



PROGRAM : DIPLOMA
BIOTECHNOLOGY

SUBJECT : MICROBIOLOGY 3

CODE : MCB2AM3

DATE : WINTER EXAMINATION
MAY 2018

DURATION : (X-PAPER) 08:30 - 11:30

WEIGHT : 40 : 60

TOTAL MARKS : 175

EXAMINER : MR K MACLEAN Sanso Number

MODERATOR : MR N LALOO File Number

NUMBER OF PAGES : 10 PAGES

INSTRUCTIONS TO INVIGILATORS

QUESTION PAPERS MUST BE HANDED IN.
CALCULATORS ARE PERMITTED (ONLY ONE PER STUDENT).
NO CELLULAR PHONES ALLOWED.

REQUIREMENTS

1x EXAMINATION SCRIPT
1x MCQ ANSWER SHEET.

INSTRUCTIONS TO CANDIDATES:

1. PLEASE ANSWER ALL THE QUESTIONS.
 2. RETURN EXAMINATION PAPER WITH SCRIPT.
 3. ANSWER SECTION A ON MCQ CARD.
 4. ANSWER SECTION B IN YOUR SCRIPT.
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SECTION A**QUESTION 1**

Multiple Choice Questions. For each of the questions below, select the **one best** answer and indicate on the MCQ card provided.

- 1.1 Which of the following is (are) potential complications of mumps?
- a) septicemia
 - b) inflammation of the testes in males
 - c) endocarditis
 - d) Both (a) and (b)
 - e) All of the above
- 1.2 The following is /are virulence factors.
- a) capsules
 - b) pili
 - c) toxins
 - d) All of the above can be virulence factors
 - e) Only (a) and (c) can be virulence factors
- 1.3 In which kingdom(s) will yeasts be found?
- a) *Animalia*
 - b) *Plantae*
 - c) *Monera*
 - d) *Protista*
 - e) *Fungi*

- 1.4 Which of the following is not true about rabies?
- a) It can be transmitted to humans by the bite of an infected animals
 - b) It can be transmitted by aerosols in caves
 - c) It can be caused by contamination of wounds
 - d) It can be caused by contamination of scratches
 - e) All of the above are true about rabies
- 1.5 Piedras refers to a fungal infection of:
- a) nails
 - b) skin
 - c) eyes
 - d) All of the above
 - e) None of the above
- 1.6 *Cryptococcus neoformans*:
- a) is a bacterial infection
 - b) is a viral infection
 - c) causes systemic mycosis
 - d) cutaneous mycosis
- 1.7 Drugs used to slow the progress of AIDS fall into which of the following categories?
- a) Reverse transcriptase inhibitors
 - b) Protease inhibitors
 - c) Both (a) and (b) are correct
 - d) Neither (a) nor (b) is correct
- 1.8 Mechanisms of antimicrobial drug action involve:
- a) Cell wall disruption
 - b) Cidal and Statics
 - c) Sensitivity to heat inactivation
 - d) Only (a) and (b)
 - e) All of (a), (b) and (c)
- 1.9 Which of the following is (are) used in the treatment of gas gangrene?
- a) Surgical removal of foreign material and dead tissue from the wound
 - b) Toxins against necrosis-causing toxins released by the organism
 - c) Hypobaric chamber treatment
 - d) All of the above

- 1.10 The science that evaluates the determinants, occurrences, distribution and control of health and disease in a defined population is referred to as:
- a) Health
 - b) Disease
 - c) Pandemiology
 - d) Sporadic disease
 - e) None of the above
- 1.11 The ability of a drug to kill or inhibit the growth of a pathogen while damaging the host as little as possible is called:
- a) Toxic dose
 - b) Therapeutic index
 - c) Selective toxicity
 - d) (a) and (b)
- 1.12 Diseases of the gastrointestinal tract that are caused by the ingestion of bacterial enzymes even in the absence of the viable microorganisms that produced them are called:
- a) food poisonings
 - b) food infections
 - c) both (a) and (b)
 - d) None of the above
- 1.13 A / factor/s which influence the effectiveness of a drug is/are:
- a) Ability to reach the site of infection
 - b) Susceptibility of pathogen to drug
 - c) Ability of drug to reach correct concentration
 - d) All of the above are factors
- 1.14 New cases of listeriosis are the result of
- a) recent transmission
 - b) reactivation of old dormant infections
 - c) Both (a) and (b) are correct
 - d) None of the above
- 1.15 Control of candidiasis involves:
- a) follow-up on sources and contacts
 - b) sexual hygiene
 - c) use of condoms
 - d) all of the above
 - e) None of the above

