

BITS, PILANI – DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY
FIRST SEMESTER 2008 – 2009
COURSE NO: BIO C241
MICROBIOLOGY TEST-I (CLOSED BOOK)

Duration: 50 min

Date: 02.11.2008

Max Marks: 45

Note: a) Attempt all questions in the order
b) Answer to the point

1. How microbes benefit humans? [3]
2. Microbes do benefit us, but they are also capable of causing many diseases. Name any 10 different diseases where microbe is the causative organism. [3]
3. Brief on Golden Age of Microbiology. [3]
4. What are the basic techniques needed to study bacteria? [3]
5. Mention the normal size (length and diameter) of bacteria. [2]
6. What is a minimal medium? Why such media is required? What are the disadvantages? [3]
7. Name any 3 different methods for the preservation of microorganisms? [3]
8. The chemical composition of the defined media for *E.coli* and *Leuconostoc citrivorum* is: 1. Similar (or) 2. different. Justify. [3]
9. The bacteria seek favorable environment for its growth and it is accomplished by the phenomena called "taxis". Name any 4 different such "taxis". [4]
10. The cell wall of archaea contains high concentrations of murein and peptidoglycan in order survive under extreme environment. The statement is true or false. [3]
11. Name any 6 different functions of bacterial membranes. [4]
12. Briefly write on the terminal electron acceptors of aerobic and anaerobic respiration. [2]
13. Glycolysis is an important metabolic pathway in the production of fermentation products like lactic acid and alcohol. Write the basic steps in glycolysis (in a flow diagram) [4]
14. The protein profiles of *E. coli* grown in nutrient medium and nutrient medium supplemented with sterile milk visualized with Commassie Brilliant Blue R-250 and Silver stain shown to be different. Why? [2]
15. What are the different factors which affect the microbial growth? [3]

BITS, PILANI – DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY
FIRST SEMESTER 2008 – 2009
COURSE NO: BIO C241
MICROBIOLOGY TEST-II (OPEN BOOK)

Duration: 50 min

Date: 21.12.2008

Max Marks: 45

Note: a) Attempt all questions in the order
b) Answer to the point

1. A pastry chef accidentally inoculated a cream pie with six *S. aureus* cells. If *S. aureus* has a generation time of 60 minutes, how many cells would be in the cream pie after 7 hours? [2.0]
2. Briefly explain the cause of cell death resulting from damage to each of the following; [6.0]
 - a. Cell wall
 - b. Plasma membrane
 - c. Proteins
 - d. Nucleic acids
3. Thermal death point is not considered an accurate measure of the effectiveness of heat sterilization. List 5 factors that can alter thermal death point. [5.0]
4. The use-dilution values for two disinfectants tested under the same conditions are: Disinfectant A- 1:2; Disinfectant B-1:10,000. If both disinfectants are designed for the same purpose, which would you select? [2.0]
5. Differentiate recombinant DNA from biotechnology. [1.0]
6. What is the role of the alga in a lichen? What is the role of fungus? [3.0]
7. Recall the life cycle of *Plasmodium*. Where does asexual reproduction occurs? Where does sexual reproduction occur? Identify the definitive host. Identify the vector. [5.0]
8. Plant viruses cannot penetrate intact plant cells because-----; therefore, they enter cells by -----, Plant viruses can be cultured in ----- [3.0]
9. Write short notes on the following antibiotics and how is translation inhibited by each of the following? [8.0]
 - a. Chloramphenicol
 - b. Erythromycin
 - c. Tetracycline
 - d. Streptomycin

10. Give one possible explanation of why *Penicillium* would make penicillin, since the fungus does not get bacterial infections. [2.0]
11. Briefly explain the following with Chemical reactions and Microorganisms involved: [4.0]
- a. Ammonification
 - b. Nitrification
 - c. Denitrification
 - d. Nitrogen fixation
12. What is industrial microbiology? Why is it important? [1.0]
13. Why is a bioreactor better than a large flask for industrial production of an antibiotic? [2.0]
14. How will you improve the organic content of the soil and make it more amenable for plant growth? List the biotechnological application of the study of desert ecology, biodiversity of plants and microbes and saline environment? [1.0]

BITS, PILANI – DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY
FIRST SEMESTER 2008 – 2009
COURSE No: BIOC 241
MICROBIOLOGY QUIZ-I (CLOSED BOOK)

Duration: 15 min.

