CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Autumn Examination 2016

Bacteriology: Continuous Assessment (Semester 2)

Module Code: BIOM 6007

School: Science

Programme Title: BSc in Applied Biosciences& Biotechnology
BSc Hons Pharmaceutical Biotechnology
BSc Hons in Nutrition and Health science
BSc Hons in Herbal Science

Programme Code: CR_SBIOS_7_Y2
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Instructions: Answers are written on this booklet, which is to be handed up after the exam.

This paper is divided into two sections:

(A) Laboratory Practical Section: 30% of overall marks (Answer 6 of the 8 questions)

(B) MCQ-Based Theory Section: 70% of overall marks (answer all questions)

Duration: 2 hours

Sitting: Autumn 2016
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

Section A
(Answer 6 of the 8 questions)

1. Detection of microorganisms on surfaces is often done using RODAC plates.

(a) What does RODAC stand for? (4 marks)

(b) Draw a side-view diagram of a RODAC plate AND describe the procedure for using it. (6 marks)

2. (a) Explain the Kirby-Bauer Method (5 marks)

(b) What is the reason for using the Kirby-Bauer Method (3 marks)

(c) Name a Gram-positive bacterium (give full name of genus and species), which is often tested using the Kirby-Bauer Method (2 marks)

3. The Catalase test is frequently performed as an aid in microbial identification.

(a) Explain the background to the Catalase test. (7 marks)

(b) What observations indicate a Catalase-positive result and a Catalase-negative result? (3 marks)

4. The Oxidase test is frequently performed as an aid in microbial identification.

(a) Explain the background to the Oxidase test. (7 marks)

(b) What observations indicate an Oxidase-positive result and an Oxidase-negative result? (3 marks)

5. The results of the IMViC tests are frequently used in the identification of bacteria.
(a) Name the 4 tests that are included in the abbreviation **IMViC**
(8 marks: 2 each)

(b) Which one of the following are usually tested using IMViC (2 marks)
(i) Lactic acid bacteria,
(ii) Spore-formers,
(iii) Enterobacteriaceae,
(iv) Gram-positive cocci associated with human infection,
(v) Antibiotic resistant Gram-positives,
(vi) Yeasts.

6. Many bacteria produce extracellular enzymes, whose presence can be detected using different agar media.

(a) Name an agar medium used for detecting proteolysis (protease activity) in bacteria **AND** describe how protein hydrolysis is detected on the agar plate. (2 marks)

(b) Name an agar medium used for detecting starch hydrolysis (Amylase activity) in bacteria **AND** describe how starch hydrolysis is detected on the agar plate. (3 marks)

(c) Name an agar medium used for detecting lipid hydrolysis (lipase activity) in bacteria **AND** describe how lipid hydrolysis is detected. (3 marks)

(d)Name a Gram-positive bacterium that exhibits a large amount of extracellular enzyme activity. (2 mark)

7. (a) Describe the typical colony characteristics of coagulase-positive *Staphylococcus aureus* on Baird Parker agar (3 marks).

(b) Explain the chemical background to the three colony characteristics of the typical coagulase-positive *Staphylococcus aureus* on Baird Parker agar. (7 marks)

8. A bacterial conjugation was performed with the following donor and recipient cells.

Donor: *E.coli* Trp^+, Str^S

Recipient: *E.coli* Trp^-, Str^R

The ability to make tryptophan (Trp^+) is encoded on a conjugative plasmid in the donor. The resistance to streptomycin (Str^R) is encoded on the chromosome in the recipient.

(a) State the essential components of the medium that should be used to detect transconjugants (5 marks)

(b) State the essential components of the media that should be used to confirm that the donor and recipient had the correct characteristics (5 marks)

Section B

MCQ-Based Theory Section: 70% of overall marks. Answer all questions.

Circle the correct answer (a, b, c or d) for all the MCQ questions below. Then fill in the correct answers on the Pink MCQ scan sheet provided. Use a pencil. Do not use an eraser. If you make a mistake, get a new sheet.

One mark is assigned for a correct answer. Minus one third of a mark is assigned for a wrong answer. No marks are assigned for a blank.

1. With regard to lactose utilization, *Salmonella* is:
   (a) Always Lactose positive (utilizes lactose)
   (b) Always Lactose negative (never utilizes lactose)
   (c) Sometimes Lactose positive and sometimes Lactose negative
   (d) Lactose utilization ability is irrelevant in these bacteria

2. Salmonella can cause the following disease:
   (a) Dysentery
   (b) Scurvy
   (c) Typhoid
   (d) Cholera

3. Today, the amount of official **species** of *Salmonella* that exists is:
   (a) Between 50 and 100
   (b) Over 100
   (c) About 2000
   (d) 2

4. Individual *Salmonella* isolates are nowadays known by their:
   (a) Genus
   (b) Species
   (c) Serotype
   (d) Subspecies

