

Needleman - Wunsch: Goal: Minimize the cost of alignment

$W_1 = AACT$

$W_2 = GAT$

Substitution/Mismatch, Deletion, Insertion = 1

Match = -1

	-	A	A	C	T
-	0	1	2	3	4
G	1	0	2	3	4
A	2	0	0	1	2
T	3	1	1	1	0

AACT
GA-T

Cost: $(1) + (-1) + (1) + (-1) = 0$

① A & G

Substitution: $0 + 1 = 1$ ✓

Insertion: $1 + 1 = 2$

Deletion: $1 + 1 = 2$

② A & G

Substitution: $1 + 1 = 2$ ✓

Insertion: $2 + 1 = 3$

Deletion: $1 + 1 = 2$ ✓

③ C & G

Substitution: $2 + 1 = 3$ ✓

Insertion: $3 + 1 = 4$

Deletion: $2 + 1 = 3$ ✓

④ T & G

Substitution: $3 + 1 = 4$ ✓

Insertion: $4 + 1 = 5$

Deletion: $3 + 1 = 4$ ✓

⑤ A & A

Match: $1 + (-1) = 0$

⑥ A & A

Match: $1 + (-1) = 0$

⑦ C & A

Substitution: $2 + 1 = 3$

Insertion: $3 + 1 = 4$

Deletion: $0 + 1 = 1$ ✓

⑧ T & A

Substitution: $3 + 1 = 4$

Insertion: $4 + 1 = 5$

Deletion: $1 + 1 = 2$ ✓

⑨ A & T

Substitution: $2 + 1 = 3$

Insertion: $0 + 1 = 1$ ✓

Deletion: $3 + 1 = 4$

⑩ A & T

Substitution: $0 + 1 = 1$ ✓

Insertion: $0 + 1 = 1$ ✓

Deletion: $1 + 1 = 2$

⑪ C & T

Substitution: $0 + 1 = 1$ ✓

Insertion: $1 + 1 = 2$

Deletion: $1 + 1 = 2$

⑫ T & T

Match: $1 + (-1) = 0$