



## MB 451 Microbial Diversity

# Midterm Exam #2

Honor pledge: "I have neither given nor received unauthorized aid on this test."

Name : \_\_\_\_\_

Signed : \_\_\_\_\_

Date : \_\_\_\_\_

1. What are the 3 primary evolutionary branches of life? (5 points)

Multiple choice (2 points each, 20 points total)

\_\_\_\_\_ 2. The deeply-branching phyla of Bacteria, the *Aquificae* and *Thermotogae*, are ...

- A. autotrophic and acidophilic
- B. mesophilic and heterotrophic
- C. thermophilic and primitive
- D. methanogenic and symbiotic
- E. microaerophilic and photosynthetic

\_\_\_\_\_ 3. Which of the following is **not** a pathway used by phototrophic Bacteria to fix carbon?

- A. the reductive acetyl-CoA pathway
- B. the electron transport chain
- C. the reverse (reductive) TCA cycle
- D. the Calvin cycle
- E. the hydroxypropionate pathway

\_\_\_\_\_ 4. The wide variety of phenotypes found in the proteobacteria are based on ...

- A. the electron transport chain
- B. autotrophic sulfur metabolism
- C. photosynthesis
- D. heterotrophy
- E. fermentation

\_\_\_\_\_ 5. The Actinobacteria and Firmicutes constitute the ...

- A. acid-fast Bacteria
- B. anaerobic green phototrophs
- C. alpha-proteobacteria
- D. Archaea
- E. Gram-positive Bacteria

\_\_\_\_\_ 6. Sphingolipids are found in the membranes of ...

- A. Bacterioids
- B. Spirochaetes
- C. Chlamydiae
- D. Proteobacteria
- E. Planctomycetes

\_\_\_\_\_ 7. An organism with a fibrous stalk not surrounded by the cell envelope is most likely to be ...

- A. an appendaged bacterium
- B. a Planctomycete
- C. a Spirochaete
- D. an Actinobacterium
- E. a Verrucomicrobium

8. Which of the following is *not* a phylum of Bacteria with few or no cultivated members?
- A. OP 11
  - B. Acidobacteria
  - C. Fusobacteria
  - D. Nitrospira
  - E. Bacteroids

9. In which of the following structures do Archaea resemble Bacteria?
- A. flagella
  - B. RNA polymerases
  - C. membrane lipids
  - D. genomes
  - E. promoters

10. The unikonts are the phylogenetic group ("Super-Kingdom") of eukaryotes that include animals. Which of the following does *not* also belong to this group?
- A. green plants
  - B. fungi
  - C. amoeba
  - D. slime molds
  - E. choanoflagellates

11. Which if the following is *not* a potential origin of viruses?
- A. extremely reduced bacterial parasites
  - B. remnants of the "RNA World"
  - C. spontaneous generation
  - D. plasmids or genes that "escaped" from the host

12. Match the 10 of the following 12 phenotypes with the correct phylogenetic group. Use each only once, and mark the two you choose not to answer with an "X". (2 points each, 20 points total)

Methanogenesis	<i>Example</i>	Planctomycetes
Oxygenic photosynthesis		Euryarchaea
Internal cytoplasmic membrane		Cyanobacteria
Radiation resistance		Proteobacteria
helical or wave-shaped cell with periplasmic flagella		Chlorobi
Mycolic acid outer membrane		Actinobacteria
Purple photosynthesis		Deinococci
Green photosynthesis and sulfur oxidation		Chlamydiae
Hydrogen oxidation (Knallgas)		Spirochaetes
Loose outer membrane with large periplasm		Aquificae
Obligate intracellular parasites		Thermotogae
Endospores		Chloroflexi
Flexible unbranched filaments	Firmicutes	

13. In the boxes to the right of each phylogenetic group name, write the name(s) of a genus in that group. Fill out only 20 names and leave the other blank. If you give more than 30 genera, only the first 30 will be graded. (1 point each, 30 points total)

Chloroflexi		
Aquificae		
Thermotogae		
Deinococci		
Chlorobi		
Cyanobacteria		
Chlamydiae		
Bacteroids		
Planctomycetes		
Spirochaetes		
Firmicutes		
Actinobacteria		
Alpha-proteobacteria		
Beta-proteobacteria		
Gamma-proteobacteria		
Delta-proteobacteria		
Epsilon-proteobacteria		
Crenarchaea		
Euryarchaea		
Excavates		
Unikonts		

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Essay questions (5 points each, 25 points total)

14. Describe *in detail* any non-photosynthetic bacterium of your choice.

15. Describe *in detail* any archaeon of your choice.

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16. Describe *in detail* any *photosynthetic* bacterium of your choice. Make sure to read the next question before deciding which organism to answer this question with.

