Supporting Information

Controllable patterning of tannic acid on DNA origami

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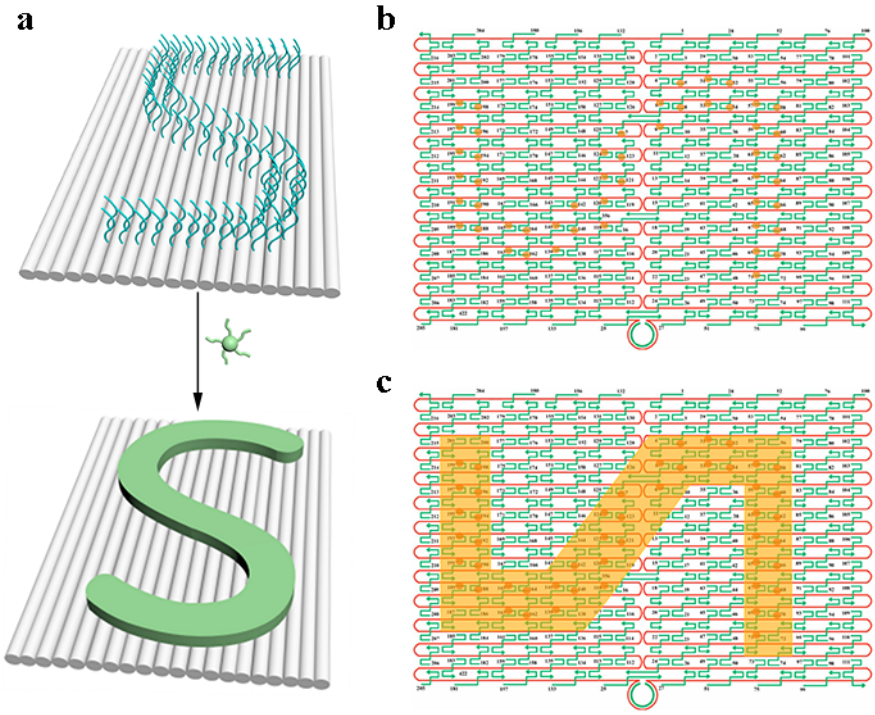

Figure S1. Calculation of theoretical deposition area ratio of TA on DNA origami.[1] (a) Schematic illustration of site-specific controllable patterning of tannic acid on a DNA origami template. (b) Description of calculation method 1: since there are 216 staples in rectangular origami, 50 of them are designed as pcDNA for TA adsorption, therefore, the TA deposition rate is 50/216=23.1 %. (c) Description of calculation method 2: since the size of the rectangular origami tile is 7000 nm^2, the TA deposition area is 2065 nm^2, so the deposition ratio is 2065/7000=29.5 %.

