

Canis lupus mitochondrion, complete genome

GenBank: KT901460.1

[FASTA Graphics](#)

[Go to:](#)

LOCUS KT901460 16580 bp DNA circular MAM 22-DEC-2016
DEFINITION Canis lupus mitochondrion, complete genome.
ACCESSION KT901460
VERSION KT901460.1
KEYWORDS .
SOURCE mitochondrion Canis lupus (gray wolf)
 ORGANISM [Canis lupus](#)
 Eukaryota; Metazoa; Chordata; Craniata; Vertebrata; Euteleostomi;
 Mammalia; Eutheria; Laurasiatheria; Carnivora; Caniformia;
Canidae;
 Canis.
REFERENCE 1 (bases 1 to 16580)
 AUTHORS An, J.
 TITLE Mitochondrial genome of Canis lupus in South Korea
 JOURNAL Unpublished
REFERENCE 2 (bases 1 to 16580)
 AUTHORS An, J.
 TITLE Direct Submission
 JOURNAL Submitted (13-OCT-2015) Department of Animal Resources, National
 Institute of Biological Resources, Korea, Hwangyeong-ro 42, Seo-
gu,
 Incheon, South Korea
FEATURES Location/Qualifiers
 source 1..16580
 /organism="Canis lupus"
 /organelle="mitochondrion"
 /mol_type="genomic DNA"
 /db_xref="taxon:[9612](#)"
 [gene](#) 1..69
 /gene="trnF"
 /locus_tag="ClupusMt_t001"
 [tRNA](#) 1..69
 /gene="trnF"
 /locus_tag="ClupusMt_t001"
 /product="tRNA-Phe"
 [gene](#) 70..1023
 /locus_tag="ClupusMt_r001"
 [rRNA](#) 70..1023
 /locus_tag="ClupusMt_r001"
 /product="12S ribosomal RNA"

```

/feature="s-rRNA"
gene 1024..1090
/feature="trnV"
/locus_tag="ClupusMt_t002"
tRNA 1024..1090
/feature="trnV"
/locus_tag="ClupusMt_t002"
/product="tRNA-Val"
gene 1091..2669
/locus_tag="ClupusMt_r002"
rRNA 1091..2669
/locus_tag="ClupusMt_r002"
/product="16S ribosomal RNA"
/feature="l-rRNA"
gene 2670..2744
/feature="trnL"
/locus_tag="ClupusMt_t003"
tRNA 2670..2744
/feature="trnL"
/locus_tag="ClupusMt_t003"
/product="tRNA-Leu"
gene 2747..3702
/feature="ND1"
/locus_tag="ClupusMt_p001"
CDS 2747..3702
/feature="ND1"
/locus_tag="ClupusMt_p001"
/feature="TAA stop codon is completed by the addition of 3' A
residues to the mRNA"
/codon_start=1
/transl_except=(pos:3701..3702,aa:TERM)
/transl_table=2
/product="NADH dehydrogenase subunit 1"
/protein_id="ALT55526.1"
/translation="MFFINIISLIIPILLAVAFLTLVERKVLGYMQLRKGNIVGPYG
LLQPIADAVKLFKEPLRPLTSSMSMFILAPILALSLALTMWIPLPMPYPLINMNLGI
LFMLAMSSLAVYSILWSGWASNSKYALIGALRAVAQTISYEVTLAIILSVLLMNGSF
TLSTLIITQEHWLIFPAWPLAMMWFISTLAETNRAPFDLTEGESELVSGFNVEYAAG
PFALFFLAEYANIIMMNLTTILFFGAFHNPFMPELYSINFMTKLLLTICFLWIRAS
YPRFRYDQLMHLLWKNFLPLTLALCMWHVALPIITASIPPQT"
gene 3703..3771
/feature="trnI"
/locus_tag="ClupusMt_t004"
tRNA 3703..3771

```

```

/ gene="trnI"
/ locus_tag="ClupusMt_t004"
/ product="tRNA-Ile"
gene      complement (3769..3842)
/ gene="trnQ"
/ locus_tag="ClupusMt_t005"
tRNA      complement (3769..3842)
/ gene="trnQ"
/ locus_tag="ClupusMt_t005"
/ product="tRNA-Gln"
gene      3844..3913
/ gene="trnM"
/ locus_tag="ClupusMt_t006"
tRNA      3844..3913
/ gene="trnM"
/ locus_tag="ClupusMt_t006"
/ product="tRNA-Met"
gene      3914..4955
/ gene="ND2"
/ locus_tag="ClupusMt_p002"
CDS       3914..4955
/ gene="ND2"
/ locus_tag="ClupusMt_p002"
/ note="TAA stop codon is completed by the addition of 3' A
residues to the mRNA"
/ codon_start=1
/ transl_except=(pos:4955,aa:TERM)
/ transl_table=2
/ product="NADH dehydrogenase subunit 2"
/ protein_id="ALT55527.1"
/ translation="MKPPILIIIMATIMTGTMIIVMLSSHLLIWIWGFEMNMLAIIPIL
MKKYSPRAMEASTKYFLTQATASMLLMMGVTINLLYSGQWVISKISNPISIMMTTAL
TMKLGSLSPFHFVPEVTQGITLMSGMILLTWQKIAPMSILYQISPSINTNLLMLMALA
SVLVGGWGGGLNQTQLRKIMAYSSIAHMGWMTAIITYNPTMMILNLTLYILMTLSTFML
FMLNSSTTTLSLSHMWNKFPLITSMILILMLSLGGLPPLSGFIPKWMIIQELTKNNMI
LIPTLMAITALLNLYFYLRITYSTALTMFPSTNNMKMKWQFEYTKKATLLAPLIITST
MLLPLTPMLSVLD"
gene      4956..5023
/ gene="trnW"
/ locus_tag="ClupusMt_t007"
tRNA      4956..5023
/ gene="trnW"
/ locus_tag="ClupusMt_t007"
/ product="tRNA-Trp"