Date: 30.10.2008

Max. Marks 15

Name:

ID No:

1. Which of the following is one of the advances in preventing infectious diseases?
 - a. development of vaccines that cause infection
 - b. public hygiene such as water and sewage treatment
 - c. building of more hospitals
 - d. writing of journal articles

2. Select the correct statement about eukaryotic cells.
 - a. Algae, protozoa and bacteria have eukaryotic cells
 - b. Eukaryotic cells have lack a true nucleus
 - c. All eukaryotic organisms can carry on photosynthesis
 - d. Eukaryotic cells are characterized by membrane-bounded organelles

3. An industrial microbiology student would study
 - a. how to build factories
 - b. how microorganisms affect the earth and environment
 - c. the use of microorganisms to produce foods
 - d. the spread of diseases

4. The organism that is most frequently used as the host for manipulated DNA is
 - a. *E.coli*
 - b. *Staphylococcus aureus*
 - c. *Yersinia pestis*
 - d. *Phytophthora infestans*

5. Why are bacteria very suitable for experimental investigations?
 - a. Their metabolism and genetic properties are very similar to those of plants and animals
 - b. They are difficult to culture
 - c. They are eukaryotic
 - d. They grow slowly

6. Name any three techniques for ultrastructural studies in molecular microbiology.
 - a. Scanning and Transmission electron microscopy
 - b. Atomic force microscopy
 - c. Confocal microscopy

7. Why the anaerobes are sensitive to Oxygen?
8. Name any one Culture media used for the cultivation of Lactic acid bacteria.
9. Name any 3 different industrial enzymes.
10. Name any 6 different fermentation products of microorganisms
11. Name any 2 Genera which can produce Lactic acid.
12. The nuclear pores are passageways between the nuclear matrix and the cytoplasm which
 - a. allow DNA to reach the cytoplasm to be translated to RNA
 - b. allow ribosomes to enter the nuclear matrix
 - c. allow proteins synthesized in the cytoplasm to enter the nucleus
 - d. structurally reinforce the nuclear membrane
13. Cell walls, when they exist, usually contain peptidoglycan in
 - a. procaryotes only
 - b. eucaryotes only
 - c. both procaryotes and eukaryotes
14. When flagella exist, their movement is powered by ATP in
 - a. procaryotes only
 - b. eucaryotes only
 - c. both procaryotes and eukaryotes
15. Exoenzymes are contained in the periplasmic space in
 - a. procaryotes only
 - b. eucaryotes only
 - c. both procaryotes and eukaryotes

gf. P

**BITS, PILANI – DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY
FIRST SEMESTER 2008 – 2009
COURSE No: BIOC 241
MICROBIOLOGY QUIZ-II (CLOSED BOOK)**

Duration: 15 min. Date: 16.12.2008 Max. Marks 15

Name: _____

ID No: _____

1. A 4-month-old infant presents with failure to thrive, progressive muscular weakness, and poor head control. On questioning, the mother states that she typically feeds the baby soy-based formula sweetened with honey. Which of the following organisms is most likely to be responsible for the child's presentation?
 - A. *Clostridium botulinum*
 - B. *Clostridium difficile*
 - C. *Clostridium perfringens*
 - D. *Clostridium tetani*

2. R factors:
 - A. Are small plasmids which encode resistance to only one type of antibiotic
 - B. Contain plasmid elements (replication origins, incompatibility determinants, etc.) that were widespread in the pre-antibiotic era
 - C. Represent genetically engineered cloning vectors which have escaped into pathogenic bacteria
 - D. All of the above are correct

3. Movement of DNA from one bacteria to another through a tubular bridge or pilus:
 - A. Conjugation
 - B. Transposition
 - C. Transfection
 - D. Transduction

4. The target site in the DNA for the EcoRI is

5. Which of the following diseases are not transmitted by ticks:
 - A. Ulceroglandular tularemia
 - B. Bubonic plague
 - C. Relapsing fever
 - D. Lyme disease

