

## HOX:

- python3 main.py -q \_data/Human\_HOX.fa -r \_data/Fly\_HOX.fa

Score: -494

### Aligned Query Sequence:

\_\_MS\_\_S\_\_SY\_\_YVNA\_\_LFSKY\_TAG\_TSL\_\_\_\_FQ\_\_N\_\_AEPTSCSF\_\_\_\_AP\_\_N\_\_\_\_  
SQ\_\_R\_\_S\_\_GYG\_\_A\_\_G\_\_A\_\_\_\_GA\_\_\_\_FASTVPGL\_\_\_\_YVNSPLYQSP\_\_FA  
S\_\_\_\_GYGL\_\_\_\_G\_\_AD\_AYG\_\_N\_\_L\_\_\_\_PCA\_\_SY\_\_\_\_D\_\_\_\_QN\_\_IPGLCSDLAKG\_\_\_\_  
\_\_A\_\_CDKTDEGA\_\_\_\_LH\_G\_\_AAEAN\_\_\_\_FRIYPWMRS\_SG\_\_PDRKRGRQTYTRYQTLELEKEFH  
NRYLTRRRRIEIAHALCLTERQVKIWFQNRMRKWKKEHKDEGPTAAAAPEGAVPSAAATAAADKADEEDDDE\_EEEDDEE

### Aligned Reference Sequence:

MTMSTNNCESMTSYFTNSYMGADMHHGHYPGNGVTDLDAQMHHSQNPNQGNMP\_YPRFPPYDRMPYYNGQGMDDQQQI  
HQGYSRPDSSSQVG\_GVMPQAQTNGQLVSVAQQQQQTQQQQQAQTQQQQAQQAP\_LQQQHPQVTQQVTHPQQQPVVYA  
SCKLQAAVG\_GLGMVQEGGSPLVDQMGGHMHNAQMTLPHMHGHPQAQLGYTDVGVDPDTEVHQNHNMGMYGQQQTGVPP  
VVAPPQAMMHPGAGQGPQMHHQHPGQHTPPSQNPSSQSSGMPSPLYPWMRSQFGKCQERKRGRQTYTRYQTLELEKEFH  
NRYLTRRRRIEIAHALCLTERQIKIWFQNRMRKWKKENK\_\_\_\_T\_KGEP\_G\_\_S\_\_\_\_GGE\_GDEITPPNSPQ

## PAX:

- python3 main.py -q \_data/Human\_PAX.fa -r \_data/Fly\_PAX.fa

Score: -850

### Aligned Query Sequence:

MQN\_\_\_\_S\_\_\_\_HSGVNQLGGVFVNGRPLPDSTRQKI  
VELAHSGARPCDISRILQVSNGCVSKILGRYYETGSIRPRAIGGSKPRVATPEVVS KIAQYKRECPSIFAW EIRDRLLESEG  
VCTNDNIPSVSSINRVLRLNLA SEK\_QQ\_\_\_\_M\_\_\_\_  
\_\_GA\_\_DG\_\_MYDKLRMLN\_\_\_\_G\_\_\_\_QTG\_S\_\_WGTR\_\_P\_\_G\_\_\_\_W\_\_Y  
PG\_\_T\_\_\_\_SV\_\_\_\_P\_\_\_\_G\_Q\_\_P\_\_T\_\_\_\_QDGCQQQE\_G\_G\_GE  
NTNSISSN\_G\_EDSDEAQMRLQLKRKLQRNRTSFTQEIEALEKEFERTHYPDVFARERLAAKIDLPEARIQVWFSNRRA  
KWRREEKLNRQR\_\_\_\_QASNT\_P\_\_\_\_S\_HIP\_\_I\_\_SS\_S\_FSTSVYQP\_\_\_\_I  
\_\_POPT\_TP\_\_VSSFTS\_\_G\_S\_MLGR\_\_TDTAL\_\_\_\_TNT\_\_YS\_\_\_\_AL\_P\_\_P\_\_\_\_MPSF\_TM\_AN  
\_\_NLPM\_\_\_\_QP\_P\_\_\_\_V\_\_\_\_PS\_\_\_\_Q\_\_T\_SS\_YSC\_M\_L\_\_\_\_P\_\_\_\_TS\_\_  
PSVN\_G\_\_\_\_RS\_Y\_\_DTY\_\_TPPHM\_\_\_\_QT\_\_H\_\_MNS\_\_QP\_MGTS\_\_G\_TTSTG\_\_\_\_LI  
SPGV\_\_\_\_S\_\_\_\_VP\_\_\_\_VQV\_PG\_SEPDMS\_QYWPR LQ\*

