

# GENOTYPING BY PCR PROTOCOL

## MUTANT MOUSE RESOURCE & RESEARCH CENTER: UC DAVIS

[mmrrc@ucdavis.edu](mailto:mmrrc@ucdavis.edu)

530-754-MMRRC

Protocol Name: B6;129S5-Tmem178tm1Lex/Mmucd MMRRC: 032664-UCD

**Protocol:**

Reagent/Constituent	Volume (µL)
Water	5.6
GoTaq® G2 Colorless Master Mix, 2X	7.5
Primer 1. (stock concentration is 20µM)	0.45
Primer 2. (stock concentration is 20µM)	0.45
DNA (example) extracted w/ "Qiagen DNeasy columns or other similar silica based kits"	1.0
<b>TOTAL VOLUME</b>	
15	

**Comments on protocol:**

- Protocol may work with other DNA extraction methods.
- Use Touch-Down cycling protocol-first 10 cycles anneal at 65°C decreasing in temperature by 1.0°C; next 30 cycles anneal at 55°C.
- The mutant PCR is a general LacZ PCR. The wild type is specific for this strain.

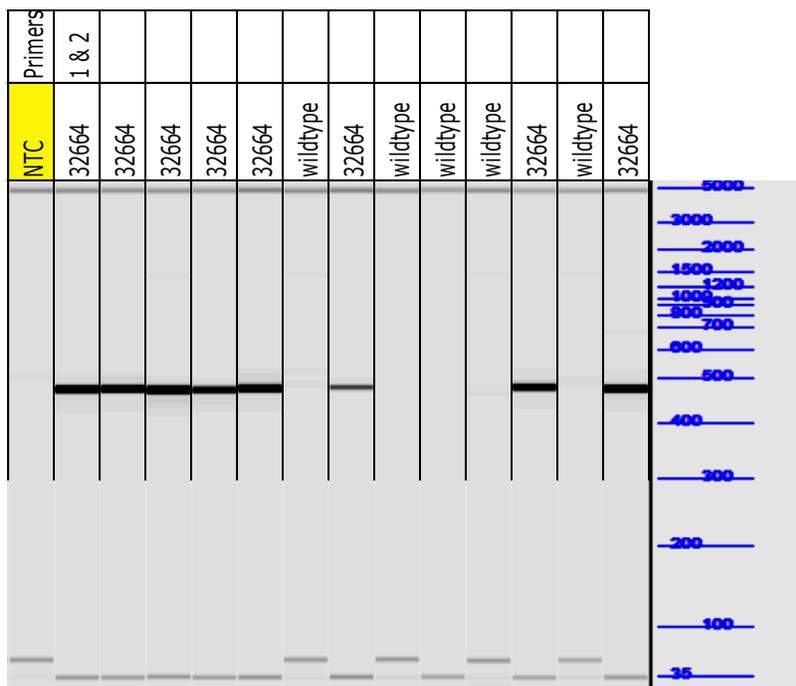
**Strategy:**

Steps	Temp (°C)	Time (m:ss)	# of Cycles
1. Initiation/Melting <span style="float: right;">HOT START? <input type="checkbox"/></span>	94	2:00	<b>1x</b>
2. Denaturation	94	0:10	
3. Annealing <span style="float: right;">steps 2-3-4 cycle in sequence</span>	65 (↓1°C/cycle)	0:30	<b>10x</b>
4. Elongation	68	2:00	
5. Denaturation	94	0:15	
6. Annealing <span style="float: right;">steps 5-6-7 cycle in sequence</span>	55	0:30	<b>25x</b>
7. Elongation	68	2:00 (↑20sec/cycle)	

**Primers:**

**Electrophoresis Protocol:**

Name	Nucleotide Sequence (5' - 3')	Argarose: 1.5%	V: 90
1. DNA216-23	AAAGGGCACGTCTCAAAGGA	Estimated Running Time: 90 min.	
2. Neo3a	GCAGCGCATCGCCTTCTATC	<b>Primer Combination</b>	<b>Band (bp)</b>
3. DNA216-6	ATCAGAAGAACCGCCTGATG	1 & 3	475
4. DNA216-9	TCTGGAAGGGTGAAAAATGC	3 & 4	377
			<b>Genotype</b>
			mutant
			wildtype





## Lexicon Genetics Incorporated – Genentech Project Materials

<b>Genentech ID:</b>	UNQ5926	<b>Date of Submission:</b>	1-10-05
<b>Lexicon Contract Name:</b>	DNA216	<b>Mutation Type:</b>	<input checked="" type="checkbox"/> Standard Knock out
<b>LexVision Name:</b>	MEM705N1		<input type="checkbox"/> Conditional
<b>Reference accessions:</b>	ENSMUST00000025092, NM_026516	<b>Is this gene X-linked?</b>	No

**Required Materials:** X pKOS clone DNA(s)   pKOS40    
 X Target Vector DNA   pKOS40.TV    
 X Targeted ES Cell DNA   2F5    
 X Genomic Map

**Southern Blot Analysis:**  
*External/Internal Probe Strategies*

	<b><u>5' External</u></b>	<b><u>3' External</u></b>
Name of Probe:	<b>16+17</b>	<b>20+22</b>
Restriction Enzyme for Genomic Digest:	<b>ApaLI</b>	<b>Avr II</b>
Predicted Wild-type Band (kb):	<b>13.8 kb</b>	<b>11.9 kb</b>
Predicted Mutant Band (kb):	<b>11.4 kb</b>	<b>12.8 kb</b>
Probe Size:	<b>329 bp</b>	<b>374 bp</b>

**PCR Strategies:***For standard knockouts, give wildtype and mutant-specific strategies**For conditionals, give 5' loxP and cre-excision strategies*

Wild type-specific (absent in targeted allele)		Mutation-specific product (absent in wt)	
5' Primer Name:	DNA216-6	5' Primer Name:	Neo3A
3' Primer Name:	DNA216-9	3' Primer Name:	DNA216-23
Predicted Wild-type Band (bp):	377 bp	Predicted Wild-type Band (bp):	none
Predicted mutant band (bp)	none	Predicted mutant band (bp)	475 bp

5' loxP strategy		Distinguish Cre-excised and wt	
5' Primer Name:		5' Primer Name:	
3' Primer Name:		3' Primer Name:	
Predicted Wild-type Band (bp):		Predicted Wild-type Band (bp):	
Predicted mutant band (bp)		Predicted mutant band (bp)	

**Primer sequences:****Southern probes**

DNA216-16 5' – ACCCTGAAATAGATGGTGCC  
DNA216-17 5' – AGGCAATGGGCATCTTAGC  
DNA216-20 5' – TTACACCCGAGTTGCTATGG  
DNA216-22 5' – TCCCAGTATGCGCAATCTG

**PCR Genotyping**

DNA216-6 5' – ATCAGAAGAACCGCCTGATG  
DNA216-9 5' – TCTGGAAGGGTGAAAAATGC  
DNA216-23 5' – AAAGGGCACGTCTCAAAGGA  
Neo3A 5' – GCAGCGCATGCGCTTCTATC

**Genomic Sequence Deleted:**

GGCGGCGGCGGCGAGCCCACCGGCGGCGGCTGCTGGCCGGGAAGCCATGGAGCCACGGGCGCTCGTCACGGCGCTAA  
GCCTCGGCCTCAGCCTTTGCTCCCTGGGGCTGCTCGTCACGGCCATCTTACCGACCACTGGTACGAGACCGACCCCGG  
GCGCCACAAGGAGAGCTGCGAGCGCAGCCGCGCGGGCGCCGACCCCGGATCAGAAGAACCGCCTGATGCCGCTGT  
CGCACCTGCCGCTGCGGGACTCGCTCCCCTGGGGCGCCGGCTGCTCCCCGGCGGCCCCGGGCGCTCAGACCCTGAGTC  
CTGGCGCTCGCTTCTGGGGCTTGGCGGGTTGGACGCTGAGTGTGGCCGGCCACTGTTCCGCCACCTACTCGGGCCTCTGG  
AGGAAGTGCTACTTTCTGGGCATCGACCGGGACATCGACACCCTCATCCTGAAAGGTGAGCGGCGGGCGCGCCCCGCG  
TCTCTACGTCGCGCGGAGCTCAGCCCCGGGCATCCCAGGGGCGCGGGTCCCTGCGGTGCGCTCTCCAGTCGCTGC  
GCTCCGTTGCCCGC

**Genomic Locus: (The deleted sequence represents nt14786-15348 in the sequence below. KOS40 used to generate the TV represents nt10270-20911 in the sequence below.)**