```

gene	complement (5037..5105) /gene="trnA" /locus_tag="ClupusMt_t008"
tRNA	complement (5037..5105) /gene="trnA" /locus_tag="ClupusMt_t008" /product="tRNA-Ala"
gene	complement (5107..5178) /gene="trnN" /locus_tag="ClupusMt_t009"
tRNA	complement (5107..5178) /gene="trnN" /locus_tag="ClupusMt_t009" /product="tRNA-Asn"
gene	complement (5213..5279) /gene="trnC" /locus_tag="ClupusMt_t010"
tRNA	complement (5213..5279) /gene="trnC" /locus_tag="ClupusMt_t010" /product="tRNA-Cys"
gene	complement (5280..5347) /gene="trnY" /locus_tag="ClupusMt_t011"
tRNA	complement (5280..5347) /gene="trnY" /locus_tag="ClupusMt_t011" /product="tRNA-Tyr"
gene	5349..6893 /gene="COX1" /locus_tag="ClupusMt_p003"
CDS	5349..6893 /gene="COX1" /locus_tag="ClupusMt_p003" /codon_start=1 /transl_table= 2 /product="cytochrome c oxidase subunit I" /protein_id=" ALT55528.1 " /translation="MFINRWLFSTNHKDIGTLYLLFGAWAGMVGTALSLIRAE LGQPGTLLGDDQIYNVVVTAHAFVMIFFMVMPIMIGGFGNWLVP LMIGAPDMAFPRMNMSTWLLPPSFLLLLASSMVEAGAGTGWTVYPPLAGNLAHAGASVDLTIFSLHLAGVSSILGAINFITTIINMKPPAMSQYQTPLFVWSVLITAVLLLLSLPVLAAGITMLLTDRNLNTTFFDPAGGGDPILYQHLFWFFGHPEVYILILPGFGMISHIVTYYSKGKEPFGYMGMVWAMMSIGFLGFIVWAHHMFTVGMDVDTRAYFTSATMIIAIP TGVKVFSWLATLHG GNIKW

```

SPAMLWALGFIFLFTVGGLTGIVLANSSLDIVLHDTYYVVAHFHYVLSMGAVFAIMGG
FAHWFPFLFSGYTLNDTWAKIHFTIMFVGVNMTFFPQHFLGLSGMPRRYSYDPDAYTTW
NTVSSMGSFISLTAVMLMIFMIWEAFASKREVAMVELTTTNIEWLHGCPPPYHTFEED
TYVIQK"
gene      complement(6891..6959)
          /gene="trnS"
          /locus_tag="ClupusMt_t012"
tRNA      complement(6891..6959)
          /gene="trnS"
          /locus_tag="ClupusMt_t012"
          /product="tRNA-Ser"
gene      6966..7033
          /gene="trnD"
          /locus_tag="ClupusMt_t013"
tRNA      6966..7033
          /gene="trnD"
          /locus_tag="ClupusMt_t013"
          /product="tRNA-Asp"
gene      7034..7717
          /gene="COX2"
          /locus_tag="ClupusMt_p004"
CDS       7034..7717
          /gene="COX2"
          /locus_tag="ClupusMt_p004"
          /codon_start=1
          /transl_table=2
          /product="cytochrome c oxidase subunit II"
          /protein_id="ALT55529.1"
          /translation="MAYPFQLGLQDATSPIMEELLHFHDHTLMIVFLISSLVLYIISL
MLTTKLTHTSTMDAQEVETVWTILPAIILILIALPSLRILYMMDEINNPSLTVKTMGH
QWYWSYEYTDYEDLNFDSYM IPTQELKPGELRLLEVDNRVVLPMEMTIRMLISSEDL
HSWAVPSLGLKTD AIPGR LNQTTL MAMRPGLYYGQCSEICGSNHSFMP I VLEMVPLSY
FETWSALMV"
gene      7735..7801
          /gene="trnK"
          /locus_tag="ClupusMt_t014"
tRNA      7735..7801
          /gene="trnK"
          /locus_tag="ClupusMt_t014"
          /product="tRNA-Lys"
gene      7803..8006
          /gene="ATP8"
          /locus_tag="ClupusMt_p005"
CDS       7803..8006

```

```

/ gene="ATP8"
/ locus_tag="ClupusMt_p005"
/ codon_start=1
/ transl_table=2
/ product="ATP synthase F0 subunit 8"
/ protein_id="ALT55530.1"
/ translation="MPQLDTSTWFIMILSMFLTLFILFQLKISNHHYPENPMTKSTKI
TGQHNPWENKWTKIYSPLSLPPQ"
gene      7964..8644
/ gene="ATP6"
/ locus_tag="ClupusMt_p006"
CDS      7964..8644
/ gene="ATP6"
/ locus_tag="ClupusMt_p006"
/ codon_start=1
/ transl_table=2
/ product="ATP synthase F0 subunit 6"
/ protein_id="ALT55531.1"
/ translation="MNENLFASFAAPSMGLPIVV LIVMFPSILFPAPNRLINRLIS
IQQWLIQLTSKQMLAIHNQKGR TWALMLMSLILFIGSTNLLGLLPHSFTPTTQLSMNL
GMAIPLWAGAVITGFRYKTKASLAHFLPQGTPLPLIPMLVIIETISLFIQPMALAVRL
TANITAGHLLIHLIGGATLALINISATTAFITFIILILLTILEFAVALIQAYVFTLLV
SLYLHDNT"
gene      8644..9427
/ gene="COX3"
/ locus_tag="ClupusMt_p007"
CDS      8644..9427
/ gene="COX3"
/ locus_tag="ClupusMt_p007"
/ note="TAA stop codon is completed by the addition of 3' A
residues to the mRNA"
/ codon_start=1
/ transl_except=(pos:9427,aa:TERM)
/ transl_table=2
/ product="cytochrome c oxidase subunit III"
/ protein_id="ALT55532.1"
/ translation="MTHQTHAYH MVNPSWPWPLTGALSALLMTSGLIMWFHYNMSLLT
LGLTTNLLTMYQWWRDVIREGTFQGHHTPIVQKGLRYGMVLFIVSEVFFFAGFFWAFY
HSSLAPTPELGGCWPPTGI IPLNPLEVPLLN TSVLLASGV SITWAHHS LMEGNRKHML
QALFITISLGVYFTLLQASEYYETSFTISDGVYGSTFFMATGFHGLHVIIGSTFLIVC
FLRQLHYHFTSNHHFGFEAAAWYWHFVDV VWLFLYVSIYWWGS"
gene      9428..9495
/ gene="trnG"
/ locus_tag="ClupusMt_t015"

