Midterm exam #2 Take-home questions MB 451 Microbial Diversity

The rules: You are free to use any notes, books, or online material while taking this take-home exam. You are NOT allowed to get (or give) help of any kind from (or to) anybody. If you have questions about the exam, send an email to Dr. Brown at james_brown@ncsu.edu. You MUST turn this completed take-home portion of the exam in with the rest of the exam when you take it, unless you take the exam in the DELTA offices, in which case you need to turn it in at my office or mailbox.

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

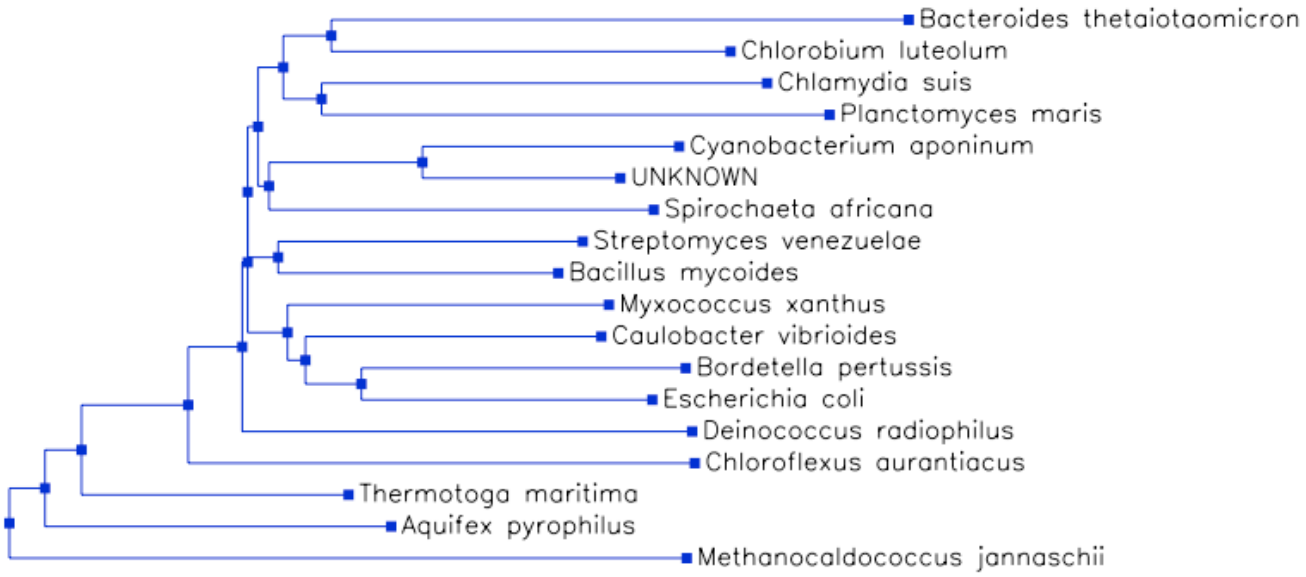
Signed : _____ Date : _____

Name : _____

1. For each of the phylogenetic groups listed, provide the name of one organism (genus or species) in that group, and something about it (½ point each):

Genus	Phylogenetic group (Phylum)	Something about it
Sulfolobus		
Sphyraena		
Chlamydiophila		
Blastopirellula		
Sphaerotilus		
Clostridium		
Desulfovibrio		
Arthrobacter		
Borrelia		
Thermotoga		
Methanocaldococcus		
Bacteroides		
Thermus		
Streblomastix		
Rotalipora		
Chlorobium		
Rhodomicrobium		
Roseiflexus		
Azotobacter		
Oscillatoria		

2. You have isolated an unknown organism in lab. You've misplaced your notes, and your plates, so you don't know anything about it. But your ssu-rRNA PCR was successful, and you have good sequence data. From this sequence, you generate the following tree:

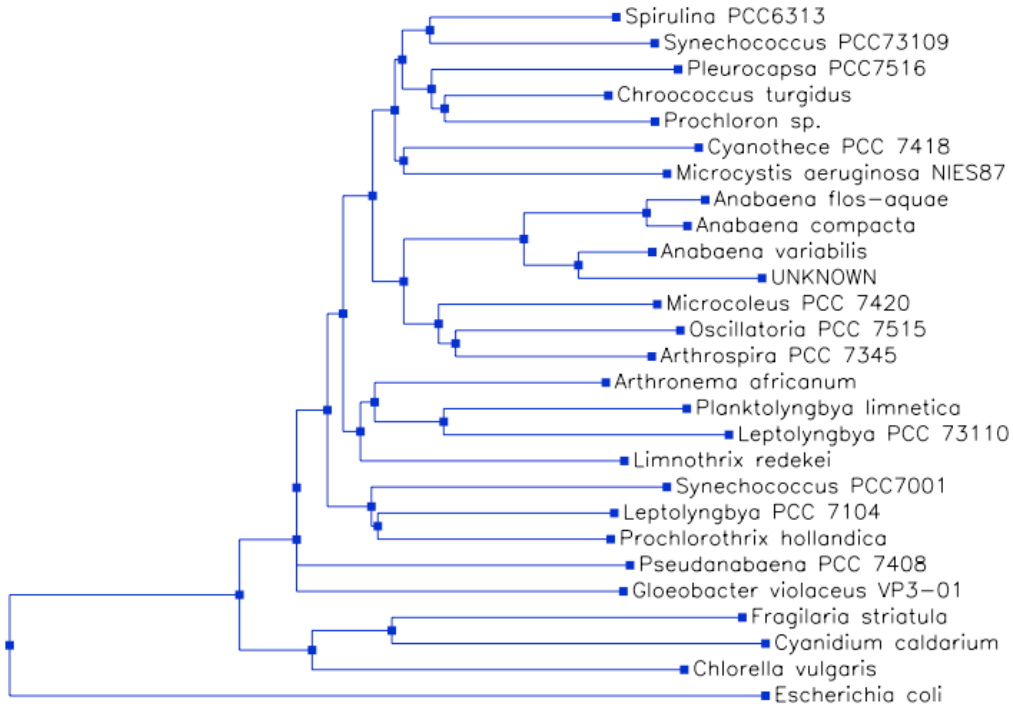


List 5 things you *can* or *can't* predict with reasonable confidence about this organism (2 points each). Common features of Bacteria, or life in general, will not accepted, e.g. "it has DNA", "it doesn't have Golgi", or "don't know what country it comes from".

Hint : If it tree'ed out as a mammal, you could predict it had a bony skeleton and at least some hair, but unless it tree'ed specifically out with a particular group, you couldn't predict it whether it was a carnivore or herbivore, or how big it is.

2.1.
2.2.
2.3.
2.4.
2.5.

3. Based on the placement of this organism in the previous tree, you create a more detailed tree:



List 5 *new* things you *can* or *can't* predict about this organism (2 points each):

3.1.
3.2.
3.3.
3.4.
3.5.

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

Multiple choice (2 points each)

2. _____ Which one of the following groups is predominated by phototrophs?
   A. Cyanobacteria
   B. Proteobacteria
   C. Firmicutes
   D. Euryarchaea
   E. Excavates

3. _____ Which one of the following groups is predominated by thermophiles?
   A. Firmicutes
   B. Unikonts
   C. Proteobacteria
   D. Crenarchaea
   E. Planctomycetes

4. _____ Which of the following is ***not*** a mechanism used to fix carbon?
   A. The hydroxypropionate pathway
   B. The reverse TCA cycle
   C. The Calvin cycle
   D. The reductive acetyl-CoA pathway
   E. Oxygenic photosynthesis

5. _____ The highest of these temperatures for which there is good evidence for life is…
   A. 86°C
   B. 100°C
   C. 125°C
   D. 180°C
   E. 240°C