CATAATGCCTGAAGAAAAGGGTGTGTGCGCTCGCACTCAAAGCGCAGATCTCACAGTCACTCTCCAGCTCTGAGATAC  
AGTGCATACCCTTTTGTGTGAAAGATTTCAATTTTGAATCTCTTGAATTCAATTCAGTACACTGAGGGGTCATGGAGG  
AGGGAAGGGCGTGGTGAAGTGGATGGGGTGGAGTGGGGTGGTCTGTCTGAAAATAGAAGCAGCTTAATAGCCAGTT  
TGTTTCTAAAGCTGCCACAACAATACTAGTAAGTACTAGCCACTTAATACAAGTTATCACATTGTATTTCTGTAGATCAG  
AAGTCCAAAATTAGGGCCTTTGGCATGAAGGCAAGGGATTTTCAAGATGGGTTCTTCTGGAGACCTGGGGAAAATGGGT  
TCCATGTTCTTCTGCCTTCTAGAGGTTAGCCTGCATTCTGTAGCTCATGCCAGCTTCTTCTTCAAGGCCACTAACACT  
GTGGCTCTCTGTCTGTCTCTTTGTTGTCATCCTGCTCTCTTTTCCAGATTATGGCAGGAAAAAAATCCTATGGTTATAA  
GATTGCACATTGATTAAATCAGATATATGTATATAATTAAGGATAATCTCTCATTTCAGCCAACCTCTGAACCTTTAGTT  
TTACTGCTTAAAGTGCGTGCCTGTGCATATACGCATTCATATATGTGAACATTTATGGGTTGCATGGTGTGACGGGTTGGG  
GGTTGGGGATTGAGATATACCCAGAGGTCAACTTCAGCTGTTTCTCAGTCAAGACCCATCCTGTGTTTTGAGACCGGAT  
CTCTCACAGTCTAGGGATCACCAATGCACCTAGGCTAGCTGGCCAGCAAGCCTCAGCCATCCACTTGCCTCTACCTTTT  
CAATACTGAGATTACACACGTGTGCCACCACCCCTAGCATTTTAAACGTGGCCCTGAGATTGAACCTGATCCTCGTGCTT  
TGGGCAGTAAGCATTTTACTGACCAAGTTATTGCCATGTAAGGGAATATGTTCTTGGATCGTGGAGGAGACTGGCAATT  
ACTGGATCCCACCCAGCCACACAGCTGATATTGTAAGTGAAGCACAAGGTTTTTAAATTAGACCTGACTTTTCCATCT  
CCTTAGGAGCTAATAACTCCCCATAGATTTTTCTTTTAAAGCTGTCTGATTGATTGGATATCAATCAGTTTATAGGCAA  
GCAATAATAATACTAGCAACGTCTTAATTTTTGTTATTCAAATTATAAGGTTAATTTGCTATACATAAGCTTGGTGTGAT  
TTTTCTATAGCCTCTTCTTCAAACATACATGGGTTTCCCTATCTTAGGAGAGTGGGGCTTAGCTCAGTGATAGAGCGCT  
TATGCATGAAGCAGATAGCCTTGGCTTGGTCTCAACTTGAAGAAAACAACAACAACAACAACAACAACAACAACAACA  
CCACAATAAGGCCTTACTTTTTCTGTCTTTGACACCTGGACAAGGTTCTCTGCCTTCAATTGCTGGAGTTCCAACACA  
TGCTACCTATATTTTTTCCCTCAGTTTTATTACCCCTCAGAATCCAAAGGCTAATGTCTGTTTTAGTCTTTTTCCACT  
GGCTGCTGAGCGAGCTCCCCTGTAATTTCTTTCAGTTCACCATGAAGTCCCACACCTGGAGTTCCCGTGGCTCTCCTGACT  
CCTCACATCTAATTTCTTGTCTTCCACCACCTCTGTCTCTCGTGGGCACCACCCAGTGAACATTTCTGCATAGACATCA  
TTCTGTCTCTAAGTCTCGATGGCCAGGGCCTCAGTCTTGTAAGCTGTTCTCCTGCTTGGCTTGTGTTGCCTACCCATCTAC  
ATAACTCTATCTTTTTCATTAAGAGAGCTCTGTCAATTGCTTTAGCTATCTTGGCCTAAGCATCGGATCTTTCAGTGTCCACC  
TGACTCCTTTCCCCTTTGATTTACCCAGTGTACAATGTACAATGCCTGTGTGATCTCTTCTTTTGCATCTGTGCTGTCC  
TTATGAGTCTCTTACTCATGCCAAATGACTCTGGGTGCACTGTTATCATTTTCGTTGTCACCAAGGCTACAGTAATCA  
CCTTCTTTCTTTTTTTTCCGTAGATGGTGTGCTGCAGCTCTTTCCCCCATTGCTTAATATCTTGATGGCATTTTAAAGACCAT  
GGGTTCTGAATCAACCTGTTGCCGTTTTATCCAAGATTCTTACCAAAAAGTCTCTATCCTTGTGACCGTGGTGGCCCA  
CTGACCATGAATGAAATCTTCTCCCTCGCCACCAACGTGCTCCCATTACCTGGGACCCAGCAGCATGTCTACAGCCA  
CCTCTGTTTCATGACTTCCCCTCCTCTTGTACACATTACCATCACCTGAGAAATACCGAGCAGCAAAGAACTTCTGCAAT  
GCCAACCAAACTATCACAGTTGTTTCATATCCCTGCTTCTCCTGCTGTGTCCGAGCTCTTTTTGACCATTCTACAGGTG  
ACAACGTTGTACACACTCATGACAGTCTTCCATTTGTCTAGCAGATTCTTTTCTTCTTGTGCTGATATGTGAGATGTGC  
GACTAGGGAACAGACTAGCAACCAGTGATCCATTTGGCTTGGGCTATGCACACCCATCTTCTAATAATGTATCAGGCAC  
TACTTCTGTAAGTACTATGTATACAAACATACCTCTGAATATGGAGGGTATGAGAGCAGATCTGGCACAGACTGTATT  
GGAGTACAAGGCAAAACTGTGTCTTTTTCAGTAAATTTTTTAAAGGAAATCTTTTATTAGCTATCTAATACCTACCAATAAT  
AGGGTGTACATATTAACGTCAGATGGATTAAGGGAAGAATGGCTCACAGTGAACAACCTGTTAATGTGATCCAAGCTGA  
CAGTCAAAAATAGGGAATCACTTGATTACACGCCTAGCACCAAAAGCTCCCTCCTCTTGTGTATCTTACAAAAAGAAGCC  
CAAACAGTACTTGGAGCCTTGAGTATCTCATAACATGCGGCCACCGTCTCTTGCAGTATATTCTGTTCTGTTGCTTCT  
CTTGAATGAAGTCTCCTCACTATTTTGTAAATCTGTGTGGACTTTGATTTTCAAGCCAAGAACCTGGAAACACCTGGCCCA  
GATCCTGACTGCTATCAACACACCAACTTTGTCCAGCTTGA AAAACAAAGCAGAACA AAAACAAGACAAAGGCAAAGAC  
AAAAAAACA AAAACA  
TTGTGTTTTATTTTCTCATTAGTCATTCTGTAGTGTGAGCACAACACACGCCACGCCTCATCAAAAACATACTGTACTTTA  
TTTCCATGTCACTCCCTCCCACTTATTCTTCTTGAACA AAAACA AAAACA AAAACA AAAACA AAAACA AAAACA AAAACA  
CTCAGGCTACTCTCAGGCAAGCTCACACCCACTACCAAGGAAACCCTTACAGTGAAGCTTCCAGCGACATCTGCACTG  
CCAAGGCCACTCTGAAGTCCCAGCTCTTGTCTTGGTCAACGAGTCCGAGTCACTGACTTCGGGGGCTGATGAATCCCT

TCTGTCCTGAAACACTTGCTTCTCTGGCTCGCTCTTGGGACTCTGAACTCTTGCACTCTCTGGCCATGTCCTTTTGCT  
CCTTGTGCTTCCCTAGACTCCAATAGATGGTGAATTTCCATGTCTCAGTCCTTGACCTTTCCTGTCAAGGCTTACTCTCTG  
GCTGACATCATGCAGTCTCATGGTTGAAGCCTCATCTATAATTTGGATTCTCTTGGTTCCGAGTTTCTATCTTTAGCCTGA  
ACTTCTTCTTTAACTCTCTGCTTGCACATCCCATGGCTTCCCTTACTGTCCGGTATCTCGCAGCTAGTAGAACTCATAGTGC  
ACTCTGTCTGAGCTCCTGACGTGGTCCACACTTCCACTCGCCTCCAGCAGCCTGTGCTTTGTCTGCTGACTCTATTGTCA  
CCCTTCTTTTTGTTGGCACATTGGAAATTCTTTTGGTTTCACTTTCAAGACCTCCCCAGAAACCACACGCTTGTGCGCCAT  
CTGACAGGCTACCTCTATCTGGTCTAAAACCTGTCAATTGCCTATGAACTAAACAAACAGCCTGCACAAGTACAGACC  
CTGAAGTCCCACCATGCAGACTGGACGCAGTGGCTCTGCCAGTAAAGAATGACCTGAGCAAGGTGCTCAACTCTGCTT  
CTCCAGTTTCTCACTGGGAAGACTGGGATCCTAACAACAATGCTGCTACTATGACTAGAAGTTGTGGAAAGTATTTAAA  
GAAAAAACAACCCACATATAAAATATTGCCAGCCCTACCAAATAGCATATGACCAATAAATGCTAAGTATT  
ATCTATAAAGCTATAAAAACTCCATGCAGCGATTGAAAGGTGTCAGCAAATCAGAGAAGTTATGGGAATAACTAT  
TCTGCTGAGCATAAGCCAAGACGATCTTCCATATCCAAACCTAAGACAGGTGTGGTGGTGTGTGCCAACAACTCAGT  
GCTTTGGAGGCAGAGGCAAGAGGATCAAGATTTCAAGGCGATCTTCAGACAATAGTGAGCCCAAGGGAAGCCTGGGCT  
GCATTAGGTGCTATGTCAAAAATTCAAACATGAATAAATAAATAAATAAATAAATAAATAAATAAATAAATAAATAAATAA  
TCAGGATAGAGCATGTTTGCATCAACTACTCTGACCTGTGCCTGTCTCTCGGTCCATTGCACCTTGGAGCAGCTTTTATC  
TGTCTTACAGTTTTACAGACAGACAACCCACTGCTAAGATGCCTCGATCTGGTAGTACTTGGTATTATCATGTGCTGCT  
CTCAGCTTTAAGAACAATTTCTTCTCCAAATCCCCTTCCAGATCCCAGGAATCACAGATGGCCTTAATCTCAATCTTGGC  
TCTATTCTTGGTCAATCCCCCAATCACTCTTAAGGATTCCATATCTGGGTTACTGTTGCTGCTACCAATGACCACATTTA  
AAAGTGAGCCCAGCTCGGCATCAGTCTCTGCCTATATACTGGAGCTTCCAGGTTAAGTGTTTTATGGGTGCTTGAGT  
GTGCAAACAAGAGGGTCTCTGACTCTTCTGCTTCTTGTGCTTTTTTCTTCTGTTGGTTTTGCTTGGCCAACTTTAATGTA  
TCTTATTATATTCGTTTTATCTTATTATATTTTATTTTGTATATTAAGAAGTGAATGAATGAATGAATGAATGAATGAAT  
GAATAAATGAAAACCTTAGCATAAAGGTTAACAACCTGAACTGTCATTATACCTGCTGGGGACAGGAGAGGGAAAAATC  
AGTTTTCTCCGACAAAATAACACTGGGTGTATCAACCATTCCAGAACAGGCCTCACGTTCCATGTGCGCTGACCAGCAC  
ATAACTGGACTCCACAATTATTATTTTTTTGTGTGATTTTTCTTGGCTATGCTTTGGCAGATCCTTTTTTTTTTCTCTTT  
TGTGGTATGGTTTTTACCTTGTTTTCTTGGTTTTGAGGGGCTCTGCTGTGTTGAGTTTTTGTGTTTTTGAACAGGAAC  
TTAAAGTTGGGTGGGTAAGGAAGGGGAAGAGGATCTAAAAGGACAGGTGAAGTGAAGAATATGATCAAAAATATATT  
GAAATTTTAAATATTTTTAAATAATAAGATGTAATTAAGCTACATTAAAAACGAGCCCTATAAATCTAATTTTCATGC  
AGCCATGAAGACCATTTTTAAATTTCTCATTTTACTGGGAAAAAGAAAGCCAGGCTTTTGGAGAAATGTGGTTGCTACAG  
AAAAATTGTAAGCCGCCAAGTAAGACCAGAAAAACTAATAATTTCCATAAAATTCAAAGGTGAGGCCAGCCAGCCAGA  
CCTCCATGGGTGAAAAAAAAAAAAAGAGTAATTAATAATTTTCTGAACACCAGCAGTAACCTTTCTTATTTGTGACT  
AACTTCATCAGTAGAACTTTAGGAATTTCTTTTGGCTAATTGTAGGGTTTTCTAGGAGAGAACCCTTTCTGTGGTAT  
TGGGATTTCCACAAGCACAAAGTGCCTTGGCTGGAAACACTAAGAGGCATCTCCCTCACTGCCAGCCTTCTCTCTGGC  
TTGCCACTCACACCATCCAAAGGCTCTCCTTACAAGCAGGTTGATGCCGACACCTAATAAATTAGGCATATGGGGCTC  
ATACATCAACCCACCTACTGGATTCTTTTTGGTCACTGATGCGTTCCCTCGCCCCCCCCCTTAATCAGCCTCA  
TAAATCTGACCCTGACAAGTCCCTGCCATCTCCATCTGTAGTAGGAGGTGAAGTGGTCAATTTGTCCCCAAGCTTTTCT  
CCCAGTCTCTCCTTGAGTGACCATCAGTGCCATGTGGTGCCATTTCATTACAGGGGCTCAGGTGTGCCATGAAGATCG  
TGTGTCAAGGGCTGCCAAACCGGTGACTCCTTCCAGGAGGACAGCATGGCTCTCCAAGCACTGTGCGCATCAGATGCTC  
GCACTCCGCAGTGCCTGATTTATCCTGGCACACTGAGTGTGCTGTGCTGGATAGATCACACCCTGAGCTATTTCCCCCCCC  
CCCCCAGCATCCAGCCGTTGATAGCTATCCACACCCAAGCTAATGAATACATGGAATCGTCCAGTTTTTTTCAAGAGAT  
TTATCCAAAACAAGAATTGAAGACGAAAAACAGAGCTGTCCAGGGTGTGACCTTGCTCTCACAGGTGGGGACAAATGCT  
TATGTGATCCTGTTGATTTCGAATTTGACTCAATCTTTATCTCCAGATCTTGGCCCTGAGAATCAGGAATGTTGACCCAGC  
TCATGCCGCGGTGTTTATGTTCTCATGACTTGAGCAGCGGTGTTTTACGCCTTCTAGGAGATGTGTCATTAGTCTGG  
ACTGTGTCTGAATCCTTGTCTTTCTCATGCTCTTCTTAAAAGGGGGAGGGGGTGGGGAAACATATCCCACCCAATCAG  
AGGAGGAGGGGAGAGGGTAATAGGAGGAAGGATTGTGTGAGGGGGTACTGGAAGGGGGCAGTGATTGTGATATAAA  
GTGAATAAATAAATAAATAAATAAACAACAATAAATAAAGAGGAGGGTAGTTTTTTCTCTTCTTCTTATACAGGTGTTGTT  
CAAGGCTGACTTAATGTCCCCTTGTCTCTGAGAGCTTCTCTATCCCTTATTCAAGAAAAAATAAGTTCAGATACACT  
CACCCATGATTTGTGCCTGTAAGATGCAGCAGCTGTGGGCAGTCATTTACGCCCAGGCCTTTCCAGCTCATCCACTCT  
AAAGACCTGGGAAGGTGAAGACACCTTATCAGGCTCCAGCAGCTCATTTATGCTGTTACAAAACCTGCATTAACCACCT  
TCTTTATGGGCCATAACAAATAGGCTATTGAAAGAGTGTAATGGTTCCATAGTTGGATGCATATCATCTCACAGG  
CAATTTATGTTTTGGGGGGTTTTAAACCGGGCCTTTGTGCTTCTCATTAGGGCCCCGTCTTGGAAAGAGGGTCAATGTT  
CTGACCACAGGATTGTGAGCAGCAAGAGCGAGCAGTCTCCAGAGCTTGTGTTGCCGATGATAAATGATAAGCAGGAG  
AACACGCTGTCAGTTATGCTGAGCACTTGTCTGCGTCAGCTTACACCCCGCTGTGTCTCTAACTGCTTTGTCTCCTTTA  
GATTCTTCTAGCATCCTTAAGGAGGACCCTACTCTTATCCCCACTTACAGAGGGCGTGGAGTCTTCTTCTTAAACGAAGC  
TCTCTATTTTCCAGGGTCTCAGATCCCTGACTCCAGTCTCTCAGCTTTTTTATGCCGTTCTTCCCTTGGCAATCTCATCT  
AGTCTTATGAATTTAACAGTCAATAGGCAGTTTGTACCTATATGTTGATATTGCTAATTTAAATCTCTACTCTAAATTTCT  
CCTTACTCCCTCTGCTTGGGAACATAACCAGGGCTTTGCCCGCATCAAGAAAACATTCTACCATCAAGCCACACCCTCG  
CCCAGGCTGCTTCTCTTAGTCTTTTTTTAAGAAAATTTTTGTGGTTTTATTGTATCATGAGGCATTGAAACATCTGAAC  
AAATCAATATCTGGGCGGTTGGTGAAGCAGCTGCTTCTCCTTCACTTCTTTGGGTTACTAGAGCAACTTGTGAGTAGAT  
TAAAAACAACAACAACAACAATTAACAACAACAACAACCCACAATCGTTTGCATTAAGTCTTTCCAAGGC

