

Tips for success-

1. **HANDWRITE** out your study guide. Some (very few) students do fine with typing, but most do much better when they handwrite their study guide.
2. Don't split up the parts among people in a group. The benefits of doing the study guide are gained from actually writing out the answers yourself. It's great to work in groups and discuss the answers with others, but be sure you do your own writing. Besides if I see exact copies of study guides, no one in the group will get the extra credit for it.
3. Draw yourself diagrams and pictures whenever you can to illustrate processes. You can redraw the pictures for yourself on your exam and use them as models to answer questions. If you can, create a little "movie" in your head of cellular processes.
4. Focus on learning **processes** rather than just definitions whenever applicable. For example, for the vocabulary term below-"photosynthesis" you should not stop at defining it, but should be sure that you understand what kinds of organism do it, what kind of environmental conditions are required, how the process works, what are the reactants and products, etc.
5. Get a good night's sleep and eat a good breakfast before the exam. An extra hour of sleep will be more valuable than an extra hour of studying if you are exhausted. If you find yourself in this predicament often, then you need to start studying much earlier for the exam.

Prokaryotic Cell Structures**Vocabulary:**

Cocci
 Bacillus
 Vibrio
 Spirillum
 Spirochete
 Pleomorphic
 Cell wall
 Peptidoglycan
 Lipopolysaccharide (LPS)
 Porin
 NAG, NAM
 Lipid A
 O antigen
 Endotoxin
 Teichoic Acid

Mycobacteria spp
 Mycolic Acid
 Capsules/Slime layers
 Biofilms
 Glycocalyx
 Endospores
 Dipicolinic acid (DPA)
 Inclusion Bodies
 Bacterial ribosomes
 Binary fission
 Pili
 Fimbriae
 Nucleoid
 Methanogens
 Halophiles
 Thermophiles

1. Describe the various possible arrangements for bacterial cells that were discussed in class. For example, Strepto, Staphylo, Diplo, Single, Palisade, etc.
2. Describe, in detail, and/or diagram the structures of gram-positive, gram-negative and acid-fast cell walls. Why do we care about these?
3. Describe the differences/similarities between eubacteria and archaeobacteria.
4. What is the clinical importance of biofilms? How are they formed? Give some examples of where they are found?
5. In what functional aspects is a bacterial cell membrane different than eukaryotic cell membranes? Why?
6. How are bacterial flagella different from fimbriae? What is the function of a sex pilus?
7. What kinds of things are found in inclusion bodies? How and why are they involved in floatation in some cyanobacteria?
8. What kinds of organisms form endospores? Why? Describe the major benefits and drawbacks to endospores from the organism's point of view and from a clinical point of view.

Microbial Growth

Vocabulary:

Binary Fission	Acidophile
Generation time	Alkaliphile
Mesophiles	Halophile
Thermophile	Osmophile
Psychrophile	Water activity
Aerobe	Fastidious microbe
Anaerobe	Autotroph
Facultative anaerobe	Chemotroph
Microaerobes	Phototrophs
SOD	Heterotroph
Catalase	Lithotrophs
Oxidase	Growth Phases
Capnophile	
Neutrophile	

1. Diagram and describe the bacterial growth curve. Include the terms lag phase, log phase, stationary phase and death. What are three ways to “count” bacteria? How does each work (basically)?
2. Organisms can be classified into one of 3-4 groups depending upon their temperature requirements for growth. What are the groups? What kind of temperatures does each prefer?
3. Describe the oxygen requirements for the following types of bacteria and describe where you would expect to find them growing in a tube of nutrient broth (assume air is at top of tube) obligate aerobes, obligate anaerobes, facultative anaerobes, aerotolerant anaerobes, microaerophiles. Why are there obligate anaerobes? (I.e. why are some bacteria killed by oxygen?)
4. What's a capnophile? Where might a capnophile be found?
5. Describe the concepts of water activity as opposed to water content. How does this affect bacterial growth. What does this have to do with food safety? How do salts and sugar affect most bacteria?
6. What types of bacteria require UV light? Why do most organisms get damaged by UV light? What organisms are most resistant to killing by UV light? Why?
7. What are the basic nutritional requirements for bacterial growth? Where do these requirements come from (not in the lab media).

