GRIFFITH UNIVERSITY

FACULTY OF SCIENCE AND TECHNOLOGY

SCHOOL OF SCIENCE

SS13BMM MOLECULAR AND APPLIED MICROBIOLOGY EXAMINATION

November 1995

DATE:	Monday 13 November 1995
TIME ALLOWED:	Perusal - 15 minutes
	Writing - 3 hours
PERUSAL:	2.00pm
START WRITING:	2.15pm
FINISH WRITING:	5.15pm

INSTRUCTIONS:

TOTAL MARKS ALLOCATED - 160

The examination paper has been divided into two (2) sections. **Section A** is worth 100 marks and should be answered in the main answer book. **Section B** is worth 60 marks and should be answered in the new supplementary answer book provided.

Remember to write your name on the answer books before attempting any questions.

Attempt all questions.

Allocate your time wisely in relation to the number of marks assigned for each question and time available.

SECTION A

Question 1

Answer **any one** (1) of the following **two** (2) questions.

(a) This question is composed of four (4) parts, all of which are to be answered.

(i) Why are 16S rRNAs thought to be the best molecules for undertaking phylogentic studies

(ii) What major evolutionary findings emerged from the study of 16S rRNA sequences?

(iii) Describe and discuss the structure of 16S rRNA with respect to its functions in a bacterial cell.

(iv) What are signature sequences and of what phylogenetic value are they?

(b) Discuss the statement citing examples "Complex interactions occur amongst individual microbial cells and microbial populations in an ecosystem".

(40 marks)

Question 2

Write notes on **any two** (2) of the following. Draw schematic diagrams where appropriate.

(a) Sampling procedures in microbiology

(b) r and k strategists

(c) Skin microflora

(d) Hydrothermal vent communities

(40 marks)

Question 3

Answer **both** questions (a) and (b)

(a) Write only the correct alphabet letter against the question number in your answer book

(i) Lignin is broken down in the soil primarily by...

a. aerobic fungi
b. anaerobic bacteria
c. protozoa
d. algae

(ii) The type of anatgonism in which one species is suppressed by the products of another is called...

a. amensalism
b. neutralism
c. commensalism
d. parasitism

(iii) Most of the methane in the air is produced by...

a. photosynthetic processes
b. aerobic oxidation of glucose
c. reduction of carbonate
d. anaerobic microbial processes

(iv) Which of the following substances is most resistant to microbial degradation?

a. ligin
b. cellulose
c. hemi-cellulose
d. anaerobic microbial processes

(v) The microorganisms normally associated with a particular tissue can be referred as...

a. indigenous microbial population
b. microbiota
c. microflora
d. all of the above

(vi) The surface layer of soils usually have ... microbial numbers to that of lower layers.

a. High
b. Low
c. The same

(vii) The microbes in the air are .... populations.

a. transient
b. resident
c. microbiota
d. zoonotic

(viii) The most numerous bacterium associated with the skin gland is ...

a. Staphylococcus epideremis
b. Pityrosporum orale
c. Propionibacterium acne
d. Lactobacillus

(ix) ... is involved in periodontal diseases

a. Streptococcus mutans
b. Bacteroides gingivatis
c. Escherichia coli
d. Lactobacillus

(x) ... in the gastrointestinal tract is regarded as a barrier to the entry of pathogens.

a. stomach
b. jejunum
c. duodenum
d. colon

(10 marks)

(b) Answer the following questions in brief.

(i) What type of ribosomal RNA is found in the 30S ribosome subunit of a bacterial cell?

(ii) What is the general secondary structure of ribosomal RNA?

(iii) Name the organ of Riftia pachyptilla in which as yet uncultured symbiotic bacteria are found.

(iv) Do Gram + ve or Gram -ve bacteria predominate in soil?

(v) Give the most important characteristics of the marine microorganisms.

(vi) State an approach which you would use to trace genetically modified microorganisms that had been released in an aquatic ecosystem.

(vii) How does S mutans attach tot he crevices of the teeth?

(viii) Name three (3) antibacterial agents present in the skin.

(ix) ATP levels are similar in all cells. State true or false, qualifying your answer.

(x) What is a biofilm? Cite an example.

(10 marks)

SECTION B

This section is to be answered in a new supplementary book.

Question 4

Write brief answers (1 or 2 sentences and/or appropriate diagrams) on any eleven (11) of the following:

(a) The evolution of modern eukaryotic cells.

(b) Cell wall composition in Archae, bacteria and eukaryotes

(c) TRUE or FALSE; The structure of lipids differs in archae and bacteria. Explain.

(d) Start condons in bacteria, eukaryotes and archea.

(e) The possible formation of Z-DNA is archea.

(f) HMF from Methanothermus fervidus.

(g) The possible role of reverse gyrase in archea.

(h) What is an attractant and what process is it involved with?

(i) The distinction between infection and disease.

(j) Structure of Type I pili in E.coli.

(k) Mode of adherence by Giardia lamblia

(l) distinguish between endotoxins and exotoxins

(m) Non-fimbrial adhesins

(n) Virulence factors

(22 marks)

Question 5

(a) Write a paragraph on any **three** (3) of the following:

(i) The genetic material of extreme thermophiles must be protected form thermal degradation. Explain how is this achieved?

(ii) Archeal RNA polymerases are similar to those found in eukaryotes and explain the reason for your answer. State True or False.

(iii) DNA associated proteins in archae.

(iv) Expression of cloned archeal genes in E.coli may only occur at low levels. Give reasons why this may happen.

(9 marks)

(b) Gene structure and organisation in archae have features which resemble eukaryotes and bacteria. Explain this statement using specific examples

(10 marks)

Question 6

(a) Write a paragraph on **three** (3) of the following:

(i) Differentiation of Proteus mirabilis cells.

(ii) Aerosol transmission of Streptococcus pneumoniae and Bordetella pertussis

(iii) Phagocytosis as a defence against pathogens

(iv) The role of fibronectin in the pathogenicity of certain organisms

(v) Virulence gene expression in Salmonella pathogenesis

(9 marks)

(b) Compare and contrast mechanisms of infections by Shigella, Salmonella and Yersinia . In your answer, you should include discussions on the sties of entry and invasive processes of these organisms.

(10 marks)