```

tRNA	9428..9495 /gene="trnG" /locus_tag="ClupusMt_t015" /product="tRNA-Gly"
gene	9496..9842 /gene="ND3" /locus_tag="ClupusMt_p008"
CDS	9496..9842 /gene="ND3" /locus_tag="ClupusMt_p008" /note="TAA stop codon is completed by the addition of 3' A residues to the mRNA" /codon_start=1 /transl_except=(pos:9841..9842,aa:TERM) /transl_table=2 /product="NADH dehydrogenase subunit 3" /protein_id=" ALT55533.1 " /translation="MNVMLTLVTNVTLASLLVLIAFWLPQLNIYTDKTSPLYECGFDPMSGARLPFSMKFFLVAITFLLFDLEIALLLPLPWASQTNKLTTMLIMALLLISLLAASLAYEWTEKGLEWTE"
gene	9843..9911 /gene="trnR" /locus_tag="ClupusMt_t016"
tRNA	9843..9911 /gene="trnR" /locus_tag="ClupusMt_t016" /product="tRNA-Arg"
gene	9912..10208 /gene="ND4L" /locus_tag="ClupusMt_p009"
CDS	9912..10208 /gene="ND4L" /locus_tag="ClupusMt_p009" /codon_start=1 /transl_table=2 /product="NADH dehydrogenase subunit 4L" /protein_id=" ALT55534.1 " /translation="MSMVYINIFLAFILSLMGMLVYRSHLMSSLLCLEGMMLSLFVMMSVTILNNHLTLASMMPIVLLVFAACEAALGLSLLVMVSNITYGTDYVQNLNLLQC"
gene	10202..11579 /gene="ND4" /locus_tag="ClupusMt_p010"
CDS	10202..11579 /gene="ND4"

```

/locus_tag="ClupusMt_p010"
/note="TAA stop codon is completed by the addition of 3' A
residues to the mRNA"
/codon_start=1
/transl_except=(pos:11579,aa:TERM)
/transl_table=2
/product="NADH dehydrogenase subunit 4"
/protein_id="ALT55535.1"
/translation="MLKIIIPTIMLIPLTWMSKPNMIWINTTTYGLLISLISLFYLNQ
PNDNALNSSLMFSDSLAPLLALTWLLPLMLMASQHHLSKEPLTRKKLYISMLILL
QLFLIMTFTASELIFFYILFEATLIPTLIIITRWGNQTERLNAGLYFLFYTLMGSLPL
LVALLYIHNFMGSLNFLMIQYWIQPLPNSWSNIFLWLACMMAFMVKMPYGLHLWLPK
AHVEAPIAGSMVLA AVLKLGGYGMMRITTLNPLTNFMAYPFMMLS LGWMIMTSSIC
LRQTDLKSLIAYSSVSHMALVIVAVLIQTPWSYMGATALMIAHGLTSSMLFCLANSNY
ERHSRTMILARGLQTLPLMAAWWLLASLTNLALPPTINLIGELFVVVSSFSWSNIT
IILMGINITITALYSLYMLITTQRGKYSHHIKNIKPSFTRENALMTLHLLPLLLLSLN
PKIILGPIY"
gene      11580..11648
          /gene="trnH"
          /locus_tag="ClupusMt_t017"
tRNA      11580..11648
          /gene="trnH"
          /locus_tag="ClupusMt_t017"
          /product="tRNA-His"
gene      11649..11708
          /gene="trnS"
          /locus_tag="ClupusMt_t018"
tRNA      11649..11708
          /gene="trnS"
          /locus_tag="ClupusMt_t018"
          /product="tRNA-Ser"
gene      11709..11778
          /gene="trnL"
          /locus_tag="ClupusMt_t019"
tRNA      11709..11778
          /gene="trnL"
          /locus_tag="ClupusMt_t019"
          /product="tRNA-Leu"
gene      11779..13599
          /gene="ND5"
          /locus_tag="ClupusMt_p011"
CDS       11779..13599
          /gene="ND5"
          /locus_tag="ClupusMt_p011"

```


	/codon_start=1 /transl_table=2 /product="NADH dehydrogenase subunit 5" /protein_id="ALT55536.1" /translation="MNMFTSCMITALVILTLPIIMTSTKLYKNKLYPYVKTATSYAF MISMIPTMMFIYSGQETIVSNWHWMTIQTMKLSMSFKLDYFSMIFVPVALFVTWSIME FSMWYMHSDPYINRFFKYLLLFLITMMVLVTANNMFQLFIGWEGVGIMSFLLIGWWHG RTDANTAALQAVLYNRIGDVGFIMAMAWFLLNLNTWNLQQIFITNDSEFNPLLGLLL AATGKSAQFGLHPWLPSAMEGPTPVSALLHSSTMVAGVFLLIRFHPIMEHNQTIQTL TLCLGAITTLFTAICALTQNDIKKIVAFSTSSQLGLMMVTIGINQPYLAFLHICTHAF FKAMLFMCSGSIHSLNDEQDIRKMGGFLFKVLPFTTSLIIRSLALTGMPFLTGFYSK DLIIESANTSNTHAWALLITLVATSLTAAYSTRIMFFALLGQPRFSPMILINENNPLL INSIKRLLIGSVFAGYIISHSITPTTIPQMTMPHYLKMMALAVTILGFILALELNLTV QGLKFNYPSNYFKFSNLLGYYPTIMHRLTPKTSLTISQKSASMLLDSTWLESILPKSI SYFQMKSSALISNQGLIKLYFLSFMLTMILSLILNYHG"
gene	complement(13583..14110) /gene="ND6" /locus_tag="ClupusMt_p012"
CDS	complement(13583..14110) /gene="ND6" /locus_tag="ClupusMt_p012" /codon_start=1 /transl_table=2 /product="NADH dehydrogenase subunit 6" /protein_id="ALT55537.1" /translation="MMTYIVFILSIVFVMSFVGFATKPSPIYGGLVLIISGGIGCAIV LNFGGSFLGLMVFLIYLGMLVVFYTTAMATEQYPEVWVSNKAVLAAFITGLLSELL TACYILKDDEVEVVLKFNGMGDWVIYDTGDSGFFSEEAMGIAALYSYGTWLVVVTGWS LLIGVLVIMEVTRGN"
gene	complement(14111..14179) /gene="trnE" /locus_tag="ClupusMt_t020"
tRNA	complement(14111..14179) /gene="trnE" /locus_tag="ClupusMt_t020" /product="tRNA-Glu"
gene	14184..15323 /gene="CYTB" /locus_tag="ClupusMt_p013"
CDS	14184..15323 /gene="CYTB" /locus_tag="ClupusMt_p013" /codon_start=1 /transl_table=2

```

        /product="cytochrome b"
        /protein_id="ALT55538.1"
        /translation="MTNIRKTHPLAKIVNNSFIDLPAASNISAWWNFGSLLGVCLILQ
        ILTGLFLAMHYTSDTATAFSSVTHICRDVNYGWIIRYMHANGASMFFICLFMHVGRGL
        YYGSYVFMETWNIGIVLLFATMATAFMGYVLPWGQMSFWGATVITNLLSAIPYIGTDL
        VEWIWGGFSVDKATLTRFFAFHFILPFI AALAMVHLLFLHETGSNNPSGITSDSDKI
        PFHPYYTIKDILGALLLLLVLMSLVLFSPDLLGDPDNYTPANPLNTPPHIKPEWYFLF
        AYAILRSIPNKLGGVLALVFSILILAFIPFLHTSKQRSMMFRPLSQCLFWLLVTDLLT
        LTWIGGQPV EHPFIIIGQIASILYFTILLILMPTISVIENNLLKW"
gene      15324..15393
        /gene="trnT"
        /locus_tag="ClupusMt_t021"
tRNA      15324..15393
        /gene="trnT"
        /locus_tag="ClupusMt_t021"
        /product="tRNA-Thr"
gene      complement(15393..15458)
        /gene="trnP"
        /locus_tag="ClupusMt_t022"
tRNA      complement(15393..15458)
        /gene="trnP"
        /locus_tag="ClupusMt_t022"
        /product="tRNA-Pro"
D-loop    15459..16580