ATGCGCTGGTACAACAACTTCTGTGCTAGATGCGACTAGTCTAGCATCCAAACATCATGCACAACACCGTGGTGAC  
AGAAGCGCCCTGCACCCGCTCCCGCCTCGGCCCTGCTCGTTTGTGTATGATATTTGGAGCATCTGGAGGAGTGAAGTGA  
GATTGGGAAGAGGGAGGAGGAAACAGCGTGAAGTGTGGCCAGGAGGAGGTCAGCCGAAGTTGCAGGGCAAGCCTGAAC  
ATGTCATTGGTGCACCAAGCATTGTTGATGTTCTTTAATAGAAACATCTGGTGGAAACCCATGATGGGATCTTCAT  
CAGCCTTGAGCTGGCCACAACATGCTGATGATGCAGCTATCTGGTGTAGGCTGGTGGTCTGCGCCGTGATGCTATG  
CTGAATTTTCTGGAACGGAAGGCTAGATAGCTTCTCCACAATGGCAGCTTTCCCTGGAACCTGCTGACCTTCCACGTA  
AGGCATGATGCATCAATATAAATTGCGCCTAGTTGGGTTCTGTCGTTATCAAATAACTGGTAGTAATGCTGAATAAAGC  
TGGATCCAATCTGCTCCCAAATTGGCTTGTCTCCATCCTGGAGAGTCAACCCACCTCTGAGACCCGTGGGGCTGGCAG  
ATGGCGGCAGCGCGCGGCAACCCAGCGTGTCTGCTTCTCTTAGTCTTACATTCACACATCCAACCTGCCTTTTCCACT  
GGGCTTGTGAGTGCCATCTCAAAGTCAACGTGCCAAAGCATTCTTCCGCTTCTCTGTAAATGCTTTTCTCCTCTG  
TCTTCTTTTACAGCTCCTGGTTACATTGAAAATGAATGGGGCTTGGTTTCTGGTCTCCATAACCTGGCTCACAGTGA  
TTCTGTGAGTTAGAGCTCCACCAGTTTCCCTGTTAAGTGTGCTGCCTCCTTGGGCTATGTGTTAATGGTACCAATCTTG  
TCTAGACCATTGTGCCTGACTGGTTGTCTGCCTGATACTGGCCAGCCCAACCCCAAGCCAATTTTGGCAGCAGTCT  
GAGTGACATTTACAAACATGAATCAATTCATGCCCTTTCCCTGCTTAAAACCTCTTAAAGATTTTCTTTTGATTCAAGTC  
CAAGCTCCATATATGGTTGAACTTGACCGATGTTGCAATGTCACCTCGTACTTTAACTATTTCCCATTCCTTTGTCAACT  
ATTTGAATGTAAATAACAGCATGGACATGTGTCATAATAAATTATCTAACCACCTGCATCTATGCCATCTACATTA  
TGTCTCACTATAATAGGCACGGGGAGGGAAGGGAGTGGGAAGGATTATGAAGACCGTGTGAGGCAGACATTTATAG  
TCTAGTTGTTTCAAGACTGTGTATCTGAGAATATGGGTAACACCTGCCTTGCAGTGCAGAGTTAGGGAGCACTGAGCCT  
CTGTTAGGCAGGCTGTTTTGACCCAAGCACCCATGGGAATCCCTAGGTCCTGGGTTCTTTGTAGGGGTATAGCTGTGA  
TAGAAGATTTATGTCTGAGAAAATGGGTAGACATTTGGTAAGCCAGGCTCTTTTGTCCATCGGGGCAACCACACAGATG  
GTTATGAATTGGAGGCAATGGGCATCTTAGCTACATTCAGTTGTACTTTGGTTGTACATATCACCCAAGAGCATAGAA  
TCGAACCCTAGTATCTACAAACACAGACAAGGTGGCGGGTGCAGTTAGGTATGGCGATTAATGAGCCGCCATCTGCCA  
GCACATCATGCTTTGAGTGGGACTTAACGTGGTTACGGGTGTCTTTGAACATTTCCCCCTACCATATGTGCTTAAAGGA  
TCCAAAAGGAAACAGCTTAATCCAGGAATGTGTAAGAATGGTGCATTCTGTGGTGTGTCAGTGAGATGAGAAAC  
TTATCAGGCACCATCTATTTCAAGGTTTTCTGGTATTTTGTGGTTTCAGGCATCTAGTCTGTGACAAAATGGCACTGTC  
AGGATGATTTTCCACATGTGTGGGATCCTGTGGAGCACCATGGTGTGGGTGCTGCTTCTAAAAATACACCCGTGGGGTT  
GCCCTGGACTCAGCTGACAGAAGAAATGACTTCTTTTCTTCCAAGGGCCTGAGATAGTGTGATGCCACGCTTTTTCAGA  
GTGGAAACTTCTGTCTCTAGACTAGGTTTTCTCTGGGATGTTTTTGTGCCCTTGTGACATCATTTGTCCAAGCTCTTCA  
TTGCTTCTTACATTTCTGTTTTCTTCTCTAGCAACCTAAAGCTTCCCTAGGACATGCATAGAGCATGTTTCTCCACGGT  
GGCAGAATCCAGTGAGGCCTAGCACCAAGACTTACATTGGAAGTGTCTAATATATCTTGAGTTAAAATAACATTGCTTC  
CAGAGAAAAAATAGAGAAGATACCTCAAGTATTTTAGAAACGACATATTGTAGATCAACAACATAATTGACTACAT  
CCTTACATTAAGTACTGGAAAAAAAATGTGTGATATTACCAGGAAAAAGAAAGCCTCACTTTTTCATGAGTTAGTTCCT  
AGGTTTGGTTAAATAACATGGGCTTAGTCCACGTGTTCAAATAAAGGAAGGGTGGTACATGGAATCTTGGCACTATTAC  
AGAAAGGCAAAGGCTTTTAGAATATTTATGACCAGCAATGTTAACTTAGCATTGATGTATCAATAAATCATTTGTGATA  
GCGCCATAGTTCTGGGATACATGGAGGTGTGTAATGT  
TCTATAAGGAAATATTTATGCAATGACTCTAATGATAAATATGATCAAAGTTTGGCACTCAGATATTATAGCGAATGTG  
TTTGAGGAGGGCAAAGTGTAAAATGGCCAACACATCAGTTGGGGCATTAAATGCTATGGGAATACTTAAACAGTAA  
CAAAGAAGGCCCTAGGGAGATACAGTGAGTTATTTTCTCTATGCTAAAGAGTGGGGCATGTAAGGTGACAGGAGGAAA  
GGGACATTAAGAAGGATGCAGTGGCAACAGTATCTGTGGTGAAGTATAGGAAGAGCTGGTCTGAAATCCTGGGGACCA  
AGGAGAGCACTGCCACCCACGACGGGCTACTGGAAAAGACCCAGAAGGACAGATATAAATGACACTTCAAAGGAAA  
AAGCCACATGATTTGCGAAATTCTGAAACACAGAGTATGAGTGGCTTATATGGCTTGTCAACAGGAGAGAAAAAGAGA  
TTGGAGGCAGGGCAGACACAACGTAGGGAAAGACGAGCTTGGAGTTTGGACATGTTCAAATACAGTAACGTTCCCAGA  
TGGAAATTCTCAGATTTCTCCCTGTCCCTTCAACAGGGCTGTTTAGTGAGGGATGCACTGGAGTGTGGTGTGGA  
GAGAGCAAAGACAAATTTTAGATGAGTGAAGCAAGCAACATTTGAAAATATTGAGGTCTAGCCCTGCTAATTCTGAG  
CCATGTAAGAAGCCATTAGATTAGTCCGACTAGATGACTTAAAGACATGGAAAAGTATTTGTATTACAGTGTCCATAAA  
CACTGAAATTTCAAATGTACTAGATGGACATAAAACCAAGAGTTATAACCTGAATGAGATGCTAGTATCGCTGATAT  
TTTCCCTTGGCAAACCTGAATCTATCCTTGGAGAATAAGTCAGATGCCTGTCTCAGCCACCTGAATTTCCCGCTCCC  
AGGCAGTCTGTCATTTACTGTTTCTTCCCACAACACTCGGTTTATATTTCTGCCACAGCCCTTGCCTCTAGTTCTGTGC  
ATGTTTTCCCGCTTGGCACCAGACTGGGGACAGCATGAAGATGGGAAGTTTTCTCATCTCGGCATTCCTCACTCCTGA  
GCAGCTGGGGTTGGTGGGTGACAATTCATCACTGGAAATCTCCAACAGAGGAAGGCTGAAAACGTGGACGGACGAAG  
CGATGTGCAGTCGCTGTAGCAAAGCCAGTATACACATCACATGTCACTTTTCTCCGACGCCGATAATGCAGAACCAGCA  
GAGGCAGCACTCTCATTACACACTGCTGGCCCATATTTGTAATGTGTGACATTTTTTATGAAATACTGTCAAAGGCAAT  
CCATCATTGAATAACCTTTAGATTATATGCTGAGGTTGATTTTAAACAGAGACGTAATGAACTCCGAGGATGATGCTG  
GTTTTTAAGAAGGGTGTGATCAAAGAGTTCCACAAAGGCAGAACAAATGCCACGGTCTATAAGACACCATGTTCTATA  
GGCAGGACACTATGTTCTTTAAGTACATAGCAGTGAAGTGAAGATTTTCTGCTACCCTTTTTTCACTTGGGGACAGG  
GTTAGTGTGATGATAATCATGTGACTATGAAATGTGGCTGAGTATTTGTGCCTTGTAGTACATTTGGGTGAGGACATGAT  
AAAGGGGCGAAGACAATAACATGAAGCAGTCTCGGGCTTGTAAATACTATCTTGAGAAATGCCATATGGTATATG  
TATATGTATATATGTGTATATGTATATGTATATGTATATGACACAGGGCACTCTAAGTTAATTTAGATGCCAGTTCG  
ACTCACAGTTAAAGGGCTCTGTATATCTGGAAAGATCTATAATCTTACACATATTATAGAATATAAATAAATGAAACC