17. For the organism you described in the above question, describe how this organism obtains the reducing power it needs for carbon fixation. Be sure to include both a diagram and a written description.

18. Describe the strengths and weaknesses of the Prion hypothesis. What do **you** think?

EXTRA CREDIT 2 POINTS:

What experimental result would convince you that you are wrong about prions?

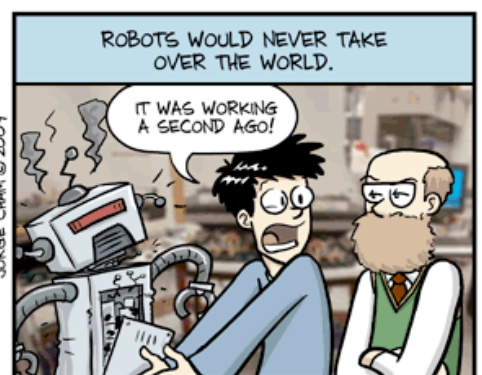


## Example organisms from the lectures:

*Acidobacterium capsulatum*  
*Anabaena*  
*Anaerolinea thermophila*  
*Aquifex pyrophilus*  
*Archaeoglobus fulgidus*  
*Arthrobacter globiformis*  
*Azotobacter vinelandii*  
*Bacillus cereus*  
*Bacteroides thetaiotaomicron*  
*Bdellovibrio bacteriovorus*  
*Beggiatoa alba*  
*Blastopirellula marina*  
*Borrelia recurrentis*  
*Brocadia anammoxidans*  
*Buchnera aphidicola*  
*Caulobacter crescentus*  
*Chlamydia trachomatis*  
*Chlorobium limicola*  
*Chloroflexus aurantiacus*  
*Chromatium vinosum*  
*Clostridium botulinum*  
*Cryomallon squamiferum symbiont*  
*Cytophaga hutchinsonii*  
*Deinococcus radiodurans*  
*Dermocarpa*  
*Desulfovibrio desulfuricans*  
*Dictyostellium*  
*Escherichia coli*  
*Fervidobacterium islandicum*  
*Fischerella*  
*Flavobacterium johnsoniae*  
*Fusobacterium nucleatum*  
*Gemmata obscuriglobus*  
*Giardia lamblia*  
*Halobacterium salinarium*  
*Helicobacter pylori*  
*Heliobacterium chlorum*  
*Herpetosiphon aurantiacus*  
*Isosphaera pallida*  
*Korarchaeum cryptofilum*  
*Leptospira biflexa*  
*Leptospirillum ferrooxidans*  
*Leuconostoc mesenteroides*  
*Magnetobacterium bavaricum*  
*Methanocaldococcus jannaschii*  
*Methanosarcina barkeri*

*Methanothermobacter thermoautotrophicus*  
*Microcystis*  
*Mycobacterium ulcerans*  
*Mycoplasma hominis*  
*Myxococcus xanthus*  
*Nanoarchaeum equitans*  
*Nitrospira marina*  
*Opitutus terra*  
*Oscillatoria*  
*Paramecium*  
*Pelodictyon phaeoclathratiforme*  
*Prochloron*  
*Prostheco bacter fusiformis*  
*Protochlamydia amoebophila*  
*Pyrococcus furiosus*  
*Pyrodictium occultum*  
*Ralstonia solanacearum*  
*Rhizobium etli*  
*Rhodomicrobium vannielii*  
*Roseiflexus castenholzii*  
*Sphaerotilus natans*  
*Spiroplasma*  
*Streptomyces antibioticus*  
*Sulfolobus solfataricus*  
*Thermocrinus ruber*  
*Thermodesulfobacterium hydrogenophilum*  
*Thermoleophilum album*  
*Thermomicrobium roseum*  
*Thermoplasma acidophilum*  
*Thermoproteus tenax*  
*Thermosiphon africanus*  
*Thermotoga maritima*  
*Thermus aquaticus*  
*Thiobacillus thioparus*  
*Trichomonas vaginalis*  
*Trypanosoma*  
*Veillonella atypica*  
*Verrucomicrobium spinosum*  
*Wolbachia pipientis*

## IF TV SCIENCE WAS MORE LIKE REAL SCIENCE



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