### Aligned Reference Sequence:

MRNLPCLG TAGGSGLGGIAGKPSPTMEAVEASTASHPHSTSSYFATTYYHLTDDECHSGVNQLGGVFVGG RPLPDSTRQKI  
VELAHSGARPCDISRILQVSNGCVSKILGRYYETGSIRPRAIGGSKPRVATAE VVS KISQYKRECPSIFAW EIRDRLLEQEN  
VCTNDNIPSVSSINRVLRLNLAAQEQQSTGSGSSSTSAGNSISAKVSVSIGGNVSNVASGSRGTLSSSTDLMQTATPLNSS  
ESGGASNSGEGSEQEAIYEKLRLLNTQHAAGPGPLEPARAAPLVGQSPNHLGTRSSHPQLVHGNHQA LQQHQQQSWPPRHY  
SGSWYPTSLSEIPISSAPNIASVTAYASGPSLAHSLSPNDIESLASIGHQRNCPVATEDIHLKKELDGHQSD ETGSGEGE  
NSNGGASNIGNTED\_D\_\_QARLILKRKLQRNRTSFTNDQIDSLEKEFERTHYPDVFARERLAGKIGLPEARIQVWFSNRRA  
KWRREEKLNRQRRTPNSTGASATSSSTSATASLTDSPNSLSACSSLLSGSAGGPSVSTINGLSSPSTLSTNVNAPT LGAGI  
DSSSEPTPIPHIRPCTSDNDNGRQSEDCRRVCSPCLGVGGHQNTHHIQSNGHAQGHALVPAISPRLNFNSGSGFGAMYSN  
MHHTALSMDSYGA VTIPIPSFNHSAVGPLAPPSPIPQGGDLTPSSLYPCHMTLRPPPMAPAHHHIVPGDGGRPAGVGLGSG  
QSANLGASCSGSGYEVL SAYALPPPPMASSSAADSSFAASSASANTVPHHTIAQESCSPCSSASHFGVAHSSGFSSDPI  
SPAVSSYAHMSYNYASSANTMTTPSSASG TSAHVAPGKQQFFASCFYSP\_\_WV

## TITIN:

- python3 main.py -q \_data/TITIN\_Human.fa -r \_data/TITIN\_Mouse.fa -m \_data/TITIN\_Match.txt