TTCTAAGTCCCATCATTCTGTGTAAATCCTGAAAACGCTTCCTCTGCCGGGTTAGTGCTTCCTGAGAAGGAAAAGCTG  
ATTGTGAGAAGAACTAAAATTGTAATTCTTTGCTTCCTAATTAGACCCAGAGCTCATCACAGTTCTTGCTGAAGCT  
GTGAGGAAAAATCCAAGCAATAATTCACATTGTGTCAGGTCAGCAGACACGGGCATGGGGGTCTGATAGGACCAAGATT  
GCTTAAGGGATCTTTCTGTGAAGTGAACAGCTAAGAAGAGGTACATGCTCTTCCACAGGAAAAAATCCCTGAAG  
ACGTGGAGCCCAAGCAGCAATGAACATGGATCGCAGCAGCATCTCGTGTACCGTTACAGATGCCATTCCATAGGAGG  
CAGATCAACCACCTCTATACCAACGGACGTGGGGCACTAATTAATAAGTCCATTAAGCACGGAGTAATGACATTTA  
GCATCTAATGAATGCCTCATAATCTCTTCAGTCATTAATATTTTCATAGTGTGAGAGCATAAAGGATAGCCGTCCTGGACT  
GGTACAGCATGGTTTTCTGCCTCTGACATGGCCCCAAGGGTGTAGGTGGGACCAGGGTATGGCACCTTGCCATGCAGAA  
TATACATGCGCATCATTCACTCTGTACTTTGGTCCCAAGGATTCTCTTTTAGAAAAGATCCTGCCTGCCATTTTTAGAGT  
GAACATCTGTGACTCCAGAAAAGCCCTGGAAAAGCAGAAAAGCCTCAGATGTTGACCGGTGTAGAGCACTGGTTTGTG  
TTGACCCTCGATGACCACAGGAAAAAAGAACTAGTACAGGAGAAAAATCATTACTTTGATTTATCAGTGGTGGGCTT  
GCTTTATTCAAAGGCAATAATCACTTGGCAGAGCAGGTGCCACTGCAAGGCCGTATTGATCCAGGAGACGGTCAGTCA  
CTCAGGCGTAGAGATAGCCCAAGAAAAAGAAGTCCATCTCAGAACAGGCAGGAATGAAGTGGGCGGCTATTATCTCTG  
ACTGTGGTTCTGTGGCTCCAGGGACACTGGGCATCTTCTGCGAAGCAGGGCTGGAGCAGAGAGAAGGGTTCCAGGC  
TGCCAGGAGCCCGAGAGAGGGAAGCAGGGCTATTGAGCTAGCTGCCAAGGTCTCTGAGATTGGATCCTTCGGAAGTCT  
AGAAAAGAGGCTGGCTGCTCTAGATCAAGAGTCTAAAGAGTCAAACCACACGCGTTCAAGGATGGGATTTGCTCCTG  
GGAGCAAAACAGAGACAGTGATCAAAATCAACTTGGACAAGAGACAAAGATCCAGCCTGATGTTGGTGGATGTCTTGT  
AAGTCTGTGGGAGGGACAGAGGATCGGAGGTGGTGTGTGCAGGGGTAGGTGCAGAGAGGGTTGGAATCCAAGGCAGG  
TATATAAAGGCAGAAGGAGCCAGGGACACAAAGGCCCTCCGAGTGGGAAAGAGCGTCTGGAAGAGTTGAAGAAAA  
GTAAAGGGAAAGTAGGGACGGGGTTAAGAGGAGAAAGGAGGATAGAGAGCAAAGGGAGGATGGAGAGCAGAGGTGA  
AGGCAGGGAGAGGGGGCTGGAGAGAGGGGGCTGACCGCGGGAGCTGGAAGCAGGGAGAGGGACGAGGGCGTGATC  
GGCCGGGGTAGCGGGTGGGTGGGTGTGGGGAAGTGCAGGGGAGCCGGCTTTAGGGGGAGGGCCGCGGGAAAGTGAGA  
GCKCGGGAGGGCGCGGGGCCGGGCGSAGGAGGCTCCCGCGGGGGAGAGAGGGCGGGCGGGCGGCGGCTGGGAGGGA  
GAGTGCAGGGCAGGTGGCRGGAGGGAGGGCGCTCGGTGGAGCGCCGAGGCCAAGTGCATTGTGTCTGGCGGGCGG  
GCGAGCCACCGGCGGGCTGCTGGCCGGAAGCCATGGAGCCACGGGCGCTCGTCACGGCGCTAAGCCTCGGCCTC  
AGCCTTGTCTCCCTGGGGCTGCTCGTCACGGCCATCTTACCAGCCACTGGTACGAGACCGACCCCGGGCGCCACAAGG  
AGAGCTGCGAGCGCAGCCGCGGGGCGCCGACCCCGGATCAGAAGAACCAGCCTGATGCCGCTGTCCGACCTGCCGC  
TGCGGGACTCGCCTCCCTGGGGCGCGGGCTGCTCCCGGGCGGGCCCGGGCGCTCAGACCCTGAGTCTGGCGCTCGCT  
TCTGGGGCTTGGCGGGTTGGACGCTGAGTGTGGCCGGCCACTGTTCCGACCTACTCGGGCCTCTGGAGGAAGTGCTAC  
TTTCTGGGCATCGACCGGGACATCGACACCCTCATCCTGAAAGGTGAGCGGGCGGGCGCGCCCGCGTCTCTACGTCCGC  
GCGCGGAGCTCAGCCCGGGCATCCCAGGGGCGCGGGTCCCTGCGGTGCGCTCTCCAGTCGCTGCGCTCCGTTGCCCC  
GCGCATTTTTACCCCTCCAGATTGCTTCCCTGCTTCCCTCCAGTACTCTTCTTCTCCCTTTCTTCTGCTCCTTCATC  
CTACCCTTCTTTTACCATTTTCTGGACTCCGTTTTACCCCTCACACTGTCTCTTTATCTTCCCTAAGACTCTCTCTCTG  
TCCCTCTGTCTGTCTGCTGCTGCTCGGGTGTAGATATGGATTTTCTGACAGTGTTCACAGGAGGGTGACAGCCA  
CAAAGACTGATCTTTCTCAACTGGGTTCTTCTTCCCTCAACTTGCATTTTCTTTGAGACGTGCCCTTTGGAAGAGACAAG  
TGTAACCTCAGAACAAAGGAAAGAGGGCTTTCTCATGATTGAGTCTCGTGGTATACCATTAATCGAGGTGGCATTCC  
AGCCTGGAATGGGGAGCGAAGGTCTGTCTCCAAACACTCCAAGTTCAGGATCTGTTTGAATTGGACTTCGTATTCCCT  
AATCACTAGTAAAGGCAGCTAAAGGGAKCTAAGACACCGGCTTTACTCATTATTCAACCTTCCAGATGACCACCCTCC  
TCAGGGTCTAGGAAGCAGCTGAGGAGAGCCAAGGGCCAAGTCCCTGAAAGTAGACTTGCCTCAGAGATTCTACCTGC  
CACGCTCTTATGGTTGTGACACTTTGTAGGTTGTCTTTATTGTTTTGTTATTGGGCTTTGCGTTGGTACAGCATCATTTTG  
CTCTTCTGGAATCTATGCAACACCTATCTTATGTATGGAATCAGGTAGTTTGAATATTTTCTTTGTAATCCTCTCTTGTGG  
TGATTCTTTAACTTCTAAAGATCAAACCTTAGTAGAATTTTTTGTCCCCTGAGAGAAAAACAATAAACTTCTTT  
TCCTTGGACTCACTGTTCCCAAAAGGAAGTACGAGGTGAGTCCATTTGAAAATATTTAGAAGCAAGTGAACAGATGTA  
AATTGAATTACAGCCTGCCATGGAACCTACCGAGAAAGGAGGGGTTAATACTGGCCTTCCCATCTTGTCTTTGGCAT  
AGTCTTCAATTTCTCAAACATGTCAATTTCTCTTCCATGGCTAGCCCAGCTGGGGACTGCCATCCAAATCTGTCTGTA  
TATGGAAGGACTCCAGCAATTTGGGGGTGGGGTGGGGTGGGGCAATCGGATACAGTAATCTTCTTTGGGAAGTAAAC  
CTTTTTCTTTTCTGTTCCAACCTGCATCCAAATCTGATTTCTCTCATGAAGACACTGCATAATTAATCCTGATAGTAGCG  
TAATACAGGAACAACTGTAAGAGCTGACTGTGGAGGCTCAGTTATGGAATGCTCATTTAGGCAGGACAATTTGAAA  
GTAAGCAGTGTAGTCTGTCTTTGAAATAGCAGAAATTGCATTTTTACACACACACACACACACACACACACACACAC  
ACACACACACACACACATTCCCTGTGCTTAGAGTATTTCACTGCATGCAATTTGGATAGAGTGTAGTGTCTGAAAC  
AGTAGAGCAGAGTCTAAGCCCACAGCAGGAGAACTCCCACAGGGATACTCCAGGATACTTATGGAATGTGCTGGCTA  
GCTGAGGTGTCCAGAATCAAATGATCGTAGGAGATGAAGAATGTTATCAGAGGTCAATGAATCCAACCTTTCAATCCA  
CTGTTCTAACCTGTACAGTTTCTGACAGATGGCCACCAATACAGAACTCATATGCTATTTAGATGAATTACATTGTT  
CTGGTCATGAATACATCTTTTAGATGAAAAAAAATTACCTCACATATACTATTGATAGTTGCTAGCTCATCTTTGT  
GGAGAACTGGGGGTTTCTGGCCTGACAGAAGGTAGGGGTGGCTACAATCGTTCATACTTACTTGGTTTTGTTGTCTC  
TTGTCTGTGAGGGTTGACTATTCTTTGGGGAACCTGCTAGATCTGAGATGTATCGTTGTTTTAAGAACAACAACATGATT  
TTAGCTTCTGGGAAGCTAGTGAGCTGATACTGTTAGAAAATGAGGAGCTTAGACCAAAGGATGACGCCTGTCATTCCG  
GGATTCTGATTTGTTGTTGGTTGTTGGGGAGAAGATGAGAAGCGCCTCTGGTACTAACAACAGCAGTTTGTACTGACC  
CACGTTAGGCTGGACGAGTAACTCTTTGGGTCTGTTTACCTCTGGGAAATGCATGGACATGGAAATTTCAATAAAT



