PRACTICE EXAMINATION QUESTIONS

MULTIPLE CHOICE QUESTIONS Note: More than one answer can be correct. Circle all correct answers.

1. What groups listed below have true cell walls?
   A. algae
   B. mycoplasmas
   C. Gram-positive bacteria
   D. fungi
   E. protozoans

2. Identify which statements are correct.
   A. All bacteria have peptidoglycan in their cell walls.
   B. All fungi have chitin in their cell walls.
   C. All algae have cellulose in their cell walls
   D. All protozoans have protein in their cell walls.

3. Which of the following characteristics do not occur in prokaryotic cells?
   A. cellular organization
   B. thylakoid membranes within chloroplasts
   C. oxygenic photosynthesis
   D. anaerobic respiration
   E. several circular chromosomes

4. The membrane of gas vesicles is composed of:
   A. triglycerides
   B. phospholipids
   C. proteins
   D. lipopolysaccharide
   E. hydrocarbons

5. Which of the following are not found in Cyanobacteria?
   A. thylakoids
   B. gas vesicles
   C. chloroplasts
   D. heterocysts
   E. endospores

6. Phagocytosis is not a characteristic of which groups?
   A. protozoans
   B. algae
   C. fungi
   D. *Archaea*
   E. *Bacteria*

7. The bacterial cytoplasmic membrane contains:
   A. ester-linked phospholipids, but no sterols
   B. ester-linked phospholipids and sterols
   C. ether-linked phospholipids, but no sterols
   D. ether-linked phospholipids, sulfolipids, and glycolipids

8. Who accidentally identified the antimicrobial action of penicillin?
   A. Robert Koch
   B. Richard Petri
   C. Alexander Fleming
   D. Louis Pasteur
   E. Lazzaro Spallanzani

9. Ribosomes associated with cells or organelles have a certain size, which is expressed in Svedberg units. Which associations are incorrect?
   A. cyanobacteria - 80s
   B. chloroplasts - 70s
   C. photosynthetic bacteria - 80s
   D. green algal cytoplasm - 80s
   E. mitochondria - 70s

10. Which group(s) of microorganisms is (are) thought to be the oldest living organisms?
   A. eukaryotes
   B. heterotrophic prokaryotes
   C. *Archaea*
   D. viruses
   E. autotrophic prokaryotes

11. Based on studies of 16S ribosomal RNA and cell wall composition, which of the following bacteria are classified as *Archaea*?
   A. *Halobacterium*
   B. *Methanococcus*
   C. *Sulfolobus*
   D. *Desulfovibrio*

12. Which group(s) of fungi do not generally produce sexual reproductive structures and are also sometimes known as imperfect fungi?
   A. Ascomycotina
   B. Oomycetes
   C. Zygomycotina
   D. Hyphochridiomycetes
   E. Deuteromycotina

13. When comparing the types of viruses that infect bacteria, plants, and vertebrate animals, what trends appear from bacterial to vertebrate viral groups?
   A. more complex-type forms
   B. more enveloped forms
   C. fewer enveloped forms
   D. same number of DNA-containing forms
   E. fewer complex-type forms

14. Plaques are:
   A. clear areas in a lawn of cultured cells caused by virus infection.
   B. stained areas in a cell culture indicating cells infected by a virus.
   C. virus colonies on agar.
   D. bacterial colonies on agar

15. In order to grow, all microorganisms require:
   A. liquid water
   B. organic substances
   C. oxygen
   D. warm temperatures
   E. low pressure

16. Superoxide dismutase is an enzyme that catalyzes the conversion of oxygen radicals to peroxides. Which groups of organisms do not have this enzyme?
   A. aerobes
   B. facultative anaerobes
   C. oxyduric anaerobes
   D. oxylabile anaerobes