5. Today, the number of known **serotypes** of *Salmonella* is
   (a) Around 200
   (b) Around 2000
   (c) Around 10000
   (d) Around 50

6. *Salmonella* serotyping usually utilizes which of the following antigens:
   (a) N antigen
   (b) O antigen
   (c) B antigen
   (d) C antigen

7. The more usual human infection by *Salmonella* is generally referred to as:
   (a) Salmonitis
   (b) Salmonellemia
   (c) Typhoid
   (d) Salmonellosis

8. The infectious dose (number of bacterial cells) needed to cause a *Salmonella* infection is as little as:
   (a) One cell
   (b) 15 to 20 cells
   (c) 100 to 200 cells
   (d) About 1000 cells

9. The food most commonly associated with *Salmonella* infection is
   (a) Poultry
   (b) Milk powder
   (c) Rice
   (d) Raw milk

10. The species of *Yersinia* associated with food poisoning is:
   (a) Flexneri
   (b) Jejuni
   (c) Sonneri
   (d) Enterolytica

11. *Cronobacter sakazakii* principally causes problems in which group of humans?
   (a) Infants
   (b) AIDS patients
   (c) Elderly
   (d) All humans

12. Which food product is most commonly associated with *Cronobacter sakazakii* infections?
   (a) Beef
   (b) Chicken
   (c) Milk powder
   (d) Rice

13. In quality testing, LAL stands for:
   (a) *Lactobacillus acidophilus* liquid
   (b) *Lactobacillus amebocyte* liquid
   (c) *Limulus* amebocyte liquid
   (d) *Limulus* amebocyte Lysate

14. The LAL test is carried out of what kind of product?
    (a) Foods for consumption in hospitals
    (b) Milk powder destined for infant formula
    (c) All milk powders
    (d) Injectable-grade pharmaceuticals

15. Which the main source of *Campylobacter*?
    (a) Beef
    (b) Chickens
    (c) Milk powder
    (d) Rice

16. With regard to oxygen levels tolerated, *Campylobacter* is classed as:
    (a) Strictly aerobic
    (b) Strictly anaerobic
    (c) Microaerophillic
    (d) Strictly fermentative

17. With regard to oxygen levels tolerated, *Pseudomonas* is classed as:
    (a) Strictly aerobic
    (b) Strictly anaerobic
    (c) Microaerophillic
    (d) Strictly fermentative

18. Which type of food packaging system prevents spoilage by *Pseudomonas*
    (a) Any type of hygienic packaging
    (b) Aerobord packaging
    (c) Sterile paper packaging
    (d) Modified atmosphere packaging

19. The species of *Listeria* commonly associated with human disease is
    (a) *L. abortus*
    (b) *L. ivanovii*
    (c) *L. monocytogenes*
    (d) *L. jejuni*

20. How many species of *Listeria* exist?
    (a) 2
    (b) 6
    (c) Over 100
    (d) Between 10 and 100

21. The genus *Bacillus* includes bacteria that are
    (a) Gram negative spore-forming rods
    (b) Gram positive spore-forming rods
    (c) Gram positive non-spore forming rods
    (d) Gram negative non-spore forming rods

22. *Bacillus* is generally good at secreting
    (a) Lactic acid
    (b) Acetic acid
    (c) Extracellular enzymes
    (d) Vitamin A

23. Colonies of *Bacillus* are generally
    (a) Tiny pinpoint
    (b) Quite large
    (c) black
    (d) pink

24. Which species of *Bacillus* is associated with food-borne intoxication?
    (a) Subtilis
    (b) Amyloliquefaciens
    (c) Cereus
    (d) Dysenteriae

25. Which of the following foods is most likely to be associated with *Bacillus* food intoxication:
    (a) Undercooked poultry
    (b) Undercooked minced meat
    (c) re-heated cooked rice
    (d) Raw eggs

26. The following two species are members of the genus *Clostridium*:
    (a) *Botoxii* and *monocytogenes*
    (b) *Difficile* and *perfringens*
    (c) *Jejuni* and *anthracis*
    (d) *Dysenteriae* and *sonneri*

27. Which of the following foods is most likely to get contaminated with *Staphylococcus aureus*?
    (a) Undercooked chicken and raw eggs
    (b) Cooked rice that has been re-heated
    (c) Slices of cold meat that have been handled
    (d) Tinned food that has not received the correct heat treatment

28. *Streptococcus mutans* is usually found where?
    (a) In plaque on teeth
    (b) In the intestine
    (c) on the skin
    (d) in the cows udder

29. *Lactococcus lactis* is usually used to make
    (a) Yoghurt
    (b) Cheese
    (c) Salami
    (d) Sauerkraut

30. Symbiosis means
    (a) "To compete with each other"
    (b) "To die off gradually together"
    (c) "To die off gradually but at different rates"
    (d) "To live together"35. Commensalism means

