GenSmart Optimization Report

(Tool Version Beta 1.0)

Job ID:	20260216082926845156
Date:	2026-02-16 20:29:26
Gene Name:	lcl|X87973.1_cds_CAA61231.1_2 [gene
Expression Host Organism:	Escherichia coli (E.coli)
Sequence Type:	DNA
Size:	1578bp
Excluded enzyme sites:	[]
Kept enzyme sites:	[]

Original Sequence (Original Sequence Length: 1578bp, GC%:63.05%):

ATGAACGTGCAAAGAAAACTTGCATCCACCCAGCTGAAACCCGTGTTGCTCGGCGTGCTGCTGGCCACCAGCGCCTGGAGCCAGGCCGCCCCGCCGGAGCAGGCGAGGCA
GTCCGCGCCCCCCACCCTGAGTTCGAAGCAGTACAGCGTCACCAGCGCCTCGATCGAAGCCTTGAAGCTGGACCCGCCCAAACTGCCGGATCTCTCCGGCTACACTCACGC
GGCGGTGGAGGCCAAGATCCGGCGCAAGCCCGGTGGACGCATCGCTGCGGCCATGCTGCAGCAGACCGCCCTGAAGGACTTCACCGGTGGCAGCGGACGTCTGCGCGAG
TGGATCGTCCGCCAGGGCGGTATGCCTCACGCGATCTTCATAGAAGGCGGCTATGTCGAGCTGGGTCAGTTGGCCAGGCAGTTGCCGGCCAATCAGTTCGCCGAGACCACG
CCGGGCGTCTACGTGGCGCGGGTGCCGATCGTCGTCGCCCCCGGCGCGACCCTGCACATCGGCAAGAACGTCAAGGAGCTGCGCCTCTCCGAGGAGCGCGGCGCCTTCC
TGGTCAACGATGGCAAGCTGTTCATCACCGACACCAAGCTGGTCGGCTGGAGCGAGAAGAACAACGCTCCGTCCGCCTACCGCGGCCCGGAAAGCTTCTGGGCCTTCCTGG
TGTCCTGGGGCGGCACCGAGACCTACATCTCGCGCAGACCCGTCGCCAGCCTGGGCTACAACACCAGTAAGGCCTACGGCGTGAGCATCACCCAGTACACCCCGGAAATGC
ACAAGCGCCTCAAGCGCCCGCGCCCGACCGGCTGGCTGATCGACTCGGTATTCGAGGACATCTACTACGGCTTCTACTGCTACGAAGCCGACGACGTGGTGCTCAAGGGCA
ATACCTACCGCGACAACATCATCTACGGCATCGACCCCCACGACCGCTCGGAACGCCTGGTCATCGCCGAGAACCACGTCTACGGGACGAAGAAGAAGCACGGCATCATCG
TCTCGCGGGAGGTCAACAACAGTTGGATCATCAACAACCGCACCCACGACAACAAGCTGTCGGGCATCGTTCTCGACCGTAACAGCGAACACAACCTGGTCGCCTACAACGA
GGTGTACCAGAACCACTCCGACGGCATCACCCTCTACGAGAGTTCGAACAACCTGATCTGGGGCAACCGGCTCATCAACAACGCGCGCCACGGCATCCGCATGCGCAACAG
CGTGAACATCCGGATCTACGAGAACCTGTCCGTCGTCAACCAGTTGACCGGTATCTACGGTCACATCAAGGACCTCAGCAGCACCGACCGTGACTTCAAGCTCGACCCCTTC
GACACCAAGGTGTCGATGATCGTGGTCGGTGGCCAACTGACCGGCAACGGTTCGTCGCCGATCTCCGTGGACTCGCCGCTGAGCCTCGAACTCTACCGCGTGGAGATGCTC
GCCCCGACCAAGAGTTCCGGCCTCACCTTCACCGGCATCCTCGAGGACAAACAAGAAGAGATCCTCGATCTGCTGGTGCGCCGCCAGAAGGCCGTGCTGATCGACCCCGTC
GTCGATCTCGCCCAGGCCGAGCTGTAG

Optimized Sequence (Optimized Sequence Length: 1578bp, GC%:53.23%):