6. The single most important characteristic of diarrhea caused by *Vibrio cholera* is:
- A. Profound watery diarrhea
 - B. Severe abdominal pain
 - C. Massive bloody diarrhea
 - D. Renal insufficiency
7. *Helicobacter pylori*:
- A. Is the presumed cause of colon cancer
 - B. Is the cause of most cases of acute food poisoning in the U.S.
 - C. Is the cause of about 90% of peptic ulcers in the U.S.
 - D. Is urease negative
8. Creutzfeldt-Jakob disease is caused by
- A. JC virus
 - B. Puumala virus
 - C. Prions
 - D. SV40 virus
9. All of the following are syndromes associated with enteroviruses EXCEPT:
- A. Conjunctivitis
 - B. Coronary artery disease
 - C. Myocarditis
 - D. Pericarditis
 - E. Pleuritis
10. All of the following are true statements regarding viruses EXCEPT:
- A. They contain both RNA and DNA
 - B. The nucleic acid may be single or double stranded
 - C. They are obligate intracellular parasites
 - D. They reproduce using host cell energy
 - E. The infectious particle is called a virion
11. What are the five basic steps in gene cloning?

12. What are siderophores?

13. What are the two different methods by which the bacterial growth can be measured?

14. Mention any one method by which the antibiotics can be sterilized?

15. Ames test is used to.....

M/6
2008-09

Q. 10

**BITS, PILANI – DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY
FIRST SEMESTER 2008 – 2009
COURSE No: BIOC 241
MICROBIOLOGY QUIZ-III (CLOSED BOOK)**

Duration: 15 min.

Date: 18.12.2008

Max. Marks 15

Name:

ID No:

1. Which of the following does not kill endospores?
 - a. autoclaving
 - b. incineration
 - c. hot-air sterilization
 - d. pasteurization
 - e. all of the above kill endospores

2. Which of the following is used to control microbial growth in foods?
 - a. organic acids
 - b. alcohols
 - c. aldehydes
 - d. heavy metals
 - e. all of the above

3. Restriction enzymes were first discovered with the observation that
 - a. DNA is restricted to the nucleus
 - b. Phage DNA is destroyed in a host cell
 - c. Foreign DNA is kept out of a cell
 - d. Foreign DNA is restricted to the cytoplasm
 - e. All of the above

4. You could identify an unknown bacterium by all of the following except
 - a. hybridizing a DNA probe from a known bacterium with the unknown's DNA
 - b. making a fatty acid profile of the unknown
 - c. specific antiserum agglutinative the unknown
 - d. ribosomal RNA sequencing
 - e. percentage of guanine+cytosine

5. Cyanobacteria differ from purple and green phototrophic bacteria because cyanobacteria
 - a. produce oxygen during photosynthesis
 - b. do not require light
 - c. use H₂S as an electron donor
 - d. have a membrane-enclosed nucleus
 - e. all of the above

6. The definitive host for *Plasmodium vivax* is
- Human
 - Anopheles
 - Sporocyte
 - a gametocyte
7. A mixed culture of *E. coli* and *Penicillium chrysogenum* is inoculated onto the following culture media. On which medium would you expect each to grow?
- 0.5% peptone in tap water -
 - 10% glucose in tap water -
8. The ability of a virus to infect an organism is regulated by
- the host species
 - the type of cells
 - the availability of an attachment site
 - cell factors necessary for viral replication
 - all of the above
9. Antibiotics that inhibit translation have side effects
- because all the cells have proteins
 - only in the few cells that make the proteins
 - because eukaryotic cells have 80S ribosomes
 - at the 70S ribosomes in eukaryotic cells
 - none of the above
10. Coliforms are used as indicator organisms of sewage pollution because
- they are pathogens
 - they ferment lactose
 - they are abundant in human intestines
 - they grow within 48 hours
 - all of the above
11. Outline the treatment process for drinking water [2.5]
12. Bioremediation refers to the use of living organisms to remove pollutants. Name any 5 examples of bioremediation [2.5]

BITS, PILANI – DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY
FIRST SEMESTER 2008 – 2009
BIO C241 MICROBIOLOGY
COMPREHENSIVE EXAMINATION
PART – A (CLOSED BOOK)

Duration: 1 Hour

Date: 06.01.2009

Max. Marks: 40

ID No:

Note: Questions carry 1 mark each.