17. Identify the correct statement(s). In prokaryotes:
   A. Translation begins before transcription is finished.
   B. Messanger RNA is not co-linear with the DNA template.
   C. 5s, 16s, and 28s ribosomal RNA's are present.
   D. 50s and 30s ribosomal subunits are necessary for protein synthesis.
   E. mRNA is monocistronic

18. Which of these are a type of mutation?
   A. base substitution
   B. translocation
   C. nonsense codons
   D. recombination
   E. insertion sequences
   F. reversions

19. A small molecule that combines with a specific allosteric protein so that both prevent RNA polymerase activity is called a(n):
A. inducer
B. repressor
C. corepressor
D. leader
E. ATP

20. Rolling circle replication refers to:
A. DNA replication in every prokaryotic cell division
B. DNA transfer during conjugation
C. mitosis
D. meiosis

21. Hfr strains of bacteria:
A. do <u>not</u> have an "F" (fertility) factor.
B. have an "F" factor plasmid.
C. have an "F" factor integrated in the bacterial chromosome.
D. transfer the genetic information to other bacteria with high frequency

22. Match the following terms (1-6) with their respective meanings (A-F).

1. fermentation	A. carbon from organic compounds
2. respiration	B. carbon from CO_2
3. autotroph	C. oxidative phosphorylation
4. lithotroph	D. substrate-level phosphorylation
5. heterotroph	E. energy from oxidation of inorganic compounds
6. phototroph	F. energy from light

The proper combination is:
A. 1A-2B-3E-4F-5C-6D
B. 1D-2C-3A-4B-5E-6F
C. 1D-2C-3B-4E-5A-6F
D. 1C-2A-3B-4E-5F-6D

23. What chemicals are responsible for the flavor and holes in Swiss cheese?
A. lactate, oxygen
B. propionic acid, carbon dioxide
C. acetic acid, carbon dioxide
D. ethanol, hydrogen
E. butyric acid, hydrogen

24. Which of the following <u>are not</u> examples of a terminal electron acceptor in anaerobic respiration?
A. nitrate
B. hydrogen sulfide
C. iron hydroxide
D. H_2
E. sulfate

25. Which photosynthetic pigments are found in all prokaryotic and eukaryotic photoautotrophs?
   A. chlorophyll *c*
   B. carotenoids
   C. phycobilins
   D. phycocyanin
   E. chlorophyll *a*

26. The site of ATP synthesis in microorganisms includes:
   A. cytoplasmic membranes
   B. cell walls
   C. chloroplasts
   D. mitochondria

27. NAD and FAD are hydrogen carriers, but cytochromes are electron carriers in bacteria. What happens to the protons (H^+) in electron transport chains?
   A. They go into solution inside the cytoplasm.
   B. They are taken back by NAD and FAD.
   C. They are carried from cytochromes to oxygen to form water.
   D. They go into solution outside the cytoplasmic membrane.

28. The Calvin cycle:
   A. is a C3 pathway
   B. is used by all photoautotrophic microorganisms
   C. is a C4 pathway
   D. is a dark reaction
   E. occurs in the thylakoid space in chloroplasts

29. The oxidation-reduction pairs X/XH_2 and Y/YH_2 have reduction potentials of -50 and +75 millivolts, respectively. This means that electrons would most likely be removed from _____ to reduce _____.
   A. XH_2, X
   B. Y, XH_2
   C. YH_2, X
   D. Y, YH_2
   E. XH_2, Y

30. Identify the correct statement(s). In eukaryotic microorganisms:
   A. mRNA is long-lived (hours to days).
   B. a single, circular chromosome is present.
   C. 5s, 16s, and 23s ribosomal RNA's are present.
   D. extrachromosomal DNA can be present.
   E. the initiation sequence in mRNA codes for N-formylmethionine.