ATGAATGTACAAAGGAAACTAGCTTCAACACAACTGAAGCCGGTATTGCTGGGCGTTTTACTGGCCACCTCGGCGTGGTCACAAGCGGCTCCGCCAGAGCAGGCGCGTCAAA
GCGCGCCTCCGACCCTGTCTAGCAAGCAGTATAGCGTTACCTCTGCGAGCATTGAAGCGCTGAAGCTCGACCCGCCCAAACTGCCAGATCTGTCCGGTTACACCCACGCCG
CGGTGGAAGCTAAAATCCGCCGTAAACCGGGTGGGCGCATCGCGGCCGCTATGCTGCAGCAGACCGCACTGAAGGACTTCACCGGTGGCAGCGGCCGTCTGCGTGAATGG
ATTGTTCGTCAAGGTGGCATGCCGCACGCAATTTTTATCGAAGGTGGTTATGTTGAACTTGGCCAGTTAGCGAGACAACTGCCGGCAAATCAGTTTGCAGAAACCACGCCGGG
CGTTTACGTTGCCCGCGTGCCGATAGTGGTGGCGCCGGGTGCTACCCTTCACATTGGTAAGAACGTGAAAGAACTGCGTTTGTCTGAGGAACGTGGTGCGTTCTTGGTCAAC
GATGGCAAGCTGTTCATCACCGATACCAAGCTGGTTGGTTGGTCGGAGAAAAACAATGCCCCGAGCGCGTATCGTGGTCCGGAGAGCTTTTGGGCATTCCTGGTATCCTGGG
GTGGTACGGAAACGTACATTTCTCGTCGTCCGGTTGCGAGCCTGGGTTATAACACCAGCAAAGCGTATGGCGTGAGCATCACGCAGTACACCCCGGAGATGCATAAACGTCT
GAAGCGCCCGCGTCCGACAGGCTGGCTGATCGACAGCGTTTTTGAAGATATTTACTATGGTTTTTACTGCTATGAAGCTGATGATGTTGTTTTGAAGGGCAACACCTACCGCG
ACAATATTATCTACGGCATCGACCCGCATGATCGTAGCGAGCGCTTGGTCATCGCCGAGAACCACGTTTACGGTACGAAGAAGAAACATGGTATCATCGTGAGCCGTGAGGTT
AACAACAGCTGGATTATCAACAACCGCACTCATGATAACAAACTCTCTGGCATCGTGCTGGACCGTAATTCCGAGCACAACCTGGTGGCCTACAATGAAGTGTATCAGAATCAC
TCCGATGGTATCACCCTGTACGAGAGCAGTAATAACTTGATCTGGGGCAACCGTCTGATTAATAACGCGCGGCACGGCATCCGCATGCGTAATTCCGTGAACATACGGATTTA
CGAGAACCTTAGCGTGGTTAACCAGTTGACCGGCATCTACGGCCATATTAAAGACCTGTCTTCGACCGATAGAGATTTCAAATTAGACCCATTCGATACTAAGGTGAGCATGAT
TGTGGTCGGTGGTCAATTGACTGGCAATGGTAGCTCTCCGATTAGCGTTGACAGTCCGCTGTCCCTGGAGCTGTATCGTGTTGAGATGCTGGCTCCGACCAAGTCCTCTGGT
CTGACGTTCACCGGCATCCTGGAGGACAAGCAAGAGGAAATCTTGGACTTGCTGGTACGCCGTCAAAAAGCGGTTCTGATTGACCCGGTGGTGGACCTTGCGCAGGCGGAA
CTGTAA

GC Content Adjustment:

GC Content Adjustment

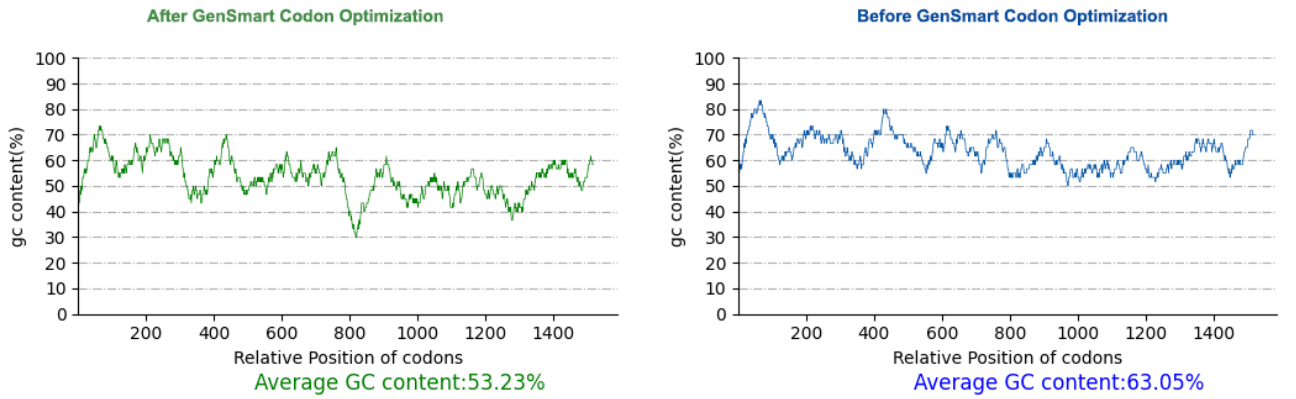

Figure 1: GC content of the sequence before and after GenSmart Codon Optimization. The ideal GC content range is between 30% and 70%.

