Lec 01 - History of Microbiology

**True or False**

1. Robert Koch is the Father of Microbiology. **False**.
2. The first recorded observation of microorganisms was in the nineteenth century. **False**.
3. Oliver Wendell Holmes was one of the first scientists to imply that hand washing might be important in preventing infection during childbirth. **True**.
4. Boiling surgical instruments was a common practice in the early 1800s for reducing infection. **False**.
5. The scientist responsible for discovering the fermenting properties of microorganisms was Louis Pasteur. **True**.

**Provide the terms or phrase that makes the statement correct.**

1. The postulates that were proposed to determine the etiology of disease were formulated by _____. (**Robert Koch**).
2. What mouthwash on the market today is a testament to one of the pioneers of antiseptic technique _____? (**Listerine**)
3. The last man to finally demonstrate the absurdity of spontaneous generation was _____. (**Pasteur**)
4. One of the first compounds used as an antiseptic for wound dressings was _____ (**Carbolic acid**)
5. The solid support used in microbiological media is called _____. (**agar-agar**).

microscopy

1. The clarity of an image seen microscopically is determined by the _____ of the microscope. (**resolving power**)
2. More parallel light rays can enter the objective lens if _____ is placed between the specimen and the objective. (**immersion oil**)
3. The organic molecule imparting color to a dye is called a(n) _____. (**chromophore**)
4. The staining of the background surrounding a microbial cell is called _____ staining. (**negative**)
5. The charge on the bacterial surface is _____ because of the presence of many _____ groups. (**negative**) (**carboxy1**)
6. The most important of the differential stains is the _____ stain. (**Gram**)
7. In _____ microscopy the background appears dark while the microbial cell appears bright and transparent. (**darkfield**)
8. At magnifications of 1000 X the _____ microscope allows due to distinguish objects in the microbial cell because of their density. (**phase contrast**)

9. The light source for the fluorescent microscope is a(n) _____ lamp, whereas a(n) _____ lamp is used for brightfield microscopy**. (mercury vapor**) (**incandescent**)
10. The electron microscope uses _____ instead of the glass lens system used in brightfield microscopy. (**electromagents**)

Lec 02 - Germ Theory of Disease

1.Besides providing strong evidence toward the disproof of spontaneous generation, Louis Pasteur made many other contributions toward the advancement of microbiology. Which of the following is not one of Pasteur's contributions?
(a) Provided evidence for the germ theory with his association of specific microbes with certain diseases in silkworms
(b) Developed the first rabies vaccine
(c) Developed the technique of pasteurization to cure sour wine
(d) Developed a cowpox vaccine for smallpox
(e) Contributed to the emerging science of immunology with the study of chicken cholera in chickens
2.The germ theory of disease states that:
(a) Microorganisms that invade other organisms can cause disease in those organisms
(b) Microorganisms can spontaneously arise in debilitated hosts
(c) Microorganisms do not cause infectious diseases
(d) Not all microorganisms are harmful
(e) Malaria is caused by bad air

3. Put Koch's postulates in order.
(a) The disease organism must be isolated in pure culture.
(b) The disease organism must be recovered from the inoculated animal.
(c) The specific causative agent must be found in every case of the disease.
(d) Inoculation of a sample of the culture into a healthy, susceptible animal must produce the same disease.

4.Match the following scientists who emerged in specialized fields of microbiology to their famous contributions and specialized field:
I. Metchinikoff
II. Beijerinck
III. McClintock
IV. Ehrlich
1. Mobile (''jumping'') genes
2. Salvarsan against syphilis
3. Cellular immunity (phagocytes)
4. Infectious filtrates contain viruses.

5. Less than 1% of microorganisms are harmful and cause disease. True or false?
6. Life on earth would be much better if all microbes were eradicated. True or false?

Lec 03 - Protection against Infection

1.Match the following types of antimicrobials with their actions:

| | |
|---|---|
| ___ Bacteriostatic | a) Kills microbes |
| ___ Germicidal | (b) Inactivates viruses |
| ___ Viricidal | (c) Kills bacteria |
| ___ Sporicidal | (d) Stops bacterial growth |
| ___ Fungicidal | (e) Kills bacterial endospores and fungal spores |
| ___ Bacteriocidal | (f) Kills yeasts and molds |

2. Which term is used to describe the reduction in numbers of pathogenic organisms on objects or in materials so that they do not pose a disease threat?
(a) Sanitization
(b) Sterilization
(c) Disinfection
(d) Decontamination
(e) Lyophilization

3. Which of the following is true of the phenol coefficienttest?
(a) Uses Salmonella typhi and Staphylococcus aureus
(b) Uses phenol as the standard chemical against which other chemicals are compared
(c) If a chemical has a phenol coefficient less than 1.0, it is less effective than phenol
(d) It is particularly reliable for chemicals derived from phenol
(e) All of these

4.The pasteurization process does which of the following in milk?
(a) It kills all microbes.
(b) It inactivates viruses.
(c) It kills all bacterial spores.
(d) It kills microbial pathogens that might be present in milk.
(e) It sterilizes milk.

