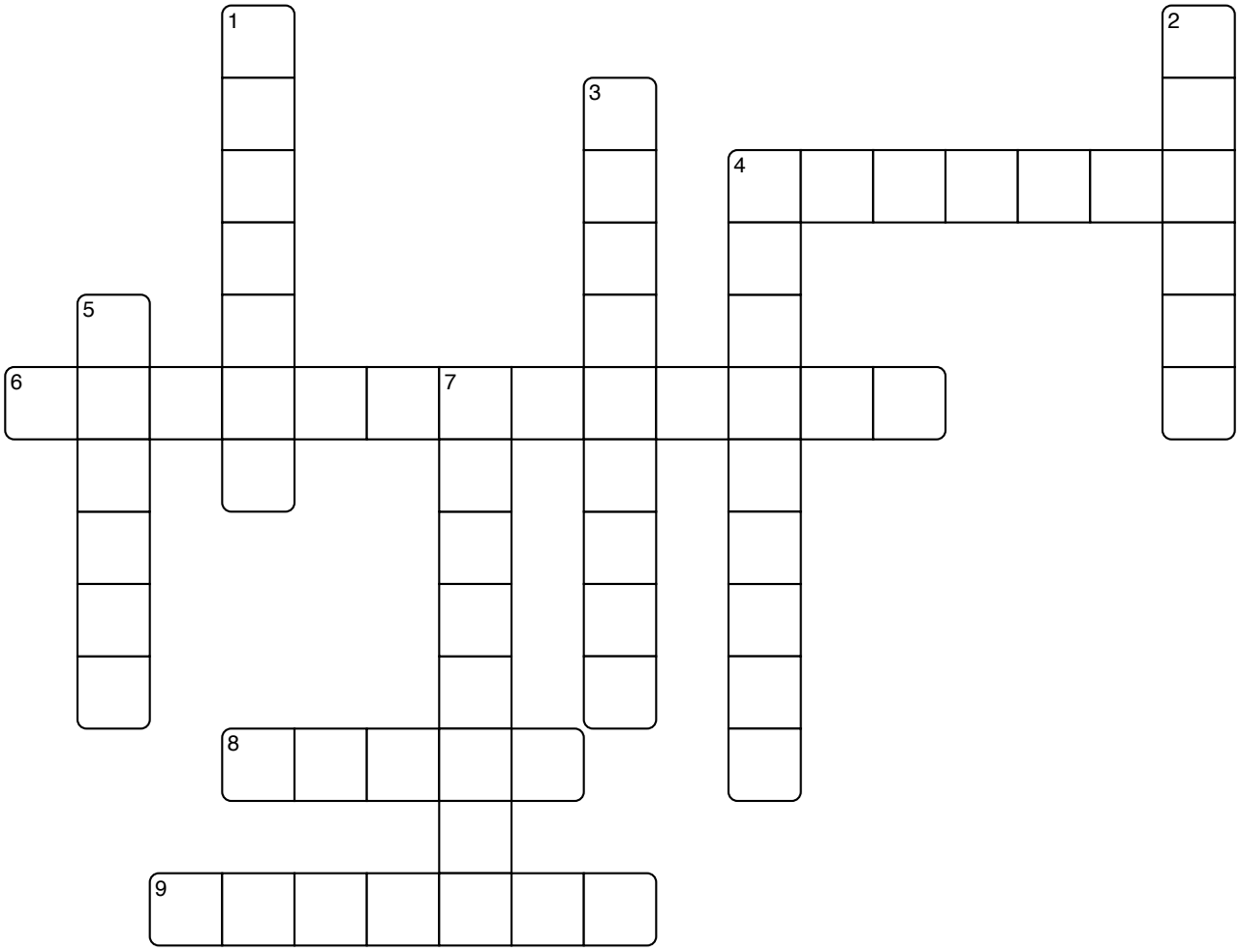
Teacher’s pack

Science for School in Teelings’s Bat Lab

Crosswords:
hints and answers

Protein synthesis



Across

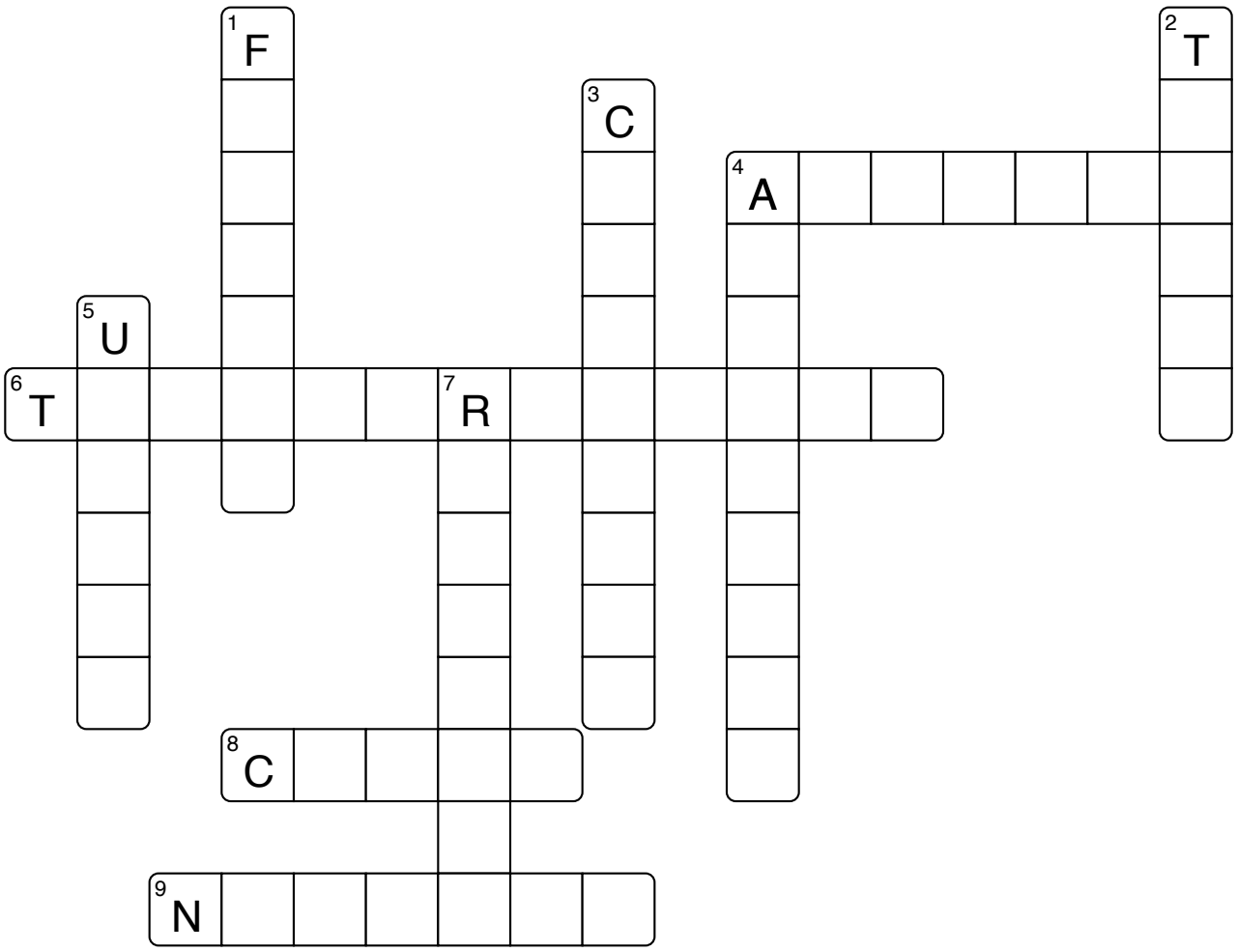
4. The name of the base which is complementary to Uracil on RNA.
6. The process where the genetic code gets transferred from one nucleic acid to another.
8. A group of 3 nucleotides-Hint: START & STOP
9. The site where initiation and translation occur.