DNA Alignment (Optimized Region)

Optimized	1	ATGAATGTACAAAGGAAACTAGCTTCAACACAACTGAAGCCGGTATTGCTGGGCGTTTTA
Original	1	ATGAACGTGCAAAGAAAACTTGCATCCACCCAGCTGAAACCCGTGTTGCTCGGCGTGCTG
Optimized	61	CTGGCCACCTCGGCGTGGTCACAAGCGGCTCCGCCAGAGCAGGCGCGTCAAAGCGCGCCT
Original	61	CTGGCCACCAGCGCCTGGAGCCAGGCCGCCCCGCCGGAGCAGGCGAGGCAGTCCGCGCCC
Optimized	121	CCGACCCTGTCTAGCAAGCAGTATAGCGTTACCTCTGCGAGCATTGAAGCGCTGAAGCTC
Original	121	CCCACCCTGAGTTCGAAGCAGTACAGCGTCACCAGCGCCTCGATCGAAGCCTTGAAGCTG
Optimized	181	GACCCGCCCAAACTGCCAGATCTGTCCGGTTACACCCACGCCGCGGTGGAAGCTAAAATC
Original	181	GACCCGCCCAAACTGCCGGATCTCTCCGGCTACACTCACGCGGCGGTGGAGGCCAAGATC
Optimized	241	CGCCGTAAACCGGGTGGGCGCATCGCGGCCGCTATGCTGCAGCAGACCGCACTGAAGGAC
Original	241	CGGCGCAAGCCCGGTGGACGCATCGCTGCGGCCATGCTGCAGCAGACCGCCCTGAAGGAC
Optimized	301	TTCACCGGTGGCAGCGGCCGTCTGCGTGAATGGATTGTTCGTCAAGGTGGCATGCCGCAC
Original	301	TTCACCGGTGGCAGCGGACGTCTGCGCGAGTGGATCGTCCGCCAGGGCGGTATGCCTCAC
Optimized	361	GCAATTTTTATCGAAGGTGGTTATGTTGAACTTGGCCAGTTAGCGAGACAACTGCCGGCA
Original	361	GCGATCTTCATAGAAGGCGGCTATGTCGAGCTGGGTCAGTTGGCCAGGCAGTTGCCGGCC
Optimized	421	AATCAGTTTGCAGAAACCACGCCGGGCGTTTACGTTGCCCGCGTGCCGATAGTGGTGGCG
Original	421	AATCAGTTCGCCGAGACCACGCCGGGCGTCTACGTGGCGCGGGTGCCGATCGTCGTCGCC
Optimized	481	CCGGGTGCTACCCTTCACATTGGTAAGAACGTGAAAGAACTGCGTTTGTCTGAGGAACGT
Original	481	CCCGGCGCGACCCTGCACATCGGCAAGAACGTCAAGGAGCTGCGCCTCTCCGAGGAGCGC
Optimized	541	GGTGCGTTCTTGGTCAACGATGGCAAGCTGTTCATCACCGATACCAAGCTGGTTGGTTGG
Original	541	GGCGCCTTCCTGGTCAACGATGGCAAGCTGTTCATCACCGACACCAAGCTGGTCGGCTGG
Optimized	601	TCGGAGAAAAACAATGCCCCGAGCGCGTATCGTGGTCCGGAGAGCTTTTGGGCATTCCTG
Original	601	AGCGAGAAGAACAACGCTCCGTCCGCCTACCGCGGCCCGGAAAGCTTCTGGGCCTTCCTG
Optimized	661	GTATCCTGGGGTGGTACGGAAACGTACATTTCTCGTCGTCCGGTTGCGAGCCTGGGTTAT
Original	661	GTGTCCTGGGGCGGCACCGAGACCTACATCTCGCGCAGACCCGTCGCCAGCCTGGGCTAC
Optimized	721	AACACCAGCAAAGCGTATGGCGTGAGCATCACGCAGTACACCCCGGAGATGCATAAACGT
Original	721	AACACCAGTAAGGCCTACGGCGTGAGCATCACCCAGTACACCCCGGAAATGCACAAGCGC
Optimized	781	CTGAAGCGCCCGCGTCCGACAGGCTGGCTGATCGACAGCGTTTTTGAAGATATTTACTAT
Original	781	CTCAAGCGCCCGCGCCCGACCGGCTGGCTGATCGACTCGGTATTCGAGGACATCTACTAC
Optimized	841	GGTTTTTACTGCTATGAAGCTGATGATGTTGTTTTGAAGGGCAACACCTACCGCGACAAT
Original	841	GGCTTCTACTGCTACGAAGCCGACGACGTGGTGCTCAAGGGCAATACCTACCGCGACAAC
Optimized	901	ATTATCTACGGCATCGACCCGCATGATCGTAGCGAGCGCTTGGTCATCGCCGAGAACCAC
Original	901	ATCATCTACGGCATCGACCCCCACGACCGCTCGGAACGCCTGGTCATCGCCGAGAACCAC