5. The advantage of UV-radiation disinfection is that it readily penetrates through most samples. True or false?

6. Which of the following are reasons why UV light might be expected to be less effective in killing bacteria?
(a) UV light cannot penetrate glass, cloth, paper, or most materials under which microbes might be located.
(b) UV light can penetrate air.
(c) Small DNA-binding proteins in bacterial spores make the DNA resistant to UV light damage.
(d) UV light sources gain intensity over time.
(e) UV light kills fewer bacteria than expected because of their DNA repair mechanisms.

7. Quaternary ammonium compounds (quats) are a type of:
(a) Soap
(b) Alkylating agent
(c) Detergent
(d) Phenolic substance
(e) Basic solution

8. The active antimicrobial ingredient in bleach is:
(a) Phenol
(b) Hydrochloride
(c) Hypochlorite
(d) Iodine
(e) Bromide

9. Match the following chemical antimicrobial agents to their uses in combating microbes:

| | |
|---|---|
| ___ Phenol derivatives | (a) Food preservation |
| ___ Iodine | (b) Puncture wound disinfection |
| ___ Alcohols | (c) Skin disinfection |
| ___ Acids | (d) Instrument disinfection |
| ___ Chlorine | (e) Water disinfection |
| ___ Oxidizing agents | |
| ___ Nitrates | |

10. Heat-sensitive materials (rubber and plastic) and bulky materials (mattresses) can be sterilized using:
(a) Dry heat
(b) Autoclaving
(c) UV radiation
(d) Gaseous ethylene oxide
(e) None of these

11. In the process of autoclaving it is the increased temperature and not the increased pressure that kills all microbes, including spores and the nucleic acids of viruses. True or False?

12. The minimum time used for sterilization by autoclaving is:
(a) 5 minutes
(b) 15 minutes
(c) 45 minutes
(d) 1 hour
(e) 2 hours

Lec 04 - Metabolism in Bacteria
Structure and function

1. The most fundamental difference between prokaryotes and eukaryotes is the presence of a nuclear membrane in _____ and its absence in _____. (**eukaryotes**) (**prokaryotes**)
2. Movement to or away from a chemical stimulus is called _____. (**chemotaxis**)
3. The type of symbiosis in which both partners benefit is called _____. (**mutualism**)
4. Members of the same species that possess different characteristics are called _____. (**strains**)
5. A classification scheme based on evolutionary changes is called _____. (**phylogeny**)
6. The analysis of 16S rRNA is used to determine the _____ relatedness of different species. (**evolutionary**)
7. The differentiated cell type of cyanobacteria that is resistant to environmental stress is called a(n) _____. (**akinete**)
8. Flagella-like filaments involved in motility but not exposed to the external environment can be found in the bacterial group called _____. (**spirochetes**)
9. The microorganism found in extreme environments that are devoid of a true peptidoglycan layer are called the _____. (**archaebacteria**)
10. The cytoplasmic membrane system of eukaryotes is called the _____. (**endoplasmic reticulam**)
11. The shorter versions of flagella in eukaryotes are called _____. (**cilia**)
12. Amebas can produce cytoplasmic projections called _____. (**pseudopodia**)
13. Some fungi can exist in two morphological states, a condition referred to as _____. (**dimorphism**)
14. The opening in some protozoa through which food is ingested is called the _____. (**cytosome**)
15. The well walls of _____ are composed almost entirely of silicon dioxide. (**diatoms**)
16. _____ is a characteristic polysaccharide found in the cell walls of fungi as well as of many algae. (**Cellulose**)
17. The mycelia of fungi that penetrate the host to obtain nutrients are called _____. (**haustoria**)
18. Organisms that live on dead material are called _____. (**saprobes**)

Lec 05 - ATP Generation

1. The nonusable energy produced during a chemical reaction is referred to as _____. **(entropy)**
2. Organisms that obtain their energy from preformed organic or inorganic molecules are called _____. **(chemotrophs)**
3. A positive $\Delta G$ implies that the reaction requires energy and is _____. **(endergonic)**
4. The anaerobic breakdown of glucose to pyruvic acid is called _____. **(glycolysis)**
5. Methane can be oxidized by a certain group of microorganisms called _____. **(methyltrophs)**

6. The pathway that supplies reduced NADP for biosynthesis is called the _____ or pentose phosphate pathway. **(hexose monophosphate shunt)**
7. The first electron carrier in the respiratory chain is usually a(n) _____. **(flavoprotein)**
8. The formation of ATP during the transport of electrons and hydrogen to oxygen is called _____. **(oxidative phosphorylation)**
9. Energy is released when electrons travel from a more _____ source to a more _____ substance. **(negative) (positive)**
10. Hydrocarbons such as alkanes are ultimately oxidized to _____ by microorganisms. **(fatty acids)**

**Multiple choice**

**Select the appropriate letter that correctly answers the question or completes the statement**

1. Which of the following statements concerning photosystems is not true?
   **a. The photolysis of water results in the formation of carbon dioxide.**
   b. ATP formation may be cyclic or noncyclic.
   c. Both photosystems are not always present in some bacteria.
   d. Chlorophyll is one of the light-harvesting pigments
   e. NADP is one of the electron carriers.