31. Commensalism means
    (a) Both organisms in the relationship are harmed
    (b) One of the organisms in the relationship is harmed
    (c) One of the organisms in the relationship benefits, the other is unaffected.
    (d) Both of the organism in the relationship benefit

32. Parasitism means
    (a) Both organisms in the relationship are harmed
    (b) One of the organisms in the relationship is harmed
    (c) Neither organism in the relationship benefits nor is harmed
    (d) Both of the organism in the relationship benefit

33. The term normal microbiota means:
    (a) Harmful organisms on your skin that often cause disease
    (b) Mixture of microorganisms and vitamins to be taken in tablet form
    (c) Organisms that colonize the body's surfaces without normally causing disease
    (d) All the normal vitamins that help microorganisms to grow in your intestine

34. Much of one's resident microbiota is established when?
    (a) By the age of 10 years
    (b) When one becomes a teenager
    (c) Before ever a baby is born
    (d) During the first few months of life outside womb

35. An opportunistic pathogen is:
    (a) A pathogen which has an opportunity to contaminate food
    (b) A pathogen which never has an opportunity to cause disease
    (c) A normally harmless microbe that can contaminate food
    (d) A normally harmless microbe that can cause disease under certain circumstances

36. The four major sites through which pathogens enter the body (portals of entry) are:
    (a) Mouth, nose, ears, and intestine
    (b) Cuts, pricks, hair follicles, and intestine
    (c) Skin, mucous membranes, placenta, and parenteral routes
    (d) Large intestine, small intestine, blood, and urinary tract infections

37. An acute disease is one which
    (a) A communicable disease that is easily spread
    (b) A disease that appears a long time after infection
    (c) A disease in which symptoms develop rapidly and that runs its course quickly
    (d) A disease where the symptoms are mild, develop slowly and last a long time

38. A chronic disease is one which
    (a) A communicable disease that is easily spread
    (b) A disease that appears a long time after infection
    (c) A disease in which symptoms develop rapidly and that runs its course quickly
    (d) A disease where the symptoms are mild, develop slowly and last a long time

39. A contagious disease is
    (a) A communicable disease that is easily spread
    (b) A disease that appears a long time after infection
    (c) A disease in which symptoms develop rapidly and that runs its course quickly
    (d) A disease where the symptoms are mild, develop slowly and last a long time

40. Epidemiology is the study of
    (a) Epidermal infections which arise in Africa
    (b) Using antibiotics in combination to avoid infections spreading
    (c) The elimination of epidemics
    (d) Where and when diseases occur and how they’re transmitted

41. Prevention of nosocomial of infections generally involves
    (a) Using antibiotics one at a time
    (b) Hand-washing and good hygiene
    (c) Using antibiotics and disinfectants in combination
    (d) avoiding antibiotics completely

42. An antibiotic is
    (a) A natural, semi-synthetic, or synthetic chemical that kills viruses
    (b) A synthetic chemical that kills all microbes
    (c) A natural chemical that kills all microbes
    (d) A natural, semi-synthetic, or synthetic chemical that kills bacteria

43. The aminoglycoside antibiotics work by
    (a) Disrupting the synthesis of the peptidoglycan layer of bacterial cell walls
    (b) Inhibiting protein synthesis
    (c) Digesting DNA and RNA
    (d) Denaturing intracellular enzymes

44. The penicillin's and other beta-lactam antibiotics work by:
    (a) Disrupting the synthesis of the peptidoglycan layer of bacterial cell walls
    (b) Inhibiting protein synthesis
    (c) Digesting DNA and RNA
    (d) Denaturing intracellular enzymes

45. In the context of antibiotic resistance, MRSA means
    (a) Multi-resistant *Staphylococcus agalactiae*
    (b) Methicillin-resistant *Staphylococcus aureus*
    (c) Methicillin-resistant *Streptococcus agalactiae*
    (d) Multi-resistant *Streptococcus agalactiae*

46. In the context of antibiotic resistance, VRE means
    (a) Valium resistant enterics
    (b) Vancomycin resistant *E.coli*
    (c) Vancomycin resistant *Enterococcus*
    (d) Vancomycin resistant *Enterobacter*

47. A DNA sequence where RNA polymerase attaches is called a
    (a) Terminator
    (b) Repressor
    (c) Promoter
    (d) Inducer

48. The end result of bacterial conjugation is
(a) both strains become donors
(b) the entire bacterial chromosome is transferred.
(c) the recipient strain is converted to a donor and the donor is converted to a recipient
(d) A and B.

49. Transduction is:
(a) Transfer of DNA from one organism to another through a sex pili
(b) Transfer of DNA from one bacterial cell to another using a bacteriophage
(c) Is the copying of DNA to mRNA
(d) Uptake of naked DNA by bacteria

50. Which of the following is part of an operon?
(a) Structural genes
(b) An operator
(c) A promoter
(e) All of the above