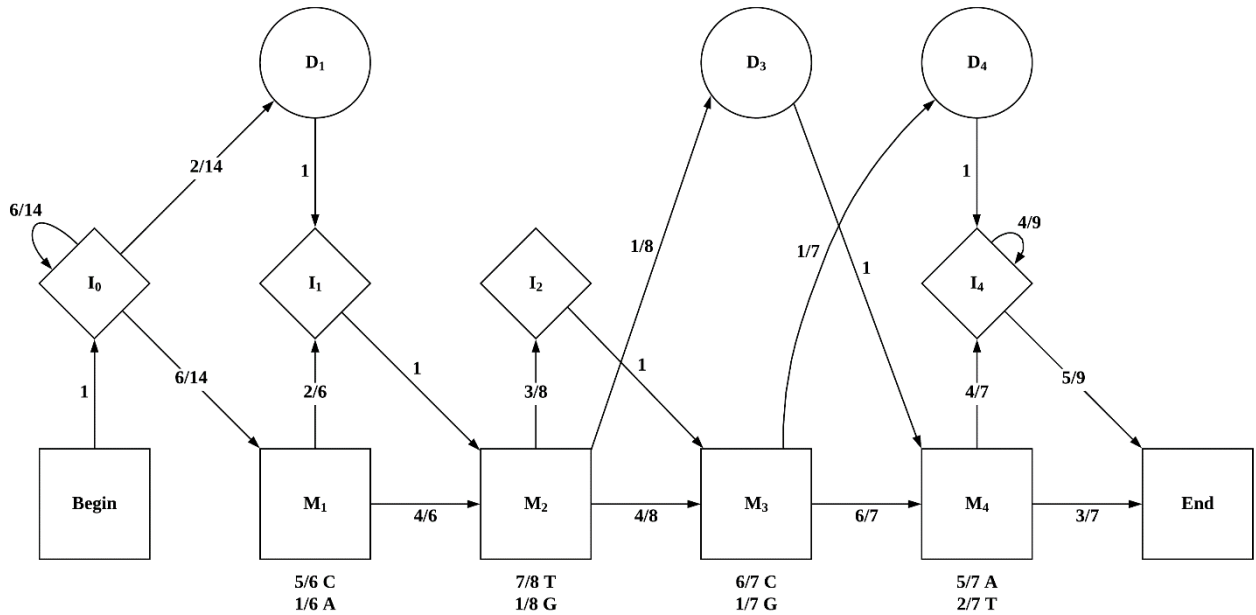


PART A

| | | | | | | | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|---|----------------|---|---|
| G | G | - | D ₁ | T | T | - | D ₃ | D ₄ | - | G | - | ➤ | Begin→I ₀ →I ₀ →D ₁ →I ₁ →M ₂ →M ₃ →M ₄ →I ₄ →End |
| - | C | T | A | T | T | - | C | A | C | - | A | ➤ | Begin→I ₀ →I ₀ →M ₁ →I ₁ →M ₂ →M ₃ →M ₄ →I ₄ →I ₄ →End |
| - | G | - | C | A | T | G | C | A | - | - | - | ➤ | Begin→I ₀ →M ₁ →I ₁ →M ₂ →I ₂ →M ₃ →M ₄ →End |
| - | A | G | C | - | T | - | - | A | C | G | A | ➤ | Begin→I ₀ →I ₀ →M ₁ →M ₂ →D ₃ →M ₄ →I ₄ →I ₄ →End |
| - | T | - | - | G | T | - | C | T | - | - | - | ➤ | Begin→I ₀ →D ₁ →I ₁ →M ₂ →M ₃ →M ₄ →End |
| - | T | A | C | - | T | A | C | A | - | A | A | ➤ | Begin→I ₀ →I ₀ →M ₁ →M ₂ →I ₂ →M ₃ →M ₄ →I ₄ →I ₄ →End |
| G | G | - | C | - | G | T | C | T | - | - | - | ➤ | Begin→I ₀ →I ₀ →M ₁ →M ₂ →I ₂ →M ₃ →M ₄ →End |
| A | C | - | C | - | T | - | C | - | - | G | - | ➤ | Begin→I ₀ →I ₀ →M ₁ →M ₂ →M ₃ →D ₄ →I ₄ →End |
| | | | * | | * | | * | * | | | | | |
| I ₀ | M ₁ | I ₁ | M ₂ | I ₂ | M ₃ | M ₄ | | | | | I ₄ | | |



PART B

I have prepared an excel sheet to calculate the probabilities. If requested, I can provide the table with the formulas. Also, I will try to explain the formulation that I've used to calculate probabilities under the table.