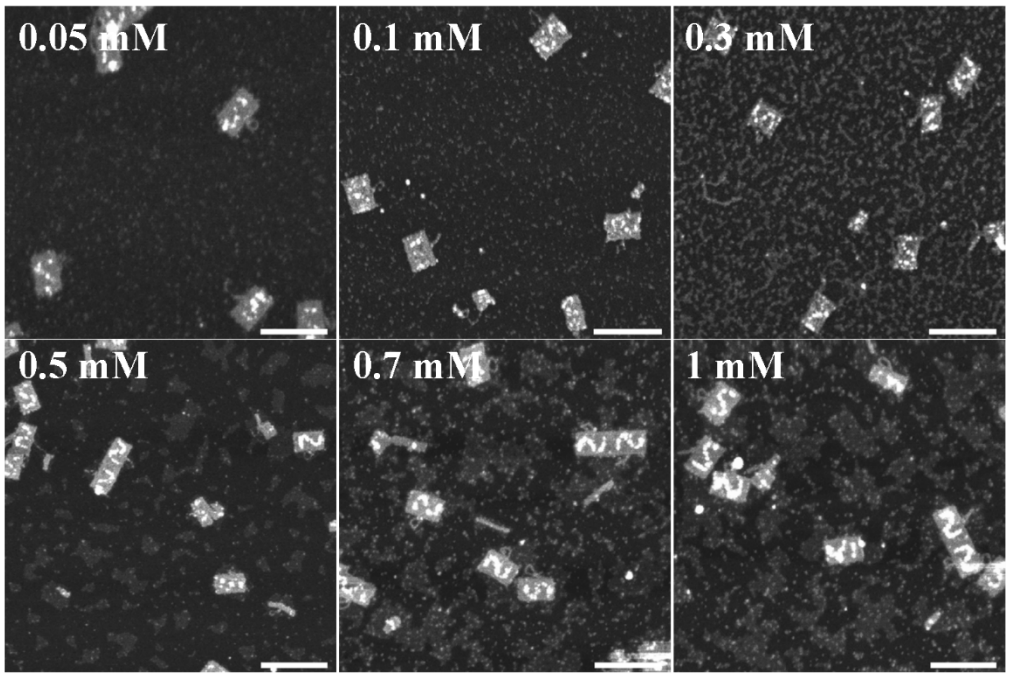

Figure S2. Effect of TA concentration on the course of patterning. AFM images of "S" patterns on DNA origami at different TA concentrations. Scale bars: 200 nm.

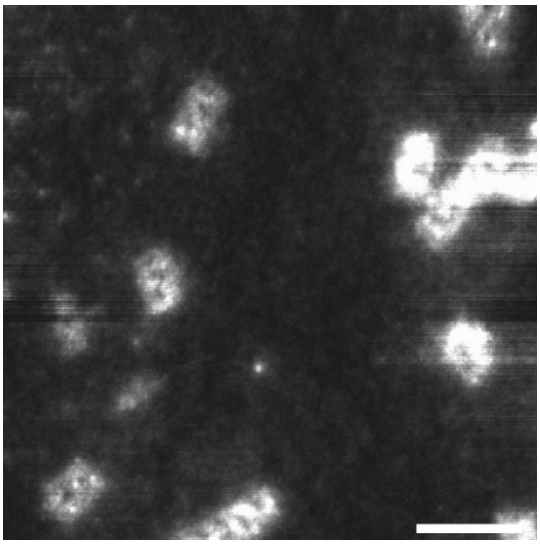

Figure S3. AFM image of "S" pattern on DNA origami at 2 mM TA. TA is adsorbed on the surface of mica to form a thin film, resulting in blurred nanopatterns. Scale bar: 200 nm.

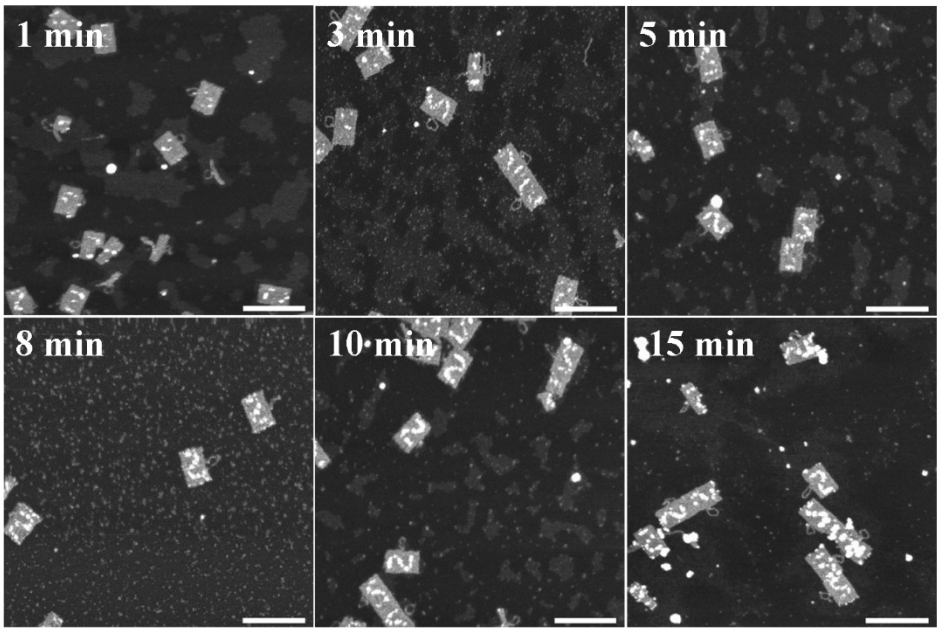

Figure S4. Effect of reaction time on the course of patterning. AFM images of "S" pattern on DNA origami at different reaction times. Scale bars: 200 nm.

