

```

1  Sub EasyKASP()
2  Dim i As Long, n As Integer, m As Double, j As Double
3  Dim ka As Integer, kt As Integer, kc As Integer, kg As Integer
4  Dim kk1 As Integer, kk2 As Integer, kk3 As Integer, h As Integer
5  Dim sF As String, sR As String, FR As Integer, k As Integer
6  Dim jj As Integer, q1 As Integer, q2 As Integer, gc As Integer
7  Dim ss As String, kkf As Integer, kkr As Integer, m2 As Integer
8  Dim tim As Long, h2 As Integer
9
10 tim = Timer
11 i = 2
12 j = 2
13 h2 = 0
14 Do While Len(Cells(i, 1)) <> 0
15     Application.ScreenUpdating = False
16     Cells(i, 4) = UCase(WorksheetFunction.Substitute(WorksheetFunction.Clean(Trim(Cells(i, 4))), " ",
17     ""))
18     Cells(i, 4) = WorksheetFunction.Substitute(Cells(i, 4), "-", "")
19     Cells(i, 4) = WorksheetFunction.Substitute(Cells(i, 4), "_", "")
20     FR = 0
21     sR = ""
22     sF = ""
23     m = 0
24     ss = ""
25     gc = 0
26     h = 0
27     If Len(Cells(i, 4)) - Len(WorksheetFunction.Substitute(Cells(i, 4), "[", "")) > 1 Then Cells(i, 1) =
28     Cells(i, 1) & " Variation mistake"
29     If Len(Cells(i, 4)) - Len(WorksheetFunction.Substitute(Cells(i, 4), "[", "")) > 1 Then Cells(i, 5) =
30     "Failed"
31
32     Do While FR = 0
33     If InStr(1, Cells(i, 4), "[") = 0 Or InStr(1, Cells(i, 4), "]") = 0 Or InStr(1, Cells(i, 4), "/") = 0 Then Cells(i,
34     5) = "Failed"
35     If InStr(1, Cells(i, 4), ",") <> 0 Or InStr(1, Cells(i, 4), "\" ) <> 0 Or InStr(1, Cells(i, 4), "*" ) <> 0 Then
36     Cells(i, 5) = "Failed"
37     If Cells(i, 5) = "Failed" Then Exit Do
38     kk1 = 0
39     kk2 = 0
40     kk3 = 0
41     q1 = 0
42     q2 = 0
43     ka = 0
44     kt = 0

```

```

45   kc = 0
46   kg = 0
47   k = 0
48
49   kk1 = WorksheetFunction.Find("[", Cells(i, 4), 1)
50   kk2 = WorksheetFunction.Find("/", Mid(Cells(i, 4), kk1 + 1, Len(Cells(i, 4)) - kk1), 1)
51   kk2 = kk2 + kk1
52   kk3 = WorksheetFunction.Find("]", Cells(i, 4), 1)
53
54   If UCase(Cells(i, 2)) <> Mid(Cells(i, 4), kk1 + 1, kk2 - kk1 - 1) Or UCase(Cells(i, 3)) <> Mid(Cells(i, 4),
55   kk2 + 1, kk3 - kk2 - 1) Then Cells(i, 1) = Cells(i, 1) & " Allele mistake"
56   Cells(i, 2) = Mid(Cells(i, 4), kk1 + 1, kk2 - kk1 - 1)
57   Cells(i, 3) = Mid(Cells(i, 4), kk2 + 1, kk3 - kk2 - 1)
58
59   Do While Right(Cells(i, 1), 7) = "mistake"
60       Cells(i, 1).Select
61       With Selection.Interior
62           .PatternColorIndex = xlAutomatic
63           .Color = 255
64       End With
65   Exit Do
66   Loop
67
68
69
70   If kk1 >= 27 Then sF = Mid(Cells(i, 4), kk1 - 26, 26) & Cells(i, 2)
71   If kk1 < 27 Then sF = Mid(Cells(i, 4), 1, kk1 - 1) & Cells(i, 2)
72   sR = Cells(i, 2) & Mid(Cells(i, 4), kk3 + 1, 26)
73   sF = Right(sF, 26)
74   sR = Left(sR, 26)
75
76
77   n = Len(sF)
78   Do While n > 0
79       If Mid(sF, n, 1) = "A" Then ka = ka + 1
80       If Mid(sF, n, 1) = "T" Then kt = kt + 1
81       If Mid(sF, n, 1) = "C" Then kc = kc + 1
82       If Mid(sF, n, 1) = "G" Then kg = kg + 1
83       n = n - 1
84   Loop
85   If InStr(1, sF, "AAAAAA") <> 0 Or InStr(1, sF, "TTTTTT") <> 0 Or InStr(1, sF, "CCCCCC") <> 0 Or
86   InStr(1, sF, "GGGGGG") <> 0 Or Len(sF) <> ka + kt + kg + kc Then FR = -1
87   m = (kg + kc) / (kg + kc + kt + ka) * 100
88   ka = 0

```

```

89   kt = 0
90   kc = 0
91   kg = 0
92
93   n = Len(sR)
94   Do While n > 0
95       If UCase(Mid(sR, n, 1)) = "A" Then ka = ka + 1
96       If UCase(Mid(sR, n, 1)) = "T" Then kt = kt + 1
97       If UCase(Mid(sR, n, 1)) = "C" Then kc = kc + 1
98       If UCase(Mid(sR, n, 1)) = "G" Then kg = kg + 1
99       n = n - 1
100  Loop
101  If InStr(1, sR, "AAAAAA") <> 0 Or InStr(1, sR, "TTTTTT") <> 0 Or InStr(1, sR, "CCCCCC") <> 0 Or
102  InStr(1, sR, "GGGGGG") <> 0 Or Len(sR) <> ka + kg + kc + kt Then FR = FR + 100
103  If FR = 99 Then Cells(i, 5) = "Failed"
104  If FR = 99 Then Exit Do
105  If FR = 100 Then FR = 1
106
107
108  kkf = 0
109
110  Do While Len(Cells(i, 2)) <> 1 Or Len(Cells(i, 3)) <> 1
111      kkf = 1
112      kkr = 1
113      h = 999
114      Do While Len(Cells(i, 2)) >= Len(Cells(i, 3))
115
116          sF = Left(Cells(i, 2), 6)
117          sR = Cells(i, 3) & Mid(Cells(i, 4), kk3 + 1, 6)
118          Do While kkf < 6
119              If Left(sF, kkf) <> Left(sR, kkf) Then Exit Do
120              If Left(sF, kkf) = Left(sR, kkf) Then kkf = kkf + 1
121          Loop
122          sF = Right(Cells(i, 2), 6)
123          sR = Mid(Cells(i, 4), kk1 - 6, 6) & Cells(i, 3)
124          Do While kkr < 6
125              If Right(sF, kkr) <> Right(sR, kkr) Then Exit Do
126              If Right(sF, kkr) = Right(sR, kkr) Then kkr = kkr + 1
127          Loop
128
129          If WorksheetFunction.Min(kkf, kkr) = 5 Then Cells(i, 5) = "Failed"
130          If FR = 1 And kkf = 5 Then Cells(i, 5) = "Failed"
131          If FR = -1 And kkr = 5 Then Cells(i, 5) = "Failed"
132          If kkf < kkr And FR = 0 Then FR = 1

