UNIVERSITY OF NAMIBIA

FACULTY	HEALTH SCIENCES AND VETERINARY MEDICINE		
SCHOOL	VETERINARY MEDICINE		
DEPARTMENT	PARACLINICAL STUDIES		
PROGRAMME	VETERINARY MEDICINE		
MODULE	VETERINARY MICROBIOLOGY II		
MODULE CODE	V3611EM		
DATE	June 2026		
DURATION	**3 HOURS**	**MARKS**	150

FIRST OPPORTUNITY EXAMINATION

Examiners: Prof. C. Ntahonshikira, Prof. S. Khaiseb, Dr. L. Mwense
Internal Moderator: Dr. M. Y. Hemberger
External Moderator: Prof. B. Namangala

This Paper consists of EIGHT (8) pages including the front page

Instructions

1. **Read the questions carefully**
2. **Answer all questions**
3. **Write clearly and concisely**
4. **Hand in this question paper together with the answer booklet**
5. **Additional material to be supplied: None**

SECTION A: MULTIPLE CHOICE QUESTIONS. **[20 MARKS]**

Choose the correct answer. **[20 marks, 1 mark each]**

1. Sterilization in steam under pressure is done at:
   a. 105^0C for 20 minutes
   b. 115°C for 15 minutes
   c. 121°C for 15 minutes
   d. 60°C for 30 minutes

2. The following conditions will be found in stationary phase except:
   a. There is exhaustion of nutrients in the medium
   b. There is accumulation of toxic substances
   c. Fresh multiplication of bacteria stops completely
   d. There is high density of bacteria in a given space
   e. The number of bacteria per ml is higher than log phase

3. Total bacterial count is:
   a. The total living bacteria in a sample
   b. The total living and dead bacteria in a sample
   c. The total bacteria in log phase of growth curve
   d. The total dead, but intact bacteria in a sample

4. Among the following, the selective medium for staphylocci is:
   a. Blood agar
   b. Mannitol salt agar
   c. Nutrient agar
   d. MacConkey agar

5. Lancefield classification of streptococci is based on:
   a. M and T antigens
   b. M, T and R antigens
   c. C substances/antigens
   d. M antigen

6. The common method of dry heat in the microbiology laboratory:
   a. Boiling water
   b. Pasteurization
   c. Bunsen burner
   d. Incineration

7. An ecological habitat is:
   a. The place where an organism lives
   b. A character that an organism exhibit

c. The role of the organism in the community
d. The site where the microorganism causes most of damages.

8. Pathogenic bacteria and fungi multiply best:
   a. below 16°C
   b. between 16-38°C
   c. above 38°C
   d. at 25 to 30^{0}C
9. Negri bodies are characteristic of:
   a. Hepatitis A infection
   b. Rabies infection
   c. Rotavirus infection
   d. Adenovirus infection

10. Which of the following is the most common group of indicator organisms used to assess microbial contamination in water and food?
    a. Salmonella
    b. Coliforms
    c. Clostridium
    d. Mycobacterium

11. Chemicals that are used to kill microorganisms on inanimate objects are collectively known as?
    a. Antiseptics
    b. Disinfectants
    c. Sterilization
    d. Sanitizer

12. Describe the growth requirements of Campylobacter species and their oxygen preference.
    a. *Campylobacter* species are microaerophilic and require nutritious media for growth.
    b. *Campylobacter* species require high oxygen levels and simple media for growth.
    c. *Campylobacter* species thrive in anaerobic conditions without any special media.
    d. Campylobacter species grow well in aerobic conditions with minimal nutrients.

13. A relationship in which one-member benefits but the host neither benefits or is harmed is:
    a. Mutualism
    b. Synergism
    c. Commensalism
    d. Antagonism

14. Metachromatic granules found in *Corynebacterium* species are composed of:
    a. Glycogen
    b. Lipids
    c. Polymetaphosphate
    d. Peptidoglycan

15. What is the primary mechanism by which non-enveloped viruses enter a host cell?
    a) Active transport across the cell membrane
    b) Direct fusion with the plasma membrane
    c) Receptor attachment and release of viral nucleic acids
    d) Endocytosis, forming a vesicle

16. Which process involves the breakdown of the viral capsid to release nucleic acids?
    a) Uncoating (correct)
    b) Budding
    c) Endocytosis
    d) Fusion

17. What is the key function of the viral proteins produced during the replication of double-stranded DNA viruses?
    a) They code for new viral mRNA.
    b) They form part of the new viral capsids.
    c) They modify the host's DNA.
    d) They inhibit the host's RNA polymerase

18. What is the major difference between positive-sense and negative-sense single-stranded RNA viruses?
    a) Only negative-sense viruses produce viral proteins.
    b) Positive-sense RNA can be directly translated, while negative-sense RNA needs to be transcribed first.
    c) Only positive-sense viruses can infect humans.
    d) Negative-sense viruses possess a double stranded RNA.

