UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY
DIPLOMA IN BIOTECHNOLOGY AND FOOD TECHNOLOGY

MODULE MCB1BM2
MICROBIOLOGY II

CAMPUS DFC

DECEMBER SUPPLEMENTARY ASSESSMENT

DATE: 9 January 2016 **SESSION: 08h00 – 10h00**

ASSESSOR(S): **MR K MACLEAN**

INTERNAL MODERATOR: **MR L ALAGIOZOGLOU**

EXTERNAL MODERATOR: **N/A**

DURATION 2 HOURS **MARKS 125**

SURNAME AND INITIALS:
_____

STUDENT NUMBER:
_____

CONTACT NR:
_____

INSTRUCTIONS:

1. THIS QUESTION PAPER MUST BE HANDED IN **SEPERATELY** WITH THE SCRIPT.
2. CALCULATORS ARE PERMITTED.

REQUIREMENTS : EXAMINATION ANSWER SCRIPTS

QUESTION 1

1.1 Define the following terms used in numerical taxonomy

1.1.1 Association coefficient
1.2.2 Simple matching coefficient
1.3.3 Jaccard coefficient.
1.4.4 Similarity matrix.
1.5.5 Dendogram. (10)

1.2 With the formula below calculate given the X and Y coefficients below:

The simple matching coefficient $(S_{SM}) = \frac{a+d}{a+b+c+d}$

The Jaccard coefficient $(S_J) = \frac{a}{a+b+c}$

1.2.1 The Simple matching coefficient
1.2.1 Jaccard coefficient

X= (1,0,0,0,0,0,0,0,0,0)
Y= (0,0,0,0,0,0,1,0,0,1)

(5)

[15]

QUESTION 2

Tabulate three Mycotoxicoxis under the following headings:

2.1 Disease
2.2 Fungus
2.3 Mycotoxin
2.4 Foodstuffs contaminated
2.5 Animals affected **[15]**

QUESTION 3

3.1 Briefly describe the nomenclature used to describe the variation between bacterial strains. (6)

3.2 Briefly assess and interpret the effect of antibiotics on viruses. (4)

[10]

QUESTION 4

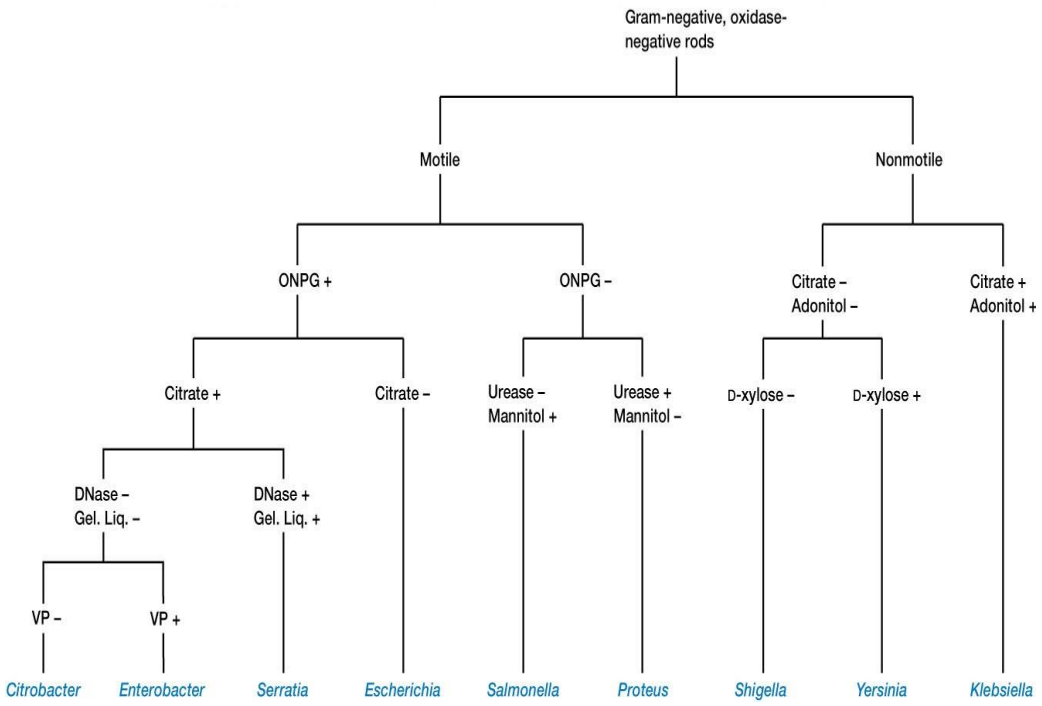
4.1 Describe how nitrogen is made available for plants to grow and discuss the microorganisms and their role in the process. In addition, discuss the fate of nitrogen after the conversion occurs. (7)

4.2 Explain why *Pseudomonas* is metabolically versatile. (3)

[10]

QUESTION 5

5.1 Briefly explain how you would identify *Citrobacter* using the flow diagram below:



(6)

5.2 *Escherichia coli* is being referred to as an indicator organism. Explain this statement. (4)