```

```

133     If kkf > kkr And FR = 0 Then FR = -1
134
135     Exit Do
136     Loop
137
138     Do While Len(Cells(i, 2)) < Len(Cells(i, 3))
139         sF = Left(Cells(i, 3), 6)
140         sR = Cells(i, 2) & Mid(Cells(i, 4), kk3 + 1, 6)
141
142         Do While kkf < 6
143             If Left(sF, kkf) <> Left(sR, kkf) Then Exit Do
144             If Left(sF, kkf) = Left(sR, kkf) Then kkf = kkf + 1
145         Loop
146         sF = Right(Cells(i, 3), 6)
147         sR = Mid(Cells(i, 4), kk1 - 6, 6) & Cells(i, 2)
148
149         Do While kkr < 6
150             If Right(sF, kkr) <> Right(sR, kkr) Then Exit Do
151             If Right(sF, kkr) = Right(sR, kkr) Then kkr = kkr + 1
152         Loop
153     Loop
154
155     If WorksheetFunction.Min(kkf, kkr) = 6 Then Cells(i, 5) = "Failed"
156     If FR = 1 And kkf = 5 Then Cells(i, 5) = "Failed"
157     If FR = -1 And kkr = 5 Then Cells(i, 5) = "Failed"
158     If kkf < kkr And FR = 0 Then FR = 1
159     If kkf > kkr And FR = 0 Then FR = -1
160
161     Exit Do
162     Loop
163 Exit Do
164 Loop
165
166 If Cells(i, 2) = Cells(i, 3) Then Cells(i, 5) = "Failed"
167 If Cells(i, 5) = "Failed" Then Exit Do
168
169
170 If Abs(m - 45) <= Abs(((kg + kc) / (kg + kc + kt + ka) * 100) - 45) And FR = 0 Then gc = 1
171 If Abs(m - 45) <= Abs(((kg + kc) / (kg + kc + kt + ka) * 100) - 45) And FR = 0 Then FR = 1
172 If Abs(m - 45) > Abs(((kg + kc) / (kg + kc + kt + ka) * 100) - 45) And FR = 0 Then gc = 2
173 If Abs(m - 45) > Abs(((kg + kc) / (kg + kc + kt + ka) * 100) - 45) And FR = 0 Then FR = -1
174
175 Do While gc = 1 Or gc = 2
176 If InStr(Mid(Cells(i, 4), kk1 - 3, 3), "AAA") <> 0 Or InStr(Mid(Cells(i, 4), kk1 - 3, 3), "TTT") <> 0 Then

```

```

177 FR = -1
178 If InStr(Mid(Cells(i, 4), kk3 + 1, 4), "AAAA") <> 0 Or InStr(Mid(Cells(i, 4), kk3 + 1, 4), "TTTT") <> 0
179 Then FR = 1
180 If InStr(Mid(Cells(i, 4), kk3 + 1, 3), "AAA") <> 0 Or InStr(Mid(Cells(i, 4), kk3 + 1, 3), "TTT") <> 0
181 Then FR = 1
182 If InStr(Mid(Cells(i, 4), kk1 - 3, 4), "AAAA") <> 0 Or InStr(Mid(Cells(i, 4), kk1 - 3, 4), "TTTT") <> 0
183 Then FR = -1
184 Exit Do
185 Loop
186
187     n = 0
188     m = 0
189
190 If Len(Cells(i, 4)) - kk3 < 70 Then q2 = 70 - (Len(Cells(i, 4)) - kk3)
191 If q2 > 0 Then n = q2
192 Do While n > 0
193     Cells(i, 4) = Cells(i, 4) & "Q"
194     n = n - 1
195 Loop
196 n = 0
197
198 If kk1 < 70 Then q1 = 70 - kk1
199 If q1 > 0 Then n = q1
200 Do While n > 0
201     Cells(i, 4) = "Q" & Cells(i, 4)
202     n = n - 1
203 Loop
204 n = 0
205 kk1 = WorksheetFunction.Find("[", Cells(i, 4), 1)
206 kk2 = WorksheetFunction.Find("/", Mid(Cells(i, 4), kk1 + 1, Len(Cells(i, 4)) - kk1), 1)
207 kk2 = kk2 + kk1
208 kk3 = WorksheetFunction.Find("]", Cells(i, 4), 1)
209
210     sR = ""
211     sF = ""
212     m2 = 1
213     ss = ""
214 Do While Len(Cells(i, 2)) = 1 And Len(Cells(i, 3)) = 1
215     m2 = 3
216     ss = Cells(i, 2) & Cells(i, 3)
217 If ss = "AT" Or ss = "GC" Or ss = "TA" Or ss = "CG" Then m2 = 0
218     ss = ""
219 Exit Do
220 Loop

