

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

The rules: You are free to use any notes, books, or online material while taking this take-home exam. You are also free to use a calculator and ruler or other drawing material. 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 no later than when the start of the rest of the exam.

Signed : _____

Date : _____

Name : _____

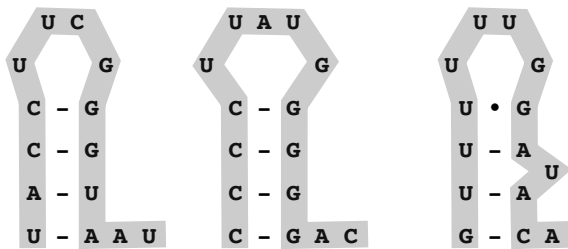
TOTAL = 55/100 points

1. Align the following sequences: (5 points)

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B. anthracis  A G A G A C U U G U A A U
B. brevis     A U G A G A C U U G C A A U
B. cereus    A C G A G A U C U G C A A U
B. diminuta  A C G A G A C C A U G C A A
    
```

2. Align the following RNAs: (5 points)



Escherichia

Frankia

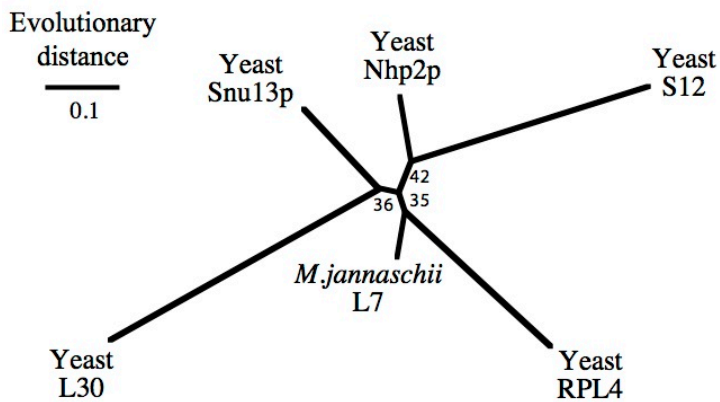
Gallionella

3. Draw the secondary structure of the *Iona* RNA in this alignment: (5 points)

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      - - ( ( ( - - - ( ( - - - - ) ) ) - - - ) ) - -
Hafnia  C C A C C - A A A U - U U C G - A U A G - G G U C G
Iona    U C G U - G A A G C C U U U - G G C G A A - A C C C
  
```

4. Convert this dendrogram into a phenogram. Please keep the tree to the same scale. Notice the bootstrap values, and assume that the Yeast L30 sequence is the outgroup. (5 points)

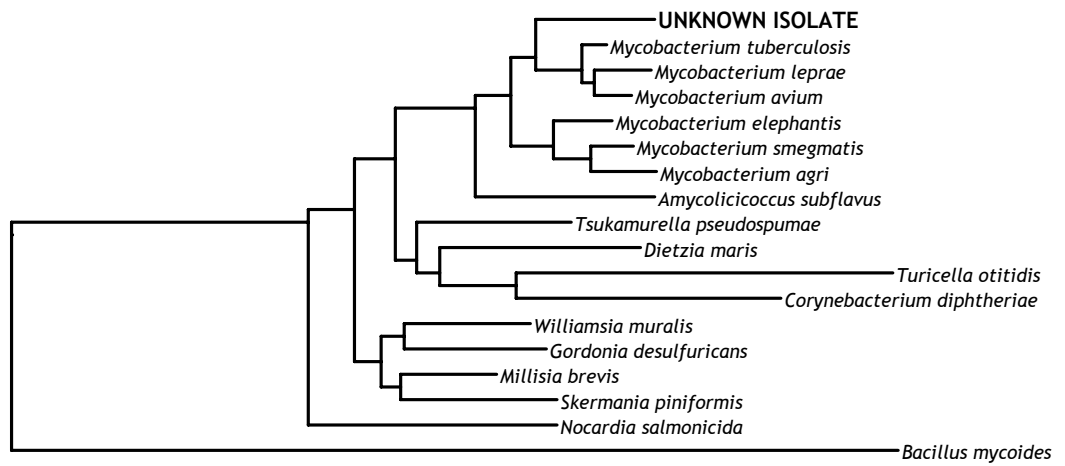


MICROBE
(ACTUAL SIZE)
↪

5. Use the following distance matrix to generate a tree (with branch lengths) using the neighbor-joining method. SHOW ALL OF YOUR WORK! (25 points)

	A	B	C	D	E	F
A	-	-	-	-	-	-
B	0.3	-	-	-	-	-
C	0.4	0.5	-	-	-	-
D	0.7	0.8	0.7	-	-	-
E	1.0	1.1	1.0	0.9	-	-
F	1.4	1.5	1.4	1.3	1.4	-

6. You have cultivated an unknown organism from a dust sample and have obtained its ssu-rRNA sequence. After running a couple of preliminary trees, you've zoomed it down to the following tree of relatives:



Scale: 0.1

A. Based on this tree, how closely can you identify this organism? _____

B. Make 4 independent, specific, testable predictions about the *properties* of your organism. (2 points each)

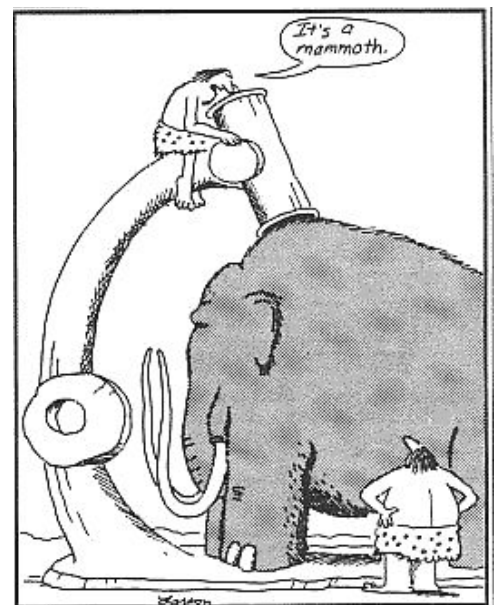
B1.

B2.

B3.

B4.

USE THIS PAGE FOR ANY ANSWERS YOU MAY HAVE BEEN LONG-WINDED ON:



Early microscope