TTTTTTTTCTCCCCCTTAGCTACTGATTTTTTTTCTTCAGAGCTAGAAAAAGCCCTCCAAGTCCATCAGGCAGACTGCT  
CCTAATTGCCAGTGTCTTGATTGCTGTGCGACATCAGCTTTTGTGAGAGGAGCATCTGGGATGACAAAGACTCCCTGT  
GTCAGTCTAATCAGGAGGTCCCAACGAGTGGCAACATTGATGGGATGGAGGCAGGTCTCAGGGCTTTCCCAACAGGA  
CCAAGAACAGACTCCATTCCATCATTGTGAACACCCGAGTGCCCCAGACTCCAGCCTATCAGCCTGTAATGACCGACT  
GTCAGATCTCATCGCAGATTGCGCATACTGGGACCTCTGCCAAGCAAGCTGTCACCTCAGATCATCTGTGCCCTCGATT  
CCCCAGCCCACCTTTCTTTTGTCTGTCTTGTCTTCCAGAAAAAGTCCACTGTCTTTCTGTGAGTCTAACGTGTGTGGATA  
CTGTGGTCTATTTTCTTCTATGGCTTGTGGTTTCCAAGAATGACAGCATCCAGACTTTGTTGGACTGTCTTCTCCATATC  
TCACCCACTTCCAACAACAGCAACTGGTGGGATGGGAGGGGAAATTGAAAACAAACCAACTGAAAGATTGGCAGATA  
ATACAAATAGCAAATATGTCTCCTTCAAAGCAAATATTAGCTCATTATTTTGTATGACAAAGATAAGATAATTTTAACC  
ATGTTAAAGCCTTAGGCTTCAAGATATTTGCTTTTATTCCAGTGTGTGTGTGTGTGTGTGTGTGTGTGTGTGTGTGTGT  
CATCATGTGCGCCAGTACAGGTACCATTAGAGGCCAGAGGGTGTGGAGCCCTGAAACTGGAATTACAGGAGGTTGT  
GGCAACTGAGCCTAGTCTTCTACAAGAGAGACTTTACACGCTTTTAAACCCTGAGCCATCCCTACAGCCCGAGTTATT  
ATCTTAAAAAACAACAAAAAACAAGTATTGATATTATCTATAGCTGAGCATAGCTTTTGGTAGAGTTTTCAA  
AATCAAATAAAGGCACAGTGACTAGAGAACAGACTTTATCTTCAAAGCTGCTAAAATTGATAACGTTTGTGTGCTG  
CTTGCTCATGGGTTTCCCTGTGGTTAAAAGTGATTGCGGTAATTAATCTGCTTTATTGCAAATTTAACTAAGAGGATG  
TAAGTGAGCTTCTTGGGGTGTGAGCCTTGGCAGTAGTGTGGCAGGAGTGTGGCTTGCAGTTCAGTGCAAGGATGTTCA  
GGCTGCATTTGTCTTTCCTGCAACTCAGGCCTGATCAGCTGACTGTAGCCCAAGCAATCATGTCTCCAGAGGACGCCAT  
CAGGGAGCGCAGCAGCAGTGGAAAGAAGAAGAATGGGCCCGTGATTTACTTTCTCCTTTCTTGAATTACAGAGGATA  
AAGTGAATTACTTACTGGGTGTTCCCCCTCCCCCAGCTTGAATTTTTTAAAAAATATTTTGTTCATAGGTTAAAATA  
AGAAATCAATCAACTCTCCCTCCCCCTCAGAATCGGAAGGACTTCTGTTTCTTTTGGTCCCTCCAAGGTTCTTGACATA  
TTTCAGCCAGAAACAGATTCCTGAAATCTTGAAGTGGCAAATTATGTCTGTTCAGATGATTCTAGAAGGCTTGGTTGT  
CTTTATCACGCCACTCACCTGAAAATCAGCAACGATGCTTGCCTCTGCCTGGTGTACTTAGGATGTCGCTTTAGCAAT  
CATAGAATGAGTTGAGTGGGAAATCAGGATGGGGTGGGGCATGATTCATTGCAGTACATTTTAAAGGAACCTTTAAATTTG  
GTGTGGGAAATGTAAGTATTTGCCTCATTCAACAGTTAATAGATATTACCCTTAGAAAAACCTATTTTAAAAAAGTGG  
TTTCTTAGTCAAAAATAAATGCCAAATGTGGTATGGTAGTTTCTGTGTTAACAGAGCTGCCATCTTTATCATAGCCACAG  
AAATGGACAAGGGGCTTCTTAGTAAGGATTAATTTCTGTAGAAAGCTACTTACCATGATCCTTTTAAATAATAGTGT  
TCAGTCTGAGCACTGTGGAAATGCTATTCATGAGGTTATTGAGGAAAAGAAGGCACAAAGTTTATCACTTATCATATGA  
TGGAGAAGTTACAGACCAGGTCATTTGAGCAACAATTTGACCCTTGATAAATTTCCAGAGGCAGAGGCAGAGAGGCGAG  
AGAGGCAGAGAGGCAGAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAG  
GAGAGAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAG  
GCAGAGAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAG  
CAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAG  
AGAGGCAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGGCAG  
GAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAGAGAGGCAG  
ATAGAGAGAGGCAGAGAGATGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGAGAGGCAGAGAGATGNNNNNNNNNNNNNNNN  
NN  
NNNNNNNNNNAGCCACTTAGAGCTCAGGATTTGTGCCGGGCCGCTGATGACTAGGAATAGCCATTGTGGCTCGTTT  
GTACTGAGCATCTGGCATATTGGGGAAGTTCTGCCTGGTGGTTAGACAATGAAAGTATTGGTAGAAGAGAGCTTAGAC  
TCCCAAGTGCTGGAAATGAAGATGGGCGGATGAAAGAACCAGCGGAGAGCAGCAGCCATGACTGACATGAAGAGCT  
CTGGAAGGGACTGTTATTTTTCTTTCAGGTGCTTGAACAACAAAGACGTGAGGGTGGCATTACTGCTCAACAGTTAACGG  
GAAATCCAGCCAGATGTCTGCTCAAGGAACATGGAAGCTGTGTTGTGCTGCTTTCTCAAGGACTATGCATCTCTTTGTCT  
TGGATCTCTTCTCTGTCTATTTCTGTCTCAGACTCTTTTCTCTCTGTATCTCTCTCTCTGCTACCCTGTCCACCTTCT  
CCAACCTTCTGCTCCCTTTCTTCTCCCTCTTTCTCCCTCTCTTTCCCTCTCTT

**Selection Cassette:**

CGCTCTAGAGGCCATAGCCGCCATTTAAATGGCGCGCCGGATCCCGGGCCGCTCTAGCTAGACTAGTCTAGCTAGAGG  
AATCCGCCCTCTCCCTCCCCCCCCCTAACGTTACTGGCCGAAGCCGCTTGGAAATAAGGCCGGTGTGCGTTTGTCTAT  
ATGTTATTTTCCACCATATTGCCGTCTTTGGCAATGTGAGGGCCCGGAAACCTGGCCCTGTCTTCTTGACGAGCATTCC  
TAGGGGTCTTTCCCTCTCGCCAAAGGAATGCAAGGTCTGTTGAATGTCGTGAAGGAAGCAGTTCCTCTGGAAGCTTCT  
TGAAGACAAACAACGTCTGTAGCGACCCTTTGCAGGCAGCGGAACCCCCACCTGGCGACAGGTGCCTCTGCGGCCAA  
AAGCCACGTGTATAAGATACACCTGCAAAGGCGGCACAACCCAGTGCCACGTTGTGAGTTGGATAGTTGTGGAAGA  
GTCAAATGGCTCTCCTCAAGCGTATTCAACAAGGGGCTGAAGGATGCCAGAAGGTACCCATTGTATGGGATCTGATC  
TGGGGCCTCGGTGCACATGCTTTACATGTGTTTAGTCGAGGTTAAAAAACGTCTAGGCCCCCCGAACCACGGGGACGT  
GGTTTTCTTTGAAAAACAGATGATAAGCTTGCACAACCATGGAAGATCCCGTCGTTTTACAACGTCTGACTGGGA  
AAACCCTGGCGTTACCCAACCTAATCGCCTTGAGCACATCCCCCTTTCGCCAGCTGGCGTAATAGCGAAGAGGCCCGC  
ACCGATCGCCCTTCCAACAGTTGCGCAGCCTGAATGGCGAATGGCGCTTTCGCTGGTTTCCGGCACCAGAAGCGGTGC  
CGGAAAGCTGGCTGGAGTGCATCTTCTGAGGCCGATACTGTGCTGTCCTTCAAACCTGGCAGATGCACGGTTACGA  
TGCGCCATCTACCAACGTAACCTATCCATTACGGTCAATCCGCCGTTTGTTCACGGAGAATCCGACGGGTTGT

TACTCGCTCACATTTAATGTTGATGAAAGCTGGCTACAGGAAGGCCAGACGCGAATTATTTTTGATGGCGTTAACTCGG  
CGTTTCATCTGTGGTGCAACGGGCGCTGGGTTCGGTTACGGCCAGGACAGTCGTTTTGCCGTCTGAATTTGACCTGAGCGC  
ATTTTTACGCGCCGAGAAAACCGCCTCGCGGTGATGGTGCTGCGCTGGAGTGACGGCAGTTATCTGGAAGATCAGGA  
TATGTGGCGGATGAGCGGCATTTTCCGTGACGTCTCGTTGCTGCATAAACCGACTACACAAATCAGCGATTTCCATGTT  
GCCACTCGCTTTAATGATGATTTACGCCGCGCTGTAAGTTCAGATGTGCGGGCAGTTGCGTGACTACC  
TACGGGTAACAGTTTCTTTATGGCAGGGTGAACCGCAGGTCGCCAGCGGCACCGCGCCTTTTCGGCGGTGAAATTATCGA  
TGAGCGTGGTGGTTATGCCGATCGCGTCACACTACGTCTGAACGTGCAAAACCCGAAACTGTGGAGCGCCGAAATCCC  
GAATCTCTATCGTGCGGTGGTTGAACTGCACACCGCCGACGGCACGCTGATTGAAGCAGAAGCCTGCGATGTGCGTTTTC  
CGGAGGTGCGGATTGAAAATGGTCTGCTGCTGCTGAACGGCAAGCCGTTGCTGATTTCGAGGCGTTAACCGTCACGAG  
CATCATCTCTGCATGGTCAGGTCATGGATGAGCAGACGATGGTGCAGGATATCCTGTGATGAAGCAGAACAACATTTA  
ACGCCGTGCGTGTTCGCATTTATCCGAACCATCCGCTGTGGTACACGCTGTGCGACCGCTACGGCCTGTATGTGGTGA  
TGAAGCCAATATTGAAACCCACGGCATGGTGCCAATGAATCGTCTGACCGATGATCCGCGCTGGCTACCGGCGATGAG  
CGAACCGTAACGCGAATGGTGCAGCGGATCGTAATACCCGAGTGTGATCATCTGGTCGCTGGGAATGAATCAGG  
CCACGGCGTAATCACGACGCGCTGTATCGCTGGATCAAATCTGTGATCCTTCCCGCCCGGTGCAGTATGAAGGCGG  
GGAGCCGACACCACGGCCACCGATATTATTTGCCCGATGTACGCGCGCGTGGATGAAGACCAGCCCTTCCCGGCTGTG  
CCGAAATGGTCCATCAAAAAATGGCTTTCGCTACCTGGAGAGACGCGCCCGCTGATCCTTTGCGAATACGCCACGCG  
ATGGGTAACAGTCTTGGCGTTTTCGCTAAATACTGGCAGGCGTTTTCGTCAGTATCCCCGTTTACAGGGCGGCTTCGTCT  
GGGACTGGGTGGATCAGTCGCTGATTAATATGATGAAAACGGCAACCCGTGGTTCGGCTTACGGCGGTGATTTTGGCG  
ATACGCCGAACGATCGCCAGTTCTGTATGAACGGTCTGGTCTTTGCCGACCGCACGCCGCATCCAGCGCTGACGGAAGC  
AAAACACCAGCAGCAGTTTTTCCAGTTCGTTTATCCGGGCAAACCATCGAAGTGACCAGCGAATACCTGTTCCGTCAT  
AGCGATAACGAGCTCCTGCACTGGATGGTGGCGCTGGATGGTAAGCCGCTGGCAAGCGGTGAAGTGCCTCTGGATGTC  
GCTCCACAAGGTAACAGTTGATTGAACTGCCTGAACTACCGCAGCCGGAGAGCGCCGGGCAACTCTGGCTCACAGTA  
CGCGTAGTGCAACCGAACGCGACCGCATGGTCCAGAAGCCGGGCACATCAGCGCCTGGCAGCAGTGGCGTCTGGCGGA  
AAACCTCAGTGTGACGCTCCCCGCCGCTCCACGCCATCCCGCATCTGACCACCAGCGAAATGGATTTTGCATCGAG  
CTGGGTAATAAGCGTTGGCAATTTAACCGCCAGTCAGGCTTCTTTACAGATGTGGATTGGCGATAAAAAACAACCTG  
TGACGCCGCTGCGCGATCAGTTCACCCGTGCACCGCTGGATAACGACATTGGCGTAAGTGAAGCGACCCGCATTGACC  
CTAACGCCTGGGTGCAACGCTGGAAGGCGGCGGGCCATTACCAGGCCGAAGCAGCGTTGTTGCAGTGCACGGCAGATA  
CACTTGCTGATGCGGTGCTGATTACGACCGCTCACGCGTGGCAGCATCAGGGGAAAACCTTATTTATCAGCCGGAAAAC  
CTACCGGATTGATGGTAGTGGTCAAATGGCGATTACCGTTGATGTTGAAGTGGCGAGCGATACCCGCATCCGGCGCG  
GATTGGCCTGAACTGCCAGCTGGCGCAGGTAGCAGAGCGGGTAAACTGGCTCGGATTAGGGCCGCAAGAAAACCTATCC  
CGACCGCCTTACTGCCGCTGTTTTGACCGCTGGGATCTGCCATTGTCAGACATGTATACCCCGTACGCTTCCCGAGCG  
AAAACGGTCTGCGCTGCGGGACGCGCAATTGAATTATGGCCACACCAGTGGCGCGGCGACTTCCAGTTCAACATCA  
GCCGCTACAGTCAACAGAACTGATGGAACACGCCATCGCCATCTGCTGCACGCGGAAGAAGGCACATGGCTGAATA  
TCGACGTTTTCCATATGGGGATTGGTGGCGACGACTCCTGGAGCCCGTCAAGTATCGCGGAATCCAGCTGAGCGCCG  
TCGCTACCATTACCAGTTGGTCTGGTGTCAAAAATAATAAACCCGGCAGGCCATGTCTGCCCGTATTTTCGCGTAAG  
AAATCCATTATGTAATTTAAAAAACACAAACTTTTGGATGTTTCGGTTTTATTCTTTTTTCTTTTACTTTTTTATCATGGGA  
GCCTACTTCCCGTTTTTCCCGATTTGGCTACATGACATCAACCATATCAGCAAAAGTGATACGGGTATTATTTTTGCCCG  
TATTTCTCTGTTCTCGCTATTATTCCAACCGCTGTTTGGTCTGCTTTCTGACAAACTCGGAACTTGTATTGACGCTTAT  
AATGGTTACAAATAAAGCAATAGCATCACAAATTTACAAATTTAATTAAGGCCGCGGGATCGATCCCGTCGAGCAGT  
GTGGTTTTCAAGAGGAAGCAAAAAGCCTCTCCACCCAGGCCTGGAATGTTTCCACCCAATGTCGAGCAGTGTGGTTTTG  
CAAGAGGAAGCAAAAAGCCTCTCCACCCAGGCCTGGAATGTTTCCACCCAATGTCGAGCAAAACCCCGCCAGCGTCTT  
GTCATTGGCGAATTCGAACACGCAGATGCAGTCGGGGCGGCGCGGTCCCAGGTCCACTTCGCATATTAAGGTGACGCG  
TGTGGCCTCGAACACCGAGCGACCCTGCAGCCAATATGGGATCGGCCATTGAACAAGATGGATTGCACGCAGGTTCTC  
CGGCCGCTTGGGTGGAGAGGCTATTCCGGCTATGACTGGGCACAACAGACAATCGGCTGCTCTGATGCCGCCGTGTTCCG  
GCTGTCAGCGCAGGGGCGCCCGGTTCTTTTTGTCAAGACCGACCTGTCCGGTGCCTGAATGAACTGCAGGACGAGGC  
AGCGCGGCTATCGTGGCTGGCCACGACGGGCGTTTCTTGGCAGCTGTGCTCGACGTTGTCACTGAAGCGGGAAGGGA  
CTGGCTGCTATTGGGCGAAGTGCCGGGGCAGGATCTCCTGTCATCTCACCTTGCTCCTGCCGAGAAAGTATCCATCATG  
GCTGATGCAATGCGGCGGCTGCATACGCTTGTATCCGGCTACCTGCCCATTCGACCACCAAGCGAAACATCGCATCGAG  
CGAGCACGTACTCGGATGGAAGCCGGTCTTGTGATCAGGATGATCTGGACGAAGAGCATCAGGGGCTCGCGCCAGCC  
GAACTGTTCCGACGGCTCAAGGCGCGCATGCCGACGGCGAGGATCTCGTCGTGACCCATGGCGATGCCTGCTTGCCG  
AATATCATGGTGGAAAATGGCCGCTTTTCTGGATTCATCGACTGTGGCCGGCTGGGTGTGGCGGACCGCTATCAGGACA  
TAGCGTTGGCTACCCGTGATATTGCTGAAGAGCTTGGCGGCGAATGGGCTGACCGCTTCTCGTGCTTTACGGTATCGC  
CGCTCCCGATTTCGACGCGCATCGCCTTCTATCGCCTTCTTACGAGTTCTTCTGAGGGGATCGGCAATAAAAAGACAGA  
ATAAAAACGCACGGGTGTTGGGTGCTTTGTTTCGGATCCGAATTCCTCGAGGGGCGCGCCATTTA:ATGGCCAGCGAGGCCG  
GTACCCAATTGCCCCATAG