[10]

QUESTION 6

During an experiment where experimental animals (mice) have been used to test the effect of certain viruses, you get the following results:

Viral dilution	Mortality ratio
10^{-1}	10/10
10^{-2}	9/10
10^{-3}	8/10
10^{-4}	7/10
10^{-5}	6/10
10^{-6}	3/10
10^{-7}	1/10
10^{-8}	0/10

6.1 Calculate the LD50 endpoint according to the method of Reed-Muench and show the steps in your calculations neatly and clearly. 50 x ½ = (25)

6.2 Explain what interferon is and name the two types. (5)

[30]

QUESTION 7

With the aid of illustrations, explain how the following fungal structures can aid to the identification of fungi:

7.1 Spores (5)

7.2 Mycelium (5)

[10]

QUESTION 8

8.1 Define taxonomy and elaborate on the three separate but interrelated parts thereof. (7)

8.2 Construct a taxonomic rank for *Salmonella typhi* starting with the Order under the Domain: Bacteria and Phylum: Proteobacteria (3)

8.3 Name five ecological characteristics which can be used to classify bacteria. (5)

[15]

QUESTION 9

Discuss the *Mycoplasmas*. What characteristics do they have and list some diseases that they cause. **[10]**

TOTAL = 125

MICROBIOLOGY 11 MEMORANDUM SUPPLEMENTARY EXAMINATION DECEMBER 2016

QUESTION1

Define the following and in each indicate its significance in numerical taxonomy

1.1 Association coefficient.

An association coefficient or correlation coefficient is an index of how strong a relationship between two variables is; a value of 0 indicates no relationship, whereas a value of, normally, 1 represents the maximum (a few coefficients have a maximum lower than 1, some can exceed 1 in particular conditions). Coefficients meant for ordinal or higher levels of measurement are signed to indicate a positive or negative association (direction of the relationship)

1.2 Simple matching coefficient.

Proportion that match whether present or absent

1.3 Jaccard coefficient.

Ignores characters that both organisms lack

1.4 Similarity matrix.

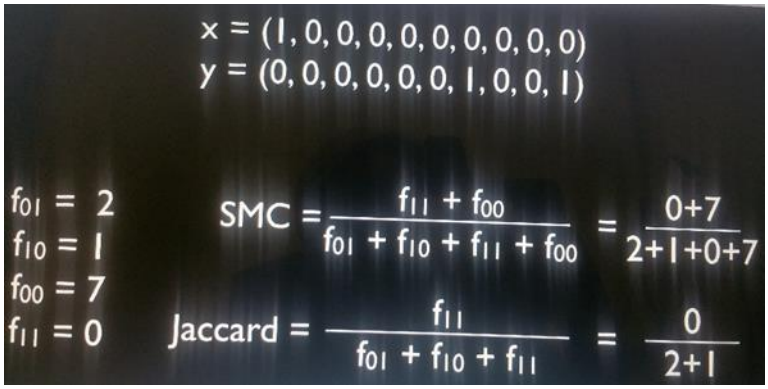
A matrix that contains numbers giving a measure of the similarity of the objects to each other

1.5 Dendrogram.

A treelike diagram used to display the results of numerical taxonomic analysis

[10]

1.2



SMC = 0.7
Jaccard = 0

QUESTION 2

Table 25.1 Some Mycotoxicoses[a] Produced by Fungal Mycotoxins in Domestic Animals

Disease	Fungus	Mycotoxin	Contaminated Foodstuff	Animals Affected
Aflatoxicosis	*Aspergillus flavus*	Aflatoxins	Rice, corn, sorghum, cereals, peanuts, soybeans	Poultry, swine, cattle, sheep, dogs
Ergotism	*Claviceps purpurea*	Ergot alkaloids	Seedheads of many grasses, grains	Cattle, horses, swine, poultry
Mushroom poisoning	*Amanita verna*	Amanitins	Eaten from pastures	Cattle
Poultry hemorrhagic syndrome	*Aspergillus flavus* and others	Aflatoxins	Toxic grain and meal	Chickens
Slobbers	*Rhizoctonia*	Alkaloid slaframine	Red clover	Sheep, cattle
Tall fescue toxicosis	*Acremonium coenophialum* (an endophytic fungus)	Ergot alkaloids	Endophyte-infected tall fescue plants	Cattle, horses

[a]A mycotoxicosis [pl., mycotoxicoses] is a poisoning caused by a fungal toxin.

