Introductory Bioinformatics

LS02 - Hands-on Class - Algorithm Implementations

Data

Consider the supplied sequence files.

Global Sum - Physical-Chemical Properties of Peptides

1. Visit the ProtParam tool page on the ExPASy portal servers (https://web.expasy.org/protparam/).
2. Locate and consult the tool's documentation page and identify the most relevant points.
3. Submit the provided sequence for analysis.
4. Consider the results and change the input data if necessary to obtain results.
5. Record the molecular weight, length, and isoelectric point.
6. Which amino acid is the most abundant?
7. What will be the electrical charge of the protein at physiological pH?

Optimization under Constraints - Design of PCR Oligonucleotide Initiators

1. You want to detect in a DNA sample, the presence of the given coding sequence and have decided to use PCR. Using the Primer3 tool, design the required primer oligonucleotides.
2. For the sake of efficiency and simplicity, work with the Primer3Plus version and in a first step, consider the suggested "primers" without additional restrictions and the product. What is their length?
3. If you intend to amplify a length that is close to the entire known sequence and never shorter than 2kb, what restrictions do you intend to impose on the optimization?
4. If they do not work, consider increasing the length of the oligonucleotides.
5. What problems might the proposed primers present? Are they disabling for specificity or amplification efficiency?

Sliding Window - Property Profile

1. How is the molecular weight of the residues distributed along the chain of P05130? Do you find any anisotropy in this distribution?

2. In a more ordinary operation, what does the distribution of hydrophobia look like? It is suggested that you consider the Kyte/Doolittle metric, a window of dimension 21 where the ends have a 30% weighting and this varies linearly.

3. Identify a candidate for the nuclear zone of a globular protein.

4. Graph the hydrophobicity as a function of molecular mass along the chain