Down

1. The last stage in protein synthesis.
2. The number of amino acids.
3. The place in the cell where you find tRNA.
4. The opposite to codon.
5. The base unique to RNA.
7. An organelle which is made up of two units.

by O.Derwin

Protein synthesis (with Hints)



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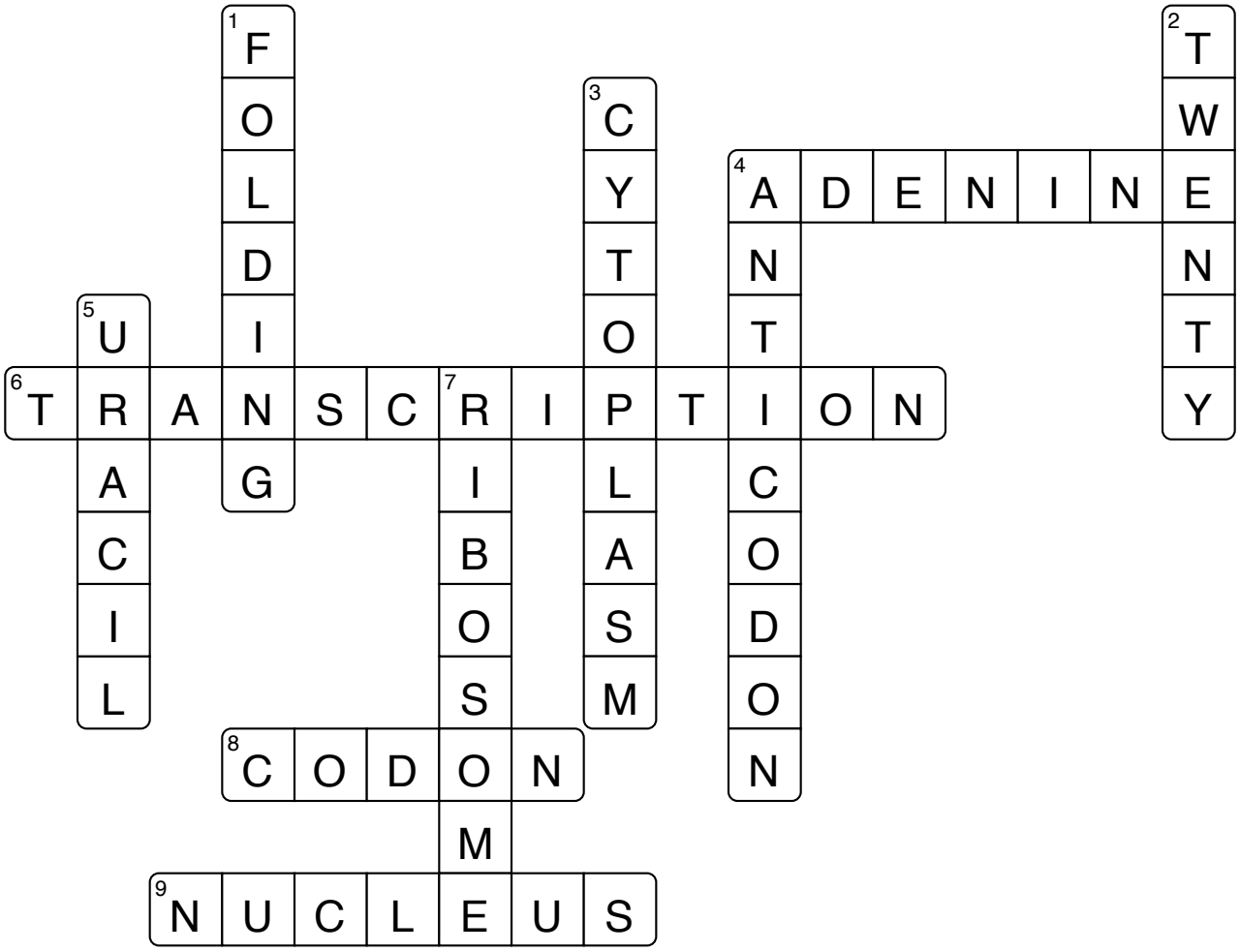
Protein synthesis (Answer Key)



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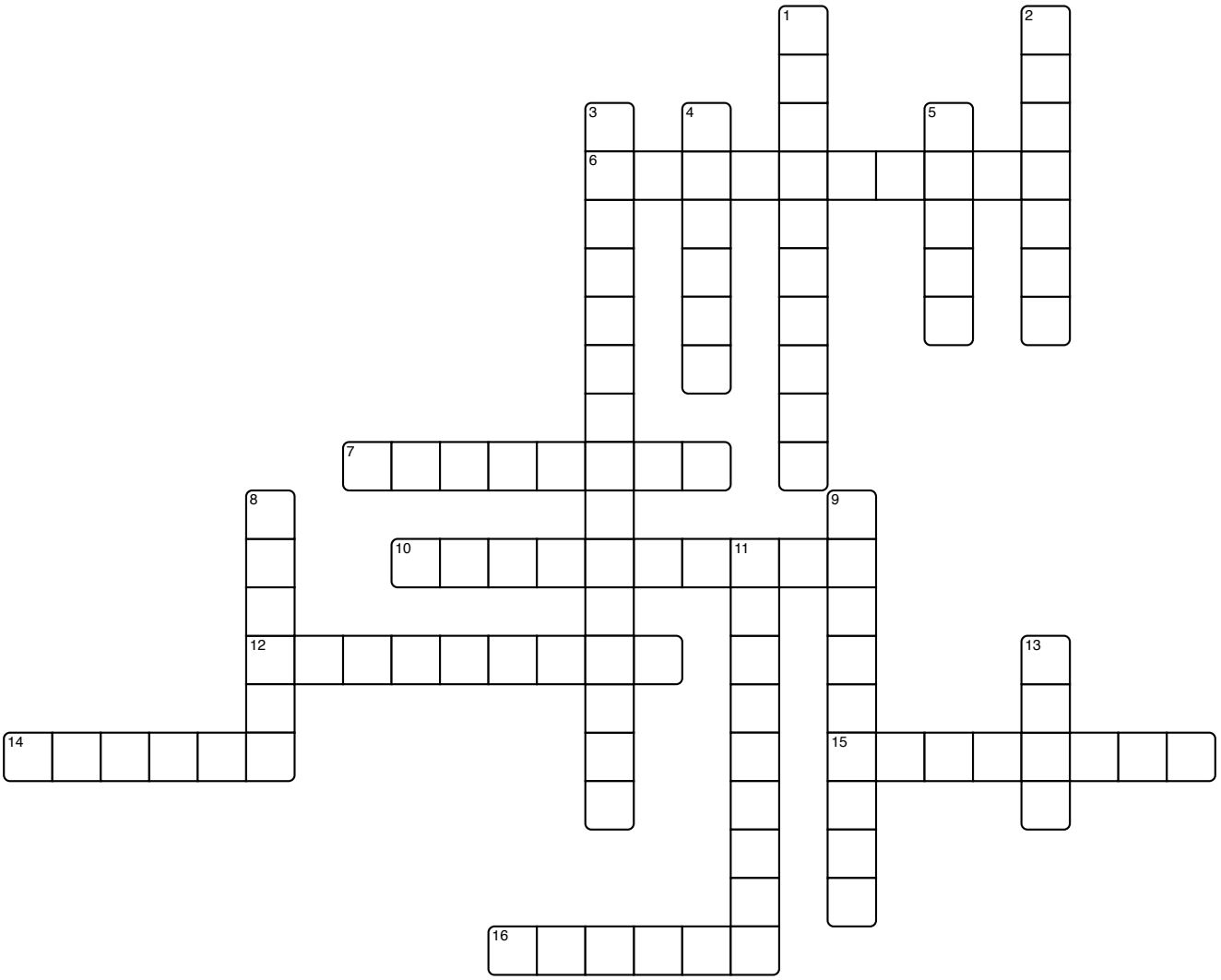
Evolution