- Table is shown just like in excel. First row and column is used to navigate the table only.

| # | A | B | C | D | E | F | G | H |
|----|----------------|------|----------|----------|----------|----------|----------|----------|
| 1 | | - | C | T | C | T | G | A |
| 2 | Begin | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | I ₀ | 0.00 | 0.25 | 2.68E-02 | 2.87E-03 | 3.07E-04 | 3.29E-05 | 3.53E-06 |
| 4 | D ₁ | 0.00 | 3.57E-02 | 3.83E-03 | 4.10E-04 | 4.39E-05 | 4.71E-06 | 5.04E-07 |
| 5 | M ₁ | 0.00 | 0.00 | 0.00 | 9.57E-03 | 0.00 | 0.00 | 2.35E-06 |
| 6 | I ₁ | 0.00 | 0.00 | 8.93E-03 | 9.57E-04 | 7.97E-04 | 1.10E-05 | 1.18E-06 |
| 7 | M ₂ | 0.00 | 0.00 | 0.00 | 0.00 | 5.58E-03 | 9.96E-05 | 0.00 |
| 8 | I ₂ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.23E-04 | 9.34E-06 |
| 9 | D ₃ | 0.00 | 0.00 | 0.00 | 0.00 | 6.98E-04 | 1.25E-05 | 0.00 |
| 10 | M ₃ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.99E-04 | 0.00 |
| 11 | D ₄ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.69E-05 | 0.00 |
| 12 | M ₄ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.44E-04 |
| 13 | I ₄ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.42E-05 |
| 14 | End | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.05E-04 |

The best path is shown with red arrows on the table and it is the following;

- Begin → I₀ → I₀ → M₁ → M₂ → M₃ → M₄ → End

For I₀ (3rd Row) formulations are;

$$C3 = B2 * (1/4)$$

$$D3 = C3 * (1/4) * (6/14), E3 = D3 * (1/4) * (6/14) \dots H3 = G3 * (1/4) * (6/14)$$

For D₁ (4th Row) formulations are;

Previous I₀ value in the same column times (1/7) or (2/14) just like shown below;

$$C4 = C3 * (1/7), D4 = C3 * (1/7) \dots H4 = H3 * (1/7)$$

For M₁ (5th Row) formulations are;

At the columns: D,F and G, due to emission probability being 0 it is 0.

At the columns C and E formulations are;

$$C5 = B3*(6/14)*(5/6), E5 = D3*(6/14)*(5/6)$$

At the last column(H) formulation;

$$H5 = G3*(6/14)*(1/6)$$

For I₁ (6th Row) formulations are;

$$C6 = \text{MAX}(B4*1, B5*(2/6)) * (1/4) \dots H6 = \text{MAX}(G4*1, G5*(2/6)) * (1/4)$$

For M₂ (7th Row) formulations are;

At the columns: C, E, and H, due to emission probability being 0 it is 0.

At the columns D and F formulations are;

$$D7 = \text{MAX}(C6*1, C5*(4/6)) * (7/8), E7 = \text{MAX}(E6*1, E5*(4/6)) * (7/8)$$

At the column G formulation is;

$$G7 = \text{MAX}(F6*1, F5*(4/6)) * (1/8)$$

For I₂ (8th Row) formulations are;

$$C7 = B7*(3/8)*(1/4), D7 = C7*(3/8)*(1/4) \dots H7 = G7*(3/8)*(1/4)$$

For D₃ (9th Row) formulations are;

Previous M₂ value in the same column times (1/8) just like shown below;

$$C9 = C7*(1/8), D9 = D7*(1/8) \dots$$

For M₃ (10th Row) formulations are;

At the columns: D, F, and H, due to emission probability being 0 it is 0.

At the columns C and E formulations are;

$$C10 = \text{MAX}(B8*1, B7*(4/8))*(6/7), E10 = \text{MAX}(D8*1, D7*(4/8))*(6/7)$$

At the column G formulation is;

$$G10 = \text{MAX}(F8*1, F7*(4/8))*(1/7)$$

For D₄ (11th Row) formulations are;

Previous M₃ value in the same column times (1/7) just like shown below;

$$C_{11}=C_{10}*(1/7), D_{11}=C_{10}*(1/7) \dots$$

For M₄ (12th Row) formulations are;

At the columns: C, E, and G, due to emission probability being 0 it is 0.

At the columns D and F formulations are;

$$D_{12} = \text{MAX}(C_9*1, C_{10}*(6/7))*(2/7), F_{12} = \text{MAX}(E_9*1, E_{10}*(6/7))*(2/7)$$

At the column H formulation is;

$$H_{12} = \text{MAX}(G_9*1, G_{10}*(6/7))*(5/7)$$

For I₄ (13th Row) formulations are;

$$C_{13} = \text{MAX}(B_{13}*(4/9), B_{12}*(4/7), B_{11}*(1))*(1/4) \dots$$

$$H_{13} = \text{MAX}(G_{13}*(4/9), G_{12}*(4/7), G_{11}*(1))*(1/4)$$

For End (14th Row) formulations are;

$$C_{14} = \text{MAX}(C_{13}*(5/9), C_{12}*(3/7)) \dots H_{14} = \text{MAX}(H_{13}*(5/9), H_{12}*(3/7))$$