1. Carbon dioxide is fixed to which of the following molecules during photosynthesis to produce carbohydrate?
   **a. ribulose 1,5-diphosphate**
   b. glyceraldehyde 3-phosphate
   c. glucose 6-phosphate
   d. ribose 5-phosphate
   e. erythrose 4-phosphate

2. Certain molecules or structures in the cell are used to quench the overproduction of oxygen during photosynthesis and are called
   a. phycobilisomes
   b. carboxysomes
   **c. isoprenoids**
   d. tetrapyrroles
   e. phycobiliproteins

3. Species of *Thiobacillus* are noted for their ability to oxidize
   a. inorganic nitrogen compounds
   b. hydrocarbons
   c. methane
   d. hydrogen gas
   **e. sulfur compounds**

4. One of the principal organic electron acceptors during anaerobic respiration is
   a. pyruvate
   d. formaldehyde

b. lactate **e. fumarate**
c. acetate

Lec 06 - Microbial Metabolism

1. What is a catalyst?
    a. a synthesis of cell molecules and structures
    b. a substance that speeds up a reaction
    c. where the substrate binds to on an enzyme
    d. organic compound that alters a substrate

2. An enzyme _____ the activation energy required for a chemical reaction.
    a. increases
    b. converts
    c. lowers
    d. catalyzes

3. Which of these types of organisms gets its organic nutrients and energy from another organism?
    a. chemoheterotroph
    b. chemoautotroph
    c. photoheterotroph
    d. photoautotroph

4. What is the chemical pathway that uses glucose and oxygen to produce carbon dioxide and water?
    a. aerobic cellular respiration
    b. fermentation
    c. photosynthesis
    d. oxidative phosphorylation

5. Where does the electron transport system take place in bacteria?
    a. cell membrane
    b. mitochondria
    c. ribosome
    d. cytoplasm

6. Where do the substrates bind on an enzyme?
    a. allosteric site
    b. active site
    c. amino acid site
    d. enzymatic site

7. Match the following electron transport and oxidative phosphorylation terms to their description:

___ Oxidative phosphorylation (a) Transfer of electrons to final electron acceptor
___ Chemiosmosis (oxygen)

___ Flavoproteins, cytochromes, and quinones
___ Electron transport

(b) Energy capture in the form of ATP harnessed from a series of redox reactions, with oxygen being the final electron acceptor
(c) Electron carriers
(d) ATP production from a proton gradient across the plasma membrane

8. The end products of photosynthesis in cyanobacteria and plant cells are:
(a) Water and oxygen
(b) Glucose and water
(c) Glucose and oxygen
(d) Water and carbon dioxide
(e) Glucose and carbon dioxide

9. The energy source that drives the photosynthetic reactions in cyanobacteria is:
(a) Heat
(b) Light
(c) Complex sugars
(d) ATP
(e) Oxygen

10. In the photosynthetic reactions, which of the following is NOT true?
(a) Carbon dioxide is required in the dark reactions.
(b) Energy is produced in the dark reactions.
(c) Light reactions require light energy.
(d) Occur in the thylakoids of the eukaryotic cells.
(e) Generally result in the formation of glucose.

11.Match the following:

___ Chemiosmosis
___ Glycolysis
___ Electron transport chain
___ Fermentation
___ Photosynthesis
___ Krebs cycle

(a) Pathway that begins the breakdown of glucose
(b) ATP production from a proton gradient across the plasma membrane
(c) Anaerobic pathway that uses an organic final electron acceptor
(d) Pathway that uses carbon dioxide, light, and chlorophyll to produce carbohydrates
(e) Also is known as the tricarboxylic acid cycle (TCA) or as the citric acid cycle
(f) Flavoproteins, cytochromes, and quinones

Lec 07 - Bacteriophages
Lec 08 - Lytic and Lysogenic Cycles

1. The classification of viruses is based primarily on _____ and _____ composition and structure. (**morphology**) (**nucleic acid**)

2. Bacterial viruses are called _____ or simply _____. (**bacteriophage**) (**phage**)
3. The complete and infective viral particle is called a(n) _____. (**virion**)
4. The protein cost surrounding the virus is called a(n) _____, which is made up of smaller protein units called _____. (**capsid**) (**capsomeres**)
5. The nucleic acid found in fungal viruses is only _____. (**RNA**)
6. The maximum number of capsomeres that have been found in viruses is _____, and the smallest number is _____. (**252**) (**12**)
7. The peplomers on the influenza virus envelope are _____ and _____. (**hemagglutinin**) (**neuraminidase**)
8. The lesions produced by animal viruses on embryonic membranes are called _____. (**pocks**)

Lec 09 - Viroids, Prions

1. A compound frequently used to inactive viruses for use in vaccines is
   a. ethylene glycol
   b. isopropy1 alcohol
   **c. formaldehyde**
   d. ether
   e. chloroform

1. Which of the following characteristics is not associated with viruses?
   a. They can be cultivated on artificial media as long as ATP is provided.
   b. Nucleic acid may be single-stranded or double-stranded DNA or RNA.
   **c. They can be inactivated only at temperatures above 100° C.**
   d. They use the ribosomes of the cell to make viral protein.
   **e. They show absolute specificity for one type of host.**

1. Which of the following characteristics would not be appropriate for use in viral classification?
   a. nucleic acid type
   b. capsid symmetry
   c. presence or absence of an envelope
   d. number of capsomeres
   **e. all of the above**

1. Which of the following best describes a viroid?
   a. Nucleocapsid has icosahedral symmetry, is an RNA virus, and causes disease in plants.
   **b. It has no protein coat, is an RNA virus, and causes disease in plants.**
   c. It has no protein coat, is a DNA virus, and causes disease in plants.
   d. It has no protein coat, is a RNA virus, and causes disease in plants.
   e. None of the above is appropriate.