Across

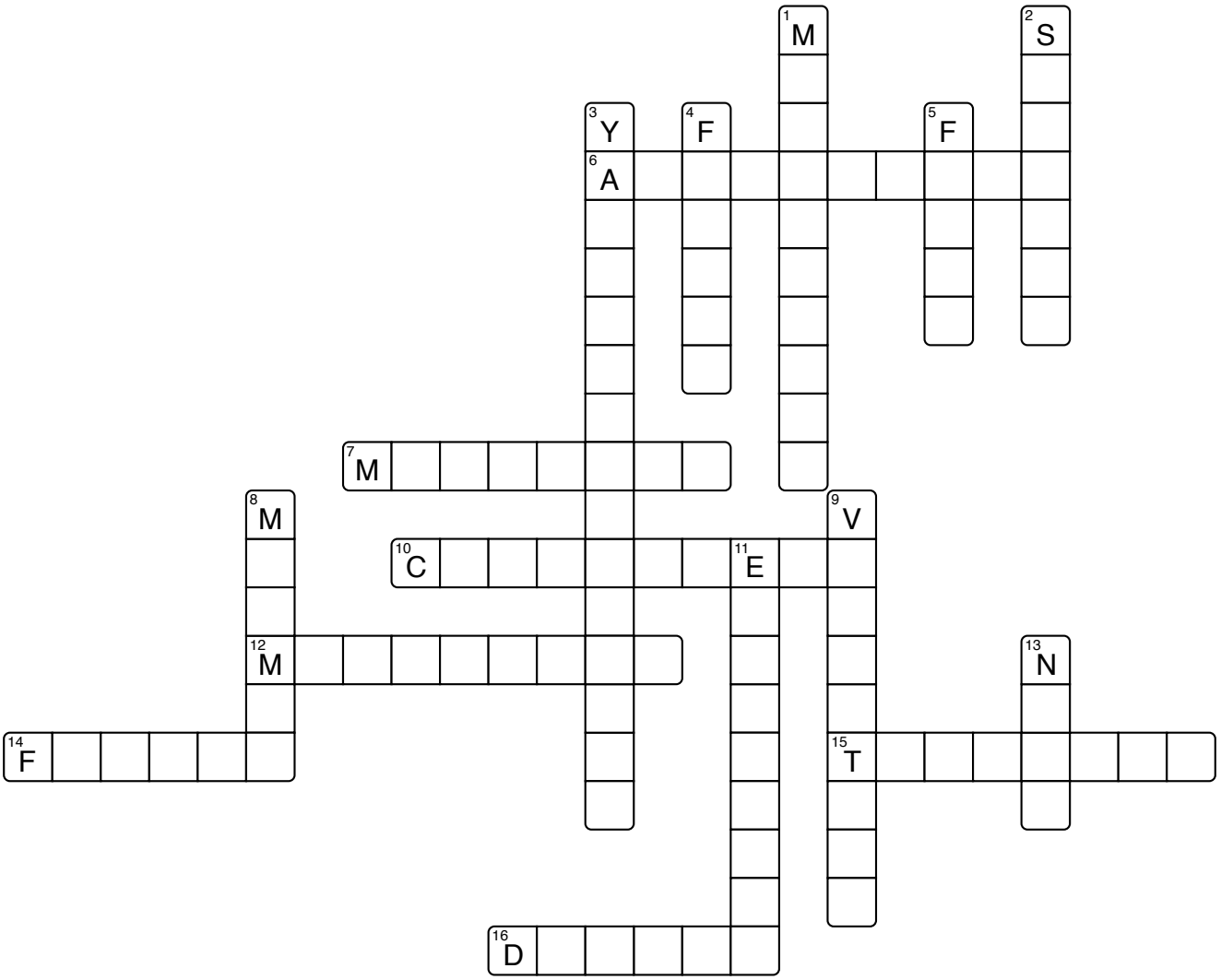
6. Another name for Geographic Isolation.
7. A cause of genetic variation.
10. Means 'Hand-Wing"
12. The only type of bats in Ireland.
14. Compressed dead plant and animal remains.
15. The study of classification.
16. The father of evolution.

Down

1. Study of structure (bones, teeth etc).
2. A group of similar organisms capable of interbreeding to form fertile offspring
3. MicroBats belong to this sub-order.
4. A trait which evolved before echolocation.
5. Megabats eat these.
8. Bats belong to this group.
9. genetic _____ essential for evolution.
11. This will not occur unless there is genetic variation.
13. The number of resident bat species in Ireland.

Olivia Derwin

Evolution (with Hints)



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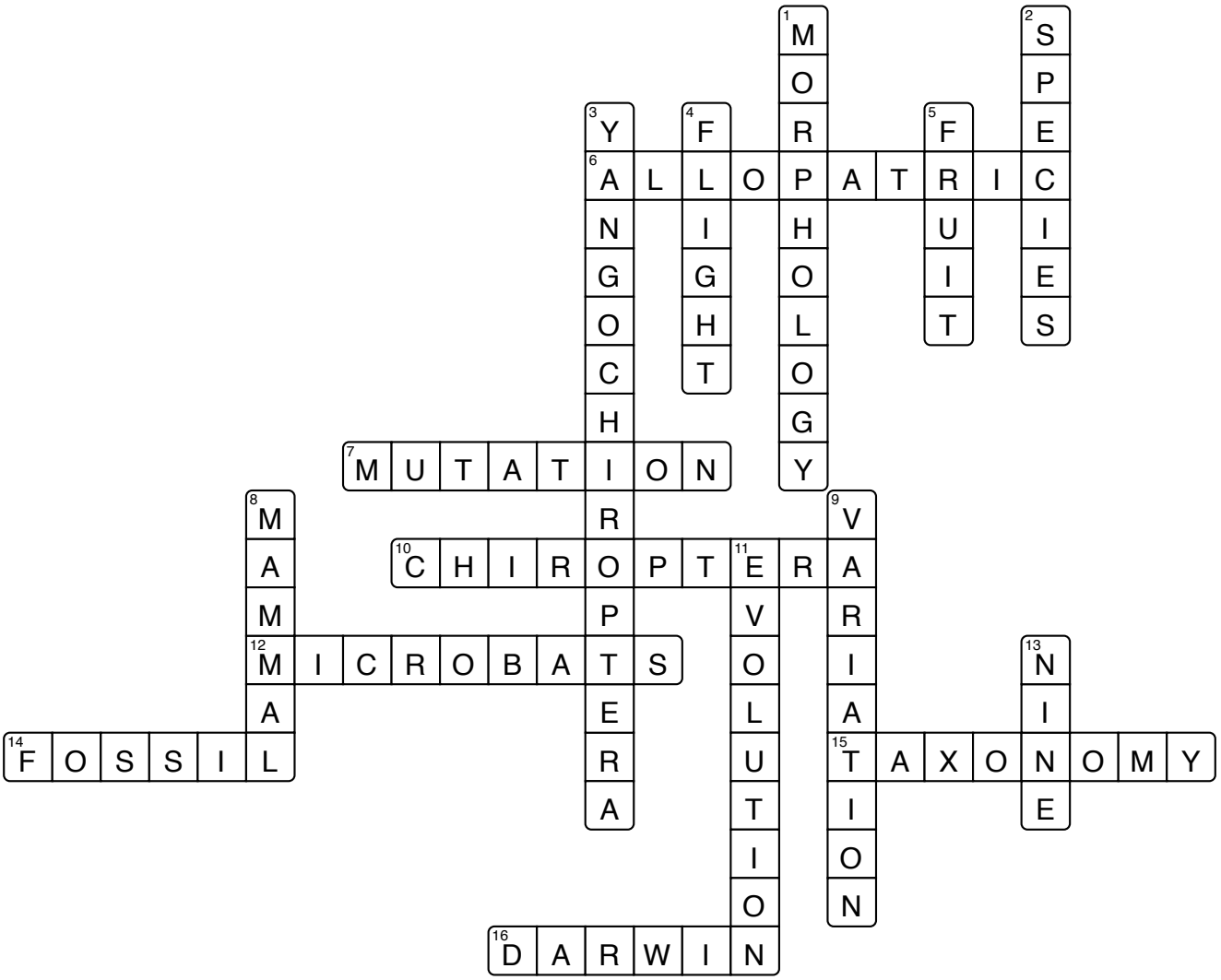