```

```

221
222
223 Do While FR = 1 Or FR = 0
224     k = 38
225     ss = Mid(Cells(i, 4), kk1 - 40, 40) & Cells(i, 2)
226     If h = 999 And Len(Cells(i, 2)) <= 38 And Len(Cells(i, 2)) >= kkf Then ss = Mid(Cells(i, 4), kk1 - 40,
227 40) & Left(Cells(i, 2), kkf)
228     If h = 999 And Len(Cells(i, 2)) < kkf Then ss = Mid(Cells(i, 4), kk1 - 40, 40) & Cells(i, 2) &
229 Mid(Cells(i, 4), kk3 + 1, kkf - Len(Cells(i, 2)))
230
231 Do While Len(Cells(i, 8)) = 0 Or Cells(i, 8) >= 56.6
232     If Cells(i, 8) >= 56.6 Then k = k - 1
233     sF = Right(ss, k)
234     n = Len(sF)
235     If n < 18 And Cells(i, 8) <= 59 And Cells(i, 8) > 0 Then sF = Right(ss, k + 1)
236     If k < 18 Then Exit Do
237     ka = 0
238     kt = 0
239     kg = 0
240     kc = 0
241     Do While n > 0
242         If UCase(Mid(sF, n, 1)) = "A" Then ka = ka + 1
243         If UCase(Mid(sF, n, 1)) = "T" Then kt = kt + 1
244         If UCase(Mid(sF, n, 1)) = "C" Then kc = kc + 1
245         If UCase(Mid(sF, n, 1)) = "G" Then kg = kg + 1
246         n = n - 1
247     Loop
248     j = 0
249     If ka + kt + kc + kg < 18 Then Exit Do
250     If Len(sF) = ka + kt + kg + kc And (kg + kc) / (ka + kt + kg + kc) <= 0.72 And (kg + kc) / (ka + kt + kg
251 + kc) >= 0.16 Then j = 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc)
252     If j >= 56.6 And j <= 59 Then Cells(i, 8) = j
253     Do While Cells(i, 8) > 0
254         If InStr(1, sF, "AAAAAA") <> 0 Or InStr(1, sF, "TTTTTT") <> 0 Or InStr(1, sF, "CCCCCC") <> 0 Or
255 InStr(1, sF, "GGGGGG") <> 0 Then Cells(i, 8) = ""
256     Exit Do
257     Loop
258
259     If Cells(i, 8) > 0 And Cells(i, 8) <= 57.8 Then Exit Do
260     If Cells(i, 8) > 0 And Len(sF) = ka + kt + kg + kc And Len(sF) = ka + kt + kg + kc And 72 + (37.4 * (kg
261 + kc) - 747) / (ka + kt + kg + kc - 1) < 56.1 Then sF = Right(ss, k + 1)
262     If Cells(i, 8) > 0 And 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc - 1) < 56.1 Then Exit Do
263
264     If Len(Cells(i, 8)) = 0 Then k = k - 1

```

```

265
266     Loop
267
268     If Cells(i, 8) > 0 And Cells(i, 8) <= 59 Then Cells(i, 5) = sF
269     If Len(Cells(i, 8)) = 0 Or Cells(i, 8) > 64.6 Then Cells(i, 5) = "Failed"
270     Cells(i, 8) = ""
271     sR = ""
272     sF = ""
273     ss = ""
274
275
276     Do While Cells(i, 5) <> "Failed"
277         k = 38
278         If m2 = 0 Or m2 = 3 Then k = Len(Cells(i, 5)) + m2
279         ss = Mid(Cells(i, 4), kk1 - 40, 40) & Cells(i, 3)
280         If h = 999 And Len(Cells(i, 3)) <= 38 And Len(Cells(i, 3)) >= kkf Then ss = Mid(Cells(i, 4), kk1 - 40, 40)
281         & Left(Cells(i, 3), kkf)
282         If h = 999 And Len(Cells(i, 3)) < kkf Then ss = Mid(Cells(i, 4), kk1 - 40, 40) & Cells(i, 3) & Mid(Cells(i,
283         4), kk3 + 1, kkf - Len(Cells(i, 3)))
284
285     Do While Len(Cells(i, 9)) = 0 Or Cells(i, 9) >= 56.6
286         If Cells(i, 9) >= 56.6 Then k = k - 1
287         sF = Right(ss, k)
288         n = Len(sF)
289         If n < 18 And Cells(i, 9) <= 59 And Cells(i, 9) > 0 Then sF = Right(ss, k + 1)
290         If k < 18 Then Exit Do
291         ka = 0
292         kt = 0
293         kg = 0
294         kc = 0
295         Do While n > 0
296             If UCase(Mid(sF, n, 1)) = "A" Then ka = ka + 1
297             If UCase(Mid(sF, n, 1)) = "T" Then kt = kt + 1
298             If UCase(Mid(sF, n, 1)) = "C" Then kc = kc + 1
299             If UCase(Mid(sF, n, 1)) = "G" Then kg = kg + 1
300             n = n - 1
301         Loop
302         If ka + kt + kc + kg < 18 Then Exit Do
303         j = 0
304         If Len(sF) = ka + kt + kg + kc And (kg + kc) / (ka + kt + kg + kc) <= 0.72 And (kg + kc) / (ka + kt + kg
305         + kc) >= 0.16 Then j = 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc)
306         If j >= 56.6 And j <= 59 Then Cells(i, 9) = j
307
308     Do While Cells(i, 9) > 0

```

```

309     If InStr(1, sF, "AAAAAA") <> 0 Or InStr(1, sF, "TTTTTT") <> 0 Or InStr(1, sF, "CCCCCC") <> 0 Or
310 InStr(1, sF, "GGGGGG") <> 0 Then Cells(i, 9) = ""
311     Exit Do
312     Loop
313
314     If Cells(i, 9) > 0 And Cells(i, 9) <= 63.3 Then Exit Do
315     If Cells(i, 9) > 0 And Len(sF) = ka + kt + kg + kc And  $72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc$ 
316  $- 1) < 56.1$  Then sF = Right(ss, k + 1)
317     If Cells(i, 9) > 0 And  $72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc - 1) < 56.1$  Then Exit Do
318
319     If Len(Cells(i, 9)) = 0 Then k = k - 1
320
321     Loop
322     If Cells(i, 9) > 0 And Left(sF, 4) = "TTTT" Then sF = Mid(sF, 2, 38)
323     If Cells(i, 9) > 0 And Cells(i, 9) <= 59 Then Cells(i, 6) = sF
324     If Len(Cells(i, 9)) = 0 Or Cells(i, 9) > 59 Then Cells(i, 5) = "Failed"
325
326     Exit Do
327     Loop
328     Cells(i, 9) = ""
329     sR = ""
330     sF = ""
331     ss = ""
332
333
334
335     jj = 4
336     Do While Cells(i, 5) <> "Failed"
337
338     Do While jj <= 30
339         k = 40
340         sF = Mid(Cells(i, 4), kk3 + jj, k)
341         j = 2
342     Do While Len(Cells(i, 10)) = 0 Or Cells(i, 10) >= 59.9
343         If Cells(i, 10) >= 59.9 Then k = k - 1
344         sF = Left(sF, k)
345         n = Len(sF)
346     If n < 20 And Cells(i, 10) >= 59.9 Then sF = Mid(Cells(i, 4), kk3 + jj, k + 1)
347     If n < 20 Then Exit Do
348     ka = 0
349     kt = 0
350     kg = 0
351     kc = 0
352     Do While n > 0

