PROBLEM 1

>>> p53seg='cggagcagctcactattcacccgatgagaggggaggagagagagagaaaatgtcctttaggccggttcctcttacttggcagagggaggctgctattctccgcctgcatttctttttctggattacttagttatggcctttgcaaaggcaggggtatttgttttgatgcaaacctcaatccctccccttctttgaatggtgtgccccaccccccgggtcgcctgcaacctaggcggacgctaccatggcgtagacagggagggaaagaagtgtgcagaaggcaagcccggaggcactttcaagaatgagcatatctcatcttcccggagaaaaaaaaaaaagaatggtacgtctgagaatgaaattttgaaagagtgcaatgatgggtcgtttgataatttgtcgggaaaaacaatctacctgttatctagctttgggctaggccattccagttccagacgcaggctgaacgtcgtgaagcggaaggggcgggcccgcaggcgtccgtgtggtcctccgtgcagccctcggcccgagccggttcttcctggtaggaggcggaactcgaattcatttctcccgctgccccatctcttagctcgcggttgtttcattccgcagtttcttcccatgcacctgccgcgtaccggccactttgtgccgtacttacgtcatctttttcctaaatcgaggtggcatttacacacagcgccagtgcacacagcaagtgcacaggaagatgagttttggcccctaaccgctccgtgatgcctaccaagtcacagacccttttcatcgtcccagaaacgtttcatcacgtctcttcccagtcgattcccgaccccacctttattttgatctccataaccattttgcctgttggagaacttcatatagaatggaatcaggatgggcgctgtggctcacgcctgcactttggctcacgcctgcactttgggaggccgaggcgggcggattacttgaggataggagttccagaccagcgtggccaacgtggtg'

>>> gccount=i=0

>>> while i<len(p53seg):

... if 'g' in p53seg[i]:

... gccount=gccount+1

... i=i+1

... elif 'c' in p53seg[i]:

... gccount=gccount+1

... i=i+1

... else:

... i=i+1

...

>>> print gccount

540

>>> print 'gc content is', 540.0/len(p53seg)

gc content is 0.529411764706

>>>

PROBLEM 2

>>> lp53seg=list(p53seg)

>>> i=0

>>> while i<len(lp53seg):

... if 'g' in lp53seg[i]:

... lp53seg[i]='c'

... i=i+1

... elif 'c' in lp53seg[i]:

... lp53seg[i]='g'

... i=i+1

... elif 'a' in lp53seg[i]:

... lp53seg[i]='t'

... i=i+1

... else:

... lp53seg[i]='a'

... i=i+1

...

>>> ''.join(lp53seg)

'gcctcgtcgagtgataagtgggctactctcccctcctctctctctcttttacaggaaatccggccaaggagaatgaaccgtctccctccgacgataagaggcggacgtaaagaaaaagacctaatgaatcaataccggaaacgtttccgtccccataaacaaaactacgtttggagttagggaggggaagaaacttaccacacggggtggggggcccagcggacgttggatccgcctgcgatggtaccgcatctgtccctccctttcttcacacgtcttccgttcgggcctccgtgaaagttcttactcgtatagagtagaagggcctcttttttttttttcttaccatgcagactcttactttaaaactttctcacgttactacccagcaaactattaaacagccctttttgttagatggacaatagatcgaaacccgatccggtaaggtcaaggtctgcgtccgacttgcagcacttcgccttccccgcccgggcgtccgcaggcacaccaggaggcacgtcgggagccgggctcggccaagaaggaccatcctccgccttgagcttaagtaaagagggcgacggggtagagaatcgagcgccaacaaagtaaggcgtcaaagaagggtacgtggacggcgcatggccggtgaaacacggcatgaatgcagtagaaaaaggatttagctccaccgtaaatgtgtgtcgcggtcacgtgtgtcgttcacgtgtccttctactcaaaaccggggattggcgaggcactacggatggttcagtgtctgggaaaagtagcagggtctttgcaaagtagtgcagagaagggtcagctaagggctggggtggaaataaaactagaggtattggtaaaacggacaacctcttgaagtatatcttaccttagtcctacccgcgacaccgagtgcggacgtgaaaccgagtgcggacgtgaaaccctccggctccgcccgcctaatgaactcctatcctcaaggtctggtcgcaccggttgcaccac'