Score: 22051

## Aligned Query Sequence:

MTTQAPTFTQPLQSVVLEGSTATFEAHISGFPVPEVSWFRDGGVISTSTLPGVQISFSDGRAKLTI PAVTKANSGRYSLK  
ATNGSGQATSTAELLVKAETAPPNFVQRLQSM TVRQGSQVRLQVRVTGIPTPVVKFYRDGAEIQSSLD FQISQEGDLYSLL  
IAEAYPEDSGTYSVNATNSVGRATSTAELLVQGE EEPVPAKKT KTIVSTAQISESRQTRIEKKIEAHFDARS IATVEMVIDG  
AAGQQLPHKTPPRIPPKPKSRSPTPPSIAAKAQLARQQSPSPIRHSPSPVRHVRAPTPSPVRSVSPAARISTSPIRSVRSP  
LLMRKTQASTVATGPEVPPPWKQEGYVASSSEAEMRETTLTSTQIRTEERWEGRYGVQEQTISG\_AAGAA\_ASVSASAS  
YAAEAVATGAKEVKQDADKSAAVATVVAAVDMARVREPVISAVEQTAQRTTTTAVHIQPAQEQVRKEAEKTAVTKVVVAAD  
KAKEQELKSRTKEV\_ITTKQEQMHVTHEQIRKETEKTFVPKVVISAAKAKEQETRIS EEI\_TK\_KQKQVTQEAI RQET\_EI  
TAASMVVVATAKSTKLE\_TVPGAQEETTTQDQMHLSYEKIMKETRKTVPKVIVATPKVKEQDLVSRGREGITTKREQVQ  
ITQEKMRKEAEKTALSTIAVATAKAKEQETILRTRETMATRQEQIQVTHGKVDVGKKA EAVATVVAAVDQARVREPREPGH  
LEESYAQQTTL EYGYKERISAAKVAEPPQRPASEPHVVPKAVKPRVIQAPSETHIKTTDQKGMHISSQIKKTTDLTTERLV  
HVDKRPRTASPHFTVSKISVPKTEHGYEASIAGSAIATLQKELSATSSAQKITKSVKAPTVPKSETRVRAEPTPLPQFPFA  
D\_\_TPDTYKSEAGVEVKKEVGVSITGTTVREERFEVLHGREAKVTETARVPAPVEIPVTPPTLV SGLKNVTVIEGESVTL E  
CHISGYPSPTVTWYREDYQIESSIDFQITFQSGIARLMIREAFAEDSGRFTCSAVNEAGTVSTSCYLAVQVSEEF EKETTA  
VTEKFTTEEKRFVESRDVVM TDTSLTEEQAGPGEP AAPYFITKPVVQKLVEGGSVVF GCQVGGNPKPHVYWKKSGVPLTTG  
YRYKVSYNKQTGECKLVISMTFADDAGEYTI VVRNKHGETSASASLLEEADYELLMKSQQEMLYQTQ\_VTAFVQEPKVGET  
APGFVYSEYEKEYEKEQALIRKKMAKDTVVVRTYVEDQEFHISSFEERLIKEIEYRIIKTTLEELLEEDGEEKMAVDISES  
EAVESGFDSRIKNYRILEGMGVTFHCKMSGYPLPKIAWYKDGKRIKHGERYQMDFLQDGRASLRIPVVLPEDEGIYTAFAS  
NIKGNAICSGKLYVEPAAPLGAPTYIPTLEPVSRI RSLSPRSVSRSPIR\_\_\_\_MSPARMSPARMSPARMSPARMSPGRRL E  
ETDESQLERLYKPVFVLKPVSFKCLEGQTARFDLKVVG RMPETFWFHDGQQIVNDYTHKVVIKEDGTQSLIIVPATPSDS  
GEWTVVAQN RAGRSSISVILTVEAVEHQVKPMFVEKLKNVNIKEGSRLEMKV RATGNPNPDIVWLKNSDIIVPHKYPKIRI  
EGTKGEAALKIDSTVSQDSAWYTATAINKAGRD TTRCKVNVEVEFAEPEPERKLIIPRGTYRAKEIAAPELEPLHLRYGQE  
QWEEGDLYDKEKQKPFFKKKLTSLRLKRFGPAHFECRLTPIGDPTMVVEWLHDGKPLEAANRLRMINEFGYCSLDYGVAY  
SRDSGIITCRATNKYGT DHTSATLIVKDEKSLVEESQLPEGRKGLQRIEELERMAHEGALTGVTTDQKEKQKPDIVLYPEP  