1. Which of the following agents would not inactivate most viruses?

**a.** **40% ethyl alcohol** d. phenol
**b.** **37° C for 15 minutes** e. formaldehyde
c. 2% glutaraldehyde

1. The viruses that exhibit complex capsid symmetry are
**a.** Adenovirus **d. smallpox virus**
b. **$T_4$ bacteriophage** e. none of the above
c. Influenza virus

Lec 10 - Bacterial Genetics

1. The enzyme used by organisms for the synthesis of DNA is called DNA _____ and the enzymes used to degrade DNA are called _____. **(polymerase) (nucleases [exonucleases and endonucleases])**
2. The DNA strand from which a complimentary molecule is synthesized is called the _____ strand. **(primer)**
3. Bidirectional DNA synthesis occurs primarily in _____ whereas unidirectional DNA synthesis is more frequently observed in _____. **(prokaryotes and eukaryotes) (viruses)**
4. The group of enzymes that aids in the interconversion of relaxed and superhelical forms of DNA are called _____. **(topoisomerases)**
5. The rolling circle mechanism of replication is an example of _____ replication**. (unidirectional)**
6. The term used to describe multiple copies of DNA that are joined together is _____. **(concatameric)**
7. Sex factor plasmids that can be integrated into the chromosome are called _____. **(episomes)**
8. Proteins produced by the bacterial cell that are toxic to related species are called _____. **(bacteriocins)**
9. Any chemical agent capable of altering the genotype and possibly the phenotype of the cell is called a(n) _____. **(mutagen)**

1. Short sequences of DNA that can "jump" from one DNA site to another have been called _____ sequences. **(insertion)**

**Multiple choice**

**Select the appropriate letter that correctly answers the question or completes the statement.**

1. The test used to determine the carcinogenic potential of a chemical is called the
a. reversion test d. replica plating test
**b. Ames test** e. none of the above
c. insertion frequency test

2. A mutant having a requirement for a certain growth factor is called a(n)
   a. protptroph
   b. autotroph
   c. heterotroph
   d. chemotroph
   **e. auxotroph**

3. The technique used to demonstrate that microbial mutants can arise spontaneously in the absence of various chemical or physical agents is called the
   a. Ames test
   b. transformation technique
   **c. replica plating technique**
   d. Kornberg assay
   e. none of the above

4. DNA synthesized discontinuously produced short fragments called
   a. Ames fragments
   b. Kornberg sequences
   c. insertion sequences
   **d. Okazaki fragments**
   e. none of the above

5. The enzyme that catalyzes the union of the DNA fragments synthesized discontinuously is called
   a. DNA gyrase
   b. DNA helicase
   c. DNA polymerase I
   d. DNA polymerase III
   **e. DNA ligase**

Lec 11 - Gene Expression

Which of the following is not characteristic of the lactose operon?
   a. The lactose repressor molecule does not require a corepressor.
   b. The operon is under positive as well as negative control mechanisms.
   **c. The repressor molecule genes are in the same operon.**
   d. The lactose structural genes are in the same operon.
   e. The lactose genes code for enzymes involved in a catabolic process.

2. The "wobble" hypothesis refers to
   a. The inability of certain tRNAs to stabilize themselves on the mRNA.
   **b. The flexibility of the codon-anticodon interaction at the third codon position.**
   c. The loose binding of codons that do not specify an amino acid.
   d. None of the above.

3. The type of mutation that would cause a change in the reading frame from CAT CAT CAT CAT . . . to CAT ATC ATC ATC . . . is called a(n)
   a. insertion
   d. transversion

**b. deletion** e. none of the above
c. transition

1. The catabolite activator protein (CAP) functions in the cell to
   a. repress the synthesis of biosynthetic enzymes
   a. bind a catabolite and prevent repressor from attaching to the promoter region
   b. bind a catabolite and prevent RNA polymerase from binding to the promoter region
   **c. bind cyclic AMP and attach to the promoter region**
   d. none of the above

1. Pribnow sequences are believed to carry out which of the following functions in the cell?
   a. site for binding of rho and termination of mRNA synthesis
   b. site for attachment of N-formylmethionine
   c. initiation site for DNA replication
   **d. site on the DNA for binding the sigma subunit of RNA polymerase**
   e. site for attachment of repressor on the operator

1. Which of the following characteristic is associated with tRNA molecules?
   a. They have a CCA end to which is attached an amino acid.
   b. They have abnormal bases such as pseudouracil and dimethylguanine.
   c. They have a cloverleaf appearance.
   d. They have a site for binding aminoacy1 tRNA synthetases.
   **e. All of the above are true.**