>>> complement=lp53seg[::-1]

>>> ''.join(complement)

'caccacgttggccacgctggtctggaactcctatcctcaagtaatccgcccgcctcggcctcccaaagtgcaggcgtgagccaaagtgcaggcgtgagccacagcgcccatcctgattccattctatatgaagttctccaacaggcaaaatggttatggagatcaaaataaaggtggggtcgggaatcgactgggaagagacgtgatgaaacgtttctgggacgatgaaaagggtctgtgacttggtaggcatcacggagcggttaggggccaaaactcatcttcctgtgcacttgctgtgtgcactggcgctgtgtgtaaatgccacctcgatttaggaaaaagatgacgtaagtacggcacaaagtggccggtacgcggcaggtgcatgggaagaaactgcggaatgaaacaaccgcgagctaagagatggggcagcgggagaaatgaattcgagttccgcctcctaccaggaagaaccggctcgggccgagggctgcacggaggaccacacggacgcctgcgggcccgccccttccgcttcacgacgttcagcctgcgtctggaactggaatggcctagcccaaagctagataacaggtagattgtttttcccgacaaattatcaaacgacccatcattgcactctttcaaaatttcattctcagacgtaccattcttttttttttttctccgggaagatgagatatgctcattcttgaaagtgcctccgggcttgccttctgcacacttctttccctccctgtctacgccatggtagcgtccgcctaggttgcaggcgacccggggggtggggcacaccattcaaagaaggggagggattgaggtttgcatcaaaacaaatacccctgcctttgcaaaggccataactaagtaatccagaaaaagaaatgcaggcggagaatagcagcctccctctgccaagtaagaggaaccggcctaaaggacattttctctctctctcctcccctctcatcgggtgaatagtgagctgctccg'

>>>

PROBLEM 3

FRAME +1

>>> standard = { 'ttt': 'F', 'tct': 'S', 'tat': 'Y', 'tgt': 'C',

... 'ttc': 'F', 'tcc': 'S', 'tac': 'Y', 'tgc': 'C',

... 'tta': 'L', 'tca': 'S', 'taa': '\*', 'tga': '\*',

... 'ttg': 'L', 'tcg': 'S', 'tag': '\*', 'tgg': 'W',

...

... 'ctt': 'L', 'cct': 'P', 'cat': 'H', 'cgt': 'R',

... 'ctc': 'L', 'ccc': 'P', 'cac': 'H', 'cgc': 'R',

... 'cta': 'L', 'cca': 'P', 'caa': 'Q', 'cga': 'R',

... 'ctg': 'L', 'ccg': 'P', 'cag': 'Q', 'cgg': 'R',

...

... 'att': 'I', 'act': 'T', 'aat': 'N', 'agt': 'S',

... 'atc': 'I', 'acc': 'T', 'aac': 'N', 'agc': 'S',

... 'ata': 'I', 'aca': 'T', 'aaa': 'K', 'aga': 'R',

... 'atg': 'M', 'acg': 'T', 'aag': 'K', 'agg': 'R',

...

... 'gtt': 'V', 'gct': 'A', 'gat': 'D', 'ggt': 'G',

... 'gtc': 'V', 'gcc': 'A', 'gac': 'D', 'ggc': 'G',

... 'gta': 'V', 'gca': 'A', 'gaa': 'E', 'gga': 'G',

... 'gtg': 'V', 'gcg': 'A', 'gag': 'E', 'ggg': 'G'

... }

>>> a=’a’

>>> protein=list(‘a’)

>>> protein\*340

['a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a', 'a']

>>> i=j=0

>>> while i<1200:

... protein[j]=standard[p53seg[i:i+3]]

... i=i+3

... j=j+1

...

