

3 Exercise solutions – Extension of global alignment

1. DP with score matrix

Use the score matrix below with gap penalty $g = 1$ and answer the following questions.

	C	G	A	T
C	1	0	0	0
G		1	1	0
A			1	0
T				1

(a) Calculate the alignment score.

- Alignment 1

q: ATGCT

d: CA--T

Solution: 1

- Alignment 2

q: CAGCT

d: C-A-T

Solution: 1

(b) Use the simple scoring scheme and fill the empty cells with appropriate scores.

- Table A

			C	
		0	-1	
C		-1	$H_{i,j}$	

Solution: 1

- Table B

		C	A	
		0	2	
A				
G		-1	$H_{i,j}$	

Solution: 1

- (c) Fill the empty cells with appropriate scores in the DP table. What is the optimal alignment score?

q\d		C	A	T
	0	-1	-2	-3
C	-1	1	0	-1
A	-2	0	2	1
G	-3	-1	1	2
C	-4	-2	0	1
T	-5	-3	-1	1

Solution: 1

- (d) There are two different alignments that give the same optimal score in the solution above. Specify both of them.

Solution:

q: CAGCT

d: CA--T

q: CAGCT

d: C-A-T