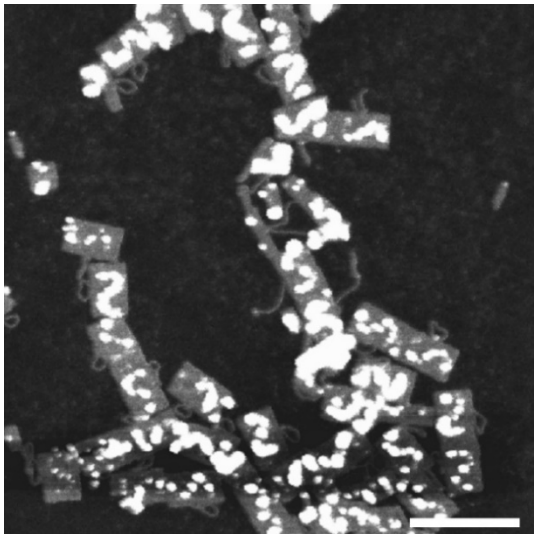

Figure S5. AFM image of the letter "S" on the DNA origami when the reaction time reaches 30 min. When the reaction time is too long, the origami will aggregate and the letter "S" overgrowth. Scale bar: 200 nm.

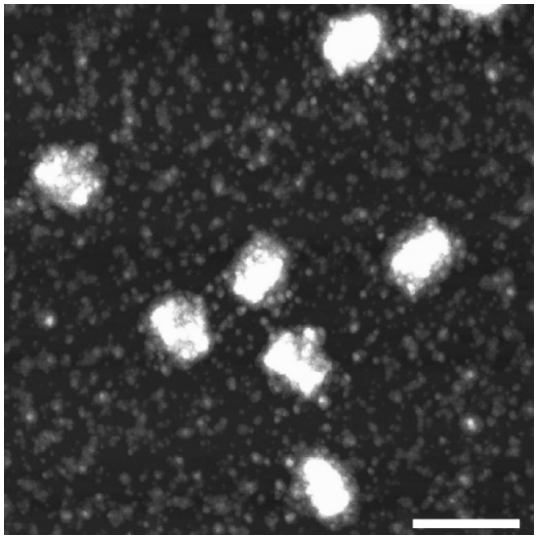

Figure S6. Representative AFM image of the TA pattern growing along the "S" shaped path on DNA origami assisted with Zn^{2+}. Scale bar: 200 nm.

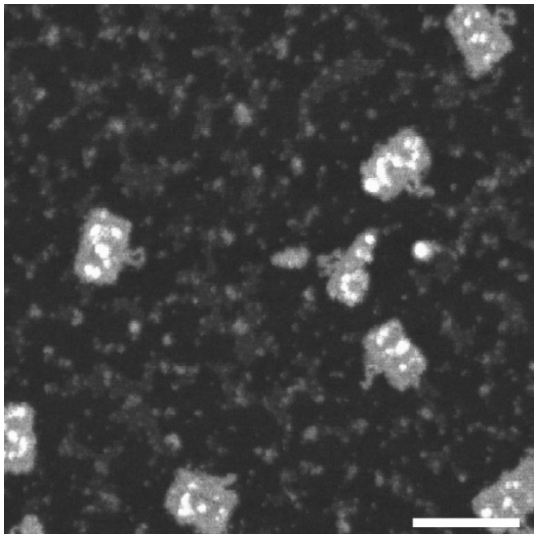

Figure S7. Representative AFM image of the TA pattern growing along the "S" shaped path on DNA origami assisted with Ca^{2+}. Scale bar: 200 nm.

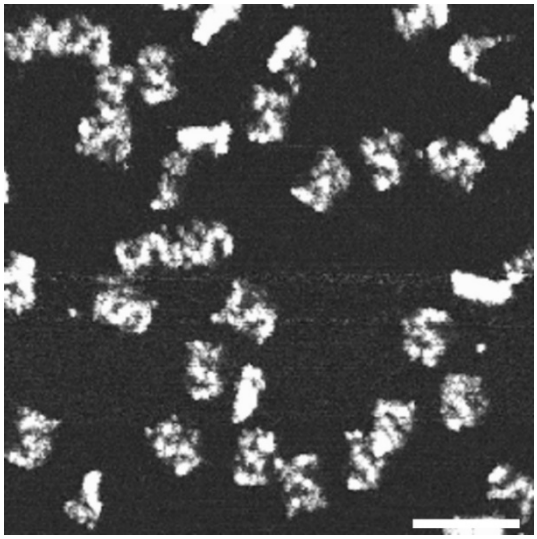

Figure S8. Representative AFM image of the "S" shaped pattern consisting of TA polymers on DNA origami after washing for three times with water. Scale bar: 200 nm.