Traceback (most recent call last):

File "<stdin>", line 2, in <module>

KeyError: ''

>>> ''.join(protein)

'RSSSLFTR\*EGRRERENVL\*AGSSYLAEGGCYSPPAFLFLDYLVMAFAKAGVFVLMQTSIPPLL\*MVCPTPRVACNLGGRYHGVDREGKKCAEGKPGGTFKNEHISSSRRKKKKNGTSENEILKECNDGSFDNLSGKTIYLLSSFGLGHSSSRRRLNVVKRKGRARRRPCGPPCSPRPEPVLPGRRRNSNSFLPLPHLLARGCFIPQFLPMHLPRTGHFVPYLRHLFPKSRWHLHTAPVHTASAQEDEFWPLTAP\*CLPSHRPFSSSQKRFITSLPSRFPTPPLF\*SP\*PFCLLENFI\*NGIRMGAVAHACTLAHACTLGGRGGRIT\*G\*EFQTSVANVV'

FRAME +2

>>> i=1

>>> j=0

>>> while i<1200:

... protein[j]=standard[p53seg[i:i+3]]

... i=i+3

... j=j+1

...

Traceback (most recent call last):

File "<stdin>", line 2, in <module>

KeyError: 'tg'

>>> ''.join(protein)

'GAAHYSPDERGGEREKMSFRPVPLTWQREAAILRLHFFFWIT\*LWPLQRQGYLF\*CKPQSLPFFEWCAPPPGSPAT\*ADATMA\*TGRERSVQKASPEALSRMSISHLPGEKKKRMVRLRMKF\*KSAMMGRLIICREKQSTCYLALG\*AIPVPDAG\*TS\*SGRGGPAGVRVVLRAALGPSRFFLVGGGTRIHFSRCPIS\*LAVVSFRSFFPCTCRVPATLCRTYVIFFLNRGGIYTQRQCTQQVHRKMSFGP\*PLRDAYQVTDPFHRPRNVSSRLFPVDSRPHLYFDLHNHFACWRTSYRMESGWALWLTPALWLTPALWEAEAGGLLEDRSSRPAWPTWV'

>>>

FRAME +3

>>> i=2

>>> j=0

>>> while i<1200:

... protein[j]=standard[p53seg[i:i+3]]

... i=i+3

... j=j+1

...

Traceback (most recent call last):

File "<stdin>", line 2, in <module>

KeyError: 'g'

>>> ''.join(protein)

'EQLTIHPMRGEERERKCPLGRFLLLGRGRLLFSACISFSGLLSYGLCKGRGICFDANLNPSPSLNGVPHPPGRLQPRRTLPWRRQGGKEVCRRQARRHFQE\*AYLIFPEKKKKEWYV\*E\*NFERVQ\*WVV\*\*FVGKNNLPVI\*LWARPFQFQTQAERREAEGAGPQASVWSSVQPSARAGSSW\*EAELEFISPAAPSLSSRLFHSAVSSHAPAAYRPLCAVLTSSFS\*IEVAFTHSASAHSKCTGR\*VLAPNRSVMPTKSQTLFIVPETFHHVSSQSIPDPTFILISITILPVGELHIEWNQDGRCGSRLHFGSRLHFGRPRRADYLRIGVPDQRGQRGV'

