Examination Candidate Number: __________
Desk Number: __________

BSc Degree Examinations 2018-9

Department:
BIOLOGY

Title of Exam:
Microbiology

Time Allowed:
1 hour and 30 minutes

Marking Scheme:
Total marks available for this paper: 50
The marks available for each question are indicated on the paper

Instructions:
Answer all questions in the spaces provided on the examination paper

Materials Supplied:
CALCULATOR

For marker use only:

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DO NOT WRITE ON THIS BOOKLET BEFORE THE EXAM BEGINS
DO NOT TURN OVER THIS PAGE UNTIL INSTRUCTED TO DO SO BY AN INVIGILATOR
1. Based on the table of attributes given below, answer the following questions about the two bacteria.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Bacterium A</th>
<th>Bacterium B</th>
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<tbody>
<tr>
<td>Endospore formation</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Capsule</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Type IV pili</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Flagella</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Morphology</td>
<td>cocci</td>
<td>bacillus</td>
</tr>
</tbody>
</table>

a) Which Bacterium is going to be more resistant to heat and ultraviolet light and why? (2 marks)

b) Which Bacterium is more likely to form a slime layer and why? (2 marks)

c) Which Bacterium is more likely to be motile and why? (2 marks)

2 a) What are the key differences in the chemical composition and structure of the cytoplasmic membranes found in Bacteria and Archaea? (3 marks)
b) What is the advantage of these archaeal membranes in relation to the types of environments Archaea may inhabit? (3 marks)

3) Why are microbial doubling times in an industrial fermenter typically shorter than those found in the environment? (3 marks)

4) A researcher isolates a mutant bacteria deficient in the FtsZ protein. Its growth appears filamentous rather than fragmenting into individual bacilli. Explain how a deficiency in FtsZ would account for this altered growth. (5 marks)
5) Explain how you would separate an endospore forming bacteria from other microbes in a sample of water. (3 marks)

6) Briefly explain the difference between ectomycorrhizae and endomycorrhizae. (2 marks)

7 a) Explain two ways in which CD4 T cells “help” immune responses. (2 marks)

b) Explain how our immune system generates T cells with such a wide range of specificities. (4 marks)
8). From the organisms listed below.

A. Giardia
B. Entamoeba histolytica
C. Plasmodium falciparum

D. Trypanosoma cruzi
E. Toxoplasma gondi
F. Paramecium

G. Leishmania mexicana
H. Trichomonas
I. Trypanosoma brucei

a) Which are flagellates? (1 mark)

b) Which are non-pathogenic? (1 mark)

c) Which are non-motile? (1 mark)

d) How do the non-motile organisms listed above invade host cells? (1 mark)

9. In the classification of Influenza viral strains (e.g. H5N1) what do the H and N stand for and what function does each accomplish? (2 marks)

The space above the line should be sufficient for your answer.
10. Briefly describe replication in the lytic cycle of a negative strand, ssRNA virus. 

(3 marks)

11. a) Briefly explain what happens to average diatom size during vegetative cell division. How does this phenomenon occur and how is the original size returned to? 

(4 marks)

b) The plastids of algae were obtained during a primary endosymbiotic event. What photosynthetic organism was engulfed by a heterotrophic protest to form the plastid? 

(1 mark)

The space above the line should be sufficient for your answer.
c) In addition to primary endosymbionts, algae can be secondary or tertiary endosymbionts. Draw a line between the algae and its endosymbiotic level.  

(2 marks)

*Thalassiosira pseudonana* (Diatom)  
Primary endosymbiont

*Emiliania huxleyi* (Coccolithophore)  
Secondary endosymbiont

*Chlamydomonas reinhardtii* (Green algae)  
Secondary endosymbiont

*Karenia brevis* (Dinoflagellate)  
Tertiary endosymbiont

12) Explain why systemic fungal infections are only seen in a subset of the human population, even though most people contact fungi and fungal spores in soil and dust all of the time?  

(3 marks)

The space above the line should be sufficient for your answer.