```

ORIGIN

```

    1  gttaatgtag cttaattaat aaagcaaggc actgaaaatg ccaagatgag tcgcacgact
   61  ccataaacat aaaggtttgg tcctagcctt cctattagtt tttagtagac ttacacatgc
  121  aagcctccac gccccagtga gaatgccctt aaaatcacca gtgatctaaa ggagcaggta
  181  tcaagcacac tcttaagtag ctcataacac cttgctaagc cacaccccc a cgggatacag
  241  cagtgataaa aattaagcca taaacgaaag tttgactaag ccatactaaa aagggttggt
  301  aaatctcgtg ccagccaccg cggtcatacg attaacccaa actaataggc ctgcggcgta
  361  aagcgtgttt aagatacctt tgcactaaag ttaaaactta actaagccgt aaaaagctac
  421  agttaccata aaataaacca cgaaagtgc tttataataa tctgactaca cgatagctaa
  481  gacccaaact gggattagat accccactat gcttagccct aaacatagat aattttacia
  541  caaaataatt cgccagagga ctactagcaa cagcttaaaa ctcaaaggac ttggcgggtgc
  601  tttatatccc tctagaggag cctgttctat aatcgataaa ccccgataaa cctcaccacc
  661  tttcgctaatt tcagtctata taccgccatc ttcagcaaac cctcaaaaagg tagaacagta
  721  agcacaatca tttcacataa aaaagttagg tcaaggtgta acttatgagg tgggaagaaa
  781  tgggctacat tttctacca agaacatttc acgaatgttt ttatgaaatt aaaaactgaa
  841  ggaggattta gtagtaaatt aagaatagag agcttaattg aatagggcca tgaagcacgc
  901  acacaccgcc cgtcaccctc ctcaagtaat aagacacagc cataatcata ttaactcaac
  961  taaaacacaa gaggagacaa gtcgtaacaa ggtaagcata ccggaagggtg tgcttggatt
 1021  aatcaaagtg tagcttaact aaagcgtctg gcctacaccc agaagatttc attacttatg
 1081  accactttga acaaaagcta gcccaactaa ccccaaactt aagcattaca gacatatata

