K. Sorensen BIOL 2200

Study Guide for Unit 1

1. Know the five classes of Microbes & the others that are included as microbes
2. Know contributions of Hook, Leeuwenhoek, Schleiden, Schwann, Redi, Needham, Sallanzani, Pasteur, Tyndall, Koch, Semmelweis, Lister, Hesse, Jenner, Chamberland, Beijerinck, Ehrilich, Flemming, Hershey, Chase, Watson & Crick & others we talked about.
3. Know Koch's postulates
4. Know and describe the scientific method

Questions 5 through 22 you should have covered in other classes and you should be familiar with them.

5. Define an atom, element, compound, & mixture
6. Draw and diagram an atom and identify the atomic particles
7. Know and understand the following: atomic number, proton, neutron, electron, mass number, molecular weight, isotope, octet rule, covalent bonds, ionic bonds, hydrogen bonds, & polarity.
8. What makes water unique in nature?
9. Know the properties of water
10. What is pH? Acid? Base?
11. Know the functional groups that are attached to carbon atoms: alcohol (hydroxyl), carbonyl (aldehyde & ketone), carboxyl, sulfhydryl, amino, phosphate, & hydrocarbon chain.
12. Know and identify the four classes of biological molecules and their monomers.
13. Define the following: monosaccharide, disaccharide, polysaccharide, dehydration/condensation, & polymer.
14. Recognize the following by their functional groups: Fatty acids (saturated and unsaturated), triglyceride, phospholipid, sterols, amino acids, and ATP.
15. Understand the nature of phospholipids
16. Identify polar/non-ionizable, polar/ionizable, and nonpolar amino acids based upon functional groups.
17. Define and explain the four levels of protein structure.
18. Know some examples of protein.
19. Be able to recognize the structure of ATP.
20. Know the nucleotide bases and which bases pair with each other in DNA and RNA.
21. Know which bases are purines and which are pyrimidines.
22. When looking at a nucleotide (RNA or DNA), be able to identify the hydrogen bonds, ribose, and phosphate.

23. Define refraction & refractive index, focal point, focal length, & parfocal.
24. Describe the types of light microscopes and describe each and how they would be used. Include the light path and illumination of the specimen.
25. Know the parts of the microscope.
26. Define resolution in language and mathematics.
27. Define working distance and how it relates to resolution and numerical aperture.
28. What is the purpose of oil?
29. Know the objective(s) magnification.
30. Be able to calculate total magnification.
31. Know the stains for the light microscope and some examples of each.
32. Know the Gram, acid fast, endospore, capsule and flagella stain. Know the stains involved in each.
33. Which organisms are acid-fast positive?
34. Understand how the electron microscope works and how samples are stained.
35. Understand the differences between scanning and transmission EM. Also, shadowing, freeze etching,
36. Describe confocal and scanning probe microscopy.
37. Have a general feel for the sizes of cells, viruses and what can be view with each microscope.
38. Basic differences between prokaryotic and eukaryotic cells.
39. Shape and arrangements of bacterial cells. Use the lab for this too.
40. Know the function and structure of the following: plasma membrane, hopanoids, peripheral proteins, integral proteins, archaeal membrane lipids, mesosomes, internal bacterial membranes, inclusion bodies (all of them including gas vacuoles), magnetosomes, ribosomes, nucleoid, topoisomerases, and plasmids.
41. Know the key structural differences between Gram (-) and Gram + bacteria. How does this relate to peptidoglycan and staining?
42. How do they differ from archaeobacteria?
43. Know the key structural differences between acid-fast bacteria (Mycobacterium) and other bacteria.
44. Describe the function and structure of the periplasm, cytoplasm, and exoenzymes.
45. Understand what penicillin and lysozyme do to bacteria.
46. Know the basic structure of the peptidoglycan for *Staphylococcus* and *Escherichia*. Why are unique amino acids important?
47. Describe the function and structure of teichnoic acids. What cells have them?
48. Describe the function and structure of LPS? What cells have them?
49. Describe porin proteins, Braun's lipoproteins, and adhesion sites.
50. What are the functions of the outer membrane and what bacteria have one?

51. Understand Osmosis and diffusion and the difference between the two.
52. Know the three methods of transport across the membrane and which requires a protein and energy.
53. Define isotonic, hypertonic, and hypotonic. What role does the cell wall play in this?
54. Define plasmolysis, osmotic lysis…
55. Describe archaeal cell walls.
56. Know the protein secretion mechanism for transporting material in and out of the cell.
57. What the functions and characteristics of the following: capsules, slime layers, and S-layers.
58. What the functions and characteristics of the following: finbriae, sex pili, and flagella.
59. Know the different types of flagella, structure, composition, and how they work.
60. Define a run and tumble and how they relate to chemotaxis (attractant and repellant).
61. How do spirochetes move? What is gliding motility?
62. What is an endospore and how does it resist heat, radiation, chemical, and desiccation?
63. Define the endospore and sporangium.
64. What role does dipicolinic acid play in sporulation? What is germination?
65. Describe the role microfilaments, intermediate filaments, and microtubules play in the cytoskeleton, motility, and organelle distribution.
66. Know the function and structure of the following: Rough ER, Smooth ER, Golgi apparatus, dictyosomes, lysosomes, and peroxisome.
67. Know the differences between the two types of endocytosis.
68. Describe endosome, phagosome, pinosomes, autophagic vacuoles, residual bodies, vauome, and phagolysosomes.
69. Describe the function of a proteosome.
70. From a diagram, be able to identify and label the following: mitochondria, chloroplast, nucleus, nucleolus, plasma membrane, nuclear envelope, & endoplasmic reticulum (smooth and rough). Know the function of each.
71. Know the differences between eukaryotic and prokaryotic ribosomes.
72. Know the mitochondria structure and function of each structure.
73. What is a kinetoplast?
74. Know the chloroplast structure and the function of each structure.
75. Define euchromatin, heterochromatin, nuclear envelope, and nucleolus.
76. Understand the cell cycle, mitosis and meiosis.
77. What is the function of the cell wall and what is its composition in different organisms.
78. What is a pellicle?
79. Know the structure of flagellum and cilium and differences between each.
80. What are basal bodies, axoneme, and their functions?
81. Describe the differences in flagellum movement between a prokaryote and eukaryote.
82. Know the differences between a prokaryote and a eukaryote.
83. What is a macronutrient and know the examples.
84. What is a microelement and know the examples. Where do organisms often acquire these?
85. Define autotroph, heterotroph, phototroph, chemotroph, lithotroph, organotroph, and mixotroph.
86. Nitrogen is needed for the synthesis of _____. Know some common sources.
87. Phosphorus is needed for the synthesis of _____.
88. Sulfur is needed for the synthesis of _____.
89. Define growth factors. Know the classes of these.
90. What are the most common methods of nutrient uptake? How does the kinetics of a carrier differ from diffusion?
91. Define an ABC transporter and group translocation.
92. Define 1° verses 2° active transport.
93. What is siderophore and how does work?
94. Define liquid, solid, synthetic or defined, complex, general purpose, enriched, selective, differential media and know examples of each.
95. What is a pure culture and describe the three ways to obtain one?
96. What is a colony; a biofilm.
97. How is growth measured?
98. Describe and draw a bacterial growth curve. Define each phase.
99. Calculate the generation time from a growth curve.
100. Know generation time and growth rate.