19. In which part of a chicken egg can certain viruses be cultured?
    a) Albumen
    b) Shell
    c) Yolk sac
    d) Air cell

20. Which of the following is the example of Gram-negative bacteria?
    a. *Streptococcus equi*
    b. *Eschericia coli*
    c. *Staphylococcus aureus*
    d. *Bacillus anthracis*

SECTION B: TRUE/FALSE QUESTIONS AND COMPLETE SENTENCES **[40 MARKS]**

QUESTION 1. Indicate whether the statement is TRUE or FALSE **[20 marks, 1 mark each]**

1. Boiling at 100°C kills all vegetative forms of bacteria within 30 minutes.
2. Growth of bacteria denotes increase in the number of the total bacterial population rather than in the size of individual bacteria.
3. Hospital strains of Staphylococcus aureus are not more resistant to penicillin than those isolated from other sources.
4. Streptococci are microaerophilic and require enriched media to grow.
5. Microbiology laboratory testing is considered to be one of the diagnostic confirmatory tests.
6. viruses can be inactivated within seconds at 56 C, within minutes at 37 C and may take days and weeks to be inactivated at 4^0C.
7. Many phytoplankton are single-celled algae.
8. *Lactobacillus* species grow best in highly alkaline media at pH 9.
9. Enterococci are Gram-positive bacteria even though found in the gastrointestinal tract.
10. *Burkholderia pseudomallei* causes melioidosis.
11. *Vibrio* species are Gram-positive organisms.
12. Plaque based assay are standard method used to determine virus concentration in term of infectious dose.
13. Pathogenic *Nocardia* species are anaerobic organisms that grow only at 37°C.
14. Specimens for laboratory examination should be collected as early as possible from affected animals before secondary bacterial or fungal infections become established.
15. Viral infection is synonymous with disease, as many viral infections are subclinical (i.e., asymptomatic, inapparent), whereas others result in diseases of varying severity that is typically accompanied by characteristic clinical signs in the affected host.
16. Replication is the process by which a virus uses host machinery to produce new virions.
17. The process of converting RNA into DNA is known as reverse transcription.
18. *Bordetella avium* and *B. bronchiseptica* are motile by peritrichous flagella.
19. The specimens selected for laboratory examination should relate to the clinical signs.
20. Some viruses remain latent in host tissues and only cause disease under specific environmental conditions.

QUESTION 2. FILL /COMPLETE THE FOLLOWING SENTENCES. **[20 MARKS]**

1. Most of pathogenic bacteria grow at a temperature between _____ and _____; that is why they are normally incubated at _____ °C.
2. The occurrence of different morphological types of bacteria within a single population is called _____.
3. The bacteria that can be isolated from hot springs/compost pits are called _____ in relation to growth temperature.
4. Normally, Staphylococci and Streptococci are found on the _____ and _____ of humans and animals.

5. The growth of bacteria on agar media is shown by _____, while the growth in liquid media is shown by _____.
6. The _____ is a fermentation chamber in ruminants (e.g., cattle, sheep) where _____ break down plant material into nutrients.
7. Microorganisms in an ecosystem can be classified into three ecological groups_____ Zymogenous and_____.
8. Corynebacteria associated with animals are called _____.
9. *Pasteurella multocida* causes _____, _____, and atrophic rhinitis in animals.
10. The widely used selective culture medium for Lactobacillus spp. is _____ agar.
11. The terms pathogenicity and virulence refer to the _____ of a virus to cause _____ in its host and are unrelated to the infectivity or transmissibility (contagiousness) of the virus.
12. Family *Enterobacteriaceae* often referred to as _____.

SECTION C: SHORT ANSWER QUESTIONS. **[30 MARKS]**

QUESTION 1. Calculate the number of bacteria at the end of each generation time up to 1 hour incubation period if the generation time is 15 minutes and the initial number of bacteria in the inoculum is 10. Note: in your answers only give the number of bacteria for a., b., c., and d. [4]

Generation time (minutes)	Number of generations	Number of bacteria
0	0	10
15	1	a.
30	2	b.
45	3	c.
60	4	d.

