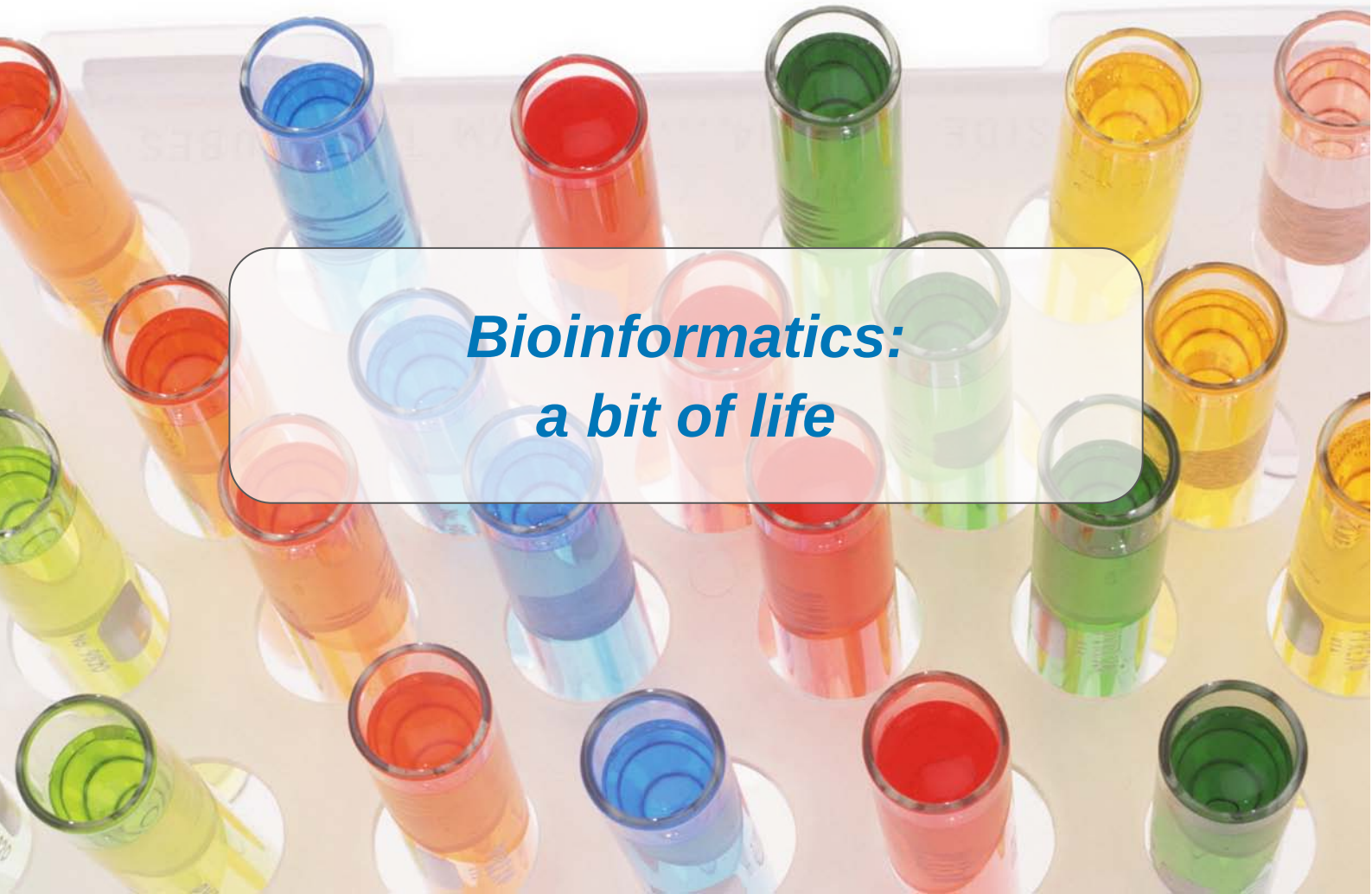
REIZENDE DNA LABS

Student Guide

level: **expert**



Bioinformatics: a bit of life

bioinformatica in de klas

Netherlands Bioinformatics Centre

UMC St Radboud

Developed by the Netherlands Bioinformatics Centre

in cooperation with the Centre for Molecular and Biomolecular Informatics
of Radboud University Nijmegen Medical Centre

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Images
www.bioinformaticaindeklas.nl

Lay out
Identim, Wageningen

Please contact the Netherlands Bioinformatics Centre (nijmegen@dnalabs.nl) for questions and remarks.