VRVLEGETARFRCRV TGYPQPKVNWYLNGLIRKSKRFRVRYDGIHYLDIVDCKSYDTGEVKVTAENPEGVIEHKVKLEIQ  
QREDFRSVLRRAP EPRPEFHVHEPGKLQFEVQKVDRPVDTTETKEVVKLKRAERITHEKVPEESEELRSKFKRRT EEGYYE  
AITAVELKSRKKDES YEELLRKTKDELLHWTKELT EEEKKALAE EGKITIPTFKPDKIELSPSMEAPKIFERIQSQT VQGQ  
SDAHFRVRVVGKPDPECEWYKNGVKIERSDRIYWYWPEDNVCEL VIRDVTAEDSASIMVKAINIAGETSSHAFLLVQAKQL  
ITFTQELQDVVAKEKDTMATFECETSEPFVKVKWYKDGMEVHEGDKYRMHSDRKVHFLSILTIDTSDAEDYSCVLVEDENV  
KTTAKLIVEGAVVEFVKELQDIEVPESYSGELECIVSPENIEGKWYHNDVELKSNGKYTITSRRGRQNLTVKDVT KEDQGE  
YSFVIDGKKTCTCKLMKPRPIAILQGLSDQKVCEGDIVQLEVKSLESVEGVMMKDGQEVQPSDRVHIVIDKQSHMLLIED  
MTKEDAGNYSFTIPALGLSTSGRVSVYSVDVITPLKDVNVIEGT KAVLECKVSPDVT SVKWYLNDEQIKPDDRVQAI VKG  
TKQRLVINRTHASDEGPYKLIVGRVETNCNLSVEKIKIIRGLRDLTCTETQNVVFEVELSHSGIDVLWNFKDKEIKPSSKY  
KIEAHGKIYKLTVLNMMKDDEGKYTFYAGENMTSGKLT VAGGAISKPLTDQTVAESQEAVFECEVANPDSKGEWLRDGKHL  
PLTNNIRSESDGHKRRLLIAATKLDDIGEYTYKVATSKTS AKLKVEAVKIKKTLKNLTVTETQDAVFTVELTHPNVKG VQW  
IKNGVVLESNEKYAISVKG TIYSLRIKNCAIVDES VYGFRLGRLGASARLHVETVKI IKKPKDVTALENATVAFEVSVSHD  
TVPVKWFHKSVEIKPSDKHRLVSEKRVHKLMLQNISPSDAGEYTA VVGQLECKAKLFVETLHITKTMKNIEVPETKTASFE  
CEVSHFNVP SMLKNGVEIEMSEKFKIVVQGLHQLIIMNTSTEDSAEYTFVCGNDQVSATLTVTPIMITSMLKDINAEEK  
DTITFEVTVNYEGISYKWLKNGVEIKSTDKCQMRTKKLTHSLNIRNVHFGDAADYTFVAGKATSTATLYVEARHIEFRKHI  
KDIKVLEKKRAMFECEVSEPDITVQWMKDDQELQITDRIKIQKEKYVHRL LIPSTRMSDAGKYTVVAGGNVSTAKLFVEGR  
DVRIRSIKKEVQVIEKQRAVVEFEVNEDDVDAH WYKDGIEINFQVQERHKYVVERRIHRMF ISETRQSDAGEYTFVAGRNR  
SSVTLYVNAPEPPQVLQELQPVTVQSGKPARFCAVISGRPQPKISWYKEEQLLSTGFKCKFLHDGQEYTL LLLIEAFPEDAA  
VYTCEAKNDYGVATTSASLSVEVPEVSPDQEMPVYPPAIITPLQDVTV TSEGQPARFQCRVSGTDLKVSWSYKDKKIKPSR  
FFRMTQFEDTYQLEIAEAYPEDEGTYTFVASNAVGQVSSTANLSLEAPESILHERIEQEIEMEMKEFSSSFLSAEE\_EGLH  
SAELQLSKINETLELLSESPYP\_\_TKFDSEKEGTGPIFIKEVSNAD\_\_ISMGDVATLSVTVIGIPKPKIQWFFNGVLLT  
PSADYKFVFDGDDHSLIILFTKLEDEGEYTCMASNDY GKTICSAYLKINS\_KGEGHKDTETESAVAKSLEKLGGPCPHFL  
KELKPIRCAQGLPAIF EYTVVGEPAPTVTWFKENKQLCTSVYYTIIHNPN GSGTFIVNDPQREDSGLYICKAENML\_GEST