>>>

FRAME -1

>>>complement='caccacgttggccacgctggtctggaactcctatcctcaagtaatccgcccgcctcggcctcccaaagtgcaggcgtgagccaaagtgcaggcgtgagccacagcgcccatcctgattccattctatatgaagttctccaacaggcaaaatggttatggagatcaaaataaaggtggggtcgggaatcgactgggaagagacgtgatgaaacgtttctgggacgatgaaaagggtctgtgacttggtaggcatcacggagcggttaggggccaaaactcatcttcctgtgcacttgctgtgtgcactggcgctgtgtgtaaatgccacctcgatttaggaaaaagatgacgtaagtacggcacaaagtggccggtacgcggcaggtgcatgggaagaaactgcggaatgaaacaaccgcgagctaagagatggggcagcgggagaaatgaattcgagttccgcctcctaccaggaagaaccggctcgggccgagggctgcacggaggaccacacggacgcctgcgggcccgccccttccgcttcacgacgttcagcctgcgtctggaactggaatggcctagcccaaagctagataacaggtagattgtttttcccgacaaattatcaaacgacccatcattgcactctttcaaaatttcattctcagacgtaccattcttttttttttttctccgggaagatgagatatgctcattcttgaaagtgcctccgggcttgccttctgcacacttctttccctccctgtctacgccatggtagcgtccgcctaggttgcaggcgacccggggggtggggcacaccattcaaagaaggggagggattgaggtttgcatcaaaacaaatacccctgcctttgcaaaggccataactaagtaatccagaaaaagaaatgcaggcggagaatagcagcctccctctgccaagtaagaggaaccggcctaaaggacattttctctctctctcctcccctctcatcgggtgaatagtgagctgctccg'

>>> protein='a'\*340

>>> protein=list(protein)

>>> while i<1200:

... protein[j]=standard[complement[i:i+3]]

... i=i+3

... j=j+1

...

Traceback (most recent call last):

File "<stdin>", line 2, in <module>

KeyError: ''

>>> ''.join(protein)

'HHVGHAGLELLSSSNPPASASQSAGVSQSAGVSHSAHPDSILYEVLQQAKWLWRSK\*RWGRESTGKRRDETFLGR\*KGSVTW\*ASRSG\*GPKLIFLCTCCVHWRCV\*MPPRFRKKMT\*VRHKVAGTRQVHGKKLRNETTAS\*EMGQREK\*IRVPPPTRKNRLGPRAARRTTRTPAGPPLPLHDVQPASGTGMA\*PKAR\*QVDCFSRQIIKRPIIALFQNFILRRTILFFFSPGR\*DMLILESASGLAFCTLLSLPVYAMVASA\*VAGDPGGGAHHSKKGRD\*GLHQNKYPCLCKGHN\*VIQKKKCRRRIAASLCQVRGTGLKDIFSLSPPLSSGE\*\*AAP'

FRAME -2

>>> i=1

>>> j=0

>>> while i<1200:

... protein[j]=standard[complement[i:i+3]]

... i=i+3

... j=j+1

...

Traceback (most recent call last):

File "<stdin>", line 2, in <module>

KeyError: 'cg'

>>> ''.join(protein)

'TTLATLVWNSYPQVIRPPRPPKVQA\*AKVQA\*ATAPILIPFYMKFSNRQNGYGDQNKGGVGNRLGRDVMKRFWDDEKGL\*LGRHHGAVRGQNSSSCALAVCTGAVCKCHLDLGKR\*RKYGTKWPVRGRCMGRNCGMKQPRAKRWGSGRNEFEFRLLPGRTGSGRGLHGGPHGRLRARPFRFTTFSLRLELEWPSPKLDNR\*IVFPDKLSNDPSLHSFKISFSDVPFFFFFLREDEICSFLKVPPGLPSAHFFPSLSTPW\*RPPRLQATRGVGHTIQRRGGIEVCIKTNTPAFAKAITK\*SRKRNAGGE\*QPPSAK\*EEPA\*RTFSLSLLPSHRVNSELLP'

>>>

FRAME -3

>>> i=2

>>> j=0

>>> while i<1200:

... protein[j]=standard[complement[i:i+3]]

... i=i+3

... j=j+1

...