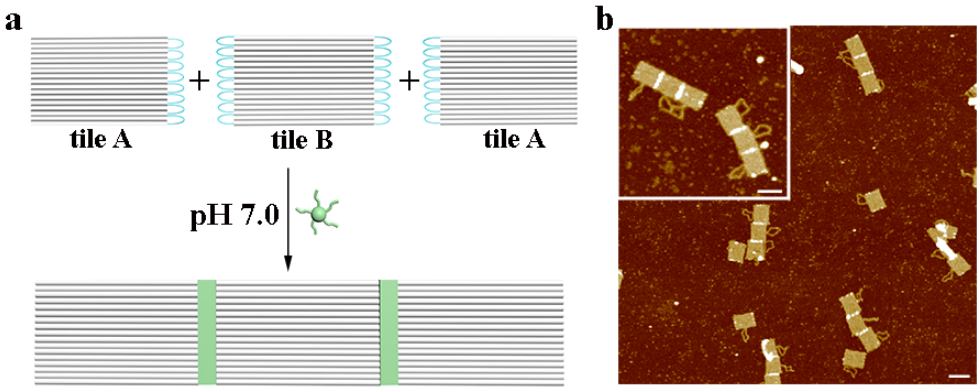

Figure S9. DNA origami trimers assembled by mixing origami tiles A and B at a ratio of 2:1 in the TA solution. (a) Assembly scheme for DNA origami trimers. (b) AFM image of DNA origami trimer. Scale bar: 100 nm.

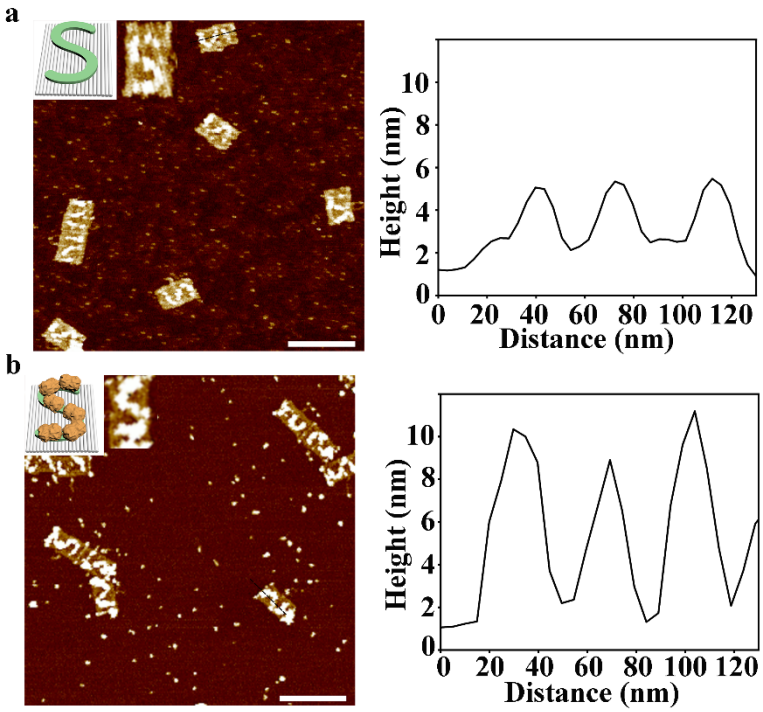

Figure S10. Glucose oxidase molecules adsorption on DNA origami along "S" shaped TA polymers. (a) "S" shaped pattern formed on DNA origami template after TA deposition and the cross-sectional analysis for TA nanopattern from AFM image. (b) The representative AFM image of glucose oxidase deposition on "S" shaped TA pattern and the corresponding cross-sectional analysis. Scale bars: 200 nm.

Table S1. Assembly yield of DNA origami dimers under pH adjustment.

pH	N (dimer)	Y (%)
7.0	0	0
7.0	103	66.4±3.1
5.5	20	17.2±4.5
7.0	97	65.1±4.2

DNA sequences:

For the letter "S" pattern on DNA origami

DNA	Sequences (5'-3')
S-005	CTTGGGTCGTAGACATCGACGACTACTAACCAGAGACCCTCAGAACCGCCAGGGGTCAG
S-006	CTTGGGTCGTAGACATCGACGACTACTTTATTCATAGGGAAGGTAAATATTCATTCAGT
S-007	CTTGGGTCGTAGACATCGACGACTACTCATAACCCGAGGCATAGTAAGAGCTTTTTAAG
S-008	CTTGGGTCGTAGACATCGACGACTACTATTGAGGGTAAAGGTGAATTATCAATCACCGG