Answer the questions in the space provided.

1. Match the following microorganisms to their descriptions. [7.0]

- | | |
|---------------|---|
| ___ Archaea | (a) Not composed of cells |
| ___ Algae | (b) Cell wall made of chitin |
| ___ Bacteria | (c) Cell wall made of peptidoglycan |
| ___ Fungi | (d) Cell wall made of cellulose; photosynthetic |
| ___ Helminths | (e) Unicellular, complex cell structure lacking a cell wall |
| ___ Protozoa | (f) Multicellular animals |
| ___ Viruses | (g) Prokaryote without peptidoglycan cell wall |

2. Match the structures to their functions. [8.0]

- | | |
|---------------------|-----------------------------------|
| ___ cell wall | (a) attachment to surfaces |
| ___ endospore | (b) cell wall formation |
| ___ Fimbriae | (c) motility |
| ___ Flagella | (d) protection from osmotic lysis |
| ___ Glycocalyx | (e) protection from phagocytes |
| ___ Pili | (f) resting |
| ___ plasma membrane | (g) protein synthesis |
| ___ Ribosomes | (h) Selective permeability |
| | (i) transfer of genetic material |

3. The following processes are used in the wastewater treatment. Match the stage of treatment with the processes. Each choice can be used once, more than once or not at all. [3.0]

- | | |
|---|---------------|
| ___ Leaching field | (a) primary |
| ___ Removal of solids | (b) secondary |
| ___ Biological degradation | (c) tertiary |
| ___ Activated sludge system | |
| ___ Chemical precipitation of phosphorous | |
| ___ Trickling filter | |
| ___ Results in drinking water | |

4. Which of the following pairs is mismatched?

- metachromatic granules-stored phosphates
- polysaccharide granules-stored starch
- lipid inclusions-poly-beta-hydroxybutyric acid
- sulfur granules-energy reserve
- ribosomes-protein storage

5. Which one of the following temperatures would most likely to kill a mesophile?
- 50°C
 - 0°C
 - 9°C
 - 37°C
 - 60°C
6. An organism that has peroxidase and superoxide dismutase but lacks catalase is most likely an
- aerobe
 - aerotolerant anaerobe
 - obligate anaerobe
7. Why aluminium foil should not be used to wrap the items for sterilization _____
8. List any four factors to consider before selecting a disinfectant _____
9. A classmate is trying to determine how a disinfectant might kill cells. You observed that when he spilled the disinfectant in your reduced litmus milk, the litmus turned blue again. You suggest to your classmate that
- the disinfectant might inhibit cell wall synthesis
 - the disinfectant might oxidize molecules
 - the disinfectant might inhibit protein synthesis
 - the disinfectant might denature proteins
 - he take his work away from yours
10. Which one of the following is not a method of horizontal gene transfer?
- binary fission
 - conjugation
 - integration of a transposon
 - transduction
 - transformation
11. Pathogenic bacteria can be
- motile
 - rods
 - cocci
 - anaerobic
 - all of the above
12. What ciliate can cause disease in humans? _____
13. List any two emerging infectious diseases _____
14. The emergence of new infectious diseases is probably due to all of the following except
- the need of bacteria to cause disease
 - the ability of humans to travel by air
 - changing environments (eg. Flood drought, pollution)
 - a pathogen crossing the species barrier
 - the increasing human population
15. Which of the following statements is not true?
- E. coli* never cause disease
 - E. coli* provides vitamin K for its host
 - E. coli* often exists in a mutualistic relationship with humans
 - E. coli* gets nutrients from intestinal contents.