CAAELLVLLEDTPCKAKSTPEAPEDFPQTPLKGPAVEALDSEQEIAT\_FVKDTILKAALITEENQQLSYEHIKAN  
ELSSQLPLGAQEL\_QSILEQDKLTPESTREFL\_CINGSIHQPLKEPSPNLQLQIVQSQKTFSEKILMPEEPETQAVLSD  
TEKIFPSAMSIEQINS\_LTVEPLKTLLEPEGNYPQSSIEPPMHSYLTSAEEVLSPKEKTVSDTNREQRVTLQKQEAQSA  
LILSQSLAEGHVESLQSPDVMISQVN\_YEPLVPSEHSCTEGGKILIESANPLENAGQDSAVRIEEGKSLRFLALEEKQV  
LLKEEHSNDVV\_MPPDQIIES\_KREPVAIKKVQEVQGR\_DLLSKESL\_LSGIPEEQRLNLKIQICRALQAAVASEQPGLF  
SEWLRNIEKVEVEAVNITQEP\_RHIMCMYLVTSKSVTEE\_VTIIIEDVDPQMANLKME\_LRDALCAIIEEIDILTAE  
GPRIQQGAKTSLQEEMDSFSGSQKVE\_PITEPEVESKYLISTEEVSFNVQSRVKYLDATPVTKGVASAVVSD\_E\_KQDE  
SLKPSEEKEESSSESGETEAVTVKIQ\_EAEGGLIKED\_GP\_MIHTPLVDTVSEEGDIVHLTTSITNAKEVNWYF\_ENKLV  
PSDEKFKCLQDQNTYTLVIDKVNTEDHQGEYVCEALNDSGKTA\_TSAKLTVVKRAAPVIKRIEPLAVALGHLAKFTCEIQ  
SAPNVRFQWFKAGREIYESDKCSIRSSKYISSLEILRTQVVDCGEYTCKASNEYGSVSCTATLTVTEAYPPTFLSRPKSLT  
TFVGKAAKFICTVTGTPIETIWQKDGAALSPSPNWRISDAENKHILELSNLTIQDRGVYSCKASNKFGADICQAEIIID  
KPHFIKELEPVQSAINKKVHLECQVDEDRKVTVTWSKDGQKLPPGKDYKICFEDKIATLEIPLAKLKDSGTYVCTASNEAG  
SSSCSATVTVREPPSFVKKVDP SYLMLPGESARLHCKLKGSPVIQVTFWKNKELSESNTVRMYFVNSEAILDITDVKVED  
SGSYSCEAVNDVGSDSCSTEIVIKEPPSFIKTLLEPADIVRGTNALLQCEVSGTGPFESWFKDKKQIRSSKKYRFLFSQKSL  
VCLEIFSFNSADVGEYECVAVNEVGKCGCMATHLLKEPPTFVKKVDDLIALLGGQTVTLQAAVRGSEPISVTWMKGQEVIRE  
DGKIKMSFSNGVAVLIIPDVQISFGGKYTCLAENEAGSQTSGELIVKEPAKIIERAELIQVTAGDPATLEYTVAGTPELK  
PKWKYDGRPLVASKKYRISFKNNVAQLKFYSaelHDSGQYTFEISNEVGSSSCETTFTVLDRDIAPFFTCLPLRNVDSVUNG  
TCRLDCKIAGSLPMRVSWFKDGKEIAASDRYRIAFVEGTASLEIIRVDMNDAGNFTCRATNSVGSKDSSGALIVQEPPSFV  
TKPGSKDVLPGSAVCLKSTFQGSTPLTIRWFKGNKELVSGGSCYITKEALESSLELYLVKTSDSGTYTCKVSNVAGGVECS  
ANL FVKEPATFVEKLEPSQLLKKGDATQLACKVTGTPPIKITW FANDREIKESSKHRMSFVESTAVLRLTDVGIEDSGEYM  
CEAQNEAGSDHCSSIVIVKESPYFTKEFKPIEVLKEYDVMLLAEVAGTPPFEITWFKDNTILRSRKYKTFIQDHLVSLQI  
LKFVAADAGEYQCRVTNEVGSSIC SARVTLREPPSFIKKIESTSSLRGGTAAFQATLKGSLPITVTWLKDSDEITEDDNIR  
MTFENNVASLYLSGIEVKHDGKYVCQAKNDAGIQRCALLSVKEPATITEEAVSIDVTQGD PATLQVKFSGTKEITAKWFK  
DGQELTLGSKYKISVTDTVSILKIISTEKKDSGEYTFEVQNDVGRSSCKARINVL DLIIPPSFTKKLKKMDSIKGSFIDLE  
CIVAGSHPI SIQWFKDDQEISASEKYKFSFHDNTAFLEISQLEGTDSGTYTCSATNKAGHNQCSGHLTVKEPPYFVEKPQS  
QDVNPNTRVQLKALVGGTAPMTIKWFKDNKELHSGAARSVWKDDTSTSLELFAAKATDSGTYICQLSNDVGTAT\_SKATLF  
VKEPPQFIKKPSPVLVLRNGQSTTFECQITGTPKIRVSWYLDGNEITAIQKHGISFIDGLATFQISGARVENS GTYVCEAR  
NDAGTASCSIELKVKEPPTFIRELKPVEVVKYSDVELECEVTGTPPFEVTVLKNREIRSSKKYTLTDRVSFVNLHITKCD  