S-009	CTTGGGTCGTAGACATCGACGACTACTAAAAGTAATATCTTACCGAAGCCCTTCCAGAG
S-031	CTTGGGTCGTAGACATCGACGACTACTGCCACCACTCTTTTCATAATCAAACCGTCACC
S-032	CTTGGGTCGTAGACATCGACGACTACTGTTTGCCACCTCAGAGCCGCCACCGATACAGG
S-033	CTTGGGTCGTAGACATCGACGACTACTGACTTGAGAGACAAAAGGGCGACAAGTTACCA
S-034	CTTGGGTCGTAGACATCGACGACTACTAGCGCCAACCATTTGGGAATTAGATTATTAGC
S-057	CTTGGGTCGTAGACATCGACGACTACTAATCACCAAATAGAAAATTCATATATAACGGA
S-058	CTTGGGTCGTAGACATCGACGACTACTTCACAATCGTAGCACCATTACCATCGTTTTCA
S-059	CTTGGGTCGTAGACATCGACGACTACTATACCCAAGATAACCCACAAGAATAAACGATT
S-060	CTTGGGTCGTAGACATCGACGACTACTATCAGAGAAAGAACTGGCATGATTTTATTTTG
S-061	CTTGGGTCGTAGACATCGACGACTACTTTTTGTTTAAGCCTTAAATCAAGAATCGAGAA
S-062	CTTGGGTCGTAGACATCGACGACTACTAGGTTTTGAACGTCAAAAATGAAAGCGCTAAT
S-063	CTTGGGTCGTAGACATCGACGACTACTCAAGCAAGACGCGCCTGTTTATCAAGAATCGC
S-064	CTTGGGTCGTAGACATCGACGACTACTAATGCAGACCGTTTTTATTTTCATCTTGCGGG
S-065	CTTGGGTCGTAGACATCGACGACTACTCATATTTAGAAATACCGACCGTGTTACCTTTT
S-066	CTTGGGTCGTAGACATCGACGACTACTAATGGTTTACAACGCCAACATGTAGTTCAGCT
S-067	CTTGGGTCGTAGACATCGACGACTACTTAACCTCCATATGTGAGTGAATAAACAAAATC
S-068	CTTGGGTCGTAGACATCGACGACTACTAAATCAATGGCTTAGGTTGGGTTACTAAATTT
S-069	CTTGGGTCGTAGACATCGACGACTACTGCGCAGAGATATCAAAATTATTTGACATTATC
S-070	CTTGGGTCGTAGACATCGACGACTACTAACCTACCGCGAATTATTCATTTCCAGTACAT
S-071	CTTGGGTCGTAGACATCGACGACTACTATTTTGCGTCTTTAGGAGCACTAAGCAACAGT
S-118	CTTGGGTCGTAGACATCGACGACTACTGTTAAAATTTTAACCAATAGGAACCCGGCACC
S-120	CTTGGGTCGTAGACATCGACGACTACTAGGTAAAGAAATCACCATCAATATAATATTTT
S-121	CTTGGGTCGTAGACATCGACGACTACTTTTCATTTGGTCAATAACCTGTTTATATCGCG
S-122	CTTGGGTCGTAGACATCGACGACTACTTCGCAAATGGGGCGCGAGCTGAAATAATGTGT
S-123	CTTGGGTCGTAGACATCGACGACTACTTTTTAATTGCCCGAAAGACTTCAAAACACTAT
S-124	CTTGGGTCGTAGACATCGACGACTACTAAGAGGAACGAGCTTCAAAGCGAAGATACATT
S-139	CTTGGGTCGTAGACATCGACGACTACTGAAGATCGGTGCGGGCCTCTTCGCAATCATGG
S-140	CTTGGGTCGTAGACATCGACGACTACTAAATAATTTTAAATTGTAAACGTTGATATTCA
S-141	CTTGGGTCGTAGACATCGACGACTACTGCAAATATCGCGTCTGGCCTTCCTGGCCTCAG
S-142	CTTGGGTCGTAGACATCGACGACTACTACCGTTCTAAATGCAATGCCTGAGAGGTGGCA
S-162	CTTGGGTCGTAGACATCGACGACTACTCAGCTGGCGGACGACGACAGTATCGTAGCCAG
S-163	CTTGGGTCGTAGACATCGACGACTACTGTTTGAGGGAAAGGGGGATGTGCTAGAGGATC
S-164	CTTGGGTCGTAGACATCGACGACTACTCTTTCATCCCCAAAAACAGGAAGACCGGAGAG
S-165	CTTGGGTCGTAGACATCGACGACTACTAGAAAAGCAACATTAAATGTGAGCATCTGCCA
S-188	CTTGGGTCGTAGACATCGACGACTACTACCCGTCGTCATATGTACCCCGGTAAAGGCTA
S-189	CTTGGGTCGTAGACATCGACGACTACTCATGTCAAGATTCTCCGTGGGAACCGTTGGTG
S-190	CTTGGGTCGTAGACATCGACGACTACTTCAGGTCACTTTTGCGGGAGAAGCAGAATTAG