Bioinformatics: a bit of life

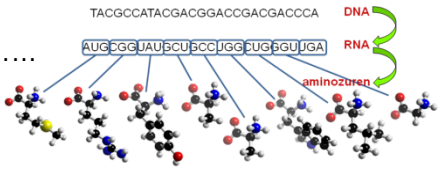
DNA, genes, proteins and genomes. That is what these lessons are about. A student from Radboud University will teach the modern techniques of DNA-research during a two-hour practical. Before the practical, you need good preperation. And afterwards, you will even go a step further in genomics. You will work with scientific research in depth or map the relation between genomics and society.
Have fun while working with these small molecules with big consequences!

Introduction

What are the names of the processes given by the arrows?

From DNA to RNA: ……

From RNA to amino acids: ……



Which amino acids are encoded by the codons given below?

AUG: …… GCC: ……

CGG: …… UGG: ……

UAU: …… CUG: ……

GCU: …… GGU: ……

What is the short code (1-letter) for these amino acids? : … … … … … … … …

UGA is a stopcodon. *How does a stopcodon work?*

……

Complete the scheme below to show what happens at each level when a certain change occurs.

	An organism is exposed to a lot of UV-radiation	A liver cell divides	The DNA mutates in a non-coding part of the sequence	One protein is folded in a wrong way
Organism				
Cell				
DNA				
Protein				

Practical part 1

Screening suspects

Fill in your findings and conclude which protein may have killed the American tourist.

Questions for each protein:

1. Which protein is it?
2. From which organism does it originate?
3. What is de function of the protein?
4. Is this protein guilty? Could it be responsible for the death of the tourist? Why (not)?
5. Other comments on your findings

Members of the CSI-team:

Suspect 1	1
	2
	3
	4
	5
Suspect 2	1
	2
	3
	4
	5

Suspect 3	1
	2
	3
	4
	5
Suspect 4	1
	2
	3
	4
	5
Final conclusion: What is the cause of death?	

Practical part 2

3D drug design

Exercise 1:

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.....

.....

.....

Exercise 2: Start Yasara and load: introduction.sce.

Exercise 3:
A. *Atoms in amino acids*:.....

B. *Atoms in Yasara:*

Red: ..... Dark blue: ..... Green: ..... Light blue: .....

Exercise 4:
White bonds: .....

Yellow bonds: .....

Exercise 5:

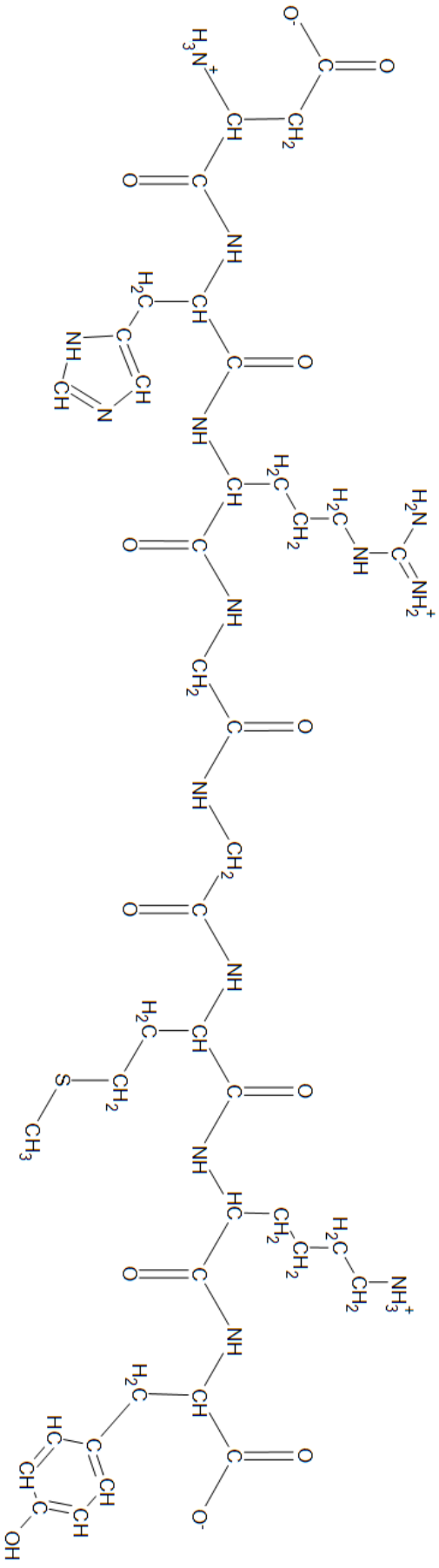
A. *Green: .....*

Blue: .....