PSDTGEYQCIVSNEGGS CSCSTRVALKEPPSFIKKIENTTTVLKSSATFQSTVAGSPPI SITWLKDDQILDEDDNVYISFV  
DSVATLQIRSDNGHSGRYTCQAKNESGVERCYAFLLVQEP AQIVEKAKSVDVTEKDPMTLECVVAGTPELVKWLKDGKQ  
IVPSRYFSMSFENNVASFRIQSVMKQDSGQYTFKVENDFGSSSCDAYLRVLDQNIPPSFTKKLTKMDKVLGSSIHMECKVS  
GSLPISAQWFKDGKEISTSAKYRLVCHERSVSLEVNLEEDTANYTCKVSNVAGDDACSGILTVKEPPSFLVKPGRQQA  
PDSTVEFKAILKGTPPFKIKWFKDDVELVSGPKCFIGLEGSTSFLNLYSVDASKTGQYTC HVTNDVGS DSC TMLLVTEPP  
KFVKKLEASKIVKAGDSSRLECKIAGSPEIRVWFRNEHEL PASDKYRMTFIDSVAVIQMNNLSTEDSGDFICEAQN PAGS  
TSCSTKVIVKEPPVFSSFPPIVETLKNAEVSLECELSGTPPFEVVWYKDKRQLRSSKKYKIASKNFHTSIHILNV DTS\_DI  
GEYHCKAQNEVGSDTCVCTVKLKEPPRFVSKLNSLTVVAGEPAELQASIEGAQPIFVQWLKEKEEVIRESENIRITFVENV  
ATLQFAKAEPANAGKYICQIKNDGGMRENMATLMVLEPAVIVEKAGPMTVTVGETCTLECKVAGTPELSVEWYKDGKLLTS  
SQKHKFSFYNKISSRLILSVERQDAGTYTFQVQNNVGKSSCTAVVDVSDRAVPPSFTRRLKNTGGVLGASCILECKVAGSS  
PISVAWFHEKTKIVSGAKYQTTFSDNVCTLQLNSLDSSDMGNYTCVAANVAGSDECRAVLTVQEPPSFVKEPEPLEVLPGK  
NVTFTSVIRGTPPFKVNWFRGARELVKGDRCNIFYEDTVAEELFNIDISQSGEYTCVVSNNAGQASCTTRLFVKEPAAFL  
KRLSDHSVEPGKSIILESTYTGTLPISVTWKKDGFNITTSEKCNIVTTEKTCILEILNSTKR DAGQYSCEIENEAGR DVC  
ALVSTLEPPYFVTELEPLEAAVGDSVSLQCQVAGTPEITVSWYKGDTKLRPTPEYRTYFTNNVATLVFNKVNINDSGEYTC  
KAENSIGTASSKTVFRIQERQLPPSFARQLKDIEQT VGLPVTLTCLRLNGSAPIQVCWYRDGVLLRDDENLQTSFVDNVATL  
KILQTDLSHSGQYSCSASNPLGTASSSARLTAREPKKSPFFDIKPVSIDVIAGESADFECHVTGAQPMRITWSKDNKEIRP  
GGNYTITCVGNTPHLRILKVKGKDSGQYTCQATNDVGKDMCSAQLSVKEPPKFVKKLEASKVAKQGESIQLECKISGSPEI  
KVSWFRNDSELHESWKYNMSFINSVALLTINEASAEDSGDYICEAHNGVDASCSTALTVKAPPVFTQKPSV GALKGSDV  
ILQCEISGTPPFEVVWVKDRKQVRNSKKFKITSKHFDTS LHILNLEASDVGEYHCKATNEVGSDTCSCSVKFKEPPRFVKK  
LSDTSTLIGDAVELRAIVEGFQPI SVVWLKDRGEVIRESENTRISFIDNIATLQLGSPEASNSGKYICQIKNDAGMRECSA  
VLTVLEPARIIEKPEPMTVTTGNPFALECVVTGTPELSAKWFKDGRELSADSKHHITF\_INKVASLKIPCAEMSDKGLYSF  
EVKNSVGKS NCTVSVHVS DRIVPPSFIRKLKDVNAILGASVVL ECRVSGSAPISVGWFQD GNEIVSGPKCQSSFSENVCTL  
NLSLLEPSDTGIYTCVAANVAGSDECSAVLTVQEPPSFEQTPDSVEVLPGMSLTFTSVIRGTPPFVKVWFKGSRELVPGES  
CNISLEDFVTELELFEVQPLESGDYSLVTNDAGSASCTTHLFVKEPATFVKRLADFSVETGSPIVLEATYTGTPPISVSW  
IKDEY\_LISQSERC SITMTEKSTILEILESTIEDYAQYSCLIENEAGQDICEALVSVLEPPYFIEPLEHVEAVIGEPATLQ  
CKVDGTPEIRISWYKEHTKLRSAPAYKMQFKNNVASLVINKVDHSDVGEYSCKADNSVGAVASSAVLVIKARKLPPFFARK  
LKDVHETLGFPAFECRINGSEPLQVSWYKDGVL LKDDANLQTSFVHN VATLQILQTDQSHIGQYNCSASNPLGTASSSAK  
LILSEHEVPPFFDLKPVSVDLALGESGTFKCHVTGTAPIKITWAKDNREIRPGGNYKMTLVENTATLTVLKVKGK DAGQYT