16. The removal of plasmids reduces virulence in which of the following organisms?
- Clostridium tetani
 - Escherichia coli
 - Staphylococcus aureus
 - Streptococcus mutans
 - Clostridium botulinum
17. An encapsulated bacterium can be virulent because the capsule
- resists phagocytosis
 - is an endotoxin
 - destroys host tissues
 - interferes with physiological processes
 - has no effect; because many pathogens do not have capsules, capsules do not contribute to virulence.
18. Which of the following statements is true?
- the primary goal of a pathogen is to kill its host
 - Evolution selects for the most virulent pathogens
 - a successful pathogen doesn't kill its host before it is transmitted
 - a successful pathogen never kill its host
19. MRSA is _____
20. natural and semisynthetic Penicillins have _____ ring in its structure.
21. Which of the following pairs is mismatched.
- antihelminthic-inhibition of oxidative phosphorylation
 - antihelminthic-inhibition of cell wall synthesis
 - antifungal-injury to plasma membrane
 - antifungal-inhibition of mitosis
 - antiviral-inhibition of DNA synthesis
22. An antimicrobial agent should meet all of the following criteria except
- selective toxicity
 - the production of hypersensitivities
 - a narrow spectrum of activity
 - no production of drug resistance
 - none of the above
23. What is the MMR vaccine? Attenuated _____
24. Nineteen workers in a slaughterhouse developed fever and chills, with the fever spiking to 40°C each evening. The most likely method of transmission of this disease is
- a vector
 - the respiratory route
 - a puncture wound
 - an animal bite
 - water
25. How fluorescent labeled cells can be separated? Name an experimental technique
-

BITS, PILANI – DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY
FIRST SEMESTER 2008 – 2009
BIO C241 MICROBIOLOGY
COMPREHENSIVE EXAMINATION
PART – B (OPEN BOOK)

Duration: 2 Hour

Date: 06.01.2009

Max. Marks: 80

Note: Attempt all parts of a question in a sequence
Support your answer with suitable example

1. What are the similarities between chloroplasts and prokaryotic cells? [3.0]
2. Starch is readily metabolized by many cells, but a starch molecule is too large to cross the plasma membrane. How does a cell obtain the glucose molecules from a starch polymer? How does the cell transport these glucose molecules across the plasma membrane? [3.0]
3. An antibiotic erythromycin binds with the 50S portion of a ribosome. What effect does this have on a prokaryotic cell? A eukaryotic cell? [3.0]
4. Compare and contrast carbohydrate catabolism and energy production in the following bacteria: [6.0]
 - a. *Pseudomonas*, an aerobic chemoheterotroph
 - b. *Spirulina*, an oxygenic photoautotroph
 - c. *Ectothiorhodospira*, an anoxygenic photoautotroph
5. Which bacterium would be more likely to require a CO₂ rich environment: *Pseudomonas aeruginosa* or *Campylobacter jejuni*? Explain. [3.0]
6. At what phase of bacterial growth do you think antibiotics are usually the most effective. Justify your answer with a suitable diagram. [4.0]
7. If pasteurization does not achieve sterilization, why is food treated by pasteurization? [2.0]
8. How do salts and sugars preserve foods? Why are these considered physical rather than chemical methods of microbial control? How do you account for the occasional growth of *Penicillium* mold in jelly, which is 50% sucrose. [3.0]
9. Why R factors are important in the treatment of infectious diseases? [2.0]
10. Explain how you would find an antibiotic-resistant mutant by direct selection and how you would find an antibiotic sensitive mutant by indirect selection. [2.0]
11. Describe the principle of Ames test for identifying chemical carcinogens with a schematic diagram. [5.0]
12. Explain with a suitable diagram the mechanism by which the presence of glucose inhibits the *lac* operon. [5.0]
13. Briefly describe the methods of classifying and identifying microorganisms. [3.0]
14. Contrast viroids and prions. Name a disease caused by each. [3.0]
15. What is epidemiology? What is the role of the Centers for Disease Control and Prevention (CDC)? [2.0]

16. Compare and contrast the following aspects of endotoxins and exotoxins: bacterial source, chemistry, toxicity, and pharmacology. Give an example of each toxin. [5.0]
17. How can viruses and protozoa avoid being killed by the host's immune response? [2.0]
18. What complications can occur from HSV-1 infections? [2.0]
19. How are mycorrhizae valuable for the uptake of phosphorus? Explain with associated biochemical pathways. [5.0]
20. In nature, are leguminous plants most likely to be valuable in rich agricultural soils or poor desert soils? [2.0]
21. Explain in detail any one method for the remediation of oil spills? [5.0]
22. Outline the steps in the production of cheese, and compare the production of hard and soft cheeses. [5.0]
23. What is the major contribution of cyanobacteria as symbionts? Explain with a suitable diagram. [5.0]