```

```

353     If UCase(Mid(sF, n, 1)) = "A" Then ka = ka + 1
354     If UCase(Mid(sF, n, 1)) = "T" Then kt = kt + 1
355     If UCase(Mid(sF, n, 1)) = "C" Then kc = kc + 1
356     If UCase(Mid(sF, n, 1)) = "G" Then kg = kg + 1
357     n = n - 1
358     Loop
359     If ka + kt + kc + kg < 20 Then Exit Do
360     j = 0
361     If Len(sF) = ka + kt + kg + kc And (kg + kc) / (ka + kt + kg + kc) <= 0.7 And (kg + kc) / (ka + kt + kg
362 + kc) >= 0.21 Then j = 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc)
363     If j >= 59.9 And j <= 62.9 Then Cells(i, 10) = j
364
365     Do While Abs(Cells(i, 10) - 60.4) <= 0.57
366     If InStr(1, sF, "AAAAAA") <> 0 Or InStr(1, sF, "TTTTTT") <> 0 Or InStr(1, sF, "CCCCCC") <> 0 Or
367 InStr(1, sF, "GGGGGG") <> 0 Then Cells(i, 10) = ""
368     If Left(sF, 4) = "AAAA" Or Left(sF, 4) = "TTTT" <> 0 Or Left(sF, 4) = "CCCC" <> 0 Or Left(sF, 4) =
369 "GGGG" <> 0 Then Cells(i, 10) = ""
370     If Right(sF, 4) = "AAAA" Or Right(sF, 4) = "TTTT" <> 0 Or Right(sF, 4) = "CCCC" <> 0 Or Right(sF, 4)
371 = "GGGG" <> 0 Then Cells(i, 10) = ""
372     Exit Do
373     Loop
374
375     If Cells(i, 10) >= 59.9 And Len(sF) = ka + kt + kg + kc And 72 + (37.4 * (kg + kc) - 747) / (ka + kt +
376 kg + kc - 1) < 59.34 Then sF = Mid(Cells(i, 4), kk3 + jj, k + 1)
377     If Cells(i, 10) >= 59.9 And 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc - 1) < 59.34 Then Exit Do
378
379     If Len(Cells(i, 10)) = 0 Then k = k - 1
380
381     Loop
382
383     If Len(Cells(i, 7)) = 0 And Abs(Cells(i, 10) - 60.4) <= 0.57 Then Cells(i, 7) = sF
384     Do While Abs(Cells(i, 10) - 60.4) <= 0.57 And Len(Cells(i, 7)) <> 0
385     If Left(sF, 1) <> "A" And Left(sF, 1) <> "T" And Abs(Len(sF) - 29.5) <= 4.5 Then Cells(i, 7) = sF
386     If Left(Cells(i, 7), 1) <> "G" And Left(Cells(i, 7), 1) <> "C" And Abs(Len(sF) - 29.5) <= 4.5 Then
387 Cells(i, 7) = sF
388     If Cells(i, 7) <> sF And Abs(Len(Cells(i, 7)) - 29) > 5 And Abs(Len(sF) - 29) <= Abs(Len(Cells(i, 7)) -
389 29) Then Cells(i, 7) = sF
390     Exit Do
391     Loop
392
393     jj = jj + 1
394     If jj >= 10 And Left(Cells(i, 7), 1) <> "A" And Left(Cells(i, 7), 1) <> "T" And Len(Cells(i, 7)) <> 0 Then
395 Exit Do
396     If jj >= 20 And Len(Cells(i, 7)) <> 0 Then Exit Do

```

```

397 Cells(i, 10) = ""
398
399 Loop
400
401 If Len(Cells(i, 7)) = 0 Then Cells(i, 5) = "Failed"
402 If Cells(i, 5) = "Failed" Then Cells(i, 10) = ""
403
404 If Len(Cells(i, 7)) <> 0 Then sF = Cells(i, 7)
405 If Len(Cells(i, 7)) = 0 Then sF = ""
406 If Len(Cells(i, 7)) <> 0 Then Cells(i, 7) = ""
407 n = Len(sF)
408 Do While n > 0
409     If UCase(Mid(sF, n, 1)) = "A" Then Cells(i, 7) = Cells(i, 7) & "T"
410     If UCase(Mid(sF, n, 1)) = "T" Then Cells(i, 7) = Cells(i, 7) & "A"
411     If UCase(Mid(sF, n, 1)) = "C" Then Cells(i, 7) = Cells(i, 7) & "G"
412     If UCase(Mid(sF, n, 1)) = "G" Then Cells(i, 7) = Cells(i, 7) & "C"
413     n = n - 1
414 Loop
415
416 Exit Do
417 Loop
418
419 Exit Do
420
421 Loop
422 If gc = 1 And Cells(i, 5) = "Failed" Then FR = -1
423 If kkf <= kkr And kkf > 0 And Cells(i, 5) = "Failed" Then FR = -1
424 If gc = 1 And Cells(i, 5) = "Failed" Then Cells(i, 5) = ""
425 If gc = 1 And Cells(i, 5) = "Failed" Then Cells(i, 6) = ""
426 If gc = 1 And Cells(i, 5) = "Failed" Then Cells(i, 7) = ""
427
428 sR = ""
429 sF = ""
430 ss = ""
431 j = 2
432 Do While FR = -1
433     k = 38
434     ss = Cells(i, 2) & Mid(Cells(i, 4), kk3 + 1, 40)
435
436     If h = 999 And Len(Cells(i, 2)) <= 38 And Len(Cells(i, 2)) >= kkr Then ss = Right(Cells(i, 2), kkr) &
437     Mid(Cells(i, 4), kk3 + 1, 40)
438     If h = 999 And Len(Cells(i, 2)) < kkr Then ss = Mid(Cells(i, 4), kk1 - (kkr - Len(Cells(i, 2))), kkr -
439     Len(Cells(i, 2))) & Cells(i, 2) & Mid(Cells(i, 4), kk3 + 1, 40)
440