S-191	CTTGGGTCGTAGACATCGACGACTACTCTGTAATATTGCCTGAGAGTCTGGAAAACTAG
S-192	CTTGGGTCGTAGACATCGACGACTACTCAAAATTAAAGTACGGTGTCTGGAAGAGGTCA
S-193	CTTGGGTCGTAGACATCGACGACTACTTGCAACTAAGCAATAAAGCCTCAGTTATGACC
S-194	CTTGGGTCGTAGACATCGACGACTACTTTTTTGCGCAGAAAACGAGAATGAATGTTTAG
S-195	CTTGGGTCGTAGACATCGACGACTACTAAACAGTTGATGGCTTAGAGCTTATTTAAATA
S-196	CTTGGGTCGTAGACATCGACGACTACTACTGGATAACGGAACAACATTATTACCTTATG
S-197	CTTGGGTCGTAGACATCGACGACTACTACGAACTAGCGTCCAATACTGCGGAATGCTTT
S-198	CTTGGGTCGTAGACATCGACGACTACTCGATTTTAGAGGACAGATGAACGGCGCGACCT
S-199	CTTGGGTCGTAGACATCGACGACTACTCTTTGAAAAGAACTGGCTCATTATTTAATAAA

Sequences of rectangular origami staple strands

Number	Sequences (5'-3')
001	CAAGCCCAATAGGAACCCATGTACAAACAGTT
002	AATGCCCCGTAACAGTGCCCGTATCTCCCTCA
003	TGCCTTGACTGCCTATTTCGGAACAGGGATAG
004	GAGCCGCCCCACCACCGGAACCGCGACGGAAA
005	AACCAGAGACCCTCAGAACCGCCAGGGGTCAG
006	TTATTCATAGGGAAGGTAAATATTCATTCAGT
007	CATAACCCGAGGCATAGTAAGAGCTTTTTAAG
008	ATTGAGGGTAAAGGTGAATTATCAATCACCGG
009	AAAAGTAATATCTTACCGAAGCCCTTCCAGAG
010	GCAATAGCGCAGATAGCCGAACAATTCAACCG
011	CCTAATTTACGCTAACGAGCGTCTAATCAATA
012	TCTTACCAGCCAGTTACAAAATAAATGAAATA
013	ATCGGCTGCGAGCATGTAGAAACCTATCATAT
014	CTAATTTATCTTTCCTTATCATTCATCCTGAA
015	GCGTTATAGAAAAAGCCTGTTTAGAAGGCCGG
016	GCTCATTTTCGCATTAAATTTTTGAGCTTAGA
017	AATTACTACAAATTCTTACCAGTAATCCCATC
018	TTAAGACGTTGAAAACATAGCGATAACAGTAC
019	TAGAATCCCTGAGAAGAGTCAATAGGAATCAT
020	CTTTTACACAGATGAATATACAGTAAACAATT
021	TTTAACGTTCGGGAGAAACAATAATTTTCCCT
022	CGACAACTAAGTATTAGACTTTACAATACCGA
023	GGATTTAGCGTATTAAATCCTTTGTTTTCAGG
024	ACGAACCAAAACATCGCCATTAAATGGTGGTT
025	GAACGTGGCGAGAAAGGAAGGGAACAAACTAT