**Targeted Locus:**

TGGTGTGGGTGCTGCTTCTAAAAATACACCCGTGGGGTTGCCCTGGACTCAGCTGACAGAAGAAATGACTTCTTTTCTT  
CCAAGGGCTGAGATAGTGTGATGCCACGCTTTTCAGAGTGGAACTTCTGTCTCTAGACTAGTTTTCTCTGGGAT  
GTTTTTGTGCCCTTGTGACATCATTTGTCCAAGCTCTTCATTGCTTCTTACATTTCTGTTTTCTCTCTAGCAACCTAAA  
GCTTCTTAGGACATGCATAGAGCATGTTTCTCCACGGTGGCAGAATCCAGTGAGGCCTAGCACCAAGACTTACATTGG  
AAGTGCTTAATATATCTTGAGTTAAAAAATAACATTGCTTCCAGAGAAAAAATTAGAGAAGATACCTCAAGTATTTTTAGA  
AACGACATATTGTAGATCAACAACATAATTGACTACATCCTTACATTAAGTACTGGAAAAAAAATGTGTGATATTACC  
AGGAAAAAGAAAGCCTCATTTTTCATGAGTTAGTTTCTAGGTTTGGTTAAATAACATGGGCTTAGTCCATGTGTTCAA  
ATAAGGAAGGGTGGTACATGGAATCTTGGCACTATTACAGAAAGGCAAAGGTCTTTTAGAATATTTATGACCAGCAAT  
GTTAACTTAGCATTGATGTATCAATAAATCATTGTATAGCGCCATAGTTCTGGGATACATGGAGGTGTGTGAATGTGT  
GT  
ATGATCAAAGTTTGGCACTCAGATATTATAGCGAATGTGTTTGAGGAGGGCAAAGGTGTTAAATGGCCAACACATCA  
GTTGGGGCATTAAATGCTATGGGAATACTTAACAGTAACAAAGAAGGCCCTAGGGAGTACAGTGAGTTATTTTCTCT  
ATGCTAAAGAGTGGGGCATGTAAGGTGACAGGAGAAAGGGACATTAAGAAGGATGCAGTGGAACAGTATCTGTGG  
TGACTATAGGAAGAGCTGGTCTGAAATCCTGGGGACCAAGGAGAGCACTGCCACCCAGCACGGGCTACTGGAAAA  
GACCCAGAAGGACAGATATAAATGACACTTCAAAGGAAAAAGCCACATGATTTGCGAAATTTCTGAAACACAGAGTATG  
AGTGGCTTATATGGCTTGTCAACAGGAGAGAAAAAGAGATTGGAGGCAGGGCAGACACAACGTAGGGAAAGACGAGC  
TTGAGGTTTGGACATGTTCAAATACAGTAACGTTCCAGATGGAAATTTCTCCAGATTTCTCCCTGTCCCTCACAACAGG  
GCTGTTTGTAGTGGGATGCACTGGAGTGTGGTCTGGAGAGAGCAAAGACAAATTTTAGATGAGTGAAGCAAGCAAC  
ATTTGAAAAATTTGAGGTCCTAGCCCTGCTAATTCTGAGCCATGTAAGAAGCCATTAGATTAGTCCGACTAGATGACTT  
AAAGACATGGAAAAGTATTTGTATTACAGTGTCCATAAACACTGAAATTTCCAAATGTACTAGATGGACATAAAACCA  
AAGAGTTATAACCTGAATGAGATGCTAGTATCGCTGATATTTTCCCTTGGCAAACCTGAATCTATCCTTGGAGAATA  
GTCAGATGCCTGTCTCAGCCACCTGAATTCCTGCTCCCAAGGAGTCTGTCAATTTACTGTTTCTTCCACAACACT  
CGGTTTATATTTCTGCCACAGCCCTTGCCTCTAGTTCTGTGCATGTTTTCCCGCTTGGCACCAGACTGGGGACAGCATG  
AAGATGGGAAGTTTTCTCATCTCGGCATTCCTCACTCCTGAGCAGCTGGGGTGGTGGGTGACAATTCATCACTGAAAA  
TCTCCAACAGAGGAAGGCTGAAAACGTGGACGGACGAAGCGATGTGCAGTCGCTGTAGCAAAGCCAGTATACACATCA  
CATGTCACTTTTTCTCCGACGCCGATAATGCAGAACCAGCAGAGGCAGCACTCTCATTACACACTGCTGGCCCATATTTG  
TAATGTGTGACATTTTTTATGAAATACTGTCAAAGGCAATCCATCATTGAATAACCTTTAGATTATATGCTGAGGTTGAT  
TTTAAACAGAGACGTAATGAACTCCGAGGATGATGCTGGTTTTTAAAGAAGGGTGTGATCAAAGAGTTCCACAAAGGC  
AGAACAATGCCACGGTCTATAAGACACCATGTTCTATAGGCAGGACACTATGTTCTTTTAAAGTCACATAGCAGTGACT  
GAGAAGATTTTCTGCTACCCTTTTTCACTTGGGGACAGGGTTAGTGTGATGATAATCATGTGACTATGAAATGTGGCT  
GAGTATTTGTGCCTTGTAGTACATTGGGTGAGGACATGATAAAGGGCGAAGACAATAACATGAAGCAGTCTCGGG  
GCTTGTAAATAACTATCTTGAGAAATGCCATATGGTATATGTATATGTATATATGTATATATGTATATATGTATA  
TGACACAGGGCACTCTAAGTTAATTTAGATGCCAGTTGCACTCACAGTTAAAGGGGCTCTGTATATCTGGAAAGATCT  
ATAATCTTACACATATTATAGAATATAAATAAATGAAACCTTCTAAGTCCCATTCTTGTGTAATCTTGAATCTTGTCTTC  
TTCTCTGCGGGTTTTAGTGCTTCTGAGAAGGAAAAAGCTGATTGTGAGAAGAACAATAAATTTGTAATCTTGTCTTC  
CTTAATTAGACCCAGACTCATCACAGTTCTTGTGAAGCTGTGAGGAAAAATCCAAGCAATAATTACATTTGTGCAAGT  
CAGCAGACACGGGCATGGGGTCTGATAGGACCAAGATTTGCTTAAGGGATCTTTCTGTGAAGTGAACAGCTAAGAAG  
AGGTACATGCTCTTCCACAGGAAAAAAAATCCCTGAAGACGTGGAGCCCAAGCAGCAATGAACATGGATCGCAGC  
AGCATCTCGTGCACCGTTACAGATGCCATTCCATAGGAGGCAGATCAACCACCTCTATACCAACGGACGTGGGGCACT  
AATTAATAAGTCCCATTAAAGCACGGAGTAATGACATTTAGCATCTAATGAATGCCTCATAATCTCTTACAGTCATTAAT  
ATTTCATAGTGTGACAGCATAAGGATAGCCGCTTGGACTGGTACAGCATGGTTTTTCTGCCTCTGACATGGCCCCAAGG  
GTGTAGGTGGGACCAGGGTATGGCACCTTGCATGCAGAATATACATGCGCATCATTCACTCTGTACTTTGGTCCCAAG  
GATTCCTCTTTTAGAAAGATCCTGCCTGCCATTTTTAGAGTGAACATCTGTGACTCCAGAAAAGCCCTGGAAAAGCAGA  
AAGCCTCAGATGTTGACCGGTGTAGAGCACTGGTTTGTGTTGACCCTCGATGACCACCAGGAAAAAAAATACTAGT  
ACAGGAGAAAATCATTACTTTGATTTATCACTGGTGGGCTTGCTTTATTCAAAGGCAATAATCACTTGGCAGAGCAGGT  
GCCACTGCAAGGCCGTATTGATCCAGGAGACGGTCAGTCACTCAGGCGTAGAGATAGCCCAAGAAAAAGAAGTCCATC  
TCAGAACAGGCAGGAATGAAGTGGGCGGCTATTATCTCTGACTGTGGTTCTGTGGCTCCAGGGCACTGGGCATCTTCT  
TGCAGAAGCAGGGCTGGAGCAGAGAGAAGGGTTCCAGGCTGCCAGGAGCCGAGAGAGGGAAGCAGGGCTATTGAGC  
TAGCTGCCAAGGTCTCTGAGATTGGATCCTTCGGAAGTCTAGAAAAGAGGCTGGCTGCTCTAGATCAAGAGTCTAAAG  
AGTCAAACACACGCGTTCAAGGATGGGATTTGCTCCTGGGAGCAAAAACAGAGACAGTGATCAAAATCAACTTGGAC  
AAGAGACAAAGATCCAGCCTGATGTTGGTGGATGTCTTGTAAAGGTCGTGGGAGGGACAGAGGATCGGAGGTGGTGTGT  
GCAGGGGTAGGTGCAGAGAGGGTTGGAATCCAAGGCAGGTATATAAAGGCAGAAGGAGCCAGGGACACAAAGGCCCT  
CCCGAGTGGGGAAAGAGCGTCTGGAAGAGTTGAAGAAAAGTAAAGGGAAAAGTAGGGACGGGGTTAAGAGGAGAAAG  
GAGGATAGAGAGCAAAGGGAGGATGGAGAGCAGAGGTGAAGGCAGGGAGAGGGGGCTGGAGAGAGGGGGCTGACCG  
CGGGAGCTGGAAGCAGGGAGAGGGACGAGGGGCGTGATCGGCTGGGGTAGCGGGTGGGTGGGTGTGGAGTGCGGGG  
AGCCGGCTTAGGGGGAGGGCCGCGGAAAGTGAGAGCGCGGGAGGGCGCGGGCCGGGCGGGAGGAGGCTCCCGGG  
GGGAGAGAGGCGGGCGGGCGGCGTGGGAGGGAGAGTGCGGGGCAGGTGGCGGGGAGGGAGGGCGCTCGGTGGAGC  
GCCGAGGCCAAGTGCATTGTGTCTCGTCTAGAGGCCATAGCCGCCATTTAAATGGCGCGCCGGATCCCGGGCCGCTCT  
AGCTAGACTAGTCTAGCTAGAGGAATTCCGCCCTCTCCCTCCCCCCCCCTAACGTTACTGGCCGAAGCCGCTTGAA