```

```

441 Do While Len(Cells(i, 8)) = 0 Or Cells(i, 8) >= 56.6
442     If Cells(i, 8) >= 56.6 Then k = k - 1
443     sR = Left(ss, k)
444     n = Len(sR)
445     If n < 18 And Cells(i, 8) <= 59 And Cells(i, 8) > 0 Then sR = Left(ss, k + 1)
446     If k < 18 Then Exit Do
447     ka = 0
448     kt = 0
449     kg = 0
450     kc = 0
451     Do While n > 0
452         If UCase(Mid(sR, n, 1)) = "A" Then ka = ka + 1
453         If UCase(Mid(sR, n, 1)) = "T" Then kt = kt + 1
454         If UCase(Mid(sR, n, 1)) = "C" Then kc = kc + 1
455         If UCase(Mid(sR, n, 1)) = "G" Then kg = kg + 1
456         n = n - 1
457     Loop
458     If ka + kt + kc + kg < 18 Then Exit Do
459     j = 0
460     If Len(sR) = ka + kt + kg + kc And (kg + kc) / (ka + kt + kg + kc) <= 0.72 And (kg + kc) / (ka + kt + kg
461 + kc) >= 0.16 Then j = 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc)
462     If j >= 56.6 And j <= 59 Then Cells(i, 8) = j
463     Do While Cells(i, 8) > 0
464         If InStr(1, sR, "AAAAAA") <> 0 Or InStr(1, sR, "TTTTTT") <> 0 Or InStr(1, sR, "CCCCCC") <> 0 Or
465 InStr(1, sR, "GGGGGG") <> 0 Then Cells(i, 8) = ""
466     Exit Do
467     Loop
468
469     If Cells(i, 8) > 0 And Cells(i, 8) <= 57.8 Then Exit Do
470     If Cells(i, 8) > 0 And Len(sR) = ka + kt + kg + kc And 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc
471 - 1) < 56.1 Then sR = Left(ss, k + 1)
472     If Cells(i, 8) > 0 And 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc - 1) < 56.1 Then Exit Do
473
474     If Len(Cells(i, 8)) = 0 Then k = k - 1
475     Loop
476     n = Len(sR)
477     Cells(i, 5) = ""
478     Do While n > 0 And Cells(i, 8) > 0 And Cells(i, 8) <= 59
479         If UCase(Mid(sR, n, 1)) = "A" Then Cells(i, 5) = Cells(i, 5) & "T"
480         If UCase(Mid(sR, n, 1)) = "T" Then Cells(i, 5) = Cells(i, 5) & "A"
481         If UCase(Mid(sR, n, 1)) = "C" Then Cells(i, 5) = Cells(i, 5) & "G"
482         If UCase(Mid(sR, n, 1)) = "G" Then Cells(i, 5) = Cells(i, 5) & "C"
483         n = n - 1
484     Loop

```

```

485
486 If Len(Cells(i, 8)) = 0 Or Cells(i, 8) > 64.6 Then Cells(i, 5) = "Failed"
487 Cells(i, 8) = ""
488 sR = ""
489 sF = ""
490 ss = ""
491
492
493 Do While Cells(i, 5) <> "Failed"
494 k = 38
495 If m2 = 0 Or m2 = 3 Then k = Len(Cells(i, 5)) + m2
496 ss = Cells(i, 3) & Mid(Cells(i, 4), kk3 + 1, 40)
497 If h = 999 And Len(Cells(i, 3)) >= kkr And Len(Cells(i, 3)) <= 38 Then ss = Right(Cells(i, 3), kkr) &
498 Mid(Cells(i, 4), kk3 + 1, 40)
499 If h = 999 And Len(Cells(i, 3)) < kkr Then ss = Mid(Cells(i, 4), kk1 - (kkr - Len(Cells(i, 3))), kkr -
500 Len(Cells(i, 3))) & Cells(i, 3) & Mid(Cells(i, 4), kk3 + 1, 40)
501
502 Do While Len(Cells(i, 9)) = 0 Or Cells(i, 9) >= 56.6
503 If Cells(i, 9) >= 56.6 Then k = k - 1
504 sR = Left(ss, k)
505 n = Len(sR)
506 If n < 18 And Cells(i, 9) <= 59 And Cells(i, 9) > 0 Then sR = Left(ss, k + 1)
507 If k < 18 Then Exit Do
508 ka = 0
509 kt = 0
510 kg = 0
511 kc = 0
512 Do While n > 0
513 If UCase(Mid(sR, n, 1)) = "A" Then ka = ka + 1
514 If UCase(Mid(sR, n, 1)) = "T" Then kt = kt + 1
515 If UCase(Mid(sR, n, 1)) = "C" Then kc = kc + 1
516 If UCase(Mid(sR, n, 1)) = "G" Then kg = kg + 1
517 n = n - 1
518 Loop
519 If ka + kt + kc + kg < 18 Then Exit Do
520 j = 0
521 If Len(sR) = ka + kt + kg + kc And (kg + kc) / (ka + kt + kg + kc) <= 0.72 And (kg + kc) / (ka + kt + kg
522 + kc) >= 0.16 Then j = 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc)
523 If j >= 56.6 And j <= 59 Then Cells(i, 9) = j
524 Do While Cells(i, 9) > 0
525 If InStr(1, sR, "AAAAAA") <> 0 Or InStr(1, sR, "TTTTTT") <> 0 Or InStr(1, sR, "CCCCCC") <> 0 Or
526 InStr(1, sR, "GGGGGG") <> 0 Then Cells(i, 9) = ""
527 Exit Do
528 Loop

```

```

529
530     If Cells(i, 9) > 0 And Cells(i, 9) <= 63.3 Then Exit Do
531     If Cells(i, 9) > 0 And Len(sR) = ka + kt + kg + kc And  $72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc$ 
532 - 1) < 56.1 Then sR = Left(ss, k + 1)
533     If Cells(i, 9) > 0 And  $72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc - 1) < 56.1$  Then Exit Do
534
535     If Len(Cells(i, 9)) = 0 Then k = k - 1
536
537     Loop
538
539     If Cells(i, 9) > 0 Then n = Len(sR)
540     Cells(i, 6) = ""
541     Do While n > 0 And Cells(i, 9) > 0 And Cells(i, 9) <= 59
542         If UCase(Mid(sR, n, 1)) = "A" Then Cells(i, 6) = Cells(i, 6) & "T"
543         If UCase(Mid(sR, n, 1)) = "T" Then Cells(i, 6) = Cells(i, 6) & "A"
544         If UCase(Mid(sR, n, 1)) = "C" Then Cells(i, 6) = Cells(i, 6) & "G"
545         If UCase(Mid(sR, n, 1)) = "G" Then Cells(i, 6) = Cells(i, 6) & "C"
546         n = n - 1
547     Loop
548
549     If Len(Cells(i, 9)) = 0 Or Cells(i, 9) > 59 Then Cells(i, 5) = "Failed"
550
551     Exit Do
552     Loop
553     Cells(i, 9) = ""
554     sR = ""
555     sF = ""
556     ss = ""
557
558     jj = 4
559     Do While Cells(i, 5) <> "Failed"
560
561     Do While jj <= 30
562         k = 40
563         If kk1 < k + jj + 18 Then Exit Do
564         sF = Mid(Cells(i, 4), kk1 - k - jj, k)
565         j = 2
566     Do While Len(Cells(i, 10)) = 0 Or Cells(i, 10) >= 59.9
567         If Cells(i, 10) >= 59.9 Then k = k - 1
568         sF = Right(sF, k)
569         n = Len(sF)
570     If n < 20 And Cells(i, 10) >= 59.9 Then sF = Mid(Cells(i, 4), kk1 - k - 1 - jj, k + 1)
571     If n < 20 Then Exit Do
572     ka = 0