QUESTION 2. Explain why MacConkey agar is a differential medium. [2]

QUESTION 3. Name the major modes of antibacterial action of chemotherapeutic agents (antibiotics) [4]

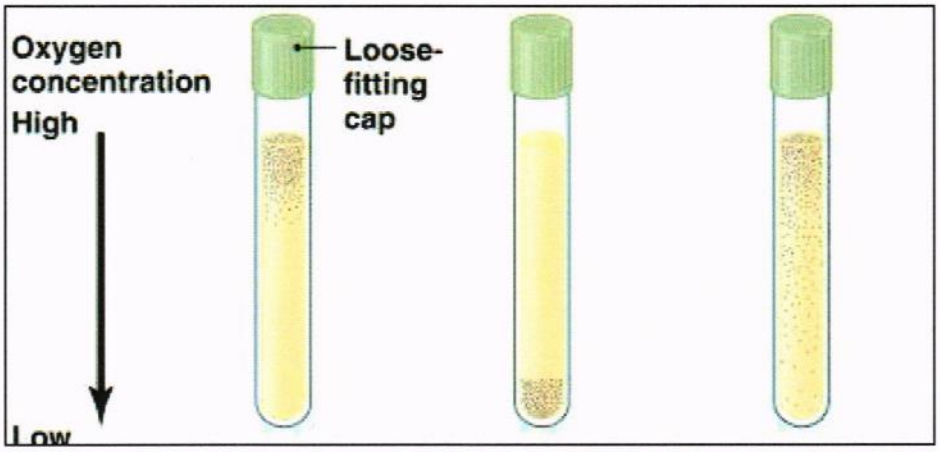
QUESTION 4. Name two (2) substances used in wet mount preparation to observe fungal structures [2]

QUESTION 4. Name one (1) disease caused by *Salmonella* spp. in poults and one (1) disease caused by *E. coli* in calves? [2]

QUESTION 5. Name three media commonly used to culture fungi. [3]

QUESTION 6. Name two common diseases of veterinary importance caused by *Streptococcus* species in cattle and horses. [2]

QUESTION 7. Look at the test tubes below and give the group to which the microorganism in tube a., b. and c. in relation to oxygen requirement. [3]



a. ..... b. ..... c. .....

QUESTION 8. Define the following terms: [8]

a. Pasteurization [2]
b. Antiseptic [2]
c. Selective media [2]
d. Differential media [2]

SECTION D: STRUCTURED QUESTIONS **[60 MARKS]**

QUESTION 1. **[10]**

a. Name the pathogenicity/virulence factors of *Bacillus anthracis* and

b. the causative agent of foulbrood

[5]

c. Define "viable bacterial cell" and describe the procedure of a viable count step by step. [5]

QUESTION 2. **[14]**

i. What are the four physical Methods of microbial control? [4]
Student may mention any of the five below.

ii. Explain any five factors (conditions) that influence the effectiveness of antimicrobial agents on microbial activity. [10]

QUESTION 3. Complete the table below by filling in the missing microbiological and diagnostic properties of the listed bacteria. [15]

Bacterium	Gram Reaction	Oxygen Requirement	Key Clue	Disease
Brucella	a)_____	Aerobic	Intracellular survival in macrophages and found in reproductive organs	_b)_____
Vibrio	c)_____	Facultative anaerobe	Comma-shaped bacterium found in marine environments	d)_____
Aeromonas	e)_____	f)_____	Freshwater organism associated with fish and wound infections	g)_____
Burkholderia	h)_____	Aerobic	Soil and water organism causing melioidosis	i)_____
Campylobacter	j)_____	k)_____	Curved rod requiring low oxygen environment	Enteritis and abortion
Helicobacter	l)_____	Microaerophilic	Produces urease enzyme and colonizes stomach	m)_____
Rhodococcus	n)_____	Aerobic	Mucoid colonies in foals and intracellular pathogen	o)_____

QUESTION 4. **[10]**

a) List five (5) classification of *E. coli* based on their virulence. [5]

b) Name five (5) common virulence factors associated with *Enterobacteriaceae.* [5]

QUESTION 5. **[11]**

Briefly describe the morphology of Salmonella species. [11]

END OF EXAM PAPER