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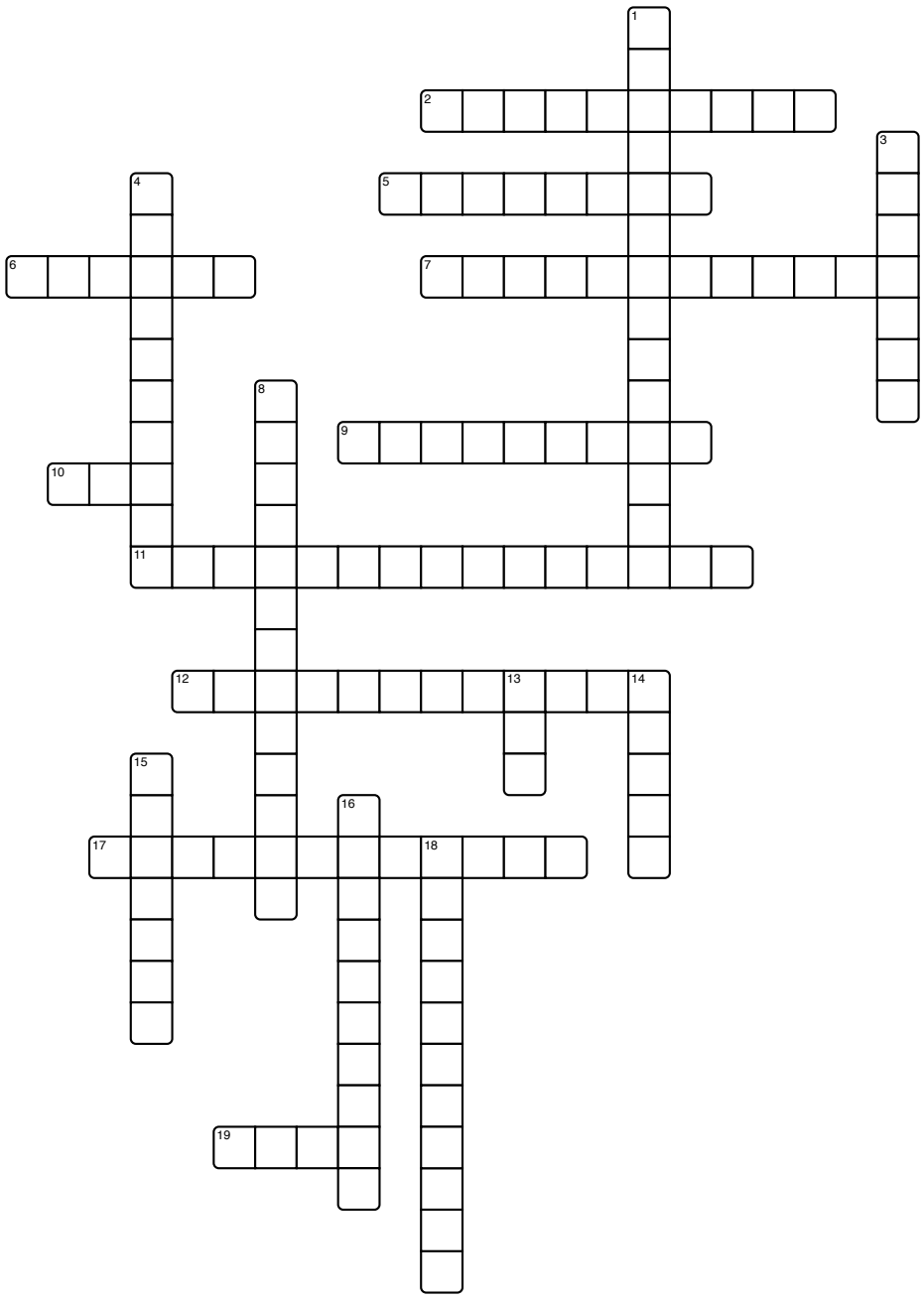
Bat Lab



Across

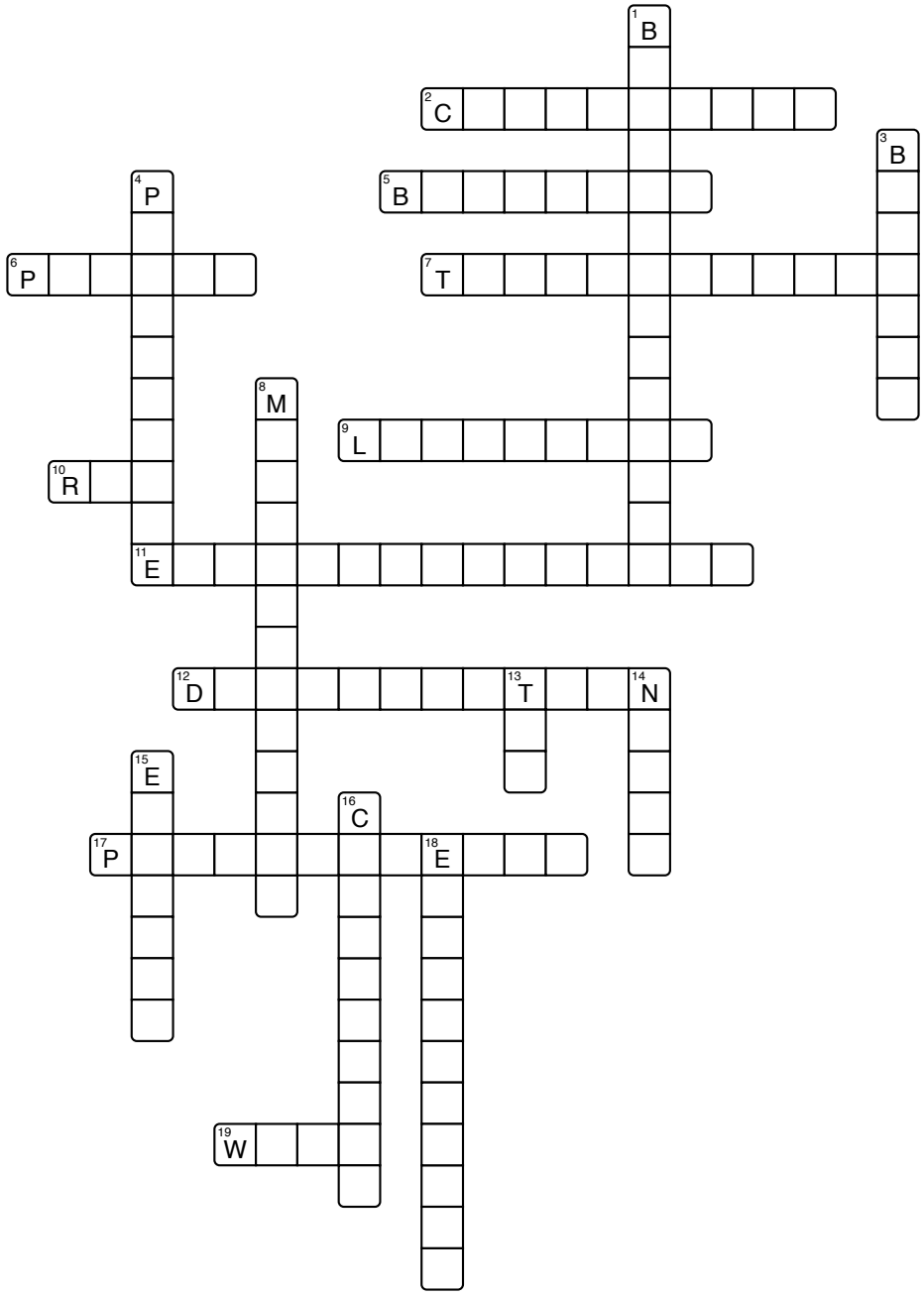
2. Chemical used in DNA purification-used as anaesthesia in bygone times.
5. An area of France where there are many bats.
6. What DNA looks like when centrifuged with ethanol.
7. Loves high temperatures.
9. A trait which bats have and we long for.
10. Single stranded nucleic acid.
11. Separating DNA fragments using electricity and gel.
12. The first stage in PCR.
17. Another name for a gene tree.
19. A part of bat where tissue samples are taken.

