UNIVERSITY OF SWAZILAND

Faculty of Health Sciences

Department of Environmental Health Sciences and General Nursing

Final Examination 2013/2014

TITLE OF PAPER	:	INTRODUCTION TO MICROBIOLOGY AND IMMUNOLOGY
COURSE CODE	:	HSC 105
DURATION	:	3 HOURS
MARKS	:	100
INSTRUCTION	:	READ THE QUESTIONS & INSTRUCTIONS CAREFULLY.
		THIS PAPER IS DIVIDED INTO TWO SECTIONS:
		SECTION A (NURSING SCIENCE) & SECTION B (ENVIRONMENTAL SCIENCE).
		ANSWER ANY FOUR QUESTIONS IN YOUR SECTION EACH QUESTION CARRIES 25 MARKS. NO PAPER SHOULD NEITHER BE BROUGHT INTO NOR TAKEN OUT OF THE EXAMINATION ROOM.
		BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.
SPECIAL REQUIREMENTS:		NONE

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

SECTION A (NURSING SCIENCE)

Question 1

a) What is a chemotherapeutic index? What is its rationale in chemotherapy? (3 marks)

b) Distinguish between self-infection and cross infection. How do they differ from environmental infection? (2 marks)

c) Fill in the following table:

Pathogen	**Disease caused**	**Gram's reaction**
Mycobacterium tuberculosis	?	Variable
Haemophilus spp	?	?
Staphylococcus spp	?	+
Clostridium spp	Tetanus	?
Escherichia spp	?	-
Vibrio spp	Cholera	?
Klebsiella spp	?	?
Bacillus spp	?	+
Shigella spp	Dysentry	?
Salmonella spp	?	?
Neisseria spp	Gonorrhea	-
Corynebacterium spp	Diphtheria	?

(14 marks)

d) How do penicillinases destroy penicillins? (1 mark)

e) List some examples of penicillins and tetracyclines. (2 marks)

f) Define the terms "50% lethal dose and 50% infectious dose". (1 mark)

g) How do gram-positive (G^+) and gram-negative (G^-) cell walls of bacteria differ? (2 marks)

[Total marks = 25]

Question 2

a) Demonstrate the importance of the bone marrow stem cells. It is ethical to transplant bone marrow from for example swine to humans? Would you support stem cell research? (5 marks)

b) Show that specific immune response results from the cooperation of various cells of the immune system. (5 marks)

c) Explain the following:

(i) T cells and their functions (4 marks)

(ii) Structure of an immunoglobulin (4 marks)

(iii) Dual nature of the immune system (4 marks)

(iv) Immunologic memory in human disease resistance (3 marks)

[Total marks = 25]

Question 3

a) Match the structures in Column A to their functions in Column B

Column A	**Column B**
i) an endospore	Attachment to surfaces .....
ii) a fimbriae	Cell wall formation .....
iii) a cell wall	Motility .....
iv) a pilus	Protection from osmotialysis .....
v) a flagellum	Protection from phagocytes .....
vi) a ribosome	Resting .....
vii) a capsule	Protein synthesis .....
viii) a plasma/cytoplasmic membrane	Selectively permeability .....
	Transfer of genetic material .....

(8 marks)

b) Write an essay on "true bacteria useful to humans". (5 marks)

c) List some examples of Enterobacteriaceae (coliforms) (2 marks)

d) Explain the pathogenecities of any two bacterial human pathogens of your choice.

(10 marks)

[Total marks = 25]

Question 4

a) What is serology? (1 mark)

b) Outline the features of:

i) a partial antigen (2.5 marks)

ii) an incomplete antigen (2 marks)

iii) a complete antigen (2.5 marks)

c) Demonstrate the mechanism of anaphylaxis in humans. (4 marks)

d) Explain the following:

i) B cells (6 marks)

ii) transplantation immunity (4 marks)

iii) immune defects (3 marks)

[Total marks = 25]

Question 5

a) Explain the economic importance of fungi. (6 marks)

b) The following is a list of fungi and their methods of entry into the body. Indicate the site of infection and type of mycosis. (10 marks)

Genus	Method of entry	Site of infection	Mycosis
Blastomyces	Inhalation	.....	.....
Sporothrix	Puncture	.....	.....
Microsporum	Contact	.....	.....
Trichosporon	Contact	.....	.....
Aspergillus	Inhalation	.....	.....

c) Explain the following:

i) systemic mycoses (3 marks)

ii) subcutaneous mycoses (3 marks)

iii) superficial mycoses (3 marks)

[Total marks = 25]

Question 6

a) What is a virus? (5 marks)

b) Name, draw, and give examples of the morphological classes of viruses. (8 marks)

c) Explain the following:

i) strains of influenza virus (4 marks)

ii) reproduction of a bacteriophage within a bacterium (4 marks)

iii) effect of viruses on host cells (4 marks)

[Total marks = 25]

SECTION B – ENVIRONMENTAL SCIENCE

Answer any FOUR questions from this section

Question 7

a) Draw and fully label a flagellated F^+ bacillus. (5 marks)

b) Discuss the composition and function of the following:

i) Capsule (2 marks)

ii) Fimbria (2 marks)

iii) Plasmid (2 marks)

iv) Cell membrane (2 marks)

v) Cytoplasm (2 marks)

c) Explain phage-mediated chromosomal recombination in bacteria. Illustrate all the key steps (10 marks)

[Total marks = 25]

Question 8

a) Describe asexual reproduction methods in bacteria. (5 marks)

b) Draw and fully explain the various regions of a generalized bacterial growth curve. (10 marks)

c) Explain how a plasmid acts as a vehicle of transfer of genetic information during the mating of a Hfr and an F^-. Illustrate your answer. (10 marks)

[Total marks = 25]

Question 9

a) Prepare a table to compare eukaryotic and prokaryotic cells. (5 marks)

b) Explain how fungi affect human welfare. (5 marks)

c) Prepare annotated diagrams to explain reproduction processes in the bread mold *Rhizopus stolonifer*. (15 marks)

[Total marks = 25]

Question 10

a) What procedures should be observed when collecting water for potability tests? (5 marks)
b) What are the characteristics of an indicator organism? (10 marks)
c) Explain a typical municipal water supply purification method. (10 marks)

[Total marks = 25]

Question 11

Write an essay on Salmonella gastroenteritis and the role played by environmental scientists in its prevention. (25 marks)

[Total marks = 25]

Question 12

Write an essay on innate immunity defences. (25 marks)

[Total marks = 25]