Part 1:
Used Linux Commands for file size

1. A) Suffix trie created in 60.134549 seconds.
   B) Trie Output file size 528M   output.txt (Uncompressed Trie and adding all the suffixes of the sequence)

2. A) Suffix Array created in 0.046285 seconds
   B) Suffix Array File size 30 M

3. A) BWT Array created in 0.042553 seconds
   B) 8.0K   bwt_output.txt

4. The suffix array and BWT are significantly more memory- and time-efficient than the uncompressed suffix trie, which takes ~60s and 528MB due to its $O(n^2)$ structure.
In contrast, **suffix arrays (~30MB)** and **BWT (~8KB)** offer drastic performance gains, making them ideal for large-scale genomic analysis.

Part 2:
a) 1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c
    1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c
    1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c
    1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c
    1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c
    1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c
    1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c
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    1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c
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    1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c
    1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c1t2a3c
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A2C1T2G1T1C1G2T1A1C1A1G1T2G1A1C1A1T1A2T2C1A2G2A1G1T2C2T1G2C1T1G1A2G
4T2C2A1G2T1A1T2G2A2T1G1C2T1G1A1G1A2T2G2A1G1A2G1C1G1A1T2G1A3G1T1A1C2
A1C1T1G1T2A1T1G3C2A2C1T1C1A5T1G1C1T2A3C1T1G5T1A1G1A1C1T1C1T3C3T2C2T1
C2A1T1C1A2C1T1A1G2C2T1C3T2C1A2C1T1G3A2G1A1C1T1C1T3C2T2A1C1T1G1A1G1A1
G2A2C2g1a1c1a1g1a1c1t2c1a1t1c2t2g1c1t2c2t1c1a1c1t2g1c1a1g4c2t2c1t1c3a1g1a1c2
t2a1c1t1c1g1t1g1c2a1g1c1t1g1a1c1t3c1a2g1a1C1A1T2C1G1A1G2A1T1G1C2A2T2A1C1

T1G1A1C2A2C1T1A1C1T1G1T2G1C1G1A1G1C1T1A1C1A1T2C1G1C1A1G1T4C1A2G2A2T
1C1G1T2C1G1A2T1G1A1T2A1C1G3C2A2T1A3C1G1c1g1t1c1t1a1t1c1a2c2t1g1t2a1t1a1g
1t1c2t3a1g1c1a2c1t1g1c1a2c1t2g2a1c1t1g3t1a1c3t2c1t1g1t2a2c1a3t1a1t2c4t2a1c1a2t
2T1G2C1T2A3T1A1C2T1A1T1G1T4A2T1C4T2A1C1T1A1G1A2C1G2C1A1C1T4C3t1c1t3a1
c5a1t1a1t4a1g4a1t1c1t1a1g4c2t1c3t1g2G1A1C1T1G1A1G1A1C2A4T1G1A2G2T2A1C1g1
c1a3g1t1g2c1t1g1t2a1t2c1t2a2g1G1A2G

b) rle: 8868 sequence: 7920

c) Original size: 7920 characters
   a. Compressed size: 11714 characters
   b. Compression ratio: 1.48
   c. ❌ RLE compression was not effective.

Part 3:
   1. Linear Search in 1.049896 seconds
   2. BWT Search in 0.008646 seconds
   3. BWT search as it is clearly faster.