Down

1. Computer analysis of genetic sequences.
3. DNA_____, created using part of the CO 1 gene sequence to identify species.
4. A type of enzyme used in PCR.
8. Organelle with DNA-useful in examining DNA changes.
13. Enzyme used in stage step 3 of PCR.
14. The prize the inventor of PCR was awarded.
15. DNA is insoluble in this.
16. Machine which spins samples, used in separation.
18. Causes the DNA to move up the gel in electrophoresis.

by Olivia Derwin

Bat Lab (with Hints)



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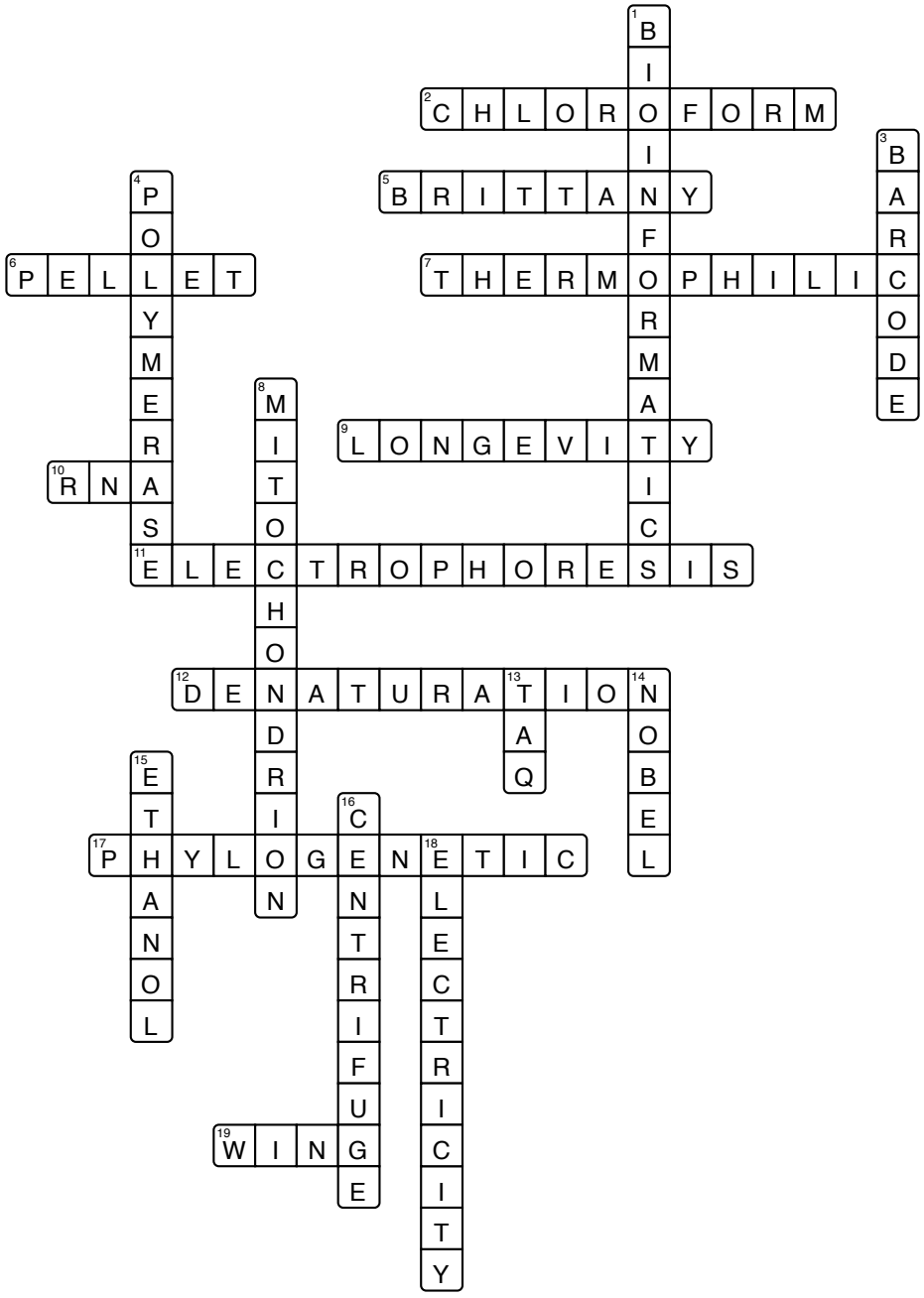

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DNA sequences in FASTA format:
Section 3

Section 3.1.
Please note that blast and other DNA analysis tools require the following format to be used while pasting the sequences for alignments:

> **(Greater than) NAME** (name of the sequence) **sequence (As, Ts, Gs, Cs)**

> *Myotis brandtii* cytochrome b (cytb) gene

ATGACCAACATTCGAAAATCTCACCCCTTAATAAAAATTATTAACAGCTCATTTATTGACCTCCCTG
CCC
CATCAAACATTTCATCTTGATGAAACTTTGGATCTCTCCTAGGAATTTGCTTAGCACTACAAATTTT
AAC
AGGACTATTTCTAGCTATACACTACACATCAGACACCACAACAGCTTTTAACTCTGTCACCCATAT
TTGC
CGAGATGTAAACTATGGTTGAGTTCTACGCTACTTGCATGCAAATGGAGCCTCCATATTTTTTATC
TGCC
TATATCTCCATGTAGGACGGGGCCTTTACTATGGGTCCTATATATATACAGAAACCTGAAATATCG
GAGT
TATTCTATTATTTGCTGTAATAGCAACAGCCTTTATAGGATATGTACTTCCATGAGGACAAATGTCT
TTC
TGAGGAGCAACAGTAATTACCAACCTGCTCTCTGCAATTCCGTACATTGGAACAGACCTTGTAGA
ATGAA
TCTGAGGCGGCTTCTCTGTTGACAAAGCTACTTTGACCCGATTCTTTGCCTTTCACTTTTTACTCC
CATT
TATTATTGCAGCCATAGTCATAGTCCACCTCCTATTTCTTCACGAAACCGGATCCAATAACCCAAC
AGGA
ATCCCCTCCAACGCTGATATAATCCCCTTCCACCCCTACTATACAATTAAAGACATTCTTGGCCTG
CTAT
TAATAATTACAGTCCTACTCATACTAGTACTATTCTCCCCCGACCTGCTAGGAGACCCTGACAACT
ACAC
ACCAGCGAACCCACTAAACACCCCTCCCCATATCAAACCGGAATGGTACTTTTTATTCGCATATG
CAATT
CTACGATCAATTCCAAACAAACTAGGAGGAGTGTTAGCCCTAGTACTATCAATCCTTATTCTAATT
ATCA
TTCCCCTACTCCACACCTCCAAACAACGCAGCATAACTTTTCGTCCCTTAAGCCAGTGCCTATTCT
GACT
ATTAACAGCAGATCTATTCACTCTAACATGAATCGGAGGACAGCCCGTCGAACATCCATATGTCA
TCATT
GGCCAACTAGCATCAATTCTTTATTTTTCTATTATCATTATCCTAATACCACTTATTAGCCTGATAG
AGA
ACCACCTACTAAAATGAAGA

Section 3.1 Student task: what do bats eat?

>gene from unknown bat food 1

TTTACATCCACCATTTTCTATACAAATGAAGATGCTCTTGGCTCGACATAGTTTGTTCTGTTCCATT
AGG
AATCTAATTTTTCTTAGGTTGATAGTACATGATGGAGCTCGAGCGGAAAGGATTGATTCATTTATC
AAGG
GGAAGAATCTAGGGTTAGTGCCAATCAATCAATAAGTTAGACCAGCTTTGTAAGTATATCCTTAAA
ATAT
AAAATAATCGGAATTGATAAAACTATTTCGATCAAAAAAAAGTGTATCACAGAGGAATCAATTCTT
CGTA
TTCTATTTCTATGGGTATTCTATTTCTATAGAAAGAAATAAAAAAAACAAAAGGTATGTTGCTGCCC
TTT
TGAAAGGAGTAAGGATCACCGAAGTAATGTCTAAGCCCAATGATTTTACAAAGCAAAGATAAAGG
ATTCC