1.16 Which of the following diseases is not caused by flavivirus?

- a) Rocky Mountain spotted fever
- b) Q fever
- c) Typhus fever
- d) All of the above are caused by flavivirus
- e) None of the above are caused by flavivirus

1.17 Which of the following diseases is (are) caused by trypanosomes?

- a) Sleeping sickness
- b) Chagas disease
- c) Both (a) and (b) are caused by trypanosomes
- d) Neither (a) or (b) is caused by trypanosomes

1.18 Most chemo antimicrobials are base analogues.

- a) True
- b) False

1.19 Which of the following would not be considered a secondary metabolite?

- a) ethanol or some other fermentation end product
- b) mycotoxins
- c) antibiotics
- d) minerals
- e) All of the above could be considered secondary metabolites

1.20 A culture system that allows toxic waste products to diffuse away from a microbial culture through a membrane, and also allows substrates to diffuse toward the microbial culture are referred to as:

- a) fixed bed reactor
- b) dialysis culture system
- c) fluidized bed reactor
- d) continuous feed reactor
- e) None of the above

1.21 Airborne diseases:

- a) Mostly involve the respiratory system
- b) Are only caused by fungi
- c) Can also cause skin diseases
- d) Both (a) and (c) are correct

1.22 ____ is not an airborne disease.

- a) Diphtheria
- b) Listeriosis
- c) Legionellosis
- d) Tuberculosis
- e) All of the above are airborne diseases

1.23 Which of the following can NOT be treated with antibiotics?

- a) Pertussis
- b) Tuberculosis
- c) Septic meningitis
- d) Aseptic meningitis syndrome
- e) All of the above can be treated with antibiotics

1.24 ____ is one of the causative agents of aseptic meningitis.

- a) *Neisseria meningitidis*
- b) *Staphylococcus aureus*
- c) Both (a) and (b) are correct
- d) Amoeba
- e) None of the above is correct

1.25 Minor microbial modifications to chemical compounds that are not usually used for growth are referred to as:

- a) Bioconversions
- b) Microbial transformations
- c) Biotransformation's
- d) All of the above are correct

1.26 Which of the following is not normally subject to biodegradation?

- a) jet fuel
- b) computer chips
- c) concrete
- d) all of the above are subject to bio deterioration

1.27 Which of the following is not used as a microbial insecticide?

- a) protozoa
- b) bacteria
- c) viruses
- d) fungi

- 1.28 Which of the following best describes the production of semi synthetic Penicillin's?
- a) addition of a side-chain precursor molecule to a *Penicillium* culture to produce a desired modification
 - b) chemical modification of a penicillin product after it has been released from the *Penicillium* culture
 - c) both (a) and (b) are correct
 - d) neither (a) nor (b) is correct
- 1.29 Which of the following is a reason why bioconversions are replacing chemical synthesis of certain compounds?
- a) stereoisomer specificity
 - b) mild reaction conditions
 - c) both (a) and (b) are correct
 - d) neither (a) nor (b) is correct
- 1.30 The lowest concentration of a drug that kills a pathogen is the:
- a) Minimal inhibitory concentration
 - b) Minimal lethal concentration
 - c) Maximum inhibitory concentration
 - d) Maximum lethal concentration

[30]

SECTION B

QUESTION 2

Morbidity and mortality rates are important statistical tools to measure the frequency of epidemics.

Briefly explain each test and also:

- 2.1 Determine the morbidity rate if there are 897 new cases of tuberculosis in KZN during 2007 with a total population of 85 000 individuals.
- 2.2 Determine the mortality rate if there are 346 new deaths due to malaria in Mozambique during 2007 with a total population of 7000 individuals presenting clinical signs of the disease.