TAAGGCCGGTGTGCGTTTGTCTATATGTTATTTTCCACCATATTGCCGCTCTTTGGCAATGTGAGGGCCCCGAAACCTGG  
CCCTGTCTTCTTGACGAGCATTCTAGGGGTCTTCCCCTCTCGCCAAAGGAATGCAAGGTCTGTTGAATGTGCGTGAAG  
GAAGCAGTTCCTCTGGAAGCTTCTTGAAGACAAACAACGTCTGTAGCGACCCTTTCAGGCAGCGGAACCCCCACCT  
GGCGACAGGTGCCTCTGCGGCCAAAAGCCACGTGTATAAGATACACCTGCAAAGGCGGCACAACCCCAAGTGCCACGTT  
GTGAGTTGGATAGTTGTGGAAGAGTCAAAATGGCTCTCTCAAGCGTATTCAACAAGGGGCTGAAGGATGCCCAGAAG  
GTACCCCAATTGTATGGGATCTGATCTGGGGCCTCGGTGCACATGCTTTACATGTGTTTAGTCGAGGTTAAAAAACGTC  
TAGGCCCCCCGAACCACGGGGACGTGGTTTTCTTTGAAAAACACGATGATAAGCTTGCCACAACCATGGAAGATCCC  
GTCGTTTTACAACGTCGTGACTGGGAAAACCTGGCGTTACCCAACTTAATCGCCTTGCAGCACATCCCCCTTTCGCCA  
GCTGGCGTAATAGCGAAGAGGCCCGCACCGATCGCCCTTCCCAACAGTTGCGCAGCCTGAATGGCGAATGGCGCTTTG  
CCTGGTTTTCCGGCACCAGAAGCGGTGCCGAAAGCTGGCTGGAGTGCATCTTCTGAGGCCGATACTGTCGCTGCTCCC  
CTCAAACCTGGCAGATGCACGGTTACGATGCGCCCATCTACACCAACGTAACCTATCCCATTACGGTCAATCCGCCGTTT  
GTTCCACGGAGAATCCGACGGGTTGTTACTCGCTCACATTTAATGTTGATGAAAGCTGGCTACAGGAAGGCCAGACGCG  
GAATTATTTTTGATGGCGTTAACTCGGCGTTTCATCTGTGGTGCAACGGGCGCTGGGTTCGGTTACGGCCAGGACAGTCG  
TTTGCCGTCTGAATTTGACCTGAGCGCATTTTTACGCGCCGGAGAAAACCGCCTCGCGGTGATGGTGCTGCGCTGGAGT  
GACGGCAGTTATCTGGAAGATCAGGATATGTGGCGGATGAGCGGCATTTTCCGTGACGTCTCGTTGCTGCATAAACCGA  
CTACACAAATCAGCGATTTCCATGTTGCCACTCGCTTAAATGATGATTTTACGCCGCGCTGTACTGGAGGCTGAAGTTCA  
GATGTGCGGCGAGTTGCGTGACTACCTACGGGTAACAGTTTCTTTATGGCAGGGTGAACGCAGGTGCCAGCGGCAC  
CGCGCCTTTCGGCGGTGAAATTATCGATGAGCGTGGTGGTTATGCCGATCGCGTCACACTACGTCTGAACGTCGAAAAC  
CCGAAACTGTGGAGCGCCGAAATCCCGAATCTCTATCGTGCGGTGGTTGAACTGCACACCGCCGACGGCAGCTGATT  
GAAGCAGAAGCCTGCGATGTCGTTTTCCGCGAGGTGCGGATTGAAAATGGTCTGCTGCTGCTGAACGGCAAGCCGTTG  
CTGATTGAGGCGTTAACCGTCACGAGCATCATCTCTGCATGGTCAGGTGATGGATGAGCAGACGATGGTGCAGGAT  
ATCCTGCTGATGAAGCAGAACAACCTTAAACGCCGTGCGCTGTTTCGATTATCCGAACCATCCGCTGTGGTACACGCTGT  
GCGACCGCTACGGCCTGTATGTGGTGGATGAAGCCAATATTGAAACCCACGGCATGGTGCCAATGAATCGTCTGACCG  
ATGATCCGCGCTGGCTACGGCGATGAGCGAACGCGTAACGCGAATGGTGCAGCGCGATCGTAATACCCGAGTGTGA  
TCATCTGGTTCGCTGGGGAATGAATCAGGCCACGGCGTAATCACGACGCGCTGTATCGCTGGATCAAATCTGTGATCC  
TTCCCGCCCGGTGCAGTATGAAGGCGGCGGAGCCGACACCACGGCCACCGATATTATTTGCCCGATGTACGCGCGCGT  
GGATGAAGACCAGCCCTTCCC GGCTGTGCCGAAATGGTCCATCAAAAAATGGCTTTCGCTACCTGGAGAGACGCGCCC  
GCTGATCCTTTGCGAATACGCCACGCGATGGGTAACAGTCTTGGCGGTTTCGCTAAATACTGGCAGGCGTTTCGTCAG  
TATCCCCGTTTACAGGGCGGCTTCGTCTGGGACTGGGTGGATCAGTCGCTGATTAAATATGATGAAAACGGCAACCCGT  
GGTCGGCTTACGGCGGTGATTTTGGCGATACGCCGAACGATCGCCAGTTCTGTATGAACGGTCTGGTCTTTGCCGACCG  
CACGCCGATCCAGCGCTGACGGAAGCAAAACACCAGCAGCAGTTTTTCCAGTTCGGTTTATCCGGGCAAACCATCGA  
AGTGACCAGCGAATACCTGTTCCGTCATAGCGATAACGAGCTCCTGCACTGGATGGTGGCGCTGGATGGTAAGCCGCT  
GGCAAGCGGTGAAGTGCCTCTGGATGTCGCTCCACAAGGTAACAGTTGATTGAACTGCCTGAACTACCGCAGCCGGA  
GAGCGCCGGCAACTCTGGCTCACAGTACGCGTAGTGCAACCGAACCGCATGGTCCAGAACGCGGCGACATCAG  
CGCTGGCAGCAGTGGCCTCTGGCGGAAAACCTCAGTGTGACGCTCCCCGCCGCTCCACGCCATCCCGCATCTGACC  
ACCAGCGAAATGGATTTTGCATCGAGCTGGGTAATAAGCGTTGGCAATTTAACCGCCAGTCAGGCTTTCTTTCACAGA  
TGTGGATTGGCGATAAAAAACAACCTGCTGACCCGCTGCGCGATCAGTTCACCCGTGCACCGCTGGATAACGACATTG  
GCGTAAGTGAAGCGACCCGCATTGACCCTAACGCCTGGGTGCAACGCTGGAAGGCGGCGGGCCATTACCAGGCCGAAG  
CAGCGTTGTTGAGTGCACGGCAGATACACTTGTGATGCGGTGCTGATTACGACCGCTCACGCGTGGCAGCATCAGGG  
GAAAACCTTATTTATCAGCCGAAAACCTACCGGATTGATGGTAGTGGTCAAAATGGCGATTACCGTTGATGTTGAAGTG  
GCGAGCGATACACCGCATCCGGCGCGGATTGGCCTGAACTGCCAGCTGGCGCAGGTAGCAGAGCGGGTAAACTGGCTC  
GGATTAGGGCCGCAAGAAAACCTATCCCGACCGCCTTACTGCCGCTGTTTTGACCGCTGGGATCTGCCATTGTCAGACA  
TGTATACCCCGTACGTCTTCCCGAGCGAAAACGGTCTGCGCTGCGGGACGCGCGAATTGAATTATGGCCACACCAGTG  
GCGCGGCGACTTCCAGTTCAACATCAGCCGCTACAGTCAACAGCAACTGATGGAACCAGCCATCGCCATCTGCTGCA  
CGCGGAAGAAGGCACATGGCTGAATATCGACGGTTCCATATGGGGATTGGTGGCGACGACTCCTGGAGCCCGTCAAGT  
ATCGGCGGAATCCAGCTGAGCGCCGGTTCGCTACCATTACCAGTTGGTCTGGTGTCAAAAATAATAATAACCGGGCAG  
GCCATGTCTGCCCGTATTTTCGCGTAAGGAAATCCATTATGTACTATTTAAAAAACACAAACTTTTGGATGTTCCGTTTAT  
TCTTTTTCTTTTACTTTTTTATCATGGGAGCCTACTTCCCGTTTTTCCCGATTGGCTACATGACATCAACCATATCAGCA  
AAAGTGATACGGGATATTTTTTGGCGTATTTCTCTGTTCTCGCTATTATTCCAACCGCTGTTTGGTCTGCTTTCTGACA  
AACTCGGAACTTGTTTATTGCAGCTTATAATGGTTACAAATAAAGCAATAGCATCACAAATTTACAAATTTAATTAAG  
GCCGCGGGATCGATCCCGTCGAGCAGTGTGGTTTTCAAGAGGAAGCAAAAAGCCTCTCCACCCAGGCCTGGAATGTTT  
CCACCCAATGTCGAGCAGTGTGGTTTTGCAAGAGGAAGCAAAAAGCCTCTCCACCCAGGCCTGGAATGTTTCCACCCA  
ATGTCGAGCAAACCCCGCCAGCGTCTTGTCAATTGGCGAATTCGAACACGCGAGATGCAGTCGGGGCGGCGCGGTCCCA  
GGTCCACTTCGCATATTAAGGTGACGCGTGTGGCCTCGAACACCGAGCGACCCTGCAGCCAATATGGGATCGGCCATT  
GAACAAGATGGATTGCACGCAGGTTCTCCGGCCGCTTGGGTGGAGAGGCTATTCCGGCTATGACTGGGCACAACAGACA  
ATCGGCTGCTCTGATGCCCGCGTGTCCGGCTGTCAGCGCAGGGGCGCCCGGTTCTTTTTGTCAAGACCGACCTGTCCG  
GTGCCCTGAATGAACTGCAGGACGAGGCAGCGCGGCTATCGTGGCTGGCCACGACGGGCGGTTCTTTCGCGCAGCTGTGC  
TCGACGTTGTCACTGAAGCGGGAAGGGACTGGCTGCTATTGGGCGAAGTGCCGGGGCAGGATCTCCTGTCTCATCTCACCT  
TGCTCTGCCGAGAAAGTATCCATCATGGCTGATGCAATGCGGCGGCTGCATACGCTTGATCCGGCTACCTGCCCATTC

