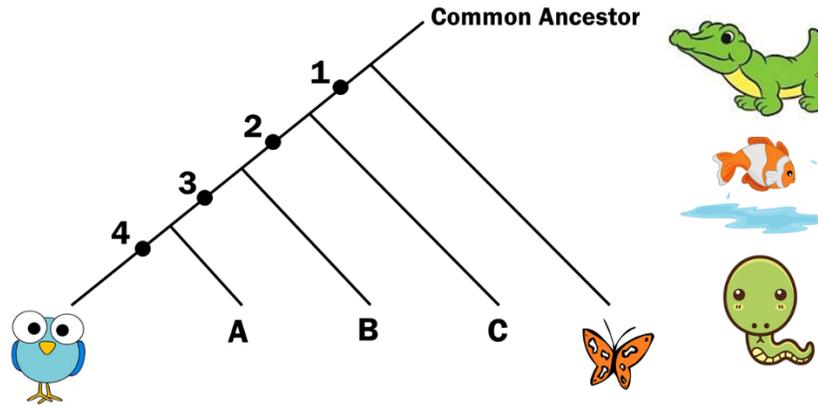# Biol 105 A Homework # 8

Exercise 1:

Complete the phylogenetic tree below using the provided pictures. Then, list 3 potential synapomorphies that differentiate the organisms. (1 pt)

1. What organism matches the letters in the phylogenetic tree above?

    A.   Click or tap here to enter text.

    B.   Click or tap here to enter text.

    C.   Click or tap here to enter text.
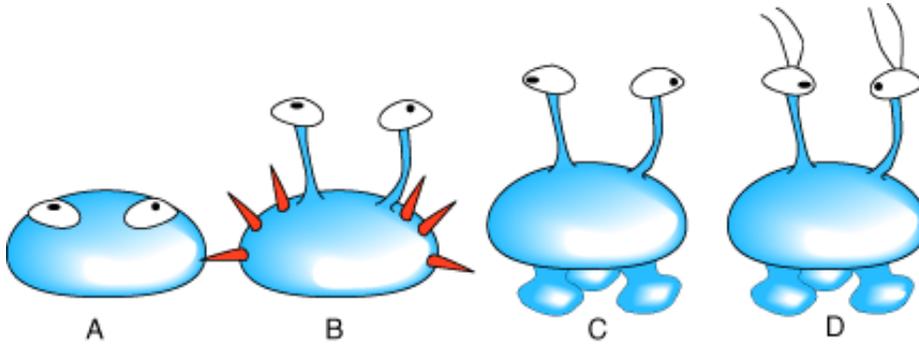
2. What are the 4 synapomorphies listed above?

    1.   Click or tap here to enter text.

    2.   Click or tap here to enter text.

    3.   Click or tap here to enter text.

    4.   Click or tap here to enter text.

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Exercise 2:

While exploring a planet in another solar system we discovered the following 4 interesting alien species. After being told that species "A" is very primitive, we decided to use it as the outgroup. To understand the evolution of this species we bring YOU on to the project to build a phylogenetic tree.

Build a <u>phylogenetic tree</u> and <u>include synapomorphies</u> based on the images of the aliens below. There is also a character matrix, which just shows the presence (1) or absence (0) of a characteristic in an alien species. (2 pts)

A   B   C   D

The following character matrix is scored:

Character	A	B	C	D
1. Eyes present	1	1	1	1
2. Spines present	0	1	0	0
3. Eyes on stalks	0	1	1	1
4. "Feet" present	0	0	1	1
5. Antennae present	0	0	0	1

Shape/ Synapomorphy	Character/Trait
Club (Outgroup)	Click or tap here to enter text.
Heart	Click or tap here to enter text.
Diamond	Click or tap here to enter text.
Spade	Click or tap here to enter text.
Synapomorphy 1	Click or tap here to enter text.
Synapomorphy 2	Click or tap here to enter text.
Synapomorphy 3	Click or tap here to enter text.
Synapomorphy 4	Click or tap here to enter text.

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Exercise 3:
Simulate evolution starting with a 10 base ancestral DNA sequence. Roll the dice to determine which base will mutate and what type of mutation will occur. Fill in the DNA sequences for all the internal nodes and tips shown in this worksheet. PRINT AND TURN IN SCAN OF EXERCISE 3(2 pts)
- Each group will begin with the same 10-nucleotide ancestral sequence.
- For every million years of time that passes, you will introduce 1 mutation.
- The 10-sided dice will determine which nucleotide gets the mutation.
- The 4-sided dice will determine what type of mutation occurs.
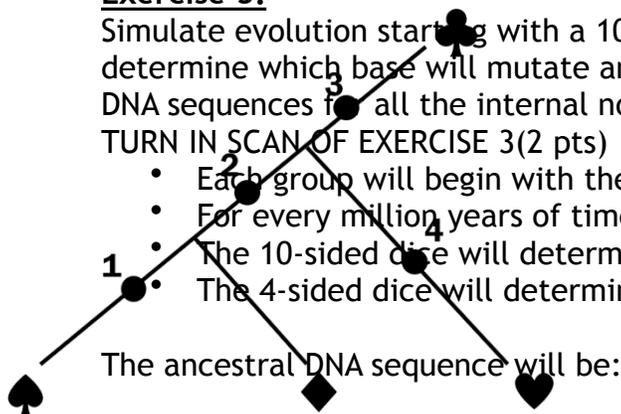
The ancestral DNA sequence will be:

1	2	3	4	5	6	7	8	9	10
A	T	C	T	G	C	G	G	A	T

From there, you will begin to simulation the process of evolution by rolling dice. You can find dice to roll by googling "roll dice."

To begin, for ancestral node 1, you will "mutate" one of the nucleotide base pairs according to the numbers rolled. The 10-sided dice will tell you what base to change and the 4-sided dice will tell you what the new base will be. You will use the table below to determine the new base.

Dice	New Base
1	A
2	C
3	G
4	T

Let's say you roll the roll below:
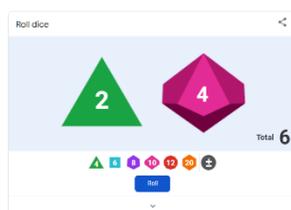
The 4 means the 4th base will change and the 2 means that the new base will be "C".

The Ancestral Node 1 will then be:

1	2	3	4	5	6	7	8	9	10

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A	T	C	C	G	C	G	G	A	T

Ancestral Node 1:

1	2	3	4	5	6	7	8	9	10
A	T	C	C	G	C	G	G	A	T

Ancestral Species

1	2	3	4	5	6	7	8	9	10
A	T	C	T	G	C	G	G	A	T

TIME

4 Million Years Ago   3 Million Years Ago   2 Million Years Ago   1 Million Years Ago   Current Time

4