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<120> Inactivated SARS-CoV-2 Virus Vaccine

<130> P6132WO00

<150> EP 20168324.0
<151> 2020-04-06

<150> EP 20202118.4
<151> 2020-10-15

<150> EP 20211853.5
<151> 2020-12-04

<150> EP 21154647.8
<151> 2021-02-01

<150> EP 21160913.6
<151> 2021-03-05

<150> US 21/20313
<151> 2021-03-01

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<170> PatentIn version 3.5

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Asp Ser Val Glu Glu Val Leu Ser Glu Ala Arg Gln His Leu Lys Asp
35 40 45

Gly Thr Cys Gly Leu Val Glu Val Glu Lys Gly Val Leu Pro Gln Leu
50 55 60

Glu Gln Pro Tyr Val Phe Ile Lys Arg Ser Asp Ala Arg Thr Ala Pro
65 70 75 80

His Gly His Val Met Val Glu Leu Val Ala Glu Leu Glu Gly Ile Gln
85 90 95

Tyr Gly Arg Ser Gly Glu Thr Leu Gly Val Leu Val Pro His Val Gly
100 105 110

Glu Ile Pro Val Ala Tyr Arg Lys Val Leu Leu Arg Lys Asn Gly Asn
115 120 125

Lys Gly Ala Gly Gly His Ser Tyr Gly Ala Asp Leu Lys Ser Phe Asp
130 135 140

Leu Gly Asp Glu Leu Gly Thr Asp Pro Tyr Glu Asp Phe Gln Glu Asn
145 150 155 160

```
Trp Asn Thr Lys His Ser Ser Gly Val Thr Arg Glu Leu Met Arg Glu
                165                 170                 175

Leu Asn Gly Gly Ala Tyr Thr Arg Tyr Val Asp Asn Asn Phe Cys Gly
            180                 185                 190

Pro Asp Gly Tyr Pro Leu Glu Cys Ile Lys Asp Leu Leu Ala Arg Ala
        195                 200                 205

Gly Lys Ala Ser Cys Thr Leu Ser Glu Gln Leu Asp Phe Ile Asp Thr
    210                 215                 220

Lys Arg Gly Val Tyr Cys Cys Arg Glu His Glu His Glu Ile Ala Trp
225                 230                 235                 240

Tyr Thr Glu Arg Ser Glu Lys Ser Tyr Glu Leu Gln Thr Pro Phe Glu
                245                 250                 255

Ile Lys Leu Ala Lys Lys Phe Asp Thr Phe Asn Gly Glu Cys Pro Asn
            260                 265                 270

Phe Val Phe Pro Leu Asn Ser Ile Ile Lys Thr Ile Gln Pro Arg Val
        275                 280                 285

Glu Lys Lys Lys Leu Asp Gly Phe Met Gly Arg Ile Arg Ser Val Tyr
    290                 295                 300

Pro Val Ala Ser Pro Asn Glu Cys Asn Gln Met Cys Leu Ser Thr Leu
305                 310                 315                 320

Met Lys Cys Asp His Cys Gly Glu Thr Ser Trp Gln Thr Gly Asp Phe
                325                 330                 335

Val Lys Ala Thr Cys Glu Phe Cys Gly Thr Glu Asn Leu Thr Lys Glu
            340                 345                 350

Gly Ala Thr Thr Cys Gly Tyr Leu Pro Gln Asn Ala Val Val Lys Ile
        355                 360                 365
```

```
Tyr Cys Pro Ala Cys His Asn Ser Glu Val Gly Pro Glu His Ser Leu
    370                 375                 380

Ala Glu Tyr His Asn Glu Ser Gly Leu Lys Thr Ile Leu Arg Lys Gly
385                 390                 395                 400

Gly Arg Thr Ile Ala Phe Gly Gly Cys Val Phe Ser Tyr Val Gly Cys
                405                 410                 415

His Asn Lys Cys Ala Tyr Trp Val Pro Arg Ala Ser Ala Asn Ile Gly
            420                 425                 430

Cys Asn His Thr Gly Val Val Gly Glu Gly Ser Glu Gly Leu Asn Asp
        435                 440                 445

Asn Leu Leu Glu Ile Leu Gln Lys Glu Lys Val Asn Ile Asn Ile Val
    450                 455                 460

Gly Asp Phe Lys Leu Asn Glu Glu Ile Ala Ile Ile Leu Ala Ser Phe
465                 470                 475                 480

Ser Ala Ser Thr Ser Ala Phe Val Glu Thr Val Lys Gly Leu Asp Tyr
                485                 490                 495

Lys Ala Phe Lys Gln Ile Val Glu Ser Cys Gly Asn Phe Lys Val Thr
            500                 505                 510

Lys Gly Lys Ala Lys Lys Gly Ala Trp Asn Ile Gly Glu Gln Lys Ser
        515                 520                 525

Ile Leu Ser Pro Leu Tyr Ala Phe Ala Ser Glu Ala Ala Arg Val Val
    530                 535                 540

Arg Ser Ile Phe Ser Arg Thr Leu Glu Thr Ala Gln Asn Ser Val Arg
545                 550                 555                 560

Val Leu Gln Lys Ala Ala Ile Thr Ile Leu Asp Gly Ile Ser Gln Tyr
                565                 570                 575

Ser Leu Arg Leu Ile Asp Ala Met Met Phe Thr Ser Asp Leu Ala Thr
            580                 585                 590
```

```
Asn Asn Leu Val Val Met Ala Tyr Ile Thr Gly Gly Val Val Gln Leu
        595                 600                 605

Thr Ser Gln Trp Leu Thr Asn Ile Phe Gly Thr Val Tyr Glu Lys Leu
    610                 615                 620

Lys Pro Val Leu Asp Trp Leu Glu Glu Lys Phe Lys Glu Gly Val Glu
625                 630                 635                 640

Phe Leu Arg Asp Gly Trp Glu Ile Val Lys Phe Ile Ser Thr Cys Ala
                645                 650                 655

Cys Glu Ile Val Gly Gly Gln Ile Val Thr Cys Ala Lys Glu Ile Lys
            660                 665                 670

Glu Ser Val Gln Thr Phe Phe Lys Leu Val Asn Lys Phe Leu Ala Leu
        675                 680                 685

Cys Ala Asp Ser Ile Ile Ile Gly Gly Ala Lys Leu Lys Ala Leu Asn
    690                 695                 700

Leu Gly Glu Thr Phe