

**CORK INSTITUTE OF TECHNOLOGY**  
**INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ**

**Autumn Examinations 2011/12**

**Module Title:      Fundamentals of Microbiology 1**

**Module Code:**      BIOM6007

**School:**      Science

**Programme Title:**

Bachelor of Science in Applied Biosciences & Biotechnology – Year 2

Bachelor of Science (Honours) in Pharmaceutical Biotechnology – Year 2

Bachelor of Science (Honours) in Nutrition and Health Science – Year 2

**Programme Code:**

SBIOS\_7\_Y2

SPHBI\_8\_Y2

SNHSC\_8\_Y2

**External Examiner(s):**      Dr J. Bird, Dr A. Gallagher, Dr A. Nelson

**Internal Examiner(s):**      Dr A. Coffey

**Instructions:** Answer Question 1 and two other questions. All questions carry equal marks.

**Duration:**      2 hours

**Sitting:**      Autumn 2012

**Requirements for this examination:**

**Note to Candidates:** Please check the Programme Title and the Module Title to ensure that you have received the correct examination paper.  
If in doubt please contact an Invigilator.

### Q1 (compulsory practical exam question)

(a) The spread-plate method was used to analyse a contaminated water sample. The water sample was serially diluted 10-fold in Ringers solution as far as the  $10^{-5}$  dilution. From the dilution series, 0.1 ml of the  $10^{-3}$ ,  $10^{-4}$  and  $10^{-5}$  dilutions were spread on three agar plates, which were then incubated overnight at  $37^{\circ}\text{C}$ .

The results of the counts for each plate are shown below.

$10^{-3}$  Plate: too numerous to count

$10^{-4}$  Plate: 571 colonies

$10^{-5}$  Plate: 52 colonies

Use the appropriate plate count to calculate the number of colony forming units per ml (CFU/ml) in the original water sample. (25 marks)

(b) The pour plate method was used to evaluate the microbes present in a milk sample. The sample was serially diluted 10-fold in Ringers solution as far as the  $10^{-5}$  dilution. From the dilution series, 1 ml of the  $10^{-3}$ ,  $10^{-4}$  and  $10^{-5}$  dilutions were added to three separate petri-dishes, which were mixed with agar, allowed to solidify and incubated overnight at  $30^{\circ}\text{C}$ .

The results of the counts for each plate are shown below.

$10^{-3}$  Plate: 621 colonies

$10^{-4}$  Plate: 67 colonies

$10^{-5}$  Plate: 5 colonies

Use the appropriate plate count to calculate the number of colony forming units per ml (CFU/ml) in the original milk sample. (25 marks)

(c) A culture of *Staphylococcus* was inoculated at 1% into a 100-ml flask of nutrient broth, which was then incubated for 4.5 hours (270 minutes). Samples were withdrawn every half hour and read in a spectrophotometer at 600nm. The OD readings were recorded in the table (below).

Time of reading (in minutes) after inoculation	OD at 600 nm
3	0.02
30	0.03
60	0.05
90	0.15
120	0.36
150	0.58
180	0.77
210	0.95
240	1.01
270	1.03

Using the full width of one page of graph paper (provided at centre of your exam book), carefully plot the above data as a growth curve with appropriate heading, captions / labels on the graph. (25 marks)

From your graph, calculate the doubling time (in minutes) of the *Staphylococcus* culture during the log-phase of growth. (25 marks)

**Q 2.** Give an account of bacterial growth media with specific reference to:

- (a) Liquid and solid media. (10 marks)
- (b) Common nutritional ingredients. (20 marks)
- (c) Defined media and complex media. (20 marks)
- (d) Selective media. (20 marks)
- (e) Enrichment media. (10 marks)
- (f) Physical conditions affecting growth. (20 marks)

**Q 3.** Discuss bacterial cultures from the point of view of:

- (a) Long-term preservation of cultures. (10 marks)
- (b) Pure cultures. (10 marks)
- (c) Streak plate for isolation of pure cultures. (10 marks)
- (d) Spread plate and its application. (30 marks)
- (e) Pour plate and applications. (30 marks)
- (f) Aseptic technique. (10 marks)

**Q 4.** Write an account of physical methods used to control and/or inhibit the growth of microorganisms with reference to:

- (a) Moist heat (boiling, autoclaving, pasteurization) (30 marks)
- (b) Dry heat. (10 marks)
- (c) Drying and the concept of  $a_w$ . (20 marks)
- (d) Osmotic pressure. (10 marks)
- (e) Filtration. (10 marks)
- (f) Irradiation. (20 marks)