```

1141 ataaaacatt tagttagaca ataaaagtat aggagataga aattttaatt ggagcaatag
1201 agatagtacc gtaagggaat gatgaaagac atcttaacag tattaacag caaagattac
1261 cccttctacc ttttgcataa tgaactagcc agaaacaact taacaaagag aacttaagct
1321 aagctccccg aaaccagacg agctacccat aaacaatcta aaaggatcaa ctcatctatg
1381 tagcaaaata gtgagaagat ttgtgggtag aggtgaaaag cctaacgagc ctgggtgatag
1441 ctggttacc acaaacagaa ttttagttca actttaaatt tacctaaaaa aataaaattt
1501 taatgtaaata ttaaaatata gtctaagaag gtacagcttc ttagaatcag gatacaacct
1561 ttattagaga gtatatacta ataccacat agttggctta aaagcagcca tcaattgaga
1621 aagcgttcca gctcaacaaa caatataact taatcccaac catactacat caactcctaa
1681 ttataccccc tgggtcattc tatttaaata tagaagcaat aatgctagta tgagtaacaa
1741 gaaccatttt ctccccgcat aagcttatat caggaaacgga tagaccactg atagttaaca
1801 atctgataat atcaacccaa aaatgaaata cttatctacc ccattgttaa cccaacacag
1861 gtatgcactt aaggaaagat taaaaggagt aaaaggaaact cggcaaacac aaacccccgc
1921 tgtttaccaa aaacatcacc tccagcattt ctagtattgg aggcactgcc tgccccgtga
1981 cacttgttta acggccgcgg tatcctgacc gtgcaaaggc agcataatca tttgttctct
2041 aaatagggac ttgtatgaat ggccacacga gggtttaact gtctcttact cccaatcagt
2101 gaaattgacc ttcccgtgaa gagggcggaa taccataata agacgagaag accctatgga
2161 gctttaatta actaacccaa acttatggat actaaatacc tataaggcat aacataacac
2221 catcattatg ggtagcaat ttaggttggg gtgacctcgg aatataaaaa aactcccag
2281 tgattaaaat ctagaccac aagtcaaaat gtaacatcac ttattgatcc aataactttt
2341 gatcaacgga acaagttacc ctagggataa cagcgcaatc ctattcaaga gtccatatcg
2401 acaatagggt ttacgacctc gatgttgat caggacatcc taatgggtga gcagctatta
2461 agggttcgtt tgttcaacga ttaaagtcct acgtgatctg agttcagacc ggagtaatcc
2521 aggtcggttt ctatctatta tataacctcc cccagtacga aaggacaagg gatgtaaggc
2581 ctacctcaca aaggcgcctt aaaactaata gatgaagtca actcaatcta accagtttat
2641 ctctcatat gcccaagaaa gagggctttg ttaggggtggc agagcccggt aactgcataa
2701 aacttaaacc tttattatca gaggttcaat tcctctccct aacaaaatgt tctttatcaa
2761 cattatctct cttatcatcc caatccttct tgccgtagct ttcctcacc tcgttgaacg
2821 aaaagtctta ggctacatac aacttcgaaa agggcctaatt attgtaggcc cctacggcct
2881 ccttcaacca atcgcagacg cagtaaaact cttcacaaaa gaacctctac gaccacttac
2941 atcctctata tcaatattca ttctagcccc tattctagct ctatcactag ccctaactat
3001 gtgaattccc ctccaatac cctaccact catcaatata aacttgggca tcctattcat
3061 actagcaata tcaagcctcg ccgtatactc catcctttga tcaggatgag cctcaaacctc
3121 caaatacgcc ctgatcggag cccttcgagc agtagctcaa acaatctcat atgaagtaac
3181 actagcaatt attctcctat cagtcctcct aataaacgga tcatttacac tatccacgct
3241 aatcattacc caagaacata tatgattaat ctttcgggcc tgaccctag ccatgatatg
3301 attcatctct accctagcag aaactaatcg agcccccttc gacttaactg aaggagaatc
3361 agaactagtt tctgggttta acgtagaata tgcagcaggt ctttttgccc tattttttct
3421 agcagagtac gcaaatatta ttataataaa catcctcaca acaattctat tcttcggtgc
3481 attccacaac ccattcatac cagagctcta ctctattaac ttcactataa aaaccctctt
3541 attaaccatc tgcttcctat gaattcgagc atcatatcct cgattccgct atgatcaatt
3601 aatacaccta ttatgaaaaa attttctacc cttaactcta gccctatgca tatgacatgt
3661 tgcccttacc attatcactg caagtatccc accccaaaca taagaaatat gtctgataaa
3721 agagttactt tgatagagta aataatagag gtttaaatcc tcttatttct agaataatag

3781 gcttcgaacc taatcttaag aattcaaaga tcttcgtgct accaaactta cactatatct
3841 tacagtaagg tcagctaaat taagctatcg ggcccatacc ccgaaaatgt tggttttatac
3901 ccttcccgta ctaataaaac cccctattct cattatcatt atagcaacta tcataacagc
3961 aaccataatc gtcataactaa gctcgactg attactgatc tgaattggat tcgaaataaa
4021 catactagcc atcatcccta ttctcataaa aaagtacagc ccacgagcca tagaagcctc
4081 cacaaaatat tttcttacac aagctactgc ctcaatatta ctaataatag gagtcactat
4141 taacctcctt tactccggcc aatgggtaat ctcaaaaatc tcaaacccca tcgcatccat
4201 catgataacc actgccctaa caataaaact aggctgtct ccattccact tctgagttcc
4261 cgaagtaaca caaggaatta cacttatatc aggaataatc ctactaacat gacaaaaaat
4321 cgcacctata tccatcctat accaaatctc tccatcaatt aacaccaacc ttcttatact
4381 aatagccctt gcatccgttc tagtaggagg ctgaggcggg ctgaatcaaa ctcaactacg
4441 aaaaatcata gcatactcct ccattgccca cataggctgg ataaccgcta tcattactta
4501 caaccctaca ataataattc taaacttaac ttatatattt ctaataacac tatctacctt
4561 catactatctt atattaaact catccaccac aaccctatct ttatcccata tatgaaataa
4621 atttccccta atcacctcca taatcttaat cttaatacta tccctaggag gactaccccc
4681 attatccggc ttcaccccta aatgaataat tattcaagaa ttaacaaaaa ataacataat
4741 tcttattcca acactaatag ctatcaccgc tctacttaac ttatatttct acctgcgact
4801 cacatatagc accgcactta ccatatttcc atccacaaat aacataaaaa taaaatgaca
4861 gtttgaatac acaaaaaagg caaccctatt agccccctta attattacct caactatgct
4921 actcccacta acacctatac tatcagtcct ggactaggag tttagggttag accagaccaa
4981 gagccttcaa agctctaagc aagtgtctata cacttaattc ctgaccaaat cacctctaag
5041 ggctgcaaga atctatctta catcaattga atgcaaatca aacacttta ttaagctaag
5101 ccctccctag attggtgagc ttctacctca cgaaatttta gttaacagct aaatacccta
5161 gtaactggct tcaatctacc ttctcccgcc gcgtaggaaa aaaaggcggg agaagccccg
5221 gcggcgtcta ggctgcttct ttgaatttgc aattcaatat gaaaattcac cacggagctt
5281 ggcaaaaaga ggactcaaac ctctatcttt agatttacag tctaattgctt ttatcagcca
5341 ttttacctat gttcattaac cgatgattgt tctctactaa tcacaaggat attggtactt
5401 tatacttact atttggggca tgagccggca tagtaggcac tgccttgagc ctctcatcc
5461 gagccgaact aggtcagccc ggtactttac taggcgacga tcaaatttac aatgtcgtcg
5521 taaccgcccc tgctttcgta ataatcttct tcatagtcac acccatcata attgggggct
5581 ttggaaactg actagtgccg ctaataattg gtgctccgga catggcattc ccccgataa
5641 ataacatgag cttctgactc cttcctccat cctttcttct actattagca tcttctatgg
5701 tagaagcagg tgcaggaacg ggatggaccg tatacccccc actggctggc aatctggccc
5761 atgcaggagc atccgttgat ctaacaattt tctccttaca cttagccgga gtctcttcta
5821 ttttaggggc aattaatttt atcactacta ttatcaacat aaaacccct gcaatatccc
5881 agtatcaaac cccctgttt gtatgatcag tactaattac agcagttcta ctctactat
5941 ccctgcctgt actggctgct ggaattacaa tacttttaac agaccggaat cttaatacaa
6001 cattttttga tcccgctgga ggaggagacc ctatcctata tcaacaccta ttctgattct
6061 tcgggcatcc tgaagtttac attcttatcc tgcccgatt cggaataatt tctcacattg
6121 tcacttacta ctcaggga aaagagcctt tcggctatat aggaatagta tgggcaatga
6181 tatctattgg gtttttaggc tttatcgat gagctcacca tatgtttacc gtaggaatag
6241 acgtagacac acgagcatac ttacatccg ccactataat tatcgctatt ccaacgggag
6301 taaaagtatt tagttgactg gcaacacttc atgggggtaa tattaaatga tctccagcta
6361 tgctatgagc tttagggttt attttcttat ttacggtagg cgggttaaca ggtattgtcc

