



**UNIVERSITY OF SWAZILAND**

**Faculty of Health Sciences**

**DIPLOMA IN ENVIRONMENTAL HEALTH  
FINAL EXAMINATION PAPER 2012**

**TITLE OF PAPER** : INTRODUCTION TO FOOD MICROBIOLOGY  
**COURSE CODE** : EHS 312  
**DURATION** : 2 HOURS  
**MARKS** : 100

**INSTRUCTIONS** : ANSWER **ONLY FOUR** QUESTIONS  
: QUESTION **ONE IS COMPULSORY**  
: EACH QUESTION CARRIES 25 MARKS.  
: WRITE NEATLY  
: BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.

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

**Question 1 [Compulsory]**  
**Multiple Choice Questions**  
**(Choose the Best Answer)**

1. *Clostridium perfringens* foodborne illness is likely to be transported by which of the following vehicles.
  - A. Potato salad
  - B. Meats served several hours or a day or so after cooking
  - C. Raw vegetables
  - D. Cooked vegetables
  - E. All of the above
  
2. The symptoms of *Clostridium perfringens* foodborne illness are largely;
  - A. Nausea and vomiting
  - B. Abdominal pains and diarrhea
  - C. Chills and fever
  - D. Fever and headache
  - E. Dizziness and headache
  
3. Concerning Salmonella, all of the following are true **EXCEPT** that:
  - A. It may produce serious systemic disease in humans
  - B. A carrier state exists in some who recover
  - C. Food animals do not serve as reservoirs
  - D. Animal feed is often contaminated, as cross-contamination occurs during processing
  - E. Any stress stressful situation combined with close confinement of stock is liable to provoke salmonellosis.
  
4. An outbreak characterized by nausea, vomiting and diarrhea which appears two to six hours after consumption of potato salad would lead you to suspect;
  - A. Botulism
  - B. Shigellosis
  - C. Salmonellosis
  - D. Staphylococcal intoxication
  - E. Campylobacteriosis

5. General knowledge indicates that most foodborne illness is caused by:
- A. Viruses
  - B. Bacteria
  - C. Protozoan
  - D. Rickettsia
  - E. Molds
6. Assume that a culture of pathogenic bacteria was in a favorable food medium. Assume further that the food medium was ingested. Foodborne disease would be less likely if the culture were in the:
- A. Logarithmic phase
  - B. Stationary phase
  - C. Lag phase
  - D. Death phase
  - E. Late log phase
7. Under normal, comparable circumstances, which of the following would be expected to have the highest bacterial counts per gram?
- A. Dagwood
  - B. T-bone steak
  - C. Chicken drumstick
  - D. Cheese burger
  - E. A, B and C since it is meat
8. The most effective measure which a food service manager can apply in the control of bacterial multiplication in the storage, preparation and service of food is:
- A. pH control
  - B. Inventory control
  - C. ~~Dishwashing control~~
  - D. Sanitation control
  - E. Time-temperature control
9. The chain of transmission for Salmonella may be:
- A. Humans to humans
  - B. Humans to animals
  - C. Animals to animals
  - D. Animals to humans
  - E. Any of the above

10. Outbreaks of *Clostridium perfringens* foodborne illness are associated with all of the following circumstances **EXCEPT**:
- A. Poor time-temperature control in the handling of cooked meat
  - B. Recontamination of cooked meat by food preparation equipment.
  - C. Sanitary care of utensils, equipment, and workers hands
  - D. Poor sanitation of food preparation utensils
  - E. Inadequate reheating of foods
11. Aflatoxins are produced during the
- A. Lag phase
  - B. Decline phase
  - C. Logarithmic phase
  - D. Stationary phase
  - E. Exponential phase
12. *Thamnidium elegans* will attack and cause greyish brown discoloration;
- A. Frozen beef and mutton
  - B. Cereals and cereal products
  - C. Chilled and refrigerated meat
  - D. Fruits and vegetables
  - E. Dairy products
13. Which of the following are most susceptible to injury at temperatures below 5° C
- A. Bacterial spores
  - B. Gram-positive cocci
  - C. Gram-positive rods
  - D. Gram-negative rods
  - E. Psychrotrophs
14. Reports of foodborne disease indicate that the implicated food was usually;
- A. A canned foodstuff
  - B. A food held for long periods at temperatures favorable to bacterial growth
  - C. An improperly cooked food
  - D. A food stored too long in the refrigerator
  - E. A food contaminated by food handlers during serving