```

```

573     kt = 0
574     kg = 0
575     kc = 0
576     Do While n > 0
577         If UCase(Mid(sF, n, 1)) = "A" Then ka = ka + 1
578         If UCase(Mid(sF, n, 1)) = "T" Then kt = kt + 1
579         If UCase(Mid(sF, n, 1)) = "C" Then kc = kc + 1
580         If UCase(Mid(sF, n, 1)) = "G" Then kg = kg + 1
581         n = n - 1
582     Loop
583
584     If ka + kt + kc + kg < 20 Then Exit Do
585     j = 0
586     If Len(sF) = ka + kt + kg + kc And (kg + kc) / (ka + kt + kg + kc) <= 0.7 And (kg + kc) / (ka + kt + kg
587 + kc) >= 0.21 Then j = 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc)
588     If j >= 59.9 And j <= 62.9 Then Cells(i, 10) = j
589
590     Do While Abs(Cells(i, 10) - 60.4) <= 0.57
591         If InStr(1, sF, "AAAAA") <> 0 Or InStr(1, sF, "TTTTT") <> 0 Or InStr(1, sF, "CCCCC") <> 0 Or
592 InStr(1, sF, "GGGGG") <> 0 Then Cells(i, 10) = ""
593         If Left(sF, 4) = "AAAA" Or Left(sF, 4) = "TTTT" <> 0 Or Left(sF, 4) = "CCCC" <> 0 Or Left(sF, 4) =
594 "GGGG" <> 0 Then Cells(i, 10) = ""
595         If Right(sF, 4) = "AAAA" Or Right(sF, 4) = "TTTT" <> 0 Or Right(sF, 4) = "CCCC" <> 0 Or Right(sF, 4)
596 = "GGGG" <> 0 Then Cells(i, 10) = ""
597     Exit Do
598     Loop
599
600     If Cells(i, 10) >= 59.9 And Len(sF) = ka + kt + kg + kc And 72 + (37.4 * (kg + kc) - 747) / (ka + kt +
601 kg + kc - 1) < 59.34 Then sF = Mid(Cells(i, 4), kk1 - k - 1 - jj, k + 1)
602     If Cells(i, 10) >= 59.9 And 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc - 1) < 59.34 Then Exit Do
603
604     If Len(Cells(i, 10)) = 0 Then k = k - 1
605
606     Loop
607
608     If Len(Cells(i, 7)) = 0 And Abs(Cells(i, 10) - 60.4) <= 0.57 Then Cells(i, 7) = sF
609
610     Do While Abs(Cells(i, 10) - 60.4) <= 0.57 And Len(Cells(i, 7)) <> 0
611         If Right(sF, 1) <> "A" And Right(sF, 1) <> "T" And Abs(Len(sF) - 29.5) <= 4.5 Then Cells(i, 7) = sF
612         If Right(Cells(i, 7), 1) <> "G" And Right(Cells(i, 7), 1) <> "C" And Abs(Len(sF) - 29.5) <= 4.5 Then
613 Cells(i, 7) = sF
614         If Cells(i, 7) <> sF And Abs(Len(Cells(i, 7)) - 29) > 5 And Abs(Len(sF) - 29) <= Abs(Len(Cells(i, 7)) -
615 29) Then Cells(i, 7) = sF
616     Exit Do

```

```

617 Loop
618
619 jj = jj + 1
620 If jj >= 10 And Right(Cells(i, 7), 1) <> "A" And Right(Cells(i, 7), 1) <> "T" And Len(Cells(i, 7)) <> 0
621 Then Exit Do
622 If jj >= 20 And Len(Cells(i, 7)) <> 0 Then Exit Do
623 Cells(i, 10) = ""
624
625 Loop
626 If Len(Cells(i, 7)) = 0 Then Cells(i, 5) = "Failed"
627 If Cells(i, 5) = "Failed" Then Cells(i, 10) = ""
628
629 Exit Do
630 Loop
631
632 Exit Do
633 Loop
634
635 Exit Do
636 Loop
637
638
639 If gc = 2 And Cells(i, 5) = "Failed" Then FR = 3
640 If kkf > kkr And FR = -1 And kkf < 4 And Cells(i, 5) = "Failed" Then FR = 3
641 If FR = 3 Then Cells(i, 5) = ""
642 If FR = 3 Then Cells(i, 6) = ""
643 If FR = 3 Then Cells(i, 7) = ""
644 sR = ""
645 sF = ""
646 ss = ""
647 Do While FR = 3
648
649 Cells(i, 8) = ""
650 Cells(i, 9) = ""
651 Cells(i, 10) = ""
652 k = 38
653 ss = Mid(Cells(i, 4), kk1 - 40, 40) & Cells(i, 2)
654 If h = 999 And Len(Cells(i, 2)) <= 38 And Len(Cells(i, 2)) >= kkf Then ss = Mid(Cells(i, 4), kk1 - 40,
655 40) & Left(Cells(i, 2), kkf)
656 If h = 999 And Len(Cells(i, 2)) < kkf Then ss = Mid(Cells(i, 4), kk1 - 40, 40) & Cells(i, 2) &
657 Mid(Cells(i, 4), kk3 + 1, kkf - Len(Cells(i, 2)))
658 Do While Len(Cells(i, 8)) = 0 Or Cells(i, 8) >= 56.6
659 If Cells(i, 8) >= 56.6 Then k = k - 1
660 sF = Right(ss, k)