Orange: .....

B.: Draw the bonds in the 2D representation on the next page.

Figure: A polypeptide of eigth amino acids.



Exercise 6: Load the file slangengif.pdb

Exercise 7:

Blue: .....

Red: .....

Exercise 8:

Double bonded oxygen atom: .....

A histidine sidechain: .....

An alpha helix: .....

Exercise 9:

.....

.....

.....

Exercise 10:

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.....

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Exercise 11: Find the active site of the snake venom

Exercise 12: Load the file slangengif2.pdb

Exercise 13: Find zinc in the active site

Exercise 14:

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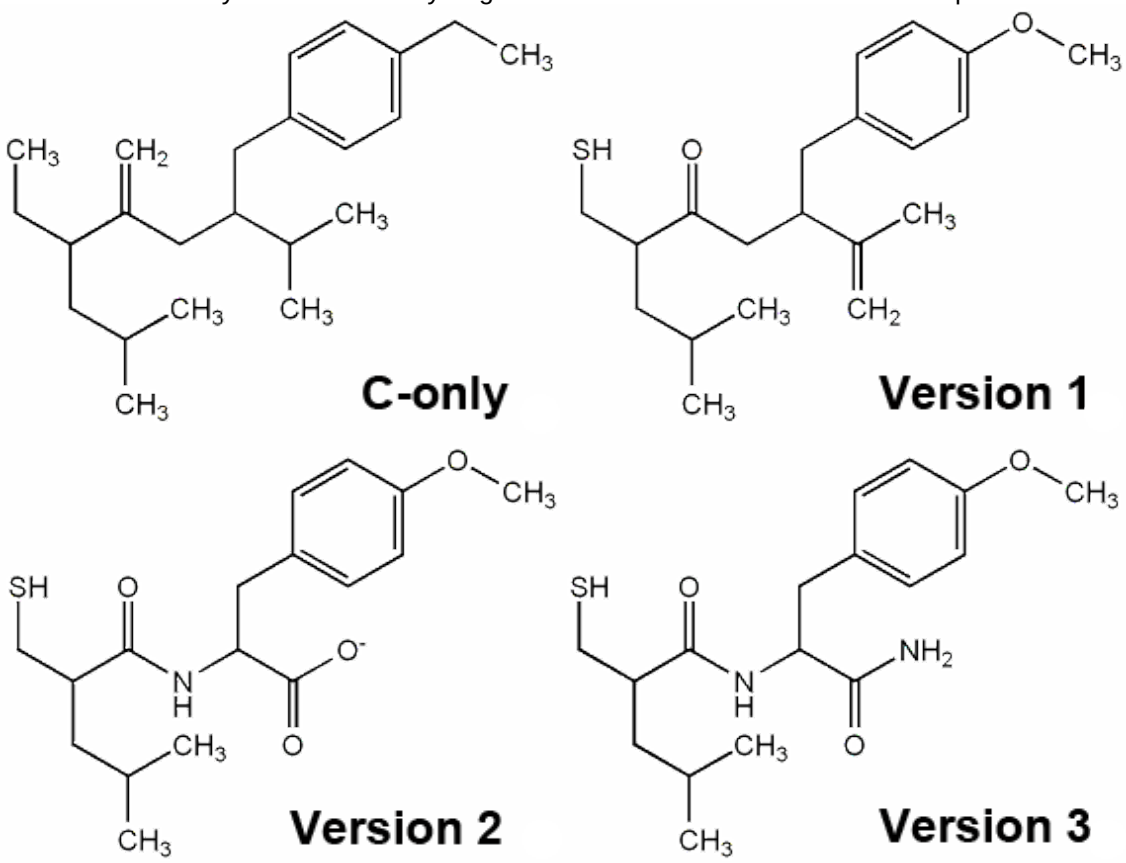
Exercise 15: Look at 6.8 Rattle snake poison help movie

Exercise 16:

The atoms that may be involved in hydrogen bonds and ionic interaction with the protein:



Exercise 17: Examine ligand_version1.sce, ligand_version2.sce en ligand_version3.sce

Final conclusion:

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More information on bioinformatics?
www.bioinformaticaindeklas.nl and www.bioinformaticsatschool.eu