Optimized	961	GTTTACGGTACGAAGAAGAAACATGGTATCATCGTGAGCCGTGAGGTTAACAACAGCTGG
Original	961	GTCTACGGGACGAAGAAGAAGCACGGCATCATCGTCTCGCGGGAGGTCAACAACAGTTGG
Optimized	1021	ATTATCAACAACCGCACTCATGATAACAAACTCTCTGGCATCGTGCTGGACCGTAATTCC
Original	1021	ATCATCAACAACCGCACCCACGACAACAAGCTGTCGGGCATCGTTCTCGACCGTAACAGC
Optimized	1081	GAGCACAACCTGGTGGCCTACAATGAAGTGTATCAGAATCACTCCGATGGTATCACCCTG
Original	1081	GAACACAACCTGGTCGCCTACAACGAGGTGTACCAGAACCACTCCGACGGCATCACCCTC
Optimized	1141	TACGAGAGCAGTAATAACTTGATCTGGGGCAACCGTCTGATTAATAACGCGCGGCACGGC
Original	1141	TACGAGAGTTCGAACAACCTGATCTGGGGCAACCGGCTCATCAACAACGCGCGCCACGGC
Optimized	1201	ATCCGCATGCGTAATTCCGTGAACATACGGATTTACGAGAACCTTAGCGTGGTTAACCAG
Original	1201	ATCCGCATGCGCAACAGCGTGAACATCCGGATCTACGAGAACCTGTCCGTCGTCAACCAG
Optimized	1261	TTGACCGGCATCTACGGCCATATTAAAGACCTGTCTTCGACCGATAGAGATTTCAAATTA
Original	1261	TTGACCGGTATCTACGGTCACATCAAGGACCTCAGCAGCACCGACCGTGACTTCAAGCTC
Optimized	1321	GACCCATTCGATACTAAGGTGAGCATGATTGTGGTCGGTGGTCAATTGACTGGCAATGGT
Original	1321	GACCCCTTCGACACCAAGGTGTCGATGATCGTGGTCGGTGGCCAACTGACCGGCAACGGT
Optimized	1381	AGCTCTCCGATTAGCGTTGACAGTCCGCTGTCCCTGGAGCTGTATCGTGTTGAGATGCTG
Original	1381	TCGTCGCCGATCTCCGTGGACTCGCCGCTGAGCCTCGAACTCTACCGCGTGGAGATGCTC
Optimized	1441	GCTCCGACCAAGTCCTCTGGTCTGACGTTCACCGGCATCCTGGAGGACAAGCAAGAGGAA
Original	1441	GCCCCGACCAAGAGTTCCGGCCTCACCTTCACCGGCATCCTCGAGGACAAACAAGAAGAG
Optimized	1501	ATCTTGGACTTGCTGGTACGCCGTCAAAAAGCGGTTCTGATTGACCCGGTGGTGGACCTT
Original	1501	ATCCTCGATCTGCTGGTGCGCCGCCAGAAGGCCGTGCTGATCGACCCCGTCGTCGATCTC
Optimized	1561	GCGCAGGCGGAACTGTAA
Original	1561	GCCCAGGCCGAGCTGTAG

Citation

If you would like to cite the GenSmart™ Codon Optimization Tool, please include the following information:

The sequence was codon-optimized using the GenSmart™ Codon Optimization Tool (https://www.genscript.com/tools/gensmart-codon-optimization) [1].

1. Long Fan (2020, February 6). *Codon optimization*. (WO Patent WO 2020/024917 A1). Nanjing GenScript Biotech Co., Ltd.