```

```

661     n = Len(sF)
662     If n < 18 And Cells(i, 8) <= 59 And Cells(i, 8) > 0 Then sF = Right(ss, k + 1)
663     If k < 18 Then Exit Do
664     ka = 0
665     kt = 0
666     kg = 0
667     kc = 0
668     Do While n > 0
669         If UCase(Mid(sF, n, 1)) = "A" Then ka = ka + 1
670         If UCase(Mid(sF, n, 1)) = "T" Then kt = kt + 1
671         If UCase(Mid(sF, n, 1)) = "C" Then kc = kc + 1
672         If UCase(Mid(sF, n, 1)) = "G" Then kg = kg + 1
673         n = n - 1
674     Loop
675     If ka + kt + kc + kg < 18 Then Exit Do
676     j = 0
677     If Len(sF) = ka + kt + kg + kc And (kg + kc) / (ka + kt + kg + kc) <= 0.72 And (kg + kc) / (ka + kt + kg
678 + kc) >= 0.16 Then j = 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc)
679     If j >= 56.6 And j <= 59 Then Cells(i, 8) = j
680
681
682     Do While Cells(i, 8) > 0
683         If InStr(1, sF, "AAAAAA") <> 0 Or InStr(1, sF, "TTTTTT") <> 0 Or InStr(1, sF, "CCCCCC") <> 0 Or
684 InStr(1, sF, "GGGGGG") <> 0 Then Cells(i, 8) = ""
685     Exit Do
686     Loop
687
688     If Cells(i, 8) > 0 And Cells(i, 8) <= 57.8 Then Exit Do
689     If Cells(i, 8) > 0 And Len(sF) = ka + kt + kg + kc And 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg +
690 kc - 1) < 56.1 Then sF = Right(ss, k + 1)
691     If Cells(i, 8) > 0 And 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc - 1) < 56.1 Then Exit Do
692
693     If Len(Cells(i, 8)) = 0 Then k = k - 1
694     Loop
695
696     If Cells(i, 8) > 0 And Cells(i, 8) <= 59 Then Cells(i, 5) = sF
697     If Len(Cells(i, 8)) = 0 Or Cells(i, 8) > 64.6 Then Cells(i, 5) = "Failed"
698     Cells(i, 8) = ""
699     sR = ""
700     sF = ""
701     ss = ""
702     j = 2
703
704

```

```

705 Do While Cells(i, 5) <> "Failed"
706     k = 38
707     If m2 = 0 Or m2 = 3 Then k = Len(Cells(i, 5)) + m2
708     ss = Mid(Cells(i, 4), kk1 - 40, 40) & Cells(i, 3)
709     If h = 999 And Len(Cells(i, 3)) <= 38 And Len(Cells(i, 3)) >= kkf Then ss = Mid(Cells(i, 4), kk1 - 40, 40)
710     & Left(Cells(i, 3), kkf)
711     If h = 999 And Len(Cells(i, 3)) < kkf Then ss = Mid(Cells(i, 4), kk1 - 40, 40) & Cells(i, 3) & Mid(Cells(i,
712     4), kk3 + 1, kkf - Len(Cells(i, 3)))
713
714 Do While Len(Cells(i, 9)) = 0 Or Cells(i, 9) >= 56.6
715     If Cells(i, 9) >= 56.6 Then k = k - 1
716     sF = Right(ss, k)
717     n = Len(sF)
718     If n < 18 And Cells(i, 9) <= 59 And Cells(i, 9) > 0 Then sF = Right(ss, k + 1)
719     If k < 18 Then Exit Do
720     ka = 0
721     kt = 0
722     kg = 0
723     kc = 0
724     Do While n > 0
725         If UCase(Mid(sF, n, 1)) = "A" Then ka = ka + 1
726         If UCase(Mid(sF, n, 1)) = "T" Then kt = kt + 1
727         If UCase(Mid(sF, n, 1)) = "C" Then kc = kc + 1
728         If UCase(Mid(sF, n, 1)) = "G" Then kg = kg + 1
729         n = n - 1
730     Loop
731     If ka + kt + kc + kg < 18 Then Exit Do
732     j = 0
733     If Len(sF) = ka + kt + kg + kc And (kg + kc) / (ka + kt + kg + kc) <= 0.72 And (kg + kc) / (ka + kt + kg
734 + kc) >= 0.16 Then j = 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc)
735     If j >= 56.6 And j <= 59 Then Cells(i, 9) = j
736
737     Do While Cells(i, 9) > 0
738         If InStr(1, sF, "AAAAAA") <> 0 Or InStr(1, sF, "TTTTTT") <> 0 Or InStr(1, sF, "CCCCCC") <> 0 Or
739 InStr(1, sF, "GGGGGG") <> 0 Then Cells(i, 9) = ""
740     Exit Do
741     Loop
742
743     If Cells(i, 9) > 0 And Cells(i, 9) <= 63.3 Then Exit Do
744     If Cells(i, 9) > 0 And Len(sF) = ka + kt + kg + kc And 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc
745 - 1) < 56.1 Then sF = Right(ss, k + 1)
746     If Cells(i, 9) > 0 And 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc - 1) < 56.1 Then Exit Do
747
748     If Len(Cells(i, 9)) = 0 Then k = k - 1

```

```

749
750 Loop
751
752 If Cells(i, 9) > 0 And Cells(i, 9) <= 59 Then Cells(i, 6) = sF
753 If Len(Cells(i, 9)) = 0 Or Cells(i, 9) > 59 Then Cells(i, 5) = "Failed"
754
755 Exit Do
756 Loop
757 Cells(i, 9) = ""
758 sR = ""
759 sF = ""
760 ss = ""
761
762
763 jj = 4
764 Do While Cells(i, 5) <> "Failed"
765
766 Do While jj <= 30
767 k = 40
768 sF = Mid(Cells(i, 4), kk3 + jj, k)
769 j = 2
770 Do While Len(Cells(i, 10)) = 0 Or Cells(i, 10) >= 59.9
771 If Cells(i, 10) >= 59.9 Then k = k - 1
772 sF = Left(sF, k)
773 n = Len(sF)
774 If n < 20 And Cells(i, 10) >= 59.9 Then sF = Mid(Cells(i, 4), kk3 + jj, k + 1)
775 If n < 20 Then Exit Do
776 ka = 0
777 kt = 0
778 kg = 0
779 kc = 0
780 Do While n > 0
781 If UCase(Mid(sF, n, 1)) = "A" Then ka = ka + 1
782 If UCase(Mid(sF, n, 1)) = "T" Then kt = kt + 1
783 If UCase(Mid(sF, n, 1)) = "C" Then kc = kc + 1
784 If UCase(Mid(sF, n, 1)) = "G" Then kg = kg + 1
785 n = n - 1
786 Loop
787 If ka + kt + kc + kg < 20 Then Exit Do
788 j = 0
789 If Len(sF) = ka + kt + kg + kc And (kg + kc) / (ka + kt + kg + kc) <= 0.7 And (kg + kc) / (ka + kt + kg
790 + kc) >= 0.21 Then j = 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc)
791 If j >= 59.9 And j <= 62.9 Then Cells(i, 10) = j
792

