UNIVERSITY OF SWAZILAND

Faculty of Health Sciences

Department of Environmental Health Sciences

Final Examination 2011/2012

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 INVIGILATORS.

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SECTION A (NURSING SCIENCE)

Question 1

a) Draw the following: (6 marks)

i)	a spiral	iv)	a spirochete
ii)	a bacillus	v)	a streptobacillus
iii)	a coccus	vi)	a staphylococcus

b) Match the structures in column A to their functions in column B (8 marks)

Column A	Column B
..... a. cell wall	1. Attachment to surfaces
..... b. Endospore	2. Cell wall formation
..... c. Fimbriae	3. Motility
..... d. Flagella	4. Protection from osmotialysis
..... e. Glycocalyx	5. Protection from phagocytes
..... f. Pili	6. Resting
..... g. Plasma membrane	7. Protein synthesis
..... h. Ribosomes	8. Selective permeability
	9. Transfer of genetic material.

c) Why is an endospore called a resting structure? Of what advantage is an endospore to a bacterial cell? (3 marks)

d) If you are shown a diagram of a gram-positive and a gram-negative bacterium, how can you tell them apart? (3 marks)

e) Explain how the Gram stain works to distinguish gram-positive and gram-negative cell walls. (5 marks)

[Total marks = 25]

Question 2

a) Provide a flow chart to demonstrate that both cells of the innate and adaptive immune system arise from the bone marrow stem cell. (5 marks)

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

c) Outline the concept of the dual nature of the adaptive immune system. (3 marks)

d) Explain the following:
   (i) Role of T cells in immune response (4 marks)
   (ii) Structure of an antibody (4 marks)
   (iii) Anamnestic response (4 marks)

[Total marks = 25]

Question 3

a) 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)

Germs	Method of entry	Site of infection	Mycosis
Blastomyces	Inhalation	.....	.....
Sporothix	Puncture	.....	.....
Microsporum	Contact	.....	.....
Trichosporon	Contact	.....	.....
Aspergillus	Inhalation	.....	.....

b) Write an essay on the economic effects of fungi. (6 marks)
c) Indicate the major mechanisms of fungal pathogenesis. (4 marks)
d) Distinguish between the toxic effects of aflatoxin and ergot poisoning. (5 marks)

[Total marks = 25]

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Question 4

a) Name one disease caused by the following: *Corynebacterium, Salmonella, Neisseria, Bacillus, Shigella, Mycobaterium, Haemophilus, Clostridium, Stophylococcus, Escherichia, Klebsiella and Vibrio spp.* (6 marks)

b) What is the gram's stain reaction of each of the above bacteria? (8 marks)

c) Explain the pathogenecity of *Staphylococcus* or *Mycobacterium* and *Streptococcus pyogenes.* (11 marks)

[Total marks = 25]

Question 5

a) i) Why do we classify viruses as obligatory intracellular parasites? (1 mark)

ii) List the four properties that define a virus. What is a virion? (5 marks)

iii) Name the four morphological classes of viruses, then diagram and give an example of each. (12 marks)

b) Write an essay on influenza virus. (7 marks)

[Total marks = 25]

Question 6

a) What is an antigen? (1 mark)

b) Explain the types of antigens we are exposed to from the environment. (7 marks)

c) Describe the mechanism of anaphylaxis . (4 marks)

d) Write short notes on the following:

(i) Immune defects. (3 marks)

(ii) B cells and their functions. (6 marks)

(iii) transplantation immunity. (4 marks)

[Total marks = 25]

SECTION B - ENVIRONMENTAL SCIENCE

Question 7

a) Illustrate and briefly describe at least five methods of asexual reproduction in bacteria . (10 marks)

b) Prepare a table to compare prokaryotic and eukaryotic cells (10 marks)

c) Illustrate endospore production (5 marks)

[Total marks = 25]

Question 8

a) Choose any five bacterial cell arrangements and explain how they are produced during cell division. (10 marks)

b) Explain the Gram staining procedure at each step explain how gram positive and gram negative walls would react and why (10 marks)

c) Draw sketches to explain the following terms

i) Amphitrichons (2 marks)

ii) Lophotrichons (1 mark)

iii) Monotrichons (1 mark)

iv) Peritrichons (1 mark)

[Total marks = 25]

Question 9

a) Describe the reproduction of Rhizopus stolomfer (bread mold). Illustrate your answer. (15 marks)

b) How could you:-

i) Identify the fungus as a zygomycete? (2 marks)

ii) Slow down the production of this fungus? (2 marks)

iii) Reduce the spread of this fungus from loaf to loaf? (1 marks)

c) Discuss the importance of fungi (5 marks)

[Total marks = 25]

Question 10

a) What properties are used to classify viruses? (15 marks)

b) Explain how a typical phage would multiply. (10 marks)

[Total marks = 25]

Question 11

a) Define an antigen, and explain the composition and function of its parts. (5 marks)

b) Draw and label the antibody IgG. (5 marks)

c) Explain antibody production. (10 marks)

d) How is the specificity of antibody-antigen reactions used in microbial identification? (5 marks)

[Total marks = 25]

Question 12

a) Explain how municipal water is purified. (10 marks)

b) Define an indicator organism and give examples. (2 marks)

c) What are the characteristics of an indicator organism? (8 marks)

d) What should one observe when collecting water for potability tests? (5 marks)

[Total marks = 25]