GAAACAAGGAAACACTATTTTCAATTGTCTCAAAAATTGGATCAGAATTAGGAATAAAAATAGATT
AGAG
ATGAGACAAACAAAAGAGGTTAGAGACGGCTCAAGAAATGTCTAAGGATTTCCCTTCGAATTCTG
TCAGA
ATTACCCAACTTGAGTTATGAGTACGAATGAAATTTATTTTTTTTTTTTTTTTAGGAAGAACAAAATA
AT
AATAATGAATTAGACTATGATTTGAGTCATTATTTTGTGTTTACTATTTGATATTATATACAGAAAGA
TA
TACCGAAATTAAAATAATTTTTTCTCGAGCTCGAGCCGTATGAGGAGAAAAACCTCCTATACGTTT
CTGG
GGGGGGATTGTTTATGTACATCTATCCCAATGAGCCATCTATCGAATCGT

>gene from unknown bat food 2

GGAACATCTTTAAGTATTTTAATTCGTGCAGAACTTGGACACCCCGGGGCCTTAATTGGAAATGA
TCAAA
TTTATAACGTAATCGTAACCGCCCATGCTTTCGTAATGATTTTTTTTATAGTAATACCAATCATAAT
TGG
AGGATTCGGAAATTGATTGGTTCCATTAATACTCGGAGCCCCGGATATAGCATTTCCCCGAATAA
ATAAT
ATAAGATTTTGAATACTTCCCCCTTCTTTAACATTACTTTTATTAAGCAGACTAGTTGAAAATGGGG
CTG
GGACTGGTTGAACAGTCTACCCCCCTCTTTCAGCTAATATCTCCCATGCAGGAGCATCAGTCGAT
CTAGC
AATTTTTTCCTTACATCTGGCAGGTATCTCCTCTATCCTAGGGGCAGTTAATTTTATTACAACAATT
ATT
AATATACGATCCAGAGGAATTTCATTTGATCGTATACCCTTATTTGTGTGATCTGTCCTAATTACTG
CTA
TCCTACTTTTACTATCTTTACCAGTTTTAGCCGGAGCAATCACTATACTTCTGACCGATCGAAATA
TTAA
TACTTCTTTTTTTGACCCCGCCGGAGGAGGAGATCCCATTTTATACCAACACTTATTTTGATTTTTT
G

Section 3.2. Sequences of cytochrome b from 8 bat species. You can use these sequences or ask students to find them at http://www.ncbi.nlm.nih.gov/nuccore/ database (note that it is best to use the scientific names of the species while browsing this resource). You should copy and paste ALL the sequences at once to Clustal.

>Flying Fox cytochrome b

ATGACAAACATCCGAAAATCACACCCATTATTCAAAATTATCAACGACTCACTAATCGACCTGCCCGCCC
CATCAAATATCTCTTCGTGATGAAACTTCGGCTCACTTCTAGGCATCTGCCTAGCCATCCAAATCTTAAC
GGGACTATTCCTGGCCATACACTACACTTCGGACACAACGACCGCCTTCCAATCCGTGACCCACATCTGC
CGAGACGTAAACTACGGCTGAATCCTACGTTACTTACATGCCAACGGAGCATCCATATTTTTCATCTGTC
TATTCCTACATGTAGGCCGAGGCCTGTATTACGGATCTTATATGTATAAAGAAACATGAAACGTAGGTGT
TATCCTCCTATTTGCTGTAATAGCAACAGCCTTCATAGGATATGTTCTCCCATGAGGCCAAATATCATTC
TGAGGAGCAACAGTCATCACCAACCTGCTCTCAGCAATCCCCTACATCGGCACAAAACTAGTAGAATGAA
TCTGAGGGGGATTCTCAGTAGACAAAGCTACCCTAACACGATTTTTCGCTTTCCACTTTCTCCTCCCATT
CATCATCTCCGCCCTAGTCCTAGTCCACCTCCTCTTTCTCCACGAAACTGGATCAAACAACCCAACAGGA
GTCCCATCAGACTCAGACATAATTCCATTCCACCCCTACTACACAATCAAAGACATACTTGGCGCACTAG
TCATAATCCTGGCACTCCTAATACTAGTCCTATTCTCCCCCGACCTCCTAGGAGACCCAGATAACTACAT
CCCAGCCAACCCACTAAATACCCCTGCCCACAGTAAACCAGAATGATACTTCCTATTCGCGTATGCCATC
CTACGATCCATCCCCAACAAACTTGGAGGAGTACTAGCCCTAGTCCTATCTATCCTAATCCTAATTCTTA
TACCACTTCTACACACATCAAAACAACGAAGCATAATATTCCGACCACTTAGCCCATGTATATTCTGACT
CTTAGTGGCGGACCTACTAACACTAGCCTGAATCGGCGGACAACCTGTTGAGCACCCATGTATTATCATC
GGCCACTTTGCATCCATCCTATATTTCCTCCTCATCCTAGTTCTGATACCCATCATAAGCATTGTAGATA
ACCATCTCCTAAAATGAAGG

>Black Flying Fox cytochrome b

ATGACAAACATCCGCAAATCACACCCACTATTCAAAATTATCAACGACTCACTGATCGACCTACCCGCCC
CATCAAGTATTTCCTCATGATGAAACTTCGGCTCACTACTAGGCATCTGCCTAGCCATCCAAATCCTAAC
AGGACTATTCCTAGCTATACACTACACTTCAGACACAACGACCGCCTTCCAATCCGTGACCCATATCTGC

CGAGACGTAAATTACGGATGAATTCTGCGTTATTTACATGCTAACGGAGCATCCATATTCTTCATCTGCC
TATTCTTACATGTAGGCCGAGGCCTCTACTACGGATCTTATATCTACAAAGAAACCTGAAACGTAGGTGT
TATTCTCCTATTTGCCGTAATAGCAACAGCCTTCATGGGATACGTACTCCCATGAGGCCAAATATCATTC
TGAGGGGCAACAGTCATTACCAATCTACTCTCAGCAATCCCCTATATCGGGACGAACCTAGTAGAATGAA
TCTGAGGGGGATTCTCAGTAGACAAAGCCACCCTAACACGATTCTTCGCTTTCCACTTCCTCCTCCCATT
TATCATCTCAGCCCTAGTTTTAGTCCACCTTCTCTTCCTTCATGAAACCGGCTCGAACAACCCAACAGGA
ATCCCATCAGACTCAGACATAATTCCATTTCACCCATATTACACAATCAAAGACATACTAGGCGCATTAG
CCATAGTCCTAGCACTCTTAATATTAGTCCTATTTTCTCCCGATCTCCTGGGAGATCCAGACAACTATAT
CCCGGCCAACCCATTAAATACCCCTCCACACATTAAGCCAGAATGATATTTCTTGTTCGCGTACGCCATT
TTACGATCTATCCCCAACAAACTTGGAGGAGTTCTAGCTCTAGTCCTATCAATCCTAATCCTAATTCTAA
TGCCACTCCTACACACATCAAAACAACGAAGCATAATATTCCGACCACTCAGCCAATGCATATTCTGACT
CTTAGTGGCCGACCTACTAACACTAACCTGAATCGGCGGACAACCCGTCGAACACCCATTTATCATTATC
GGCCAACTAGCATCTATCCTATATTTCCTTCTTATCCTAGTCCTGATACCTATTACAAGCATCGTAGAAA
ACCATCTCCTAAAATGAAGG