1. The name given to mRNA to which several ribosomes are attached is
   a. monocistronic d. polygenic
   b. polycistronic e. none of the above
   **c. polysome**

2. Which of the following nucleic acids has the fewest nucleotides?
   **a. tRNA** d. mRNA
   b. rRNA e. DNA

1. The area on the DNA that codes for a polypeptide is called a(n) _____. **(gene)**
2. A genetic code in which more than one code word specifies a single amino acid is called _____. **(degenerate)**
3. The product of structural gene activity that facilitates the binding of an aporepressor to the operator is called the _____. **(corepressor)**
4. The enzymes that catalyze the attachment of amino acids to their specific tRNA molecules are called _____. **(aminoacy1 tRNA synthetases)**
5. The triplet on the tRNA molecule that is complimentary to a triplet on the mRNA is called a(n) _____. **(anticodon)**

6. The component of the RNA polymerase enzyme that is specifically involved in initiating mRNA synthesis is called the _____. **(sigma factor)**
7. Messenger RNAs that contain information for more than one polypeptide are called _____. **(polycistronic)**
8. The energy for translocation in protein synthesis is derived from the hydrolysis of _____. **(GTP)**

Lec 12 - Recombination in Bacteria

1. Virus that integrates into the host genome is called a(n) _____. **(provirus)**
2. _____ is the process in which there is movement of certain genes from one DNA molecule to another. **(Transposition)**
3. The process in which cell-free DNA is taken up by a cell and engages in genetic recombination is called _____. **(transformation)**
4. The bridge formed between conjugants during the conjugation progress is called a(n) _____. **(pilus)**
5. The gene transfer mechanism in which bacterial information is carried by a virus is called _____. **(transduction)**
6. The inverted repeat sequences found on the ends of certain DNA units are called _____. **(palindromic)**
7. Plasmids that are composed of DNA from more than one source are called _____. **(chimeric)**
8. The amlification of a gene in a microbial cell in which the gene has been dervied from another source is called _____. **(cloning)**
9. The gene transfer mechanism in bacteria in which there is a cone-way transfer between two mating types is called _____. **(conjugation)**
10. The crossover event between lambda and the host chromosome during the excision of lambda often results in the formation of a lambda particle carrying the bacterial genes _____ and _____. **(galactose [Ga1]) (biotin [Bio])**

Lec 13 - Genetic Engineering

Lec 14 - Genetically Modified Organism

Lec 15 - Soil Microbiology

1. The group of organisms most frequently associated with the production of antibiotics is

   (a) *Actinomyces* (b) *Klebsiella* (c) *Streptomyces* (d) *Pseudomonas*

2. Which type of organism most frequently dominates the soil in terms of total biomass?

   (a) Bacteria (b) Fungi (c) Algae (d) Protozoa

3. The soil element that is most responsible for limitations of plant growth and food production is

   (a) oxygen (b) nitrogen (c) phosphorous (d) sulphur

4. The term 'rhizosphere' was coined by

   (a) Winogradsky (b) Beijerinck (c) Hiltner (d) Waksman

5. The rate of organic matter decomposition is measured by,

(a) Dilution plate count method (b) Carbon-di-oxide evolution method

(c) Conn's direct microscopic method (d) None of the above

6. One characteristic of the rhizosphere region of the soil ecosystem is its high

(a) oxygen content (b) microbial count (c) macropore count (d) humus content

7. Carbon cycles relatively rapidly except when it is

(a) dissolved in freshwater ecosystems (b) released by respiration

(c) stored in petroleum, coal or wood (d) part of bicarbonate reservoir in oceans

8. Contact slide or buried slide technique for qualitative determination of soil microflora was given by

(a) Winogradsky (b) Rossi and Cholodney (c) Beijerinck (d) Dobereiner

9. Fastest decomposition rate in soil is expected with residues having

(a) lowest N content (b) widest C:N ratio (c) lowest C:N ratio (d) highest C content

10. Which pool in the global carbon cycle uses biochemical energy from reduced carbon compounds?

(a) heterotrophs (b) autotrophs (c) carbon dioxide (d) soil organic matter

11. A free living non-symbiotic Gram negative dinitrogen fixing bacteria

(a) *Azospirillum* (b) *Anabaena* (c) *Azotobacter* (d) *Rhizobium*

12. Conversion of organic complex of an element in to its inorganic state is called

(a) Mineralization(b) Immobilization (c) Nitrification (d) Oxidation

13. Adding nitrogen fertilizer to a compost pile will ____ the decomposition rate and _____ humus production.

(a) increase, increase (b) slow, increase (c) increase, decrease (d) slow, decrease

14. The element associated with dinitrogen reductase in diazotrophs is

(a) Oxygen (b) Magnesium (c) Molybdenum (d) Cobalt

15. The process that converts gaseous nitrogen to compounds that can be used by the biological community is called

(a) mineralization (b) nitrogen fixation (c) nitrogen mobilization (d) ammonification

16. Which pool in the nitrogen cycle can be both fixed and nitrified?

(a) humus (b) ammonium (c) Nitrogen (d) nitrate

17. Sulfur metabolism is an important part of energy metabolism in which of the following groups of microorganisms?

(a) phototrophic bacteria (b) Enterobacteriaceae (c) cyanobacteria (d) Pseudomonadaceae

