BMEG3103

Pairwise alignment

1. Enumeration all possible alignments

2. Calculate score

3. Choose the alignment with the highest score

no of possible alignments:

$$\binom{2n}{n} = \frac{(2n)!}{(n!)^2}$$

Dynamic Programming

1. Large problem → Small subproblems

2. Solve small subproblems recursively, find optimal solutions

3. Combine optimal solutions for subproblems → an optimal solution for large problem

diagonal: +2

Down/ Right: gap, -10

note: add gap first, then write the subsequent base (ATCG)

down	add gap to first sequence	
right	add gap to second sequence	

Table representation

ACCG
ACG

Scoring matrix:

	A	C	G	T
A	2	-7	-5	-7
C	-7	2	-7	-5
G	-5	-7	2	-7
T	-7	-5	-7	2

Gap penalty = -10

		A	C	C	G
	0	-10	-20	-30	-40
A	-10	2	-8	-18	-28
C	-20	-8	4	-6	-16
G	-30	-18	-6	-3	-4

Scoring matrix:

	A	C	G	T
A	2	-7	-5	-7
C	-7	2	-7	-5
G	-5	-7	2	-7
T	-7	-5	-7	2

Gap penalty = -10

match: +2
mismatch: -7

r s		A	C	C	G
	0	-10	-20	-30	-40
A	-10	2	-8	-18	-28
C	-20	-8	4	-6	-16
G	-30	-18	-6	-3	-4

r ACCG
s ACG

Try coding method (Python)

from Bio import pairwise2

alignments = pairwise2.align.globalxx("ACCGT", "ACG")

from Bio.pairwise2 import format_alignment

print(format_alignment(*alignments[0]))