31. Which factor is primarily responsible for the division of bacterial populations into specific zones within sediments?
   A. predation by protozoans
   B. free oxygen availability
   C. competition for suitable electron acceptors
   D. cometabolism of organic compounds
   E. temperature

32. Which compounds produced by microorganisms can cause fever in humans and can withstand autoclaving?
   A. endotoxin
   B. Lipid A
   C. lipopolysaccharide
   D. peptidoglycan
   E. diaminopimelic acid

SHORT ANSWER QUESTIONS

1. List the similarities and differences between passive diffusion and facilitated diffusion.

2. Explain the structure and symmetry of bacterial cytoplasmic membranes as suggested by the Fluid Mosaic Model. List the biochemicals that are present in or attached to the cytoplasmic membranes of microorganisms.

3. Diagram and name four mechanisms bacteria use to transport materials across the cytoplasmic membrane. Note when energy and additional compounds are necessary for any of these mechanisms to operate.

4. Name three reserve materials synthesized by microorganisms and note which microbial groups use them as their primary storage product.

5. List the principle differences (ie. structure, anchoring, motion) between prokaryotic and eukaryotic flagella.

6. Give two other names for bacterial capsule and list five functions proposed for it.

7. Give four lines of evidence that support the Endosymbiotic Theory of the origin of eukaryotic cells.

8. Carl Woese suggested a phylogenetic classification scheme in 1980 that contained how many domains? Name these domains and explain how the relationships in his universal phylogenetic tree were determined.

9. Explain the differences in the curves resulting from the growth of bacterial and viral populations.

10. Is DNA replication a conservative or semi-conservative process? Explain how this question was answered.

11. Explain how attenuation regulates protein synthesis in prokaryotic cells.

12. You have inserted a single DNA fragment into a cloning vector. Describe two methods you could use to determine which host bacterial cells will eventually contain the clonal insert.

13. What is the outcome of photorespiration in algae? What Calvin cycle enzyme plays a central role in this process? Name three conditions that promote photorespiration in photoautotrophs.

14. Which autotrophic processes are known to produce the organic matter that supports whole ecosystems? Give an equation for each process and underline the electron donor.

15. Demonstrate how the activities of biofilm communities result in the pitting and corrosion of iron and steel pipes.

ESSAY QUESTIONS Answer all parts of the following questions completely.

1. (A) Diagram a Gram-positive and Gram-negative bacterial cell wall. (B) Demonstrate the differences in the chemical structure of these two types of bacterial cell walls. (C) Where and when does penicillin affect bacterial cells? (D) Explain how autolysins affect the cell walls of Gram-negative bacteria and mycoplasmas.

2. (A) Name, diagram, and (B) explain the mechanisms for three ways that DNA can be transferred from one prokaryotic cell to another. (C) Which two types of DNA transfer are commonly used in genetic engineering? (D) Describe three ways that genetic engineering is different from natural genetic mechanisms.

3. (A) Explain the ways in which aerobic respiration and fermentation processes are different. (B) Name the three phases of aerobic respiration and give the starting materials and end products of each phase. (C) Describe a difference in the glycolysis pathways of bacteria and eukaryotic microorganisms. (D) Draw a diagram that explains how a bacterium uses an electrochemical (eg., H^+) gradient to generate ATP.

4. (A) Give the electron donors, acceptors, and the carbon source for aerobic and anaerobic photoautotrophy. (B) Describe three differences between the light reactions of aerobic and anaerobic photosynthesis. (C) Explain the difference between aerobic photoautotrophy and aerobic chemoautotrophy. (D) Give an equation and the electron donor and acceptor for a type of chemoautotrophy.

5. (A) Give two reactions conducted by microorganisms that are important in the biomagnification and toxicity of mercury. (B) Diagram where we observe the greatest rates of these reactions in aquatic environments. (C) When considering the mercury cycle, why should we be concerned about the effects of acid rain?

6. (A) Name the two basic modes of immune response. (B) What are the two types of acquired immunity? (C) Diagram and explain how the Complement System operates. (D) Which compounds first interact with the Complement System?