6421 tagctaattc gtccttagac atcgtttcttc acgatacata ttatgttgta gccatttttc
6481 actatgtgct ttcaatggga gcagtttttg ccattatggg aggatttgcc cactgattcc
6541 ctctattctc aggttatact cttaacgaca cttgagcaaa gattcacttt acaattatat
6601 ttgtgggagt aaatataact ttcttccctc agcatttcct aggtttatct ggaatacctc
6661 gtcgatactc tgactatcca gatgcatata ccacctgaaa taccgtctcc tctataggat
6721 cgtttatctc gcttacagcg gtgatgctta tgatttttat gatctgggaa gcctttgcat
6781 ccaaacgaga agttgctata gtagaactta ctacaactaa cattgaatga ctacatggat
6841 gtccccctcc atatcacacg ttcgaagaac ctacatatgt gatccaaaaa taagaaagga
6901 aggaatcgaa cccctaaga ttggtttcaa gccaatatca taaccattat gtctttctca
6961 atcaggaggt attagtaaaa cattacatga ctttgtcaaa gttaaattat aggtgaaacc
7021 cctatatatc tctatggcgt acccatttca actcggatta caggacgcaa cctccccat
7081 tatagaggag ctacttcatt ttcatgacca tacactaata attgtattct taatcagttc
7141 tttagttctc tacatcattt cactaatact gactacaaaa ttaaccata caagcacaat
7201 agacgcacaa gaagtagaaa cagtatgaac tctctaccc gccattatcc taatccta
7261 cgctctacct tccctccgaa tctttatat aatagacgaa attaataacc cctctttaac
7321 cgtgaaaaca ataggccacc aatgatactg aagctatgaa tatactgatt atgaagactt
7381 aaactttgac tctacataa tccaacaca agaattaaag ccaggagaac tccgattatt
7441 agaagtagac aaccgagttg tctcccaat agaaataacc atccgaatac ttatctcttc
7501 agaagacgtt ttgcattcat gagctgttcc atcactaggt ctaaaaactg acgctattcc
7561 aggacgactg aaccaaacca cccttatagc catacgacca ggactgtact atggccagt
7621 ctctgaaatc tgcggatcta accatagctt tatgccatt gttcttgaaa tagtccccct
7681 atcttacttt gagacctgat ctgccttaat agtatagcct cgactagact tactcattaa
7741 gaagctataa agcattaacc ttttaagtta aagactggga gttttaacct ctccttaatg
7801 aaatgccaca gctagataca tccacctgat ttatcataat cttatcaata tttcttacct
7861 tcttcattct atttcaacta aaaatttcaa atcaccacta ccagaaaaac ccgataacca
7921 aatctactaa aattactggt caacataacc cttgagaaaa caaatgaacg aaaatttatt
7981 cgctcttttc gctgccccct caataatagg tctccctatt gtggtattga tcgtcatatt
8041 cccttccatt ttattccag caccatcg cctaataat aatcggttaa tctccattca
8101 gcaatgacta attcaactaa catcaaaaaca aatactagca attcataacc aaaagggacg
8161 aacctgagct ctcatactta tatcactaat tctattcatt ggctcaacca atctacttgg
8221 actactacct cactcattta cgcccacaac acaactctct ataaacctcg gaatagcaat
8281 cccctatga gcaggggcag taattaccgg tttccgctat aagaccaaag catctttggc
8341 acactttcta cccaagga ccccccttc cctaattcca atactagtaa tcatcgaaac
8401 tattagtcta ttatttcaac ccatagctct agccgttcga ctaaccgcca atattactgc
8461 aggacacctc ctaatccatt tgattggagg ggctacctta gctcttatta atattagcgc
8521 gaccacagct tttatcactt ttattatttt aatcctactt acgattctag aatttgctgt
8581 tgcttaatt caagcctatg tttttacctt actagtaagt ctatacttac atgacaacac
8641 ttaatgacct accaaactca cgcttaccat atagtcaacc caagcccatg accgctgaca
8701 ggagctcttt ctgccctcct tataacatcg ggtcttatca tatgatttca ctataactcg
8761 atatctctac ttacattagg actcacaacc aacctgttaa ccatatacca gtgatgacgg
8821 gacgtgatcc gagaaggcac attccaagga catcataccc ctattgtaca aaaaggacta
8881 cggtagcgaa tagttctttt tatcgatat gaagtatttt tctttgcagg cttcttctga
8941 gccttttacc attccagcct agcccctacc cctgaactcg ggggttgctg gcctcctacc
9001 ggcattattc ctcttaacct attagaagtt cctctactca acacctcagt cctcctagcc