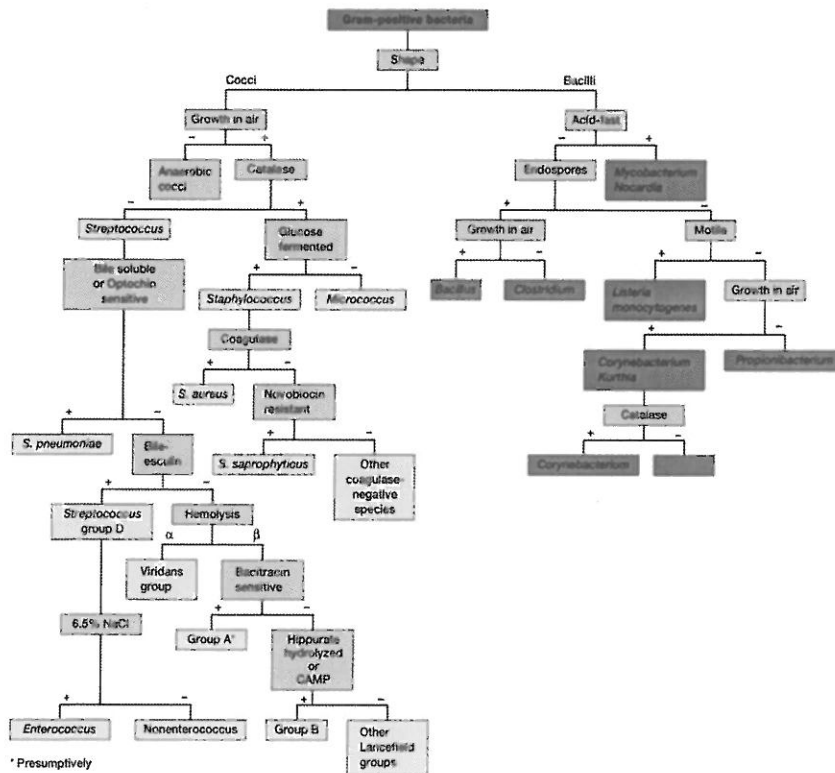
[10]

QUESTION 3

- 3.1 Name five (5) major organic acids and the organisms used to produce it. (10)
- 3.2 Name and describe five (5) ways in which microorganisms can be preserved. (10)
- 3.3 Illustrate and briefly describe five (5) types of bioreactors which can be used for fermentation. (10)
- 3.4 Name and describe five (5) ways in which microorganisms can be preserved. (10)

[40]**QUESTION 4**

- 4.1 Study the keys to the identification of gram positive bacteria below. Develop your own flow diagram to indicate how you would isolate and identify *Staphylococcus aureus* from a cooked rice sample. Also discuss the principles of the tests you would use. Write this in your answer book.



(10)

- 4.2 With the aid of a **flow diagram (using arrows)** explain how you would isolate and identify *Escherichia coli* from a package with 1kg of vacuum packed fresh pork. Also explain how you will collect and prepare the sample. (30)

[40]

QUESTION 5

Which selective agar would you recommend for isolation of the following microorganisms? Also describe the typical colonial appearance of each.

- 5.1 *Clostridium perfringens* (2)
 5.2 *Staphylococcus aureus* (2)
 5.3 *Escherichia coli* (2)
 5.4 *Penicillium chrysogenum* (2)
 5.5 *Shigella dysenteriae* (2)

[10]

[40]

QUESTION 6

- 6.1 Name the causative agents for the following diseases.
 6.1.1 Lock Jaw
 6.1.2 Shingles
 6.1.3 Mumps
 6.1.4 Boils
 6.1.5 Botulism (5)
 6.2 Describe the clinical manifestations of septic bacterial meningitis. (7)
 6.3 Name three ways in which microbial diseases can be controlled. (3)
 6.4 Using brief bulleted points explain how bacteria cause disease in humans according to the video submitted on Blackboard. (5)

[20]

QUESTION 7

There are four extrinsic parameters which require precise control when growing beneficial microorganisms in an industrial setting. Name these parameters and also differentiate between “Non-Newtonian broths” and “Scale ups”. In addition explain a continuous feeding fermentation process and its advantages.

[12]

QUESTION 8

Interpret the following graph, indicate what happens with the nutrients and explain when the onset of penicillin production is initiated.

[13]