[15]

QUESTION 3

3.1 Briefly describe how bacterial strains vary from each other in many ways. 6

- **biovars – differ biochemically and physiologically**
- **morphovars – differ morphologically**
- **serovars – differ in antigenic properties**

3.2 Antibiotics do not have an effect on viruses as it is not a living organism – symptoms usually occurs from secondary invaders –such as bacteria etc – which then can be treated with antibiotics in many cases. 4

[10]

QUESTION 4

4.1 Describe how nitrogen is made available for plants to grow and mention the microorganisms involved including the fate of nitrogen. 7

- **conversion of ammonia to nitrate by action of two genera**
  - **e.g., *Nitrosomonas* – ammonia to nitrite**
  - **e.g., *Nitrobacter* – nitrite to nitrate**
- **fate of nitrate**
  - **easily used by plants**
  - **lost from soil through leaching or denitrification**

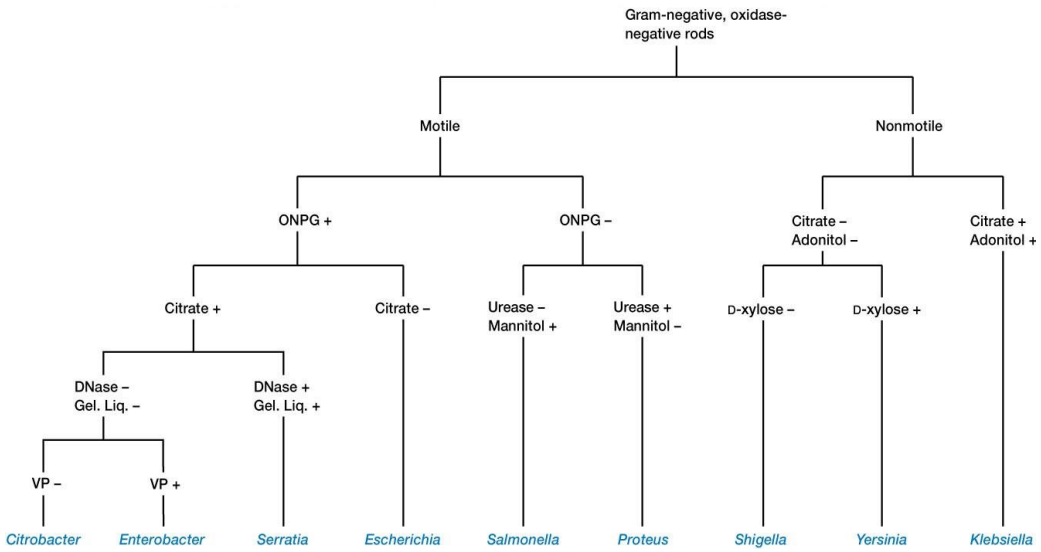
4.2 Explain why *Pseudomonas* is metabolically versatile. 3

- **degrade wide variety of organic molecules**
- **mineralization**
  - **microbial breakdown of organic materials to inorganic substrates**

[10]

QUESTION 5

5.1 Briefly explain how you would identify *Eschericia* using the flow diagram below:



6

5.2 *Escherichia coli* is being referred to as an indicator organism.
Explain this statement. 4

[10]

Found in intestines – faecal material – so if test water and find E. coli- Indication of fecal contamination

QUESTION 6

6.1

Dead	Survive	Cum Dead	Cum alive
10	0	44	0
9	1	34	1
8	2	25	3
7	3	17	6
6	4	10	10
3	7	4	17
1	9	1	26
0	10	0	36

Ratios	%
44/44	100
34/35	97
25/28	89
17/23	74
10/20	50
4/21	19
1/27	4
0/36	0

Proportional distance = $\frac{\%\text{mortality above 50} - 50\ \%}{\%\text{mortality above 50\% - \% mortality under 50\%}}$

$= \frac{74 - 5}{74 - 19}$

$= \frac{24}{25} = 0,436 = 10\ (-4,436)$

(Each step involved in this answer = 0, 5 marks)

6.2 Unique protein – stimulates translation, inhibition protein – to inhibit interferon production – low molecular weight – and high molecular weight types.

QUESTION 7

7.1 - Sprangiospore – conidiospore – blastospore – Chlamydiospore – arthroconidia and the drawing for each

7.2 - Septated, non septated – coenocytic, uninucleated, multinucleated – and the drawings for each.

QUESTION 8

8.1

- science of biological classification
- consists of three separate but interrelated parts
  - classification – arrangement of organisms into groups (taxa; s.,taxon)
  - nomenclature – assignment of names to taxa
  - identification – determination of taxon to which an isolate belongs

8.2

Order: Enterobacterialis
Family: Enterobacteriaceae
Genus: Salmomella

8.3

- life-cycle patterns
- symbiotic relationships
- ability to cause disease
- habitat preferences
- growth requirements

QUESTION 9

The Mycoplasmas are part of the low C+G Gram positive bacteria - They are mostly almost everywhere nonmotile, but some can glide.- They actually lack cell walls.- The mycoplasmas are the smallest bacteria capable of self-reproduction.- They have a very small genome, and thus need specific nutrients from their environment.- Since they lack cell walls, individual cells are pleomorphic,- but they are often pear-shaped. Colonies have a “fried egg” appearance.- Mycoplasmas can be saprophytes, commensals or parasites. Many species are important pathogens.

Mycoplasmas are often found in the mucous membranes of animals and cause diseases of joints, respiratory tracts and urogenital tracts. - They cause for example bovine pleuropneumonia in cattle and chronic respiratory disease in chickens. Pneumonia in pigs and humans are caused by them. They are even found in insects and are the cause of many plant diseases too. **[10]**