9061 tccggagtat ctattacttg agcccatcat agtttaatag aaggtaatcg caaacacata
9121 cttcaagccc tattcattac aatctcctta ggcgtatatt ttacgctact acaggcctcc
9181 gaatattatg agacatcttt tacaatctcc gatggagtat acggatctac cttttttatg
9241 gccactggat ttcacggatt gcacgtaatt attggctcta cattcctcat cgtgtgcttt
9301 ctccgacagc tacactacca cttcacatca aaccaccact tcggatttga agccgctgca
9361 tgatattgac actttgttga tgtagtctgg ctattcttat atgtatctat ttattgatga
9421 ggatcctact tcttttagtat aactagtaca attgacttcc aatcagttag ctccagatca
9481 acctggaaag aagtaataaa cgtaatatta actttggtaa ctaatgtaac cctagcatcc
9541 ttacttgtac taatcgcatt ctgacttccc caactaaata tctatacaga caagacaagc
9601 ccctacgaat gtgggttttga tcccatggga tctgctcgcc tacctttctc tataaaattt
9661 ttctagttg ccatcacatt tctgcttttc gacctagaaa ttgcactcct actcccactt
9721 ccctgagcgt cacaaccaa caagctgaca acaatactta tcatagcact cctactaatt
9781 tccctcctag ctgcgagcct agcgtatgaa tgaaccgaaa aggggctaga atgaaccgaa
9841 tatgataatt agtttaagcc aaaacaaatg atttcgactc attagattat gatttatctc
9901 ataattatca tgtgtccata gtatatatta atatctttct ggcattcatt ctttctctaa
9961 taggtatact tgtttatcga tcacacctaa tatcatcgct actatgctta gagggcataa
10021 tattatcact atttgtaata atatctgtaa ctattctcaa caaccacctc acattagcca
10081 gcatgatacc aatcgtacta ctagtatttg ctgcctgcga agcagcatta ggactgtctc
10141 tactagtatt agtatctaac acctacggga ctgattacgt acaaaccta aaccttttac
10201 aatgctaaaa attattatcc ccactatcat actaatcccc cttacatgaa tatcaaagcc
10261 taacatgatc tgaatcaaca cgacaacata tggtttgcta atcagcttaa tcagcttatt
10321 ctacctaaat caaccaaagc ataacgcatt gaactcctcc ttaatatttt tctctgattc
10381 cctatcagca ccactattag cacttacaac atgacttctg ccccttatac ttatagcgag
10441 tcaacaccat ttatcaaaag aacctttaac tcgaaaaaaa ctatatattt caatactaata
10501 tctcctccag ttgttcctaa ttataacttt cactgcctct gaactcatct tcttttatat
10561 cctatttgaa gcaacactaa tcccgacct gatcattatt acccgatggg ggaatcaaac
10621 tgaacgacta aacgcagggc tctacttctt attttatact ttaataggat ccctcccact
10681 cctagtagct ctccctttaca tccacaattt catgggctcc ctaaaatttc tcataattca
10741 atactgaatt cagcctctgc caaactcttg atctaacatt ttcttatgac tggcatgcat
10801 aatagcattc atagtaaaga tacctctata cggcctccac ttgtgactac caaaagcaca
10861 cgtagaggcc cctattgccg gctccatagt acttgccgct gtactcctaa aattaggagg
10921 ctatggcatg atgcgaatta caaccctact aaacccctg accaacttca tagcgtaccc
10981 cttcataata ttatctctat gaggcataat cataacaagc tctatctgtc tccgtcaaac
11041 agacctaaaa tccctaattg catattcctc agttagtcat atggcactgg ttatcgtagc
11101 ggttcttatc caaacaccat gaagttatat aggtgcaaca gctctaataa ttgcccatgg
11161 tttaacatcc tcaatactat tctgcttagc caattctaata tacgaacgaa tccatagccg
11221 tactataatt ctgcacgag gacttcaaac cctccttccc ctaatagcag cctgatgact
11281 attagcaagc ctcacaaatc tggctctccc tccaacaatt aatcttatcg gagaactatt
11341 tgtagtggtg tcctcattct catggtccaa cattactatt attctaattg gaattaacat
11401 taccatcact gccctatact cactttatat attaatacacc acacaacgtg gtaaataattc
11461 tcaccacatc aaaaatatta aaccatcatt cacacgagaa aatgccctaa taaccttgca
11521 tctactgcct ctactcctcc tatccctcaa ccctaaaatt attctcggtc ccatctactg
11581 taagcatagt ttaacaaaaa cattagattg tgagtctaata aataaaagct caaacctttt
11641 tgcttaccga aaaagtactg caagaactgc taattcatgc tcccatgtat aagaacatgg

11701 ctttttcaac ttttatagga tagaagtaat ccgttggctc taggaaccaa aaaattggtg
11761 caactccaaa taaaagtaat aaatatatctt acttcatgta taatcacagc cctagtcatt
11821 cttactttgc ccatcattat aacctctact aaactttaca aaaataagct ataccatac
11881 tatgtaaaaa ccgtacttcc ttacgcgttc ataattagca taattccac aataatattt
11941 atctactcag gacaggaaac aattgtttca aactggcatt gaataacgat ccagactata
12001 aaactatcca tgagtttcaa attagactac ttctcaataa tctttgtacc tgtagccctt
12061 tttgtcacgt ggtctatcat agagttctct atatgatata tacactccga tccttacatt
12121 aaccgttttt tcaaatacct tctcttattc ctctactata taatagtctt agttaccgca
12181 aacaacatat tccaactatt cattggctga gagggagtgt gcattatctc attcctactt
12241 attggatgat gacacggccg aaccgatgca aatacagccg ccctacaagc cgtcctctat
12301 aaccgtattg gagacgtagg cttcattata gccatagcat ggtttctatt aaacttaaac
12361 acatgaaacc ttcaacaaat cttcattacg acaaacgata gttttaattt gccgctactt
12421 ggcctactac tagcagctac cggtaagtct gctcaattcg gcttacatcc ctgactcccc
12481 tcagccatag aaggccccac tcctgtatca gccctacttc actcaagcac aatagttgta
12541 gcaggagtat ttcttcttat ccgtttctat ccactaatag agcacaacca aaccattcaa
12601 accctcactt tatgcttagg ggccattact acaactattta ccgcaatttg cgctcttacg
12661 cagaacgaca tcaaaaaaat tgtagcgttc tccacctcaa gccactggg cctaataata
12721 gtaacaattg gcattaacca gccctaccta gccttcttac acatctgcac tcacgcattt
12781 tttaaagcca tactattcat atgctcaggg tcaattatcc acagcctaaa cgatgaacaa
12841 gacattcgaa aaatgggtgg cctattttaa gtccttcctt ttaccacaac ctccctaatt
12901 attcgaagcc tcgcattaac aggcatgcct ttctttacag gattctactc caaagacctg
12961 atcatcgagt ccgctaacac gtogaatacc cagcctgag ccctcttaac tacactcgtt
13021 gccacatccc taaccgctgc ctacagcacc cgaattatat tctttgctct actaggccag
13081 ccccgcttct cccctataat ccttatcaac gagaataatc ctctcctaac taactctatt
13141 aaacgactcc ttatcgggag tgtatttgca gggtagatta tctccacag catcacaccc
13201 actaccatcc cacagataac tatgcctcat tatctaaaaa tgatagccct tgcagtaact
13261 atcttggggt tcactcctgc actagaacta aaccttaccg tacaaggact taaatttaac
13321 tatccttcta attactttaa attttccaac ctcttgggtt attatccaac cattatgcac
13381 cgctcacac ctaaaacaag ttttaaccatt agccagaaat cagcatccat acttctggac
13441 tccacctgac tagaaagtat cctacccaaa tcaatctcgt atttccaaat aaaatcttcc
13501 gccctcattt caaatcaaaa gggctctcat aaactctact tcctatcgtt cataactaact
13561 ataactctca gcctactaat ccttaattac caggggtaac ttccatgata accaatacac
13621 caattaatag cgaccagccc gtaacaacca ccaaccaagt cccatagctg tatagagccg
13681 caatacccat agcctcttca ctaaaaaacc cagaatcccc cgtatcatag atcaccat
13741 cccctattcc attaaacttt aacactacct ccacctcatc atccttcaaa atatagcaag
13801 cagttaacaa ttcagacaac agaccagtaa taaaagccgc tagaacagcc ttatttgaaa
13861 ctcacacctc aggggtattg tcagtagcca tagcagttgt ataaccatc actactaata
13921 tcccccccaa ataaattaaa aatactatca accctaaaaa agaaccacca aaattcagaa
13981 caatcgaca accaatccca ccgctaataa ttagcacaag cccaccataa ataggagatg
14041 gtttagtggtg aaaaccacaa aaactcatca caaaaacgat acttaaaata aatacaatgt
14101 atgttatcat tattcctaca tggaatttaa ccatgactaa tgacatgaaa aatcatcgtt
14161 gtatttcaac tataagaata ttaatgacca acattcgaaa aaccaccca ctagccaaaa
14221 ttgttaataa ctcatctatt gacctccag cgccatctaa catctccgct tgatggaatt
14281 tcggatcctt gttaggagta tgcttgattc tacagattct aacagggtta ttcttagcta