CYASNIAGKDSCSAQLGVQEPPRFIKKLEPSRIVKQDEFTRYECKIGGSPEIKVLWYKDETEIQESSKFRMSFVDSVAVLE  
MHNLSVEDSGDYTCEAHNAAGSASSSTSLKVKEPPIFRKKPHPIETLKGADVHLECELQGTPPFHVSWYKDKRELRSKKY  
KIMSENFLTSIHILNVDAAIDIGEYQCKATNDVGS DTCVGSIALKAPPRFVKKLSDISTVVGKEVQLQTTIEGAEPISVWF  
KDKGEIVRES DNIWISYSENIATLQFSRVEPANAGKYTCQIKNDAGMQECFATLSVLEPATIVEKPESIKVTTGDTCTLEC  
TVAGTPELSTKWFKDGKELTSDNKYKISFFNKVSGLKIINVAPSDSGVYSFEVQNPVGKDSCTASLQVSDRTVPPSFRKL  
KETNGLSGSSVMECKVYGSPPIVSWFHEGNEISSGRKYQTTLTDNTCALTVMLEESDSGDYTCIATNMAGSDECSAPL  
TVREPPSFVQKPDMDVLTGTNVTFTSIVKGTPPFSVSWFKGSSELVPGDRCNVSLDSVAEELFDVDTSQSGEYTCIVS  
NEAGKASCTTHLYIKAPAKFVKRLNDYSIEKGKPLILEGTFGTTPPISVTWKKNGINVTSPQRNITTTEKSAILEIPSST  
VEDAGQYNCYIENASGKDSCSAQILILEPPYFVKQLEPVKVSVDGSASLQCQLAGTPEIGVSWYKGDTKLRPTTTYKMHFR  
NNVATLVFNQVDINDSGEYICKAENSVGEVSASTFLTVEQEQKLPPSFSRQLRDVQETVGLPVVFDCAISGSEPISVSWYKD  
GKPLKDSPNVQTSFLDNTATLNIFKTDRSLAGQYSCTATNPIGSASSSARLILTEGKNPPFFDIRLAPVDAVVGESADFE  
HVTGTQPIKVSWA KDSREIRSGGKYQISYLENSAHLT\_VLKVDKGD SGQYTCYAVNEVGKDSCTAQLNIKERLIPPSFTKR  
LSETVEETEGNSFKLEGRVAGSQPITVAWYKNNIEIQPTS NCEITFKNNTLV LQVRK\_AGMNDAGLYTCKVSN DAGSALCT  
SSIVIKEPKKPPVFDQHLTPVTVSEGEYVQLSCHVQGSEPIRIQWLKAGREIKPSDRCSFSFASGTAVLELRDVAKADSGD  
YVCKASNVAGSDTTKSKVTIKDKPAVAPATKKA AVDGR LFFVSEPQSIRVVEKTTATFIAKVGGDPIPNVKWTKGKWRQLN  
QGGRVFIHQKGDEAKLEIRD TTKTDSGLYRCVAFNEHGEIESNVNLQVDERKKQEKIEGDLRAMLKKTPI LKKGAGEEEEE  
DIMELLKNVDPKEYEKYARMYGITDFRGLLQAFELLKQS QEEETHRLEIEEIERSE RDEKEFEELVSFIQQRLSQTEPVT  
IKDIENQTVLKDNDAVFEIDIKINYPEIKLSWYKGTEKLEPSDKFEISIDGDRHTLRVKNCQLKDQGNRYLVC GPHIASAK  
LTVIEPAWERHLQDVT LKEGQTCTMTCQFSVPNVKSEWFRNGRILKPQGRHKTEVEHKVHKLTIADVRAEDQGQYTC KYED  
LETS AELRIEAEPIQFTKRIQNI VVSEHQ SATFECEVSFDDAIVTWYKGPTELTESQKYNFRNDGRCHYMTIHNVT PDDEG  
VYSVIARLEPRGEARSTAELYLT TKEIKLEL KPPDIPDSRVPIPTMPIRAVPPEEIPPVVAPP IPLLPTPEEK KPPPKRI  
EVTKKAVKKDAKKV VAKPKEMTPREEIV\_KKPPPTTLIPAKAPEIIDVSSKAEEVKIMTITRKKEVQKEKEAVYEKKQAV  
HKEKRVFIESFE EPYDELEVEPYTEPFEQPYEED EDEYEEIKVEAKKEVHEEWEEDFEEGQEY YERE EGYDEGE EEWEEA  
YQEREVIQVQKEVY EESHERKVP AKVPEKKAPPPPKV IKKPVIEKIEKTSRRMEE EK VQVTKVPEVSKKIVPQKPSRTPVQ  
EEVIEVKVPAVHTKKM VISEEKMFFASHT EEEVSVTVPEVQKEIVTEEKI HVAISK RVEPPP KVP ELPEKPAPEE VAPVPI  
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QAFK  
SIHEK  
VSKI  
SETK  
KSDQ  
KTTEST  
VTRK  
TEPKA  
PEPIS  
SKPVI  
VTGLQ  
DTTV  
SSDS  
VAKFA  
VKATG  
EPRTAI\_  
WTKD  
GKAI  
TQGG  
KYKL  
SEDK  
GGFF  
LEIHK  
TDTSD  
SGLY  
TCTVK  
NSAG  
SVSSS  
CKLTI  
KAIKD  
TEAQ  
KVSTQ  
KTSEI  
TPQK  
KAVV  
QEEIS  
QKAL  
RSEE  
IKMSE  
AKS  
QEK  
LALKE  
EASK  
VLISE  
EVKKS  
AATS  
LEKS  
IVHEE  
ITKTS  
QASE  
EVRTH  
AEIK  
AFSTQ  
MSINE  
GQRL  
VLKANI  
AGAT  
DVKW  
VLNG  
VELTN  
SEEY  
RYGV  
SGSDQ  
TLTIK  
QASH  
RDEG  
ILTCI  
SKTKE  
GIVK  
CQYDL  
TSLK  
ELSD  
APAFIS  
QPRSQ  
NINE  
GQNV  
LFTCEI  
SGEPS  
PEIEW  
FKNNL  
PISISS  
NVSISR  
SRNV  
YSLEI  
RNAS  
VSDSG  
KYTI  
KAKN  
FRGQCS  
ATAS  
LMVL  
PLVEE  
PSREV  
LRTSG  
DTS  
LQGS  
FSSQ  
SVQMS  
ASKQEA  
SFSS  
FSSSS  
ASSM  
TEMKF  
ASMSA  
QSMSS  
MQES  
FVEMSS  
SSFM  
GISNMT  
QLES  
STSK  
MLKAG  
IRGIP  
PKIEAL  
PSDIS  
IDEG  
KVLTV  
ACAF  
TGEPT  
PEVTW  
SCGGR  
KIH  
SQE\_QGRF  
HIENT  
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LIIM  
DVQKQ  
DGG  
LYTSL  
LGNE  
FGSD  
SATVNI  
HIRSI