Microbial Metabolism

Vocabulary:

Anabolism	Reduction-Oxidation Rxns
Catabolism	Carrier molecules (FADH ₂ , NADH)
ATP	Blockers of OX-Phos (i.e. cyanide, sodium azide, carbon monoxide, antimycin A)
Enzymes	Denitrification
Co-enzymes	Sulfate reduction
Active site	Methanogenesis
Substrate	Chlorophylls
Substrate-level phosphorylation	Bacteriochlorophylls
Cellular respiration	Light reaction
Fermentation	Dark reaction
Photosynthesis	Photolysis
Kreb's cycle (aka Citric Acid Cycle)	Pyruvate
Glycolysis	Acetyl-CoA
Electron transport chain	Chemiosmosis-electrochemical gradient
Cytochromes	Oxidative phosphorylation
ATP synthase	

4. What are enzymes and how do they function in living systems? What is the relationship between enzymes and their substrates at the molecular level? What is substrate specificity and what does it have to do with enzyme structure? How does changing the shape of an enzyme affect its function?
5. Describe how pH, temp, concentration, allosteric regulators and phosphorylation state can affect enzyme function.
6. What is a co-factor? Co-enzyme? What's the difference? What do the terms holoenzyme and apoenzyme mean?
7. A. What is cellular respiration? B. Where does it occur? C. What is the general formula for cellular respiration? What are carrier molecules and how do cells benefit from using them instead of breaking down glucose all at once?
8. Describe *in general terms* (five or six steps) the process of cellular respiration from glycolysis to the ETC. Focus on the starting materials, the waste generated, the carrier molecules involved and the end products. Be sure to include what happens to glucose, pyruvate, NADH/FADH, H₂O, CO₂, Oxygen, ATP, electrons, H⁺ ions.
9. How do the H ions released from the carrier molecules at the ETC get converted to energy required for ATP synthesis to occur? i.e. explain chemiosmosis and electrochemical gradients.
10. Describe how molecules other than glucose can be used as fuel for cellular respiration. How are proteins metabolized into form that can be used to obtain energy? How are lipids broken down and used to generate energy?
11. What is photosynthesis? Where does it occur? What is the general formula for photosynthesis?
12. Describe *in general terms* (five or six steps) the process of photosynthesis from the ETC to the Calvin Benson Cycle. Focus on the starting materials, the waste generated, the carrier molecules involved and the end products. Be sure to include what happens to sunlight, NADH/FADH, H₂O, CO₂, Oxygen, ATP, electrons, H⁺ ions.
13. What is the difference between the so-called "light reactions" and the "dark reactions" of photosynthesis.
14. What kinds of organisms do photosynthesis? What differences are there, structurally, between euks and proks when it comes to photosynthesis and cellular respiration?

Microbial Control & Antibiotics**Vocabulary**

Sterilization	Halogens
Disinfect	Alcohols
Antisepsis	Phenolics
Sanitize	Selective toxicity
Degerm	<i>Penicillium spp.</i>
Pasteurize	<i>Cephalosporium spp.</i>
Bacteriostatic vs. bacteriocidal	<i>Actinomyces spp.</i>
Detergent	<i>Bacillus spp.</i>
Surfactant	Beta-lactam
Heavy metals	Sulfa drugs
Oxidizing agents	Spectrum of activity
	Superinfection
	Drug resistant strains

1. What are the primary mechanisms by which antimicrobial agents work? What kinds of microbial structures/characteristics make organisms more resistant to killing?
2. What are some other factors that affect how well antimicrobial agents work? Include a discussion of environmental factors like pH and temp as well as mitigating factors like body fluids and other organic substances.
3. Describe how soaps & detergents work. Discuss their effects on membranes and proteins.
4. For each of the following, recall the example given in class and describe what it might be used for: heavy metals, oxidizers, halogens, aldehydes, alcohols, phenolics. Also, discuss any special or notable characteristics for any of them.
5. What is the difference between antimicrobial agents used topically or as “cleaning” agents and antibiotics that are ingested by patients?
6. List and described the three types of microbes discussed in class that make antibiotics. What antibiotic does each make and how it was first discovered.
7. List and describe the four general modes of antibiotic activity discussed in class. Which type of antibiotics work using each mode? Be able to an example or two for each.
8. How do antiviral agents work? Why are they so limited in their capabilities?
9. Describe how multidrug resistant strains of pathogens can develop. What are some ways of combating antimicrobial resistance?