026	TAGCCCTACCAGCAGAAGATAAAAACATTTGA
027	CGGCCTTGCTGGTAATATCCAGAACGAACTGA
028	CTCAGAGCCACCACCCTCATTTTCCTATTATT
029	CTGAAACAGGTAATAAGTTTTAACCCCTCAGA
030	AGTGTACTTGAAAGTATTAAGAGGCCGCCACC
031	GCCACCACTCTTTTCATAATCAAACCGTCACC
032	GTTTGCCACCTCAGAGCCGCCACCGATACAGG
033	GACTTGAGAGACAAAAGGGCGACAAGTTACCA
034	AGCGCCAACCATTTGGGAATTAGATTATTAGC
035	GAAGGAAAATAAGAGCAAGAAACAACAGCCAT
036	GCCCAATACCGAGGAAACGCAATAGGTTTACC
037	ATTATTTAACCCAGCTACAATTTTCAAGAACG
038	TATTTTGCTCCCAATCCAAATAAGTGAGTTAA
039	GGTATTAAGAACAAGAAAAATAATTAAAGCCA
040	TAAGTCCTACCAAGTACCGCACTCTTAGTTGC
041	ACGCTCAAAATAAGAATAAACACCGTGAATTT
042	AGGCGTTACAGTAGGGCTTAATTGACAATAGA
043	ATCAAAATCGTCGCTATTAATTAACGGATTCG
044	CTGTAAATCATAGGTCTGAGAGACGATAAATA
045	CCTGATTGAAAGAAATTGCGTAGACCCGAACG
046	ACAGAAATCTTTGAATACCAAGTTCCTTGCTT
047	TTATTAATGCCGTCAATAGATAATCAGAGGTG
048	AGATTAGATTTAAAAGTTTGAGTACACGTAAA
049	AGGCGGTCATTAGTCTTTAATGCGCAATATTA
050	GAATGGCTAGTATTAACACCGCCTCAACTAAT
051	CCGCCAGCCATTGCAACAGGAAAAATATTTTT
052	CCCTCAGAACCGCCACCCTCAGAACTGAGACT
053	CCTCAAGAATACATGGCTTTTGATAGAACCAC
054	TAAGCGTCGAAGGATTAGGATTAGTACCGCCA
055	CACCAGAGTTCGGTCATAGCCCCCGCCAGCAA
056	TCGGCATTCCGCCGCCAGCATTGACGTTCCAG
057	AATCACCAAATAGAAAATTCATATATAACGGA
058	TCACAATCGTAGCACCATTACCATCGTTTTCA
059	ATACCCAAGATAACCCACAAGAATAAACGATT
060	ATCAGAGAAAGAACTGGCATGATTTTATTTTG
061	TTTTGTTTAAGCCTTAAATCAAGAATCGAGAA
062	AGGTTTTGAACGTCAAAAATGAAAGCGCTAAT

063	CAAGCAAGACGCGCCTGTTTATCAAGAATCGC
064	AATGCAGACCGTTTTTATTTTCATCTTGCGGG
065	CATATTTAGAAATACCGACCGTGTTACCTTTT
066	AATGGTTTACAACGCCAACATGTAGTTCAGCT
067	TAACCTCCATATGTGAGTGAATAAACAAAATC
068	AAATCAATGGCTTAGGTTGGGTTACTAAATTT
069	GCGCAGAGATATCAAAATTATTTGACATTATC
070	AACCTACCGCGAATTATTCATTTCCAGTACAT
071	ATTTTGCGTCTTTAGGAGCACTAAGCAACAGT
072	CTAAAATAGAACAAAGAAACCACCAGGGTTAG
073	GCCACGCTATACGTGGCACAGACAACGCTCAT
074	GCGTAAGAGAGAGCCAGCAGCAAAAAGGTTAT
075	GGAAATACCTACATTTTGACGCTCACCTGAAA
076	TATCACCGTACTCAGGAGGTTTAGCGGGGTTT
077	TGCTCAGTCAGTCTCTGAATTTACCAGGAGGT
078	GGAAAGCGACCAGGCGGATAAGTGAATAGGTG
079	TGAGGCAGGCGTCAGACTGTAGCGTAGCAAGG
080	TGCCTTTAGTCAGACGATTGGCCTGCCAGAAT
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098	GCCAACAGTCACCTTGCTGAACCTGTTGGCAA
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100	TTTTTATAAGTATAGCCCGGCCGTCGAG
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102	ACAAACAATTTTAATCAGTAGCGACAGATCGATAGC
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105	GCGCATTATTTTGCTTATCCGGTATTCTAAATCAGA
106	TATAGAAGTTTTCGACAAAAGGTAAAGTAGAGAATA
107	TAAAGTACTTTTCGCGAGAAAACTTTTTATCGCAAG
108	ACAAAGAATTTTATTAATTACATTTAACACATCAAG
109	AAAACAAATTTTTTCATCAATATAATCCTATCAGAT
110	GATGGCAATTTTAATCAATATCTGGTCACAAATATC
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112	CCGAAATCCGAAAATCCTGTTTGAAGCCGGAA
113	CCAGCAGGGGCAAAATCCCTTATAAAGCCGGC
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136	GTGAGCTAGTTTCCTGTGTGAAATTTGGGAAG