## Aligned Reference Sequence:

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LLIRKTQTTT MATGPEVPPPWKQEGYVASSTEAE MRETTMTSSTQIRREERWEGRYGVQE QVTISGAAAAAASASVS\_S\_S  
FTAGAITTGTKEVKQETDKSAAVATVVAAVDMARVREPAISAVEQTAQRTTTTAVHIQPAQE QARKEAEKTAVTKVVVAAD  
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HVDKRPRTASPHFTVSKISVPKTEHGYEASIAGSAIATLQKELSATSSTQKITKSVKAPT VKPGETRVRAEPTPSPQFPFA  
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CHISGYSPSKVTWYREDYQIESSIDFQITFQGGIARLMIREAFAEDSGRFTCSAVNEAGTVSTSCYLAVQVSE EFDKETT\_  
LTEKFATEEKRFVESRDVMTDTSITEEQAGPGEP AAPFFISKPVVQKLVEGGSVVFECQIGGNPKPHVYWKSGVPLTTG  
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NIKGNAICSGKLYVEPAAPFSAPTYMPTPEAVSRIRSVSPRSLSRSPIRMSPAMSPARMSPARMSPARMSPARMSPGRRL E  
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GEWTVVAQN RAGKSTISVTLTVEAVEHQIKPAFVEKLKNVNIKEGSRLEMKV RATGNPNPDIVWLKNSDIIVPHKYPRIRI  
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\_\_\_\_FPGASSAAQ\_VSPVTIKPLITLTAEPKGNYPQSSTAAPDHALLSSVAAETLQLGEK\_\_KIPE\_\_V\_\_DK\_\_AQRA  
LLLSQSLAEGCVESLEVPDVAVS\_\_NMRSEPQVPFQHTCTE\_GKILMASADTLKSTGQDVALRTEEGKSLSFPLALEEKQV  
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SEWLRNIDKVEVTAVNFTQEPKR\_ILCTYLITSVSSLTEELTVT\_\_IEDIDPQMANL\_\_ETGLKDALCSIVCEERNILMAE  
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