Pedro Leite - 201906697 - I2

TASK 1

seq1 = TTACGG seq2 = TAACGG Match = 1 Mismatch = 0 Gap = -2

a)

Score:

	Gap	T	A	A	C	G	G
Gap	0	-2	-4	-6	-8	-10	-12
T	-2	⑧ 1	-1	-3	-5	-7	-9
T	-4	-1	1	-1	-3	-5	-7
A	-6	-3	0	2	0	-2	-4
C	-8	-5	-2	0	3	1	-1
G	-10	-7	-4	-2	1	4	2
G	-12	-9	-6	-4	-1	2	⑤

$\max(\nwarrow + m, \uparrow + g, \leftarrow + g)$

m → match = 1
m → mismatch = 0

g → gap = -2

⑧ $\max(0+1, -2-2, -2-2) = \max(1, -4, -4) = 1$

Traceback:

	Gap	T	A	A	C	G	G
Gap	0	←	←	←	←	←	←
T	↑	↖	←	←	←	←	←
T	↑	↖↑	↑	↖ ←	↖ ←	↖ ←	↖ ←
A	↑	↑	↖	↖	←	←	←
C	↑	↑	↑	↖↑	↖	←	←
G	↑	↑	↑	↖↑	↑	↖	↖ ←
G	↑	↑	↑	↖↑	↑	↑	↖

b)

5

c)

TTACGG + TAACGG

d)

Não há, a sequência de alinhamento óptimo, apenas tem uma direção possível, já que todas as células da sequência, só têm uma seta/direção.

TASK 2

seq1 = T T A C G G seq2 = T A A C G G Match = 1 Mismatch = 0 Gap = -2

a)

Score:

	Gap	T	A	A	C	G	G
Gap	0	0	0	0	0	0	0
T	0	① 1	0	0	0	0	0
T	0	1	1	0	0	0	0
A	0	0	2	2	0	0	0
C	0	0	0	2	3	1	0
G	0	0	0	0	2	4	2
G	0	0	0	0	0	3	⑤

$\max(\nwarrow + m, \uparrow + g, \leftarrow + g, 0)$

$m \rightarrow$ match = 1

$m \rightarrow$ mismatch = 0

$g \rightarrow$ gap = -2

① $\max(0+1, 0-2, 0-2, 0) = \max(1, -2, -2, 0) = 1$

Traceback:

	Gap	T	A	A	C	G	G
Gap							
T		↑					
T		↑	↑				
A			↑	↑			
C				↑	↑	←	
G					↑	↑	↖ ←
G						↑	↑

b)

5

c)

T T A C G G + T A A C G G

d)

Não há, a sequência de alinhamento óptimo, apenas tem uma direcção possível, já que todas as células da sequência, só têm uma seta/direcção.

```
def test():
    sm = create_submat(1, 0, "ACGT")
    seq1 = "TTACGG"
    seq2 = "TAACGG"

    print("GLOBAL ALIGNMENT")
    print("")
    res = needleman_Wunsch(seq1, seq2, sm, -2)
    S = res[0]
    T = res[1]

    print("Score Matrix:")
    print_mat(S)
    print("")

    print("Traceback Matrix:")
    print_mat(T)
    print("")

    i, j = max_mat(S)
    best_score = S[i][j]
    print ("The best score:", str(best_score))
    print("")

    alig = recover_align(T, seq1, seq2)
    print("The best alignment:", alig[0], "+", alig[1])
    print("")

    print("No multiple best alignments.")
    print("")

    print("---------------------------------")
    print("")

    print("LOCAL ALIGNMENT")
    print("")
    res = smith_Waterman(seq1, seq2, sm, -2)
    S = res[0]
    T = res[1]

    print("Score Matrix:")
    print_mat(S)
    print("")

    print("Traceback Matrix:")
    print_mat(T)
    print("")

    i, j = max_mat(S)
    best_score = S[i][j]
    print ("The best score:", str(best_score))
    print("")

    alinL = recover_align_local(S, T, seq1, seq2)
    print("The best alignment:", alinL[0], "+", alinL[1])
    print("")

    print("No multiple best alignments.")
    print("")

test()
```

Assignment I2 - Pedro Leite — -bash — 80×56

```
(base) MBP-de-Pedro-3:Assignment I2 - Pedro Leite pedroalexleite$ Python3 test.p
y
GLOBAL ALIGNMENT

Score Matrix:
[0, -2, -4, -6, -8, -10, -12]
[-2, 1, -1, -3, -5, -7, -9]
[-4, -1, 1, -1, -3, -5, -7]
[-6, -3, 0, 2, 0, -2, -4]
[-8, -5, -2, 0, 3, 1, -1]
[-10, -7, -4, -2, 1, 4, 2]
[-12, -9, -6, -4, -1, 2, 5]

Traceback Matrix:
[0, 3, 3, 3, 3, 3, 3]
[2, 1, 3, 3, 3, 3, 3]
[2, 2, 1, 3, 3, 3, 3]
[2, 2, 1, 1, 3, 3, 3]
[2, 2, 2, 2, 1, 3, 3]
[2, 2, 2, 2, 2, 1, 3]
[2, 2, 2, 2, 2, 2, 1]

The best score: 5

The best alignment: TTACGG + TAACGG

No multiple best alignments.

------------------------------

LOCAL ALIGNMENT

Score Matrix:
[0, 0, 0, 0, 0, 0, 0]
[0, 1, 0, 0, 0, 0, 0]
[0, 1, 1, 0, 0, 0, 0]
[0, 0, 2, 2, 0, 0, 0]
[0, 0, 0, 2, 3, 1, 0]
[0, 0, 0, 0, 2, 4, 2]
[0, 0, 0, 0, 0, 3, 5]

Traceback Matrix:
[0, 0, 0, 0, 0, 0, 0]
[0, 1, 0, 0, 0, 0, 0]
[0, 1, 1, 0, 0, 0, 0]
[0, 0, 1, 1, 0, 0, 0]
[0, 0, 0, 1, 1, 3, 0]
[0, 0, 0, 0, 1, 1, 3]
[0, 0, 0, 0, 0, 1, 1]

The best score: 5

The best alignment: TTACGG + TAACGG

No multiple best alignments.
```