6. _____ Members of which of these groups generally have an outer membrane?
   A. Planctomycetes
   B. Crenarchaea
   C. Spirochaetes
   D. Chromalveolates
   E. Firmicutes

7. _____ Compounds that are produced only during stationary (non-growth) phase are called ...
   A. Antibiotics and bacteriocins
   B. Secondary metabolites
   C. Siderophores
   D. Akinetes
   E. All of the above

8. Compare and contrast motility by spirochaetes and *Spiroplasma*. (6 points)

9. Describe ***one*** the three major possibilities for the origin of viruses. Give an example virus (or virus class) that might have originated via this mechanism. (6 points)

10. Describe your favorite microbe. (5 points)

11. Describe a representative of the Firmicutes. You cannot use *Bacillus* or the organism you described in question 10. (5 points)

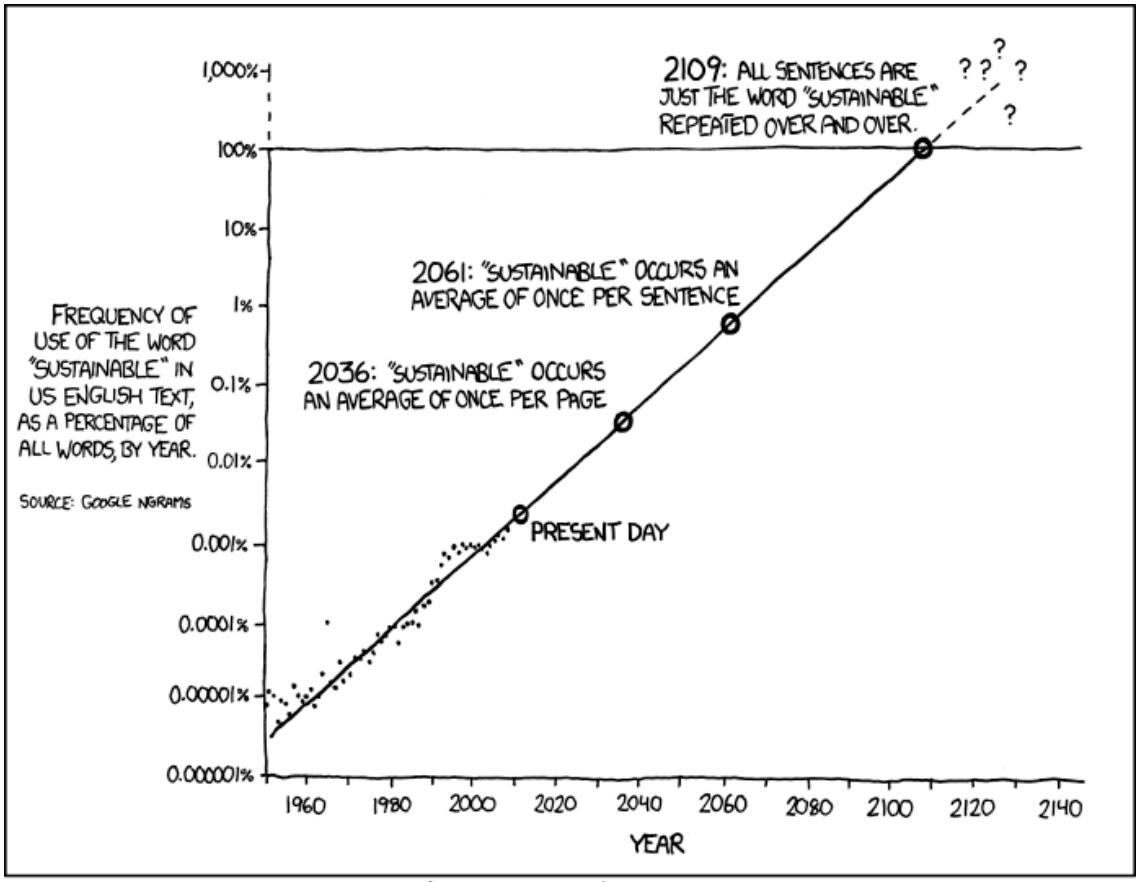
12. Describe any member of the Archaea. You cannot use the organism you described in question 10. (5 points)