15. Many researchers have reported on the lowest temperatures at which bacteria growth and toxin production will occur. Which of the following has been reported to both multiply and produce toxin at the lowest temperatures?
- A. *Staphylococcus aureus*
  - B. *Salmonella typhimurium*
  - C. *Clostridium botulinum* type E
  - D. *Escherichia coli*
  - E. *Clostridium perfringens*
16. The maximum amount of time a food may remain in the dangerous temperature zone and may still be assumed safe is;
- A. 30 minutes
  - B. 1 hour
  - C. 2 hours
  - D. 3 hours
  - E. 4 hours
17. Spoilage of canned foods is due mainly to thermophilic spore-forming bacteria. Flat sour spoilage is caused by species of the **genus**:
- A. Bacillus
  - B. Clostridium
  - C. Salmonella
  - D. Streptococcus
  - E. Staphylococcus
18. For several reasons, bacterial growth is usually more abundant in foods which have been cubed, chopped or grounded. All of the following are important factors, with one exception. What is the **EXCEPTION**?
- A. The chopping changes the food chemically to a more favorable medium
  - B. The surface area is much increased
  - C. Contaminants are spread over the new surface
  - D. The physical structure is changed
  - E. Both A and D
19. All of the following are factors affecting the thermal death of *C.botulinum* spores **EXCEPT**:
- A. The pH of the food in which the organism is suspended
  - B. The type and strain of the organism
  - C. The age of the spore
  - D. The number of spores
  - E. Both A and C

20. Botulism toxin:
- A. Is heat labile
  - B. Is produced by spores
  - C. Affects only humans
  - D. Is produced after ingestion
  - E. Both B and C
21. Staphylococcal intoxication is caused by:
- A. Ingestion of putrid food
  - B. Ingestion of preformed toxins
  - C. Toxins formed after ingestion
  - D. Ingestion of Staph. organisms.
  - E. Ingestion of food kept at room temperatures for too long
22. Which of the following preservation procedures would be most concerned with the principle of osmotic pressure?
- A. Drying
  - B. Refrigeration
  - C. Acidification
  - D. Salting and sugaring
  - E. None of the above
23. Experiments conducted on foods at refrigeration temperatures point up to all of the following with one **EXCEPTION**. What is the **EXCEPTION**?
- A. Growth rates varied with the type of bacteria
  - B. Growth rates varied according to the media
  - C. Growth rates varied according to the temperatures
  - D. *Yersinia enterocolitica* required higher temperatures for good growth than did either salmonellae or staphylococci
  - E. Both B and D
24. "Safe temperatures" in food hygiene refers to:
- A. Internal food temperatures which prevent multiplication of microorganisms which are capable of causing foodborne illness
  - B. Temperatures of food which will be warm enough to be palatable but not hot enough to burn
  - C. Temperatures required to produce a "near sterile" food
  - D. Temperatures at which no toxins will be produced
  - E. Temperatures that are hot enough to kill pathogenic spores

25. Although thermal death is principally a time-temperature effect, other factors are involved. Which of the following is the **LEAST** important factor?
- A. The nature of the medium
  - B. The moisture content
  - C. The number of vegetative cells or spores in the medium
  - D. The generation time
  - E. Both A and D

[25 Marks]

### Question 2

- a) Describe the differences in bacterial toxins and mycotoxins in food. [6]
- b) List three major sources of foodborne pathogens in foods and indicate the measures that should be implemented to reduce their incidence in foods.[15]
- c) How would you control food botulism? [4]

[25Marks]

### Question 3

- a) Many vegetables are eaten raw. Discuss what microbiological concerns the consumer should have for these vegetables. [5]
- b) Which type of food is to be given a botulinum cook and why? [4]
- c) Environmental factors such as moisture and temperature will influence the population of microorganisms on food. Using appropriate examples explain this statement. [10]
- d) How would you control *Salmonella enteritidis* in food? (6)

[25 Marks]

### Question 4

- a) "Food of animal origin is more frequently associated with foodborne disease outbreaks". Justify or explain this statement. [10]
- b) With the aid of a growth curve, show where you could set barriers to prevent foodborne illness or spoilage. (the barrier employed should be explained well and noted how it would prevent the spoilage or foodborne illness. Also show the disadvantages, if any, of setting the barriers on other areas of the growth curve)[15]

[25 Marks]

**Question 5**

- a) Discuss the significance of psychrotrophic and thermophilic microorganisms in the processing and refrigerated storage of foods. [10]
- b) Why are salmonellae microorganisms a major cause of foodborne illness in Swaziland? [10]
- c) Meat burger has a high risk to foodborne illness. Why is that so? [5]

**[25 Marks]**