```

```

793     Do While Abs(Cells(i, 10) - 60.4) <= 0.57
794     If InStr(1, sF, "AAAAAA") <> 0 Or InStr(1, sF, "TTTTTT") <> 0 Or InStr(1, sF, "CCCCC") <> 0 Or
795 InStr(1, sF, "GGGGGG") <> 0 Then Cells(i, 10) = ""
796     If Left(sF, 4) = "AAAA" Or Left(sF, 4) = "TTTT" <> 0 Or Left(sF, 4) = "CCCC" <> 0 Or Left(sF, 4) =
797 "GGGG" <> 0 Then Cells(i, 10) = ""
798     If Right(sF, 4) = "AAAA" Or Right(sF, 4) = "TTTT" <> 0 Or Right(sF, 4) = "CCCC" <> 0 Or Right(sF, 4)
799 = "GGGG" <> 0 Then Cells(i, 10) = ""
800     Exit Do
801     Loop
802
803     If Cells(i, 10) >= 59.9 And Len(sF) = ka + kt + kg + kc And 72 + (37.4 * (kg + kc) - 747) / (ka + kt +
804 kg + kc - 1) < 59.34 Then sF = Mid(Cells(i, 4), kk3 + jj, k + 1)
805     If Cells(i, 10) >= 59.9 And 72 + (37.4 * (kg + kc) - 747) / (ka + kt + kg + kc - 1) < 59.34 Then Exit Do
806
807     If Len(Cells(i, 10)) = 0 Then k = k - 1
808
809     Loop
810
811     If Len(Cells(i, 7)) = 0 And Abs(Cells(i, 10) - 60.4) <= 0.57 Then Cells(i, 7) = sF
812
813     Do While Abs(Cells(i, 10) - 60.4) <= 0.57 And Len(Cells(i, 7)) <> 0
814     If Left(sF, 1) <> "A" And Left(sF, 1) <> "T" And Abs(Len(sF) - 29.5) <= 4.5 Then Cells(i, 7) = sF
815     If Left(Cells(i, 7), 1) <> "G" And Left(Cells(i, 7), 1) <> "C" And Abs(Len(sF) - 29.5) <= 4.5 Then
816 Cells(i, 7) = sF
817     If Cells(i, 7) <> sF And Abs(Len(Cells(i, 7)) - 29) > 5 And Abs(Len(sF) - 29) <= Abs(Len(Cells(i, 7)) -
818 29) Then Cells(i, 7) = sF
819     Exit Do
820     Loop
821
822     jj = jj + 1
823     If jj >= 10 And Left(Cells(i, 7), 1) <> "A" And Left(Cells(i, 7), 1) <> "T" And Len(Cells(i, 7)) <> 0 Then
824 Exit Do
825     If jj >= 20 And Len(Cells(i, 7)) <> 0 Then Exit Do
826     Cells(i, 10) = ""
827
828     Loop
829
830     If Len(Cells(i, 7)) = 0 Then Cells(i, 5) = "Failed"
831     If Cells(i, 5) = "Failed" Then Cells(i, 10) = ""
832
833     If Len(Cells(i, 7)) <> 0 Then sF = Cells(i, 7)
834     If Len(Cells(i, 7)) = 0 Then sF = ""
835     If Len(Cells(i, 7)) <> 0 Then Cells(i, 7) = ""
836     n = Len(sF)

```

```

837 Do While n > 0
838     If UCase(Mid(sF, n, 1)) = "A" Then Cells(i, 7) = Cells(i, 7) & "T"
839     If UCase(Mid(sF, n, 1)) = "T" Then Cells(i, 7) = Cells(i, 7) & "A"
840     If UCase(Mid(sF, n, 1)) = "C" Then Cells(i, 7) = Cells(i, 7) & "G"
841     If UCase(Mid(sF, n, 1)) = "G" Then Cells(i, 7) = Cells(i, 7) & "C"
842     n = n - 1
843     Loop
844
845 Exit Do
846 Loop
847
848 Exit Do
849 Loop
850
851 Cells(i, 8) = ""
852 Cells(i, 9) = ""
853 Cells(i, 10) = ""
854
855 If q2 > 0 Then Cells(i, 4) = Left(Cells(i, 4), Len(Cells(i, 4)) - q2)
856 If q1 > 0 Then Cells(i, 4) = Right(Cells(i, 4), Len(Cells(i, 4)) - q1)
857 q1 = 0
858 q2 = 0
859 If Right(Cells(i, 5), 5) = Right(Cells(i, 6), 5) Then Cells(i, 5) = "Failed"
860 Do While Cells(i, 5) = "Failed" Or Len(Cells(i, 5)) = 0 Or Len(Cells(i, 6)) = 0 Or Cells(i, 7) = ""
861     Cells(i, 5) = "Failed"
862     Cells(i, 6) = ""
863     Cells(i, 7) = ""
864     h2 = h2 + 1
865 Exit Do
866 Loop
867
868 Do While Cells(i, 5) <> "Failed"
869 If Left(Cells(i, 5), 5) = "TTTTT" Then Cells(i, 5) = Mid(Cells(i, 5), 2, 38)
870 If Left(Cells(i, 6), 4) = "TTTT" Then Cells(i, 6) = Mid(Cells(i, 6), 2, 38)
871 If Left(Cells(i, 6), 4) = "TTTT" Then Cells(i, 6) = Mid(Cells(i, 6), 2, 38)
872 Cells(i, 5) = "GAAGGTGACCAAGTTCATGCT" & Cells(i, 5)
873 Cells(i, 6) = "GAAGGTCGGAGTCAACGGATT" & Cells(i, 6)
874 Cells(i, 5).Select
875 With Selection.Font
876     .ThemeColor = xlThemeColorLight1
877
878 End With
879 With ActiveCell.Characters(Start:=1, Length:=21).Font
880     .Color = -65536

```

```
881     End With
882 Exit Do
883 Loop
884
885 Do While Len(Cells(i, 6)) > 38
886 Cells(i, 6).Select
887     With Selection.Font
888         .ThemeColor = xlThemeColorLight1
889
890     End With
891     With ActiveCell.Characters(Start:=1, Length:=21).Font
892         .Color = -16776961
893     End With
894 Exit Do
895 Loop
896
897 i = i + 1
898 If i Mod 5 = 0 Then Application.ScreenUpdating = True
899 Loop
900
901 If i > 2 Then UserForm1.Label2 = "Success Rate: " & Format((i - 2 - h2) / (i - 2), "0.000") * 100 &
902 "%"
903 If Timer - tim < 100 Then UserForm1.Label3 = "Time-consuming: " & Format(Abs(Timer - tim),
904 "0.00") & " s"
905 If Timer - tim >= 100 Then UserForm1.Label3 = "Time-consuming: " & Format(Timer - tim, "0") &
906 " s"
907 UserForm1.Show
908 End Sub
```