>Bumblebee Bat cytochrome b

ATGACTCACATTCGAAAATCTCACCCCCTATTCAAAATCCTAAACGACTCCTTCATTGACCTACCTGCCC
CATCCAGCATTTCCTCATGATGAAACTTCGGCTCCCTCCTAGGAATTTGCCTAGGCGTACAGATCTTAAC
AGGACTCTTCCTAGCAATACACTACACATCCGACACCGCAACCGCCTTTCACTCAGTCACCCATATCTGC
CGAGACGTTAATTATGGCTGAGTCCTACGCTACACCCACGCCAACGGAGCCTCTATATTTTTTATTTGCC
TATTCCTTCATGTTGGCCGAGGTATCTACTACGGCTCATATACATACACAGAAACATGAAACGTAGGCAT
CATTCTACTATTCGCTGTTATAGCAACCGCATTCATAGGTTACGTCCTTCCATGAGGACAAATATCCTTC
TGAGGAGCTACTGTAATTACCAACCTCCTCTCAGCCATCCCCTATATTGGCACAAACCTCGTAGAATGAG
TTTGAGGTGGCTTTTCCGTTGATAAAGCCACTCTCACCCGCTTCTTTGCCCTCCACTTCTTACTCCCATT
CATCATCGCCGCCCTAGTCATAGTCCACCTACTATTCCTCCACGAAACTGGGTCCAACAACCCAACCGGA
ATCCCATCCGACATAGATATAATCCCATTCCACCCATACTACACAATCAAAGACATCCTAGGTCTTATAA
TTATGATTATAGCACTCCTCACCCTAGTCTTATTCTCACCCGACCTCTTAGGAGACCCCGACAATTACAC
CCCAGCAAACCCCCTAAACACCCCTCCCCATATTAAACCAGAATGGTATTTTCTATTCGCCTACGCTATT
CTACGCTCAATTCCTAACAAACTAGGCGGAGTGTTAGCCCTAGTCCTATCAATCCTAATTCTAGCAGTCC
TCCCACTACTCCATACATCAAAACAACGAAGTATAACCTTCCGCCCTCTTAGCCAATGCCTATTCTGACT
TCTCGTGGCCGACCTACTAACACTAACCTGAATTGGAGGCCAACCAGTTGAGCATCCCTTCATCGTTATT
GGCCAACTCGCCTCCATCCTATACTTCCTCATTATCCTCGTTCTTATACCCCTAGCAGGAATTACAGAAA
ACCGCCTATTGAAATGAAGAGTCTCTGTAGTATATGCTATTACCCCGGTCTTGTAAACCGAAAAAGAGAA
ACAACATTCTCCAAAGACTTCAAGGAAGAAACATACAGTCCCACCATCAACACCCAAAGCTGATATTCTA
CTTAAACTATTCCTTGACCACTCTTATCAATAGACTTAACACACTCTCCCCTAACACACCCCTATTAACA
CTCTCCCCTAACACACCCCTATTAACACTCTCCCCCACCCTATGTAATTCGTGCATTATATTATGTACCA
CATACATTATATAGTACATATATGTATAATAGTACATTAAATTATATGCCCCATGCTTATAAGCAAGTAC
ATATTATTATATATAGTACATAGTACATAACTGGATACGTACATAATATATATCTTCCCCACGAAAGTGC
TCTATAACAGTCAATGTTTAGTTTTACATAGTACATAGATTCCTTGGTCGTACATACCCCATTAAGTCAA
ATCATTTATCTTCCAAATGCATATCATCTCCAACGGGTTATTTCTTAATCTACCAACTCACGTGAAACCA
GCAACCCTTGCGAGACGTGTCCCTCTTCTCGCCCCGGGCCCATCGATCGTGGGGGTTTCTAGTATTGGGG
TGTAAACGACATCTGGTTCTTTCTTCAGGGCCATCTCACCTAAAATCGCCTATTCTTTCCTCTTAAATAA
GACATCACGATGGGTTCATGACTAATCAGCCCATGCCGACACATAACTGTGGTGTCATGCCTTTGGTATT
TTTAATTTTTTA

>Little Brown Bat cytochrome b

ATGACCAACATTCGAAAATCTCACCCCCTAGTAAAAATTATTAACAGCTCATTTATTGACCTTCCCGCTC
CGTCAAACATCTCATCCTGATGAAACTGTGGGTCCCTCCTAGGAATCTGTCTAGCATTACAAATCCTAAC
AGGACTATTCTTAGCCATACACTACACATCAGATACTGCAACAGCCTTCAACTCTGTCACTCATATTTGT
CGAGATGTAAACTATGGCTGAGTCCTACGCTATTTACATGCAAACGGAGCTTCCATATTTTTTATTTGCC
TATATCTTCACGTAGGGCGAGGTCTCTATTATGGGTCCTACATATATACAGAAACCTGAAATATTGGAGT
TATCCTACTATTTGCCGTAATAGCAACAGCTTTCATAGGATACGTACTTCCATGGGGCCAAATATCCTTC
TGAGGGGCAACCGTAATTACTAATTTACTCTCTGCAATCCCATATATTGGAACAAACCTAGTAGAATGAA
TCTGAGGTGGATTCTCTGTTGACAAGGCTACCTTAACCCGATTCTTTGCCTTCCACTTCCTACTCCCATT
TATCATTGCAGCCATAGTCATAGTTCACCTATTATTCCTACACGAAACAGGATCTAATAACCCAACAGGA
ATTCCTGCCAACGCAGATATAATCCCCTTTCACCCCTACTATACAATTAAAGATATTCTCGGCTTGCTAT
TAATGATCACAGCTCTGCTCACTCTAGTACTATTTTCCCCTGACTTACTAGGAGATCCTGACAATTATAC
ACCAGCCAATCCATTAAATACTCCCCCCCACATCAAACCAGAGTGATACTTTCTATTCGCATACGCAATT
TTACGATCAATTCCAAATAAACTGGGAGGAGTACTAGCCCTAGTGCTATCAATTCTTATCTTAGTTATTG
TCCCCCTACTCCACACCTCCAAACAACGCAGCATAACCTTCCGTCCCTTAAGTCAATGCCTATTCTGACT
ATTAACAGCGGACCTTTTTACTCTAACATGAATTGGAGGTCAACCTGTCGAACATCCCTACGTTATCATT

GGCCAACTAGCATCAATCCTCTATTTCTCAATTATCATTATCCTAATACCACTTACCAGCCTAATAGAAA
ATCACCTATTAAAATGAAGA

>Common Pipistrelle cytochrome b

ATGACAAACATTCGAAAATCCCACCCCCTGATCAAAATCATCAATAACTCATTCATTGATCTACCA
GCTC
CATCAAACATTTCAGCATGATGAAATTTTGGGTCCCTACTAGGCATCTGTTTGGGACTACAAATCC
TAAC
GGGCTTATTTCTTGCTATACACTACACATCAGACACAGCAACCGCCTTCAGCTCCGTTACTCACA
TCTGT
CGAGATGTGAATTACGGATGAGTTCTACGATATCTACACGCAAATGGAGCCTCTATATTTTTTATT
TGCC
TATACCTGCACGTGGGACGAGGCCTTTACTACGGATCCTACTTATTTAAAGAAACCTGAAACATA
GGGGT
TGTTTTACTATTTGCTGTGATAGCAACAGCCTTCATAGGCTATGTCCTACCATGAGGCCAAATATC
TTTT
TGAGGAGCTACTGTAATCACTAATCTACTTTCTGCAATTCCGTACATCGGAACTGACCTTGTTGAA
TGAA
TTTGAGGCGGATTCTCTGTGGATAAAGCTACCTTAACCCGATTCTTCGCCTTCCATTTCCTCCTCC
CATT
TATTATTTCAGCCTTAGTCATAGTTCACCTTCTATTTTTACATGAAACAGGATCTAATAACCCAACA
GGC
ATCCCCTCTAATATAGACATAATCCCCTTCCATCCATATTACACAATCAAGGATATTCTAGGACTC
TTTA
TAATGATCCTTGTCCTATTATCTCTAGTCCTATTCTCACCTGATATATTAGGCGACCCTGATAATTA
TAC
ACCAGCAAACCCACTTAGTACTCCCCCTCACATTAAACCAGAATGATACTTCTTATTCGCATATGC
AATC
TTACGATCAATTCCTAACAAATTAGGAGGAGTCCTAGCCTTAGTTCTTTCTATCCTTATCCTTGTAA
TCA
TCCCATTCCTCCACACATCCAAACAACGAAGTATAACTTTCCGCCCTCTCAGTCAGTGTTTATTCT
GACT
TTTAACAGCAGACCTTCTAACCTTAACATGAATTGGAGGACAACCGGTTGAACACCCTTATGTCAT
CATT
GGCCAAT