Traceback (most recent call last):

File "<stdin>", line 2, in <module>

KeyError: 'g'

>>> ''.join(protein)

'PRWPRWSGTPILK\*SARLGLPKCRREPKCRREPQRPS\*FHSI\*SSPTGKMVMEIKIKVGSGIDWEET\*\*NVSGTMKRVCDLVGITERLGAKTHLPVHLLCALALCVNATSI\*EKDDVSTAQSGRYAAGAWEETAE\*NNRELRDGAAGEMNSSSASYQEEPARAEGCTEDHTDACGPAPSASRRSACVWNWNGLAQS\*ITGRLFFPTNYQTTHHCTLSKFHSQTYHSFFFFSGKMRYAHS\*KCLRACLLHTSFPPCLRHGSVRLGCRRPGGWGTPFKEGEGLRFASKQIPLPLQRP\*LSNPEKEMQAENSSLPLPSKRNRPKGHFLSLSSPLIG\*IVSCSP'

PROBLEM 4

# the probability is 1 in 75 to compensate for the fact that a base has a 25% chance of ‘changing’ to itself. This gives an overall probability of 1 in 100 for an actual change.

standard = { 'ttt': 'F', 'tct': 'S', 'tat': 'Y', 'tgt': 'C',

'ttc': 'F', 'tcc': 'S', 'tac': 'Y', 'tgc': 'C',

'tta': 'L', 'tca': 'S', 'taa': '\*', 'tga': '\*',

'ttg': 'L', 'tcg': 'S', 'tag': '\*', 'tgg': 'W',

'ctt': 'L', 'cct': 'P', 'cat': 'H', 'cgt': 'R',

'ctc': 'L', 'ccc': 'P', 'cac': 'H', 'cgc': 'R',

'cta': 'L', 'cca': 'P', 'caa': 'Q', 'cga': 'R',

'ctg': 'L', 'ccg': 'P', 'cag': 'Q', 'cgg': 'R',

'att': 'I', 'act': 'T', 'aat': 'N', 'agt': 'S',

'atc': 'I', 'acc': 'T', 'aac': 'N', 'agc': 'S',

'ata': 'I', 'aca': 'T', 'aaa': 'K', 'aga': 'R',

'atg': 'M', 'acg': 'T', 'aag': 'K', 'agg': 'R',

'gtt': 'V', 'gct': 'A', 'gat': 'D', 'ggt': 'G',

'gtc': 'V', 'gcc': 'A', 'gac': 'D', 'ggc': 'G',

'gta': 'V', 'gca': 'A', 'gaa': 'E', 'gga': 'G',

'gtg': 'V', 'gcg': 'A', 'gag': 'E', 'ggg': 'G'

}

import random

p53mut=p53seg=list('cggagcagctcactattcacccgatgagaggggaggagagagagagaaaatgtcctttaggccggttcctcttacttggcagagggaggctgctattctccgcctgcatttctttttctggattacttagttatggcctttgcaaaggcaggggtatttgttttgatgcaaacctcaatccctccccttctttgaatggtgtgccccaccccccgggtcgcctgcaacctaggcggacgctaccatggcgtagacagggagggaaagaagtgtgcagaaggcaagcccggaggcactttcaagaatgagcatatctcatcttcccggagaaaaaaaaaaaagaatggtacgtctgagaatgaaattttgaaagagtgcaatgatgggtcgtttgataatttgtcgggaaaaacaatctacctgttatctagctttgggctaggccattccagttccagacgcaggctgaacgtcgtgaagcggaaggggcgggcccgcaggcgtccgtgtggtcctccgtgcagccctcggcccgagccggttcttcctggtaggaggcggaactcgaattcatttctcccgctgccccatctcttagctcgcggttgtttcattccgcagtttcttcccatgcacctgccgcgtaccggccactttgtgccgtacttacgtcatctttttcctaaatcgaggtggcatttacacacagcgccagtgcacacagcaagtgcacaggaagatgagttttggcccctaaccgctccgtgatgcctaccaagtcacagacccttttcatcgtcccagaaacgtttcatcacgtctcttcccagtcgattcccgaccccacctttattttgatctccataaccattttgcctgttggagaacttcatatagaatggaatcaggatgggcgctgtggctcacgcctgcactttggctcacgcctgcactttgggaggccgaggcgggcggattacttgaggataggagttccagaccagcgtggccaacgtggtg')

i=0

while i<1020:

r=random.randint(1,75)

if r==1:

rr=random.randint(1,4)

if rr==1:

p53mut[i]='a'

elif rr==2:

p53mut[i]='t'

elif rr==3:

p53mut[i]='g'

else:

p53mut[i]='c'

i=i+1

else:

i=i+1

protein=list(340\*'a')

i=j=0

while i<1020:

protein[j]=standard[''.join(p53mut[i:i+3])]

i=i+3

j=j+1

''.join(protein)

