Basic Microbiology

Second Hour Exam. Date: May 3

Name: Reg. No.:

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I. Circle the best answer (17 marks)

1. Most bacteria reproduce using which of the following processes.

a. Budding b. Mitosis
c. Binary fission d. Tetrads

2. Immediately after inoculation of a culture into 10 ml of medium, cells undergo which of the following?

a. Log b. Death
c. Stationary. d. None of the above.

3. Which of the following are the units for expressing a growth rate of a bacterial culture

a. Hours per doubling b. Doublings per hour
c. Cells per milliliter d. Cells per milligram protein

4. Which of the following best describe an organism growing at 94°C

a. Psychrophiles b. Thermophiles
c. Mesophiles d. Alkalinophiles
e. Extreme thermophiles

5. Which of the following best describe a bacterium which grows optimally in the Dead Sea.

a. Alkalophile b. Halophile
c. Saltophile d. Mesophile

6. Which of the following best describe an anaerobe.

a. Grows well with oxygen present
b. Grows very slowly with oxygen present
c. Killed by oxygen
d. Growth stimulated by low levels of oxygen

7. Which of the following best describe a bacterial culture that grows well in a Gas-Pac jar and does not grow in a candle jar or on the laboratory bench.

a. Aerobe b. Anaerobe
c. Microaerophilic d. Facultative

8. Which of the following would be the most appropriate means to sterilize heat labile (sensitive) vitamins?

a. Autoclaving b. filter sterilizing
c. Boiling d. UV irradiation
e. b and d

9. The decimal reduction time is.

a. The time required to kill all cells in a population at a given temperature
b. The time required to kill all cells in an autoclave
c. The time required to reduce the population of bacteria tenfold at a given temperature
d. The time required for a population to increase by tenfold
e. None of the above is correct.

10. Majority of human pathogens are

a. Thermophiles b. Mesophiles
c. Acidophiles d. Psychrotrophs

11. What is the term for microorganisms that can grow and cause food spoilage in the refrigerator?

a. acidophillic b. psychrophillic c. thermophillic
d. mesophillic e. thermoduric

12. An antiseptic is:

a. an antimicrobial substance used to kill microorganisms on an operating table.
b. an antimicrobial substance that is used to kill or inhibit microorganisms on the skin.
c. an antimicrobial substance added to a food or beverage to inhibit spoilage.
d. a drug derived from a natural product that is used fight microorganisms within a patient's body.
e. a drug that is a completely man-made chemical used to fight microorganisms within a patient's body.

13. Which two of the following statements about disinfectants are <u>true</u>?

i. In a diffusion test of an antimicrobial agent, the size of the zone of inhibition is not affected by the temperature of incubation or the composition of the medium.
ii. Phenol was used as a disinfectant in hospitals for many years.
iii. Chemical disinfectants are more lethal to bacteria at higher concentrations.
iv. In a diffusion test of an antimicrobial agent, a more resistant species of bacteria will show a larger zone of inhibition.

a. i. and ii. b. i. and iii. c. i. and iv. d. ii. and iii. e. ii. and iv.

14. The most selective antibiotics are those that interfere with bacterial cell wall synthesis. Why is this?

a. because bacterial cell walls have a unique structure not found in eukaryotic cells
b. because bacterial cell wall synthesis is easy to inhibit, while animal cell wall synthesis is more resistant to the actions of the drugs
c. because animal cells do not take up the drugs
d. because animal cells inactivate the drugs before they can do any damage

15. What is penicillinase?

a. an enzyme that modifies penicillins, making them more potent (effective)
b. an enzyme that cleaves the beta-lactam ring of penicillin, rendering it inactive
c. a semi-synthetic form of penicillin
d. none of the above

16. What is the drug level required for the clinical treatment of a particular infection called?

a. therapeutic dose
b. toxic dose
c. therapeutic index
d. None of the above is correct.

17. Which of the following affects the size of the clear zone in a Kirby-Bauer test?

a. the initial concentration of the drug
b. the solubility of the drug
c. the diffusion rate of the drug
d. All of the above are correct.

II. True (T) or False (F) (4 marks)

(F) **1.** Dry heat is more effective at killing bacteria than moist heat

(F) **2.** A bactericidal agent only inhibits the growth of bacteria..

(F) **3.** The general type of microorganism does not affect the type of control used

(F) **4.** During stationary phase of bacterial growth, penicillin is most effective

(F) **5.** A drug that disrupts a microbial function not found in animal cells usually has a lower therapeutic index.

(F) **6.** Static agents do not kill infectious organisms and therefore are not useful as chemotherapeutic agents.

(T) **7.** Sulfonamides and other drugs that inhibit folic acid synthesis have a high therapeutic index because humans must obtain folic acid in their diets while microorganisms synthesize their own.

(T) **8**. Ultraviolet radiation damages DNA by the formation of thymine dimers.

III. Fill in the blank (5 Marks)

1. A number of useful drugs act as _antimetabolite_____; they block the functioning of metabolic pathways by inhibiting key enzymes.

2. Antibiotics that are taken by a route other than by mouth are said to have an ___ Parenteral _____ route of administration.

3. Antibiotic that is effective against only a limited variety of pathogens are called __Narrow spectrum antibiotics_____

4. Lowest concentration of a drug necessary to prevent the growth of a particular microorganism are called _____ minimal inhibitory concentration_____

5. Lowest concentration of a drug necessary to kill a particular microorganism are called__ minimal lethal concentration (bacteriocidal)_____

IV. (8 Marks)

A. Suggest the possible **advantages** and **disadvantages** of the direct microscopic method for counting of bacteria.

- Advantages:
  - easy, inexpensive, and quick
  - counting both eucaryotes and procaryotes
- Disadvantages:
  - cannot distinguish living from dead cells

B. Why do you think 70% ethanol is more effective than 95% when used as disinfectant

70% alcohol is more effective than 95% because 95% causes too fast dehydration of the cell, blocking further entry of ethanol into the cell and the remaining dehydrated cell can sometimes act as a spore and "revive" when conditions become suitable.

C. Before the invention of refrigeration foods were commonly preserved by salting, drying, or adding sugar. Pick an example of a preserved food and explain how it is preserved.

Bacteria require a certain amount of available water for their growth. The availability of water is expressed as water activity. Adding salt or sugar to food reduces water activity to a level does not allow bacteria to grow. Example Jam, meat etc.

D. Antibiotics are natural products of certain microorganisms. What advantages might these antibiotics provide for the organisms that produce them?

It may provide them with nutritional or spatial advantage in their habitat by antagonizing the competition

V. Fill in the table cells the most appropriate word or number for each sterilization method (6 Marks)

Sterilization Method	Temp.	Time	Type	Preferred Use	Mechanism of Action
Autoclaving	**121°C**	**15 min**	**Moist**	**Media, equipment**	**Protein denaturation**
Hot air (Oven)	**170°C**	**2 hr**	**Dry**	**Glassware**	**Oxidation**
Pasteurization	**72°C**	**15 sec**	**Moist**	**Milk, alcoholic drinks**	**Protein denaturation**