>Brown Long-Eared Bat cytochrome b

ATGACCAACATTCGAAAGTCTCACCCCCTTATAAAAATTATCAATAACTCACTCATTGACTTACCTGCCC
CCTCAAATATTTCATCATGATGAAACTTCGGATCTCTTCTGGGCATCTGCCTGGCGCTACAAATTCTAAC
AGGACTTTTCTTAGCCATACATTACACATCAGATACCACAACAGCCTTCAGTTCTGTCACCCATATTTGC
CGAGACGTGAACTATGGCTGAGTACTACGATACCTTCATGCCAATGGAGCTTCTATATTTTTCATTTGCC
TTTATCTACATATTGGCCGAGGCCTATACTACGGATCCTACCTGTATATAGAGACTTGAAACGTAGGTGT
CATTCTACTATTCGCCGTTATAGCCACTGCCTTTATAGGATACGTGCTCCCATGGGGCCAAATATCTTTT
TGAGGAGCAACCGTAATCACTAACTTACTATCTGCAATCCCATATGTCGGAACAAACCTCGTCGAATGGA
TCTGAGGCGGATTTTCCGTAGATAAAGCCACATTAACCCGATTCTTCGCATTCCACTTCCTATTTCCCTT
TATCATCTCTGCCATGGTTATAGGGCACCTCTTATTTCTTCACGAAACTGGATCTAATAACCCAACAGGA
ATCCCCTCTAACATAGATATAATTCCCTTTCATCCTTATTACACAATTAAAGACATCCTAGGCCTTCTAG
TAATAATCATAAGCCTCCTGGCCTTAGTCTTATTCTCTCCAGACATGCTAGGAGATCCTGACAACTACTC
CCCAGCCAACCCACTCAATACCCCCCCTCATATCAAACCAGAGTGATACTTCTTATTTGCATACGCAATT
CTACGATCAATCCCTAATAAACTAGGCGGAGTACTTGCTCTAGTACTTTCAATCTTAATCCTCATTATCA
TCCCACTCCTCCATACCTCTAAACAACGTAGCATAACCTTTCGTCCCCTCAGCCAATGCATATTCTGACT
ATTAGTAGCAGACCTCCTAGCCCTAACATGAATTGGAGGACAACCAGTCGAACACCCATATATTATTATT
GGACAACTAGCATCAATCTTATATTTCCTAATCATTACCACACTAATACCTCTAGCCGGCCTCCTAGAAA
ACCGCCTGTTAAAATGAAGA

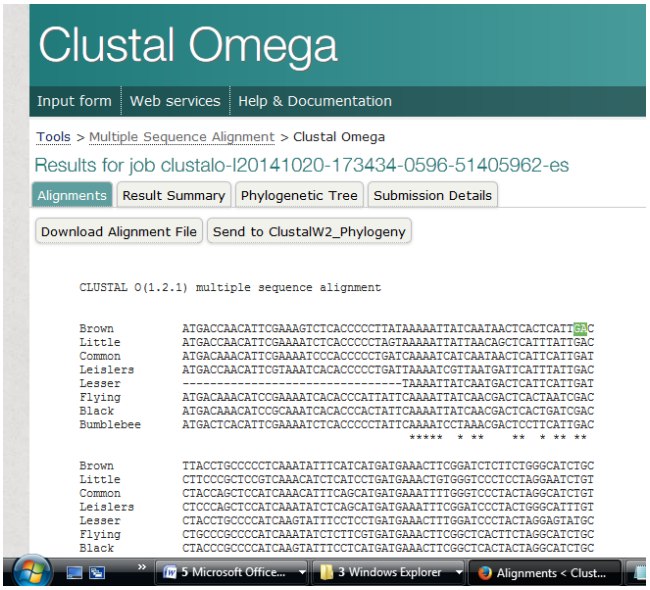
>Leislers Bat cytochrome b

ATGACCAACATTCGTAAATCACACCCCCTGATTAAAATCGTTAATGATTCATTTATTGACCTCCCA
GCTC

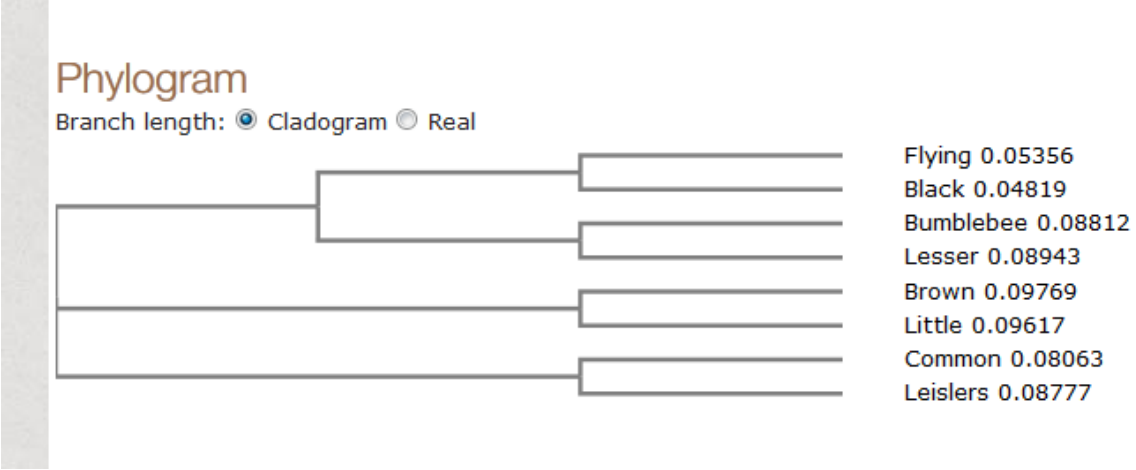
CATCAAATATCTCAGCATGATGAAATTTCGGATCCCTACTGGGCATTTGTCTAGCACTGCAGATCT
TAAC
AGGTCTATTTCTCGCCATACACTACACAGCAGACACAGCAACCGCCTTTAACTCTGTAACCCACA
TATGC
CGAGACGTAAACTATGGCTGGGTTTTACGATATTTGCACGCAAACGGGGCTTCTATGTTTTTTATT
TGCC
TTTATTTGCATGTAGGCCGGGGCATTTACTACGGATCCTACTTATATAAAGAAACTTGAAATATAG
GAGT
AATTTTATTATTCGCTGTAATAGCAACAGCATTCATAGGATATGTATTACCATGAGGCCAAATATC
ATTT
TGAGGAGCTACTGTAATTACCAACCTACTTTCCGCAATCCCATACATTGGAACAGATCTTGTTGAA
TGAA
TCTGGGGCGGATTTTCCGTAGACAAAGCTACTCTAACTCGATTTTTCGCCTTTCACTTCCTCCTCC
CTTT
TATTATTTCAGCTTTAGTTATAGTCCACCTCCTATTCTTACATGAAACAGGGTCTAATAATCCGACA
GGT
ATTCCTTCTAACATAGATATAATCCCCTTTCACCCCTATTATACAATCAAAGATATTCTAGGTCTTT
TCA
CCATACTTCTTGTATTACTGTCTTTAGTCCTCTTCTCACCTGACATACTAGGAGATCCTGATAACT
ATAC
CCCAGCAAACCCACTCAGCACCCCTCCTCATATCAAACCAGAATGATACTTCTTATTTGCATACG
CTATC
CTACGATCAATCCCCAACAAACTAGGTGGAGTCCTAGCACTAGTCCTCTCTATTCTCATCCTCATT
ATCA
TCCCTTTCCTTCACACCTCTAAACAACGCAGTATAACTTTTCGCCCTCTTAGCCAATGCCTATTCT
GACT
CTTAACAGCTGATCTTTTAACTTTAACATGAATTGGAGGACAACCAGTTGAATATCCTTATGTAATT
ATC
GGACAACTAGCCTCCATCTTATACTTTCTGATTATCATCGTAATTATACCTCTAGCTAGTCTAATAG
AAA
ACCATTTATTAAAATGAAGA

>

phylogenetic tree. After you submit your search job by pasting the cytochrome b sequences from all 8 bat species, after few minutes you will see the following screen presenting the sequence alignment.



You can access the Clustal phylogenetic tree by clicking on the ‘Phylogenetic tree’ tab. The tree generated by Clustal based on these sequences will similar to this:



As you can see, the Clustal tree is similar, but not exactly the same as the more refined model from the syllabus book, which was generated using more specialized programme MEGA 6. Make students aware that Clustal tree is only a guide tree and more sophisticated programmes/methods are advised for construction of a reliable phylogenetic tree