

- 13. (a) Explain **four** categories of micro-organisms based on their risk potential to humans. (12 marks)
- (b) Describe **four** safety precautions to be considered when working in a biosafety level one laboratory. *- PPE, do not share culture media, do not touch, never pipette, work on bench top!* (8 marks)

- 14. (a) Explain **five** operating conditions for optimal production of biogas. *any 5/5/5/5/5* (10 marks)
- (b) Explain the removal of the following biogas impurities prior to storage in compressed natural gas (CNG) cylinders:
 - (i) carbon dioxide; *CO₂ wash tank* (2 marks)
 - (ii) hydrogen sulphide; *helminth* (2 marks)
 - (iii) water. *water trap* (2 marks)
- (c) List **four** uses of biogas. (4 marks)

- 15. (a) Explain the use of the following reagents in Gram staining of bacteria:
 - (i) Crystal violet; (2 marks)
 - (ii) Gram's iodene; *fish* (2 marks)
 - (iii) Ethanol; *Algae* (2 marks)
 - (iv) Counter stain. *Amoeba* (2 marks)



- (b) Draw the replication of cycle of bacteriophage. (12 marks)

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