13. Describe any organism that has never been grown in pure culture. You cannot use the organism you described in questions 10, 11 or 12. (5 points)

14. Describe a representative of the Planctomycetes. You cannot use the organism you described in question 10 or 12. (5 points)

15. Both Chloroflexi (as well as purple photosynthetic Bacteria) and Chlorobi use electrons from sulfide or hydrogen to generate usable reducing power for carbon fixation. Compare and contrast the mechanisms by which these two kinds of organisms do this. (6 points)

Organisms we've talked about in class			
Acidobacterium capsulatum	*Cytophaga hutchinsonii*	*Methanocaldococcus jannaschii*	*Roseiflexus castenholzii*
Anabaena	*Deinococcus radiodurans*	*Methanosarcina barkeri*	*Rotalipora globotruncanoides*
Anaerolinea thermophila	*Dermocarpa*	*Methanothermobacter thermoautotrophicus*	*Saccharomyces cerevisiae*
Aquifex pyrophilus	*Desulfovibrio desulfuricans*	*Microcystis*	*Sphaerotilus natans*
Archaeoglobus fulgidus	*Escherichia coli*	Mimivirus	*Sphyraena barracuda*
Arthrobacter globiformis	*Euglyphia strigosa*	*Mycobacterium ulcerans*	*Streblomastix strix*
Azotobacter vinelandii	*Fervisobacterium islandicum*	*Mycoplasma hominis*	*Streptomyces antibioticus*
Bacillus cereus	*Fischerella*	*Myxococcus xanthus*	*Sulfolobus solfataricus*
bacteriophage M13	*Flavobacterium johnsoniae*	*Nanoarchaeum equitans*	*Thalassia testinum*
bacteriophage Mu	*Fusobacterium nucleatum*	*Navicula*	*Thermocrinus ruber*
Bacteroides thetaiotaomicron	*Gemmata obscuriglobus*	*Nitrospira marina*	*Thermodesulfobacterium*
Bdellovibrio bacteriovorans	*Giardia lamblia*	*Opitutus terrae*	*Thermoleophilum album*
Beggiatoa alba	*Halobacterium salinarium*	*Oscillatoria*	*Thermomicrobium roseum*
Blastopirellula marina	*Helicobacter pylori*	*Pelodictyon phaeoclathratiforme*	*Thermoplasma acidophilum*
Borrelia recurrentis	*Heliobacterium chlorum*	*Physarum polycephum*	*Thermoproteus tenax*
Brocadia anammoxidans	Hepatitus delta vurus	*Phytophthora infestans*	*Thermosipho africanus*
Buchnera aphidicola	*Herpetosiphon aurantiacus*	*Prochloron*	*Thermotoga maritima*
Caulobacter crescentus	*Hexacontium giganthium*	*Prosthecobacter fusiformis*	*Thermus aquaticus*
Chlamydia trachomatis	*Isosphaera pallida*	*Protochlamydia amoebophila*	*Thiobacillus thioparus*
Chlorobium limicola	*Karenia breve*	*Pyrococcus furiosus*	*Treponema denticola*
Chloroflexus aurantiacus	*Korarchaeum cryptofilum*	*Pyrodictium occultum*	*Trypanosoma brucei*
Chondrus crispus	*Leptospira biflexa*	*Ralstonia solanacearum*	*Veillonella atypica*
Chromatium vinosum	*Leptospirillum ferrooxidans*	*Reclinomonas americana*	*Verrucomicrobium spinosum*
Clostridium botulinum	*Leuconostoc mesenteroides*	*Rhizobium etli*	*Vorticella*
Crysomallon squamiferum	*Magnetobacterium bavaricum*	*Rhodomicrobium vannielii*	*Wolbachia pipientis*



THE WORD "SUSTAINABLE" IS UNSUSTAINABLE.

from XKCD.com