14341 tacactatac atcggacaca gccacagctt tttcatcagt caccacatc tgtcgagacg
14401 ttaactacgg ctgaattatc cgctatatac atgcaaatgg cgcttccata ttctttatct
14461 gcctattcat acatgtagga cgaggcctat attacggatc ctatgtattc atagaaacat
14521 gaaacattgg aattgtacta ttattcgcaa ccatagccac agcattcata ggctatgtac
14581 taccatgagg acaaatatca ttttgagggg caactgtaat cactaacctt ctctctgcca
14641 tcccatatat cggaactgac ttagtagagt gaatctgagg cggttctca gtggacaagg
14701 caaccctaac acgattcttt gcatttcaact ttatcctccc cttcatcacc gcagctctag
14761 caatagtaca cctcctatct ctacacgaaa ccggatccaa taacccttca ggaatcacat
14821 cagactcaga caaaattcca tttcaccctt actacacaat caaagatata ctaggagcct
14881 tactcctact cctggtccta atatcactag ttttattttc accagaccta ttaggagacc
14941 cagataacta caccctgca aacccttaa acaccctcc acatattaaa cctgagtggg
15001 atttcctatt cgctatgct atcctacgat ccattcctaa taaattagga ggtgtactcg
15061 ccctgggtatt ctccatccta atttttagcat tcattccatt tctccacaca tctaagcaac
15121 gcagcatgat attccggccc cttagccaat gcctattctg acttttaggt accgatcttc
15181 tcactttaac atgaattgga ggacaaccag ttgaacaccc tttcatcatt attggacaaa
15241 tcgcttcaat cctatatctt accatcctat tgatcctaata accaacaatt agcggttatcg
15301 aaaataatct cctaaaatga agagtctttg tagtataatc attaccttgg tcttgtaaac
15361 caaaaatgga gagtaatcgc cctccctaag actcaaggaa gaagctcttg ctccaccatc
15421 agcacccaaa gctgaaattc ttcttaaact attccctgac acccctacat tcatatattg
15481 gatcacctct actgtgctat gtcagtatct ccagagattc ttccctccct atgtacgtcg
15541 tgcattaatg gcttgcccca tgcataataa catgtacata atattacatt cttacatagg
15601 acatatcaac tcaactccac aatccactga ttaccaacag taatcgaatg catatcactt
15661 agtccaataa gggcttaatc accatgcctc gagaaacat caacccttgc tcgtaatgtc
15721 cctcttctcg ctccggggccc atactaacgt ggggggttact atcatggaac tatactctggc
15781 atctggttct tacctcaggg ccataacttt gtttactcca atcctactaa ttctcgcaaa
15841 tgggacatct cgatggacta atgactaatc agcccatgat cacacataac tgtggtgtca
15901 tgcatttggt atcttttatt tttagggggg gaatctgcta tcaactacat acgaccgcaa
15961 cggcactaac tctaacttat cttctgctct cagggaatat gccgctcgcg gccctaattg
16021 agtcaaataa cttgtagctg gacttattca ttatcattta tcaactcacg cataagatca
16081 aggtgctatt cagtcaatgg tttcaggaca tatagttcta ggatacacgt acgtacacgt
16141 acgtacacgt acgtacacgt gcgtacacgt acgtacacgt gcgtacacgt acgtacacgt
16201 gcgtacacgt gcgtacacgt gcgtacacgt gcgtacacgt gcgtacacgt gcgtacacgt
16261 acgtacacgt acgtacacgt gcgtacgccc gcaagacatt aagttaactt atacaaaccc
16321 cccttaccac ccataaactc atgtcatcta ttatacactt atttatgtcc cgccaaaccc
16381 caaaaacagg actaagtgca tacaatactc acaagcttta tttaaattgt atacaaatgt
16441 attgctactc tagttaactt aacacaacag tcttacacgc atttggtctc gtagtctatc
16501 tatagatagc attccctttt ttccctctct aatatttact atgtatttca tttattacgc
16561 aactacaat ttcagtatag

//