GACCACCAAGCGAAACATCGCATCGAGCGAGCACGTACTCGGATGGAAGCCGGTCTTGTGATCAGGATGATCTGGAC  
GAAGAGCATCAGGGGCTCGCGCCAGCCGAAGTTCGCCAGGCTCAAGGCGCGCATGCCCGACGGCGAGGATCTCGTC  
GTGACCCATGGCGATGCCTGCTTGCCGAATATCATGGTGGAAAATGGCCGCTTTTCTGGATTCATCGACTGTGGCCGGC  
TGGGTGTGGCGGACCGCTATCAGGACATAGCGTTGGCTACCCGTGATATTGCTGAAGAGCTTGGCGGCGAATGGGCTG  
ACCGCTTCTCGTGCTTTACGGTATCGCCGCTCCCGATTTCGCAGCGCATCGCCTTCTATCGCCTTCTTGACGAGTTCTTCT  
GAGGGGATCGGCAATAAAAAGACAGAATAAAACGCACGGGTGTTGGGTGCTTTGTTCCGATCCGAATTCCTCGAGGGC  
GCGCCATTTAAATGGCCAGCGAGGCCGGTACCCAATTCGCCCTATAGGCATTTTTACCCTTCCAGATTGCTTCCCTGCT  
TTCCTTCCCCAGCTACTCTTCTTCTCCCTTTCCTTGTCTCTTCATCCTACCCTTCTTTTACCATTTTCTGGACTCCGTTTT  
ACCCCTCACACTGTCTCTTATCTTCCCTAAGACTCTCTCTCTGGTCTTCTCTGTCTGTGCTGGCTGACTCGGGGTG  
AGATATGGATTTTCTGACAGTGTCCCAGGGAGGGTGACAGCCACAAGACTGATCTTTCTCAACTGGTTCCTTTCT  
CAACTTGCATTTTCTTTGAGAGCTGCCCTTTGGAAGAGACAAGGTGTAACCTCAGAACAAAGGAAAGAGGGCTTTCTC  
ATGGATTGAGCTSGCTGGTATACCATTAAATCGAGGTGGCATTCCAGCTGGAATGGGGAGCGAAGGTCTGTCTCCAA  
ACACTCCAAGTTCAGGATCTGTTTGAATTGGACTTCGTATTCCCTAATTCAGTAAAGGCAGCTAAAGGGAGCTAAG  
ACACCGGCTTTACTCATTATTCAACCTTCCAGATGACCACCCTCTCAGGGTCTAGGAAGCAGCTGAGGAGAGCCAAG  
GCCAAGTCTTGAAGTAGACTTGCCTCAGAGATTCTACCTGCCACGCTCTTATGGTTGTGACACTTTGTAGGTTGTCT  
TTATTGTTTTGTTATTGGGCTTTGCGTTGGTACAGCATCATTTTGTCTTCTGGAATCTATGCAACACCTATCTTATGTAT  
GGAATCAGGTAGTTTGAATATTTTCTTTGTAATCCTCTCTTGTGGTATTCTTTAACTTCTAAAGATCAAACCTTAGTA  
GAATTTTTTGTCCCTGAGAGAAAAACAAATAAATAAACTTCTTTTCTTGGACTCACTGTTCCCAAAAGGAAGTACGA  
GGTCAGTCCATTTGAAAATATTTAGAAGCAAGTGAACAGATGTAATTTGAATTACAGCCTGCCATGGAACCTACCGAGA  
AAGGAGGGGGTTAATACTGGCCTTCCCCTCTTGTCTTTGGCATAGTCTTCAATTTCTCAACATGTCAATTTCTCTCTC  
CCATGGCTAGCCAGCTGGGGACTGCCATCCAAATCTGTCTGTATATGGAAGGACTCCAGCAATTTGGGGGTGGGGT  
GGGTGGGGCAATCGGATACAGTAATCTTCTTTGGGAAGTAAACCTTTTTCTTTTCTGTTCCAACCTGCATCCAAATCTG  
ATTTCTCCTCATGAAGACACTGCATAATTAATCCTGATAGTAGCGTAATACAGGAACAACTGTAAAAGCTGACTGTGG  
AGGCTCAGTTATGGAATGCTCATTTAGGCAGGACAATTTGAAAGTAAGCAGTGTAGTCTGTCTTTGGAAATAGCAGAA  
ATTGCATTTTTCATTCCCTGTGCTTAGA  
GTATTTCACTGCATGCAATTTGGATAGAGTGTAGTGTCTGAAACAGTAGAGCAGAGTCTAAGCCCACAGCAGGAGA  
TCCCACAGGGATACTCCAGGATACTTATGGAAATGTGCTGGCTAGCTGAGGTGTCCAGAATCAAATGATCGTAGGAGA  
TGAAGAATGTTATCAGAGGTCAATGAATCCAACCTTTCAATCCACTGTTCTAACCTGCTACAGTTTCTGACAGATGGC  
CACCCAATACAGAACTCATATGCTATTTAGATGAATTACATTGTTCTGGTCATGAATACATCTTTTAGATGAAAAAAA  
ATTACCTCACATATACTATTGATAGTTGCTAGCTCATCCTTTGTGGAGAACACTGGGGGTTTCTGGCCTGACAGAAG  
GTAGGGGTGGCTACAATCGTTCATACTTACTTGGTTTTGTTGTCTCTTGTCTGTGAGGGTTGACTATTCTTTGGGAACT  
TGCTAGATCTGAGATGTATCGTTGTTTTAAGAACAACAACATGATTTTAGCTTCTGGGAAGCTAGTGAGCTGATACTG  
TTAGAAAATGAGGAGCTTAGACCAAAGGATGACGCCTGTATTCCGGGATTCTGATTTGTTGTTGGTTGTTGGGGAGAA  
GATGAGAAGCGCCTCTGGTACTAACAAACAGCAGTTTGTACTAGCCACGTTAGGCTGGACGAGTAACTTTTGGGTCT  
GTTTACCTCTGGGAAATGCATGGACATGGAAATTTCAATAAAATTTCTGATCTGTGAATAATGGAAGGAAAGCCAAAC  
GTACATATCTACCTGTCTCCAGCAGGTGACTTCGTGCATCTATATTAGGAAACATGGTTAGCGTTGTTTGGCACCTGAC  
ACCAAATAGCTCTGGTCTGAATGTCTTAGCATAAAACACTAGAAACTGTATCATGTGCACCTCAAACATCTGTTTAA  
TGGAGGCTCAAGGTCTACTTTCTACTTTCTCTCTGAATTACCTTTTGGAGCTTATAATCCCTTAGAAAATTTAATTATTG  
ACAAGTTGACTCAGATGGGAGATTAGACAGGGGTCAGAATGTGGGTTATATAAACTTTGTGGTAGGTTAGTGAACTTT  
TTCTTTTTCATGTTTLAGTGAACTTTGGAGCCAAAATAAGCCGAGCTTTTCAATCTGTGGACACAGAGGACAAAGGTGG  
GATGTGGATAAAGGCTGCAGAGAGAGCAGCACAGGAAATGTTTTTCCACCTAAGCGTTAGGGCAGCCTATTCTGGAG  
ACTCAGGATTGCCAGGATTGAGAGATGAACCACACAAGACGGAGTGGTTTGGAAATGATGGATGTAGATTCTATAAT  
ATTAATCTATCCAAGAGAAATCAGACAAACAGAAAAACATCCATCTCAATGATACAGAGATTTGGGATAAGCATCAA  
TTGTGGGGTTTTTTGTTTGGTTTTAATTTGTTTGGTTTGGTTTTTGGCCCTTTTATGATTCAAGTTTAC  
ATTTCTCTAGTTTATTCTTTAGACAGTTTAGGTTGGACCTCCAAGCAGAAGCTTCAACAAGAATGGTTGATTTCTTTCC  
TCTATTCTTCTTCCCTCCCTCCCTCCCTCCCTCCCTCCNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN  
NN  
TAAGCGTTTTAAGGACCAAGACTATAACCCTGTGCTGCTTTTGGTGGCCACAGTGAACCTACACCCCAACACTTGGAA  
AGTGTGTTGTTTAGCATCAAGCTCTCCCTGTCTGAACAGTCTCTGTCTCACCATCTTGTCTACATGGCACGGTACTCATT  
TTTTCTTGTGTGACAAAATACCCGAGAAAACCAACTTACTTTTGGAGCGTGTCTTAGGCTCATACTTTCTGTCCATAGT  
TGGTTGTTCTGTTGCATGTAGTACTCAGGAAAGCAGGCCCAGCATGGTGGAAAGCTGTTACCTCGAGGGGGCCAGG  
AAGCTGAGAGTAAGAGGAGGACTCCGGGAAGGGTACGGCCTTTCAAAGCACAGGAGACTACACCTGGTTGATTCAAT  
CCCTCAAACCTTCTCGAAACAATACCTCAAGTTTTGACTCTATCAGTGATCCAGTCAAGTCCCGAGATGTGCATCTCTG  
AACATTGCATTAAGCACATGGATTTATTTAGTGGTGGGATGGGAGGGGGCAGGATTCATGTTTAAATATAATTCCAGT  
ATAATAGGAAATCATCAAATATTTTAAAAGAGTCTACACTATACTCTTTAATTTACTTTCCAATCAAATTAACAA  
AAAGCTTATATGTGGAAGGTAGAGTTAGAAGATTTTGAATGTATTGAGGGTCTTTTATGTCTTATTCTAAGTTATTT  
TTTGGCGTGCCTTCTGTGGCTCTGGCTTTTTCAAAGATCATTTTATGTGTATGGGTGTTTTGCCTGTATATATGTCTGT  
ATAGAGTGTGCATAGCTGTGAGGGGGAGAGGGCAGAAGAGGGATTGGATCCCCTGGAAGTAAAGCCATTGTATAGGTG  
CTTGAATTCGAACCCTGGCTCTCTGGAAGCAGCCAGTGTCTTAACTACTGAGCGGTATCTCCATCTGGTCACTGC

TTTTTTGGCTCCAAGAAAGCTTTCTCGGTCAAAGGACTAGCTCTGAGAATATGCAAATCAATCACTTCTGCCTCATCAA  
ATGAGAGGTGTGGGATAGTTGAGCAAGCCAAGTAGGCCTTGAACAGAATAGACTTAATGCTCCGGCCATCAGGCTCC  
TCTGTGCTGCTGGGCGTGCAGGAGGTTTGAATGAAAGAAGCCTTTTTGGTCACAACATCAAAGAAAGGTTAGGCCAGCG  
GACTTGACACGGTCTATGTAAGGTCTCAGAAAATAGAAAGTGACCCAAAGCTAGATTCTACATTCATTTGGTCATCATC  
CATTTATTTACTCAAGAAATGGACGGTGAAGTGTGAGGCATGGTCTCGACGTAGAAGACATGGTGAGAAGTGCACACC  
CTGGACAAATCCCTCCCTTCTTAAGCGTGCATTTCATAGAGCAGGGTTTGTATTTTCCAGTGGGTTACACAGAAGCTACT  
CTTAGTAGGTGGGGGAAGATTACCTGACTAACGTGGAGAGCACTTGGGGAGAGCTGATAGCGCTAGTGAGGAAATGAC  
AGCGAATACAGTGTGGTGTGATGGAGCGTCAAGCCCTGTGGGCACTGGGTGACATCCTGTCCAAGTGCCTGGCAAGCT  
AGAAGGGCCATGGGAGGCGGGTCCTTCGGAAATGGTTTCCTTGCTTTCTCCAGCGCCCGGGAGCATTACTTTAATAA  
ATAAATAAATAAATACTGGTGAGACCTGTGGCTACATGATGTAGAACTTCAGAGACATCGGGTGTGAATTGGAGATAG  
TCCTGGGACTCTATTGGAAGTCCTAGCTATTTTATTAGCGCTAATGTAAAATTGTTTTTATTACAAGTTCTTATTAAGAG  
CAATTAACATTACTTTTTCAGCTATATGCACTTTGAGCACGCAAATCAAATTTAAGTCTTGTATTCTGCCTACAATAAACA  
AAATGAAATTTAAAGTAGTATGTGGCTTTTATGAAATTAATAAATGACAGGATTTTCAGAGCTGTGAAGATTATGACTGTG  
TGTATGTAACATTAECTTGTGAAAATGAATGGAGATTGAATTGAGACCTGAAGTAGAAATATATCCTAATGGTCTTTGA  
AGCAGTCTAATGAGATAAACAGAGATGTCACAGACAGTGAATGGTACATAAATACTCTGTCAATTTTGTCTCTGTATGA  
AAAGGGGAGAGAGAGAGAGAGAGAGAGAAAGATCTGGAAGGAATTTACTAGGCCTGTTCTGCTTTGTGCTGATGATTT  
ATCTGTTCCCTCCTGTTGCTTATTCACCACAAAATTAATAGTCTGTACAGGACCCACCAAGTTCTACCTGACACGGAAGTA  
GATTGATGATTTTCTTCAGCTCATTGTAGACCAAAGGATCATTGTGTGGGAATAATT