137	TCATAGCTACTCACATTAATTGCGCCCTGAGA
138	GGCGATCGCACTCCAGCCAGCTTTGCCATCAA
139	GAAGATCGGTGCGGGCCTCTTCGCAATCATGG
140	AAATAATTTTAAATTGTAAACGTTGATATTCA
141	GCAAATATCGCGTCTGGCCTTCCTGGCCTCAG
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155	AAAAAAGGACAACCATCGCCCACGCGGGTAAA
156	TGTAGCATTCCACAGACAGCCCTCATCTCCAA
157	GTAAAGCACTAAATCGGAACCCTAGTTGTTCC
158	AGTTTGGAGCCCTTCACCGCCTGGTTGCGCTC
159	AGCTGATTACAAGAGTCCACTATTGAGGTGCC
160	ACTGCCCGCCGAGCTCGAATTCGTTATTACGC
161	CCCGGGTACTTTCCAGTCGGGAAACGGGCAAC
162	CAGCTGGCGGACGACGACAGTATCGTAGCCAG
163	GTTTGAGGGAAAGGGGGATGTGCTAGAGGATC
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165	AGAAAAGCAACATTAAATGTGAGCATCTGCCA
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167	CAACGCAATTTTTGAGAGATCTACTGATAATC
168	CAATAAATACAGTTGATTCCCAATTTAGAGAG
169	TCCATATACATACAGGCAAGGCAACTTTATTT
170	TACCTTTAAGGTCTTTACCCTGACAAAGAAGT
171	CAAAAATCATTGCTCCTTTTGATAAGTTTCAT
172	TTTGCCAGATCAGTTGAGATTTAGTGGTTTAA
173	AAAGATTCAGGGGGTAATAGTAAACCATAAAT

174	TTTCAACTATAGGCTGGCTGACCTTGTATCAT
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176	CGCCTGATGGAAGTTTCCATTAAACATAACCG
177	TTTCATGAAAATTGTGTCGAAATCTGTACAGA
178	ATATATTCTTTTTTCACGTTGAAAATAGTTAG
179	AATAATAAGGTCGCTGAGGCTTGCAAAGACTT
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187	TAGATGGGGGGTAACGCCAGGGTTGTGCCAAG
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189	CATGTCAAGATTCTCCGTGGGAACCGTTGGTG
190	TCAGGTCACTTTTGCGGGAGAAGCAGAATTAG
191	CTGTAATATTGCCTGAGAGTCTGGAAAACTAG
192	CAAAATTAAAGTACGGTGTCTGGAAGAGGTCA
193	TGCAACTAAGCAATAAAGCCTCAGTTATGACC
194	TTTTTGCGCAGAAAACGAGAATGAATGTTTAG
195	AAACAGTTGATGGCTTAGAGCTTATTTAAATA
196	ACTGGATAACGGAACAACATTATTACCTTATG
197	ACGAACTAGCGTCCAATACTGCGGAATGCTTT
198	CGATTTTAGAGGACAGATGAACGGCGCGACCT
199	CTTTGAAAAGAACTGGCTCATTATTTAATAAA
200	GCTCCATGAGAGGCTTTGAGGACTAGGGAGTT
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203	GAGAATAGCTTTTGCGGGATCGTCGGGTAGCA
204	ACGTTAGTAAATGAATTTTCTGTAAGCGGAGT
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212	ATATAATGTTTTCATTGAATCCCCCTCAAATCGTCA
213	TAAATATTTTTTGGAAGAAAAATCTACGACCAGTCA
214	GGACGTTGTTTTTCATAAGGGAACCGAAAGGCGCAG
215	ACGGTCAATTTTGACAGCATCGGAACGAACCCTCAG
216	CAGCGAAAATTTTACTTTCAACAGTTTCTGGGATTTTGCTAAACTTTT
Loop1	AACATCACTTGCCTGAGTAGAAGAACT
Loop2	TGTAGCAATACTTCTTTGATTAGTAAT
Loop3	AGTCTGTCCATCACGCAAATTAACCGT
Loop4	ATAATCAGTGAGGCCACCGAGTAAAAG
Loop5	ACGCCAGAATCCTGAGAAGTGTTTTT
Loop6	TTAAAGGGATTTTAGACAGGAACGGT
Loop7	AGAGCGGGAGCTAAACAGGAGGCCGA
Loop8	TATAACGTGCTTTCCTCGTTAGAATC
Loop9	GTACTATGGTTGCTTTGACGAGCACG
Loop10	GCGCTTAATGCGCCGCTACAGGGCGC

References

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