18. An example of bacteria oxidizing ammonia to nitrites is

(a) *Pseudomonas* (b) *Bacillus* (c) *Rhizobium* (d) *Nitrosomonas*

19. The actinomycete that fixes atmospheric nitrogen in association with non-leguminous plants is

    (a) *Actinomyces* (b) *Streptomyces* (c) *Nocardia* (d) *Frankia*

20. The term mycorrhizae describes a symbiotic relationship between

    (a) a heterotroph and an autotroph (b) an antibiotic and a pathogen

    (c) nitrification and denitrification (d) a bacteria and a fungus

State whether the following statements are TRUE or FALSE

_____ 1. Microbial enzyme activities depends on soil pH.

_____ 2. Soil is unique with solid, liquid and gaseous phases interacting and thus supports more number and types of microflora.

_____ 3. Soil protozoa balances the soil ecosystem by feeding on soil fungi.

_____ 4. Bacteria which grows at higher soil temperatures are barophiles.

_____ 5. The classification of viruses is based primarily on morphology and nucleic acid composition and structure.

_____ 6. The mycelia of fungi that penetrate the host to obtain nutrients are called haustoria.

_____ 7. An example of an associatively symbiotic nitrogen fixing bacterium is Azotobacter.

_____ 8. Thiobacillus is involved in transformation of both nitrogen and iron.

_____ 9. The major group of organisms surrounding the root of plants are true bacteria.

_____ 10. Lignin is broken down in the soil primarily by fungi.

Fill in the blanks with appropriate words

1. The autotrophic mode of nutrition in bacteria was first established by _____.
2. An _____ pH favours growth of soil fungi.
3. Cellulose is polymer of _____.
4. The rate of decomposition of organic matter is measured by _____ method.
5. Soil microbial activity can be quantified by determining the _____ enzyme activity.
6. _____ in root nodules regulates the supply of oxygen.
7. The site of nitrogen fixation in blue green algae is _____.
8. The primary wood degrading microorganisms are _____.
9. A non filamentous bacteria capable of sulphur oxidation is _____.
10. The region around leaf surface is called _____

Lec 16 - Microbial Transformations of Carbon
Lec 17 - Microbial Transformations of Nitrogen, Phosphorus and Sulphur
Lec 18 - Biological Nitrogen Fixation
Lec 19 - Phyllosphere Bacteria

Lec 20 - Composting
Lec 21 - Environmental Microbiology
1. Which of the following is not a major subdivision of the biosphere?
a. hydrosphere c. stratosphere
b. lithosphere d. atmosphere

2. A/an is defined as a collection of populations sharing a given habitat.
a. biosphere c. biome
b. community d. ecosystem

3. The quantity of available nutrients from the lower levels of the energy pyramid to the higher ones.
a. increases c. remains stable
b. decreases d. cycles

4. Photosynthetic organisms convert the energy of into chemical energy.
a. electrons c. photons
b. protons d. hydrogen atoms

5. Which of the following is considered a greenhouse gas?
a. $CO_2$ c. $N_2O$
b. $CH_4$ d. all of these

6. The Calvin cycle operates during which part of photosynthesis?
a. only in the light c. in both light and dark
b. only in the dark d. only during photosystem I

7. Root nodules contain , which can .
a. Azotobacter, fix $N_2$
b. Nitrosomonas, nitrify $NH_3$
c. rhizobia, fix $N_2$
d. Bacillus, denitrify $NO_3$

8. Which element(s) has/have an inorganic reservoir that exists primarily in sedimentary deposits?
a. nitrogen c. sulfur
b. phosphorus d. b and c

9. The floating assemblage of microbes, plants, and animals that drifts on or near the surface of large bodies of water is the community.
a. abyssal c. littoral
b. benthic d. plankton

10. An oligotrophic ecosystem would be most likely to exist in a/an

a. ocean c. tropical pond
b. high mountain lake d. polluted river
11.Which of the following does not vary predictably with the depth of the aquatic environment?
a. dissolved oxygen
b. temperature
c. penetration by sunlight
d. salinity

12. Which of the following would be least accurate in detecting coliform bacteria in a water sample?
a. the presumptive MPN test
b. the standard plate count
c. the membrane filter method
d. the confirmatory MPN test

Lec 22 - Microbiology of Food

1. The time required to kill a specified number of microorganisms at a particular temperature is called the _____. **(thermal death time [TDT])**
2. Canned foods are thermally processed in steam-heated vats called _____. **(retorts)**
3. The species of Vibrio associated with shellfish poisoning is _____. **(*V. parahemolyticus*)**
4. The organisms responsible for the spoilage (called rope) of bread is _____. **(*Bacillus subtilis*)**
5. Fatal forms of food poisoning are more frequently caused by the microorganism _____. **(*Clostridium botulinum*)**
6. Food handlers are the most frequent source of food poisoning caused by _____. **(*Staphylococcus aureus*)**
7. The principal viral agent associated with foodborne illness is the _____. **(hepatitis A virus)**
8. The animal parasite associated with foodborne illness and resulting from the ingestion of undercooked bear or other wild meats is _____. **(*Trichinella spiralis*)**