SOME EXAMPLE RUNS:

'RNSSLFTR\*ERRRERENVL\*AGSSYLAEGGCYSPPAFLFLDYLVMAFAKAGVFVLMQTSIPPLL\*MVCPTPRVACNLGGRYHGVDREGKKCAEGKPGGTFKNEHISSSRRKKKRNGTSENEILKECNDGSFDNLSGKTIYLLSSFGLGHSSSRRRLNVVKRKGRARRRPCGPPCSPRPEPVLPGRRRNSNSFLPLPHLLARGCFIPQFLPMHLPRTGHFVPYLSHLFPKSRWHLHTASVHTASAQEDEFWPLTAP\*CLSSHRPFSASQKRFITSLPSRFPTPPLF\*S\*\*PFCLLENFI\*NGVRMGAVADACTLAHACTLGGRGGRIT\*G\*EFQTSVANVV'

'RSSSLFTR\*EGRRERENVH\*PGSSYLAEGGCYSPPAFLFLDYLVMAFAKAGVFVLMQTSIPPLL\*MVCPTPRVACNLGGRYHGVDREGKKCAEGKPGGTFKNEHISSSRRKKKKNGTSENEILKECNDGSFDNLSGKTIYLLYSFGLGHSSSRRRLNVVKRKGRARRRPCGPPCSPRPEPVLPGRRRNSNSFLPLPHLLARGCFIPQFIPMHLPRTGHFVPYLRHLFPKSRWHLHTAPVHTASAQEDEFWPLTAP\*CLPSHRPFSSSHKRFITSLPSRFPTPPLF\*SP\*PFCLLENFK\*NGIRMGAVAHACTLPHACTLRGRGGRIT\*G\*EFQTSVANVV'

'RSSSLFTR\*EGRRERENVL\*AGSSYLAEGGCYSPPAFLFLDYLVMAFAKAGVFVLMQTSIPPIL\*MVCPTPRVACNLGGRYHGVDREGKKCAEGKPGGTFKNEHISSSRRKKKKNGTSENEILKECNDGSFDNLSGKTIYLLSSFGLGHSSSRRRLNVVKRKGRARRRPCGPPCSPRPEPVLPGRRRNSNSFLPLPHLLARGCFIPQFLPMHLPCTGHFVPYLRHLFPKSRWDLHTAPVHTASAQEDEFWPLTAP\*CLPSHRPFSSSQKRFITSLPNRFPTPPLF\*SP\*PFCLLENFI\*NGIRMGAVAHACTLAHACTLGGRGGRIT\*G\*EFQTSVANVV'

'RSSSLFTR\*EGRRERENVL\*AGSSYLAEGGCYSPPAFLFLDYLVMAFAKAGVFVLMQTSIPPLL\*MVCPTPRVACNLGGRYHGVDREGKKCAEGKPGGTFKNEHISSSRRKKKKNGTSENEILKECNDGSFDNLSGKTIYLLCSFGLGHSSSRRRLNVVKRKERARRRPCGPPCSPRPEPVLPGRRRNSNSFLPLPHLLARGCFIPQFLPMHLPRTGHFVPYLRHLLPKSRWHLHTAPVHTASAQEDEFWPLTAP\*CPPSHRPFSSSQKRFITSLPSRFTTPPLF\*SP\*PFCLLENFI\*NGIRMGAVAHACTLAHACTLGGRGGRIT\*G\*ESQTSVANVV'