The recently discovered cause of bacterial foodborne illness that is associated with cereal dishes is _____. **(*Bacillus cereus*)**

1. Which of the following species or genera is a frequent contaminant of water supplies ?
   a. *Lactobacillus*
   b. *Streptococcus*
   **c. *Pseudomonas***
   d. *Clostridium*
   e. *Bacillus*

2. Contemporary milk pasteurization times and temperatures have been selected because they will destroy

a. *Mycobacterium tuberculosis*
**b. *Coxiella burnetii***
c. *Streptococcus faecalis*
d. *Bacillus anthracis*
e. *Legionella pneumophilia*

3. The majority of "swollen" cans observed in the marketplace are the result of
a. $CO_2$ production by clostridia
b. $H_2$ production by clostridia
**c. $H_2$ production from the interaction of tin and acid**
d. $O_2$ production by aerobic sporeformers
e. None of the above

1. The microorganisms most frequently involved in the spoilage of canned foods are
a. Streptococci and lactobacilli
b. *Leuconostoc* and *Pseudomonas*
**c. *Clostridium* and *Bacillus***
d. *Saccharomyces* and *Staphylococcus*
e. *Lactobacillus* and *Streptococcus*

1. If an organism has a water activity of 0.62, in which of the following foods (water activity in parentheses) will it most likely grow?
a. flour (0.61)
b. chocolate (0.54)
**c. fresh meat (0.98)**
d. honey (0.50)
e. dried beef (0.87)

2. The predominant group of microorganisms found in milk today are
a. mycobacteria
b. *Brucella*
**c. Gram-negative rods**
d. lactobacilli and streptococci
e. *Clostridium* and *Bacillus*

Lec 23 - Principles of Preservation
Lec 24 - Role of Bacteria in Fermentation

1. During fermentation, pyruvic acid is converted into major organic products such as
(A) glucose and maltose
(C) ethyl alcohol and lactic acid
(B) starch and cellulose
(D) citric acid and isocitric acid

2. The group of organisms most frequently associated with the production of antibiotics is
(A*) Actinomyces*
(C) *Streptomyces*
(B) *Klebsiella*
(D) *Pseudomonas*

3. Maximum production of antibiotics generally occurs
(A) during the log phase
(B) before the log phase
(B) after the log phase
(D) only when the pH drops below 4.3

4. The Koji process is a technique used in the industrial production of
(A) vinegar
(B) microbial polysaccharides

(C) pectinase (D) single cell protein

5. The precursor added to a fermenting medium for penicillin G production is
   (A) malic acid (B) tryptophan
   (C) yeast extract (D) lysine

**State true or False:**

6. Baffles are provided in a fermentor for mixing and turbulence.
7. A type of bacterial growth where the cells never reach its stationary phase is batch culture.
8. Mushroom production is an example of solid state fermentation.
9. Strict sterile conditions are not required in lactic acid production because the organism can be cultivated at a high temperature**.**
10. A most common mutagen used for strain improvement of industrial microbes is IR rays.

**Fill up the blanks:**

11. The device used to maintain cells in logarithmic state in a fermentor is called as _____.
12. *Aspergillus niger* is used for the industrial production of _____.
13. The organism used in recombinant DNA technology for the commercial production of interferon, insulin and growth hormones is _____.
14. The classical approach to strain improvement of industrially important strain is _____.
15. The method for screening antibiotic producing microorganisms is called _____.

**Match the following:**

| | | | |
|---|---|---|---|
| 16. | *Saccharomyces cerevisiae* | : | (a) Amylase |
| 17. | *Abhya gossypii* | : | (b) SCP |
| 18. | *Scenedesmus* | : | (c) Streptomycin |
| 19. | *Bacillus amyloliquifaciens* | : | (d) Ethanol |
| 20. | *Streptomyces griseus* | : | (e) Riboflavin |

Lec 25 - Beneficial Microorganisms in Agriculture

1. The major morphological group of bacteria found in the soil is
   a. long rods, non-spore-forming
   b. cocci
   c. rods, spore-forming
   **d. coccoidal rods**
   e. rods, gram-positive non-spore-forming

1. Which type of organisms most frequently dominates the soil in terms of total biomass?
   a. Bacteria
   **b. Fungi**
   c. algae
   d. protozoa

1. The actinomycete that fixes nitrogen in association with nonleguminous plants is a member of the genus
   a. *Actinomyces*
   b. *Streptomyces*
   **c. *Frankia***
   d. *Arachnia*
   e. *Nocardia*

2. The bacterial inhabitant of the soil that can parasitize other bacteria belongs to the genus
   a. *Erwinia*
   b. *Rhizobium*
   c. *Frankia*
   **d. *Bdellovibrio***
   e. *Bacillus*

3. The rhizosphere and rhizoplane are surrounded by a microbial community whose cell density is
   **a. greater than $10^8$/g**
   b. approximately $10^5$/g
   c. approximately $10^7$/g
   d. less than $10^5$/g

4. The major group of microorganisms found surrounding the roots of plants are
   a. algae
   **b. true bacteria**
   c. actinomycetes
   d. fungi
   e. protozoa

5. The primary purpose of the rhizosphere community is to

a. destroy potential invading plant pathogens
b. supply amino acids to the plant
c. reduce the level of toxic acids that surround the plant roots
**d. convert organic compounds containing nitrogen, phosphorous, and sulfur to inorganic products suitable for assimilation by the plant**
e. convert inorganic compounds of nitrogen, phosphorous, and sulfur to organic products suitable for growth of the plant

Choose the best answer:

1. The rate of organic matter decomposition is measured by,
   (a) Dilution plate count method (b) Carbon-di-oxide evolution method
   (c) Conn's direct microscopic method (d) None of the above
2. Which of the following substance is most resistant to microbial biodegradation?
   (A) pectin (B) cellulose
   (C) lignin (D) hemicellulose
3. Which pool in the global carbon cycle uses biochemical energy from reduced carbon compounds?
   (A) heterotrophs (B) autotrophs
   (C) lithotrophs (D) organotrophs
16. Fastest decomposition rate in soil is expected with residues having
   (A) lowest N content (B) widest C:N ratio
   (C) lowest C:N ratio (D) highest C content
17. Adding nitrogen fertilizer to a compost pile will _____ the decomposition rate and _____ humus production.
   (A) increase, increase (B) slow, increase
   (C) increase, decrease (D) slow, decrease

Define the following or answer in one sentence:

18. Humic acid
19. Mesophiles
20. Herbicide
21. Biogas
22. Vermiculture

Fill up the blanks:

23. Conversion of organic complex of an element in to its inorganic state is called _____.
24. Soil microbial activity can be quantified by determining the _____ enzyme activity.
25. The organism most frequently dominates the soil in terms of total numbers and types are _____.

26. The increase in concentration of a recalcitrant molecule as it passes through the trophic levels is called _____.
27. Those compounds, both biological and synthetic, that are resistant to microbial digestion are called _____ molecules.

Match the following:

| | | | |
|---|---|---|---|
| 16. | *Phanerochate chrysosporium* | : | (f) Methane producer |
| 17. | *Pseudomonas putida* | : | (g) Cellulose degrader |
| 18. | *Methanothrix* | : | (h) Pesticide degrader |
| 19. | *Streptomyces* | : | (i) Wood degrading fungi |
| 20. | *Trichoderma* | : | (j) Compost pits |

Lec 26 - Microbial Agents for Control of Plant Disease
Lec 27 - Biogas Production
Lec 28 - Biodegradable Plastics
Lec 29 - Plant – Microbe Interactions
Lec 30 - Bioremediation
Lec 31 - Bio Sensor
Lec 32 - Microbial Products

Nitrite is converted into nitrate by the bacteria

173. Phycobiont is

a.The algal part in Lichens

b.The fungal part in Lichens

c.Laustoria formation

d.None of these

174. Parasitic form must contain

a. Capsules b. Cell-wall c. Endospores d. Flagella

175. The total no. of genes in the group of same individuals is

a. Nitrosomonas c. Nitrobacter

b. Nitrosocytes d. Azatobacter

165. Sulphur oxidizing bacteria is

a. Alcaligenes b. Pseudomonas c. Thiobacillus d. None of these

166. Bacillus Schlegelli is

a. Hydrogen – Oxydising bacteria

b. Sulphur – Oxydising bacteria

c. Iron-Oxidising bacteria

d. Nitrite oxidizing bacteria

167. The group of bacteria which deopends on organic sources in nature for their energy requirements. They are said to be a. Chemotrophs b. Phototrophs c. Heterotrophes d. Organotrophs

168. Majority of bacteria are

a. Genome c. Gene pool

b. Gene map d. None of these

a. Saprophytes c. Commensals

169. Symbionts are

b. Symbionts d. Parasites

176. Transformation was observed mainly in

a. Bacteriophages b. Temperate phages c. ⌊ –phage d. All of these

177. Capsulated forms of bacteria are

a. Virulent b. A virulent c. Useful d. Symbiotic

178. The bacterial cells participating in conjugation are

a.Bacteria in symbiotic association

b.The group of fungi in symbiotic association

c.The groups participating in symbiotic association

d.All of these

170. The best example for symbiotic associa- tion is

a. E.coli in intestine of man

b. Lichens

c. Normal floraof skin

d. All of the above

171. The enzymes responsible for decomposi- tion is

a. Conjugants c. Exconjugants

179. Phagocytes are

a. Monocytes c. Basophils

b. Fertile cells□d. None of these

b. Macrophages d. All of these

a. Lipolytic c. Lysozyme

b. Proteolytic□d. Both a and b

180. The microorganism engulfed by phago- cyte resides in a vacuole is known as

a. Phagosome b. Lysosome□c. both a and b d. None of these

181. Toxic products in phagolysosome are

a.$H_2SO_4$

b.Singlet $O_2$

c.Superoxide radicals

d.All of these

182. During destruction of antigen particle in phagolysosome the product formed in phagolysosome the product formed during formulation is

a. Acetic acid b. Lactic acid c. Citric acid d. None of these

172. Urea is decomposed by the species

a. Micrococcus sps. b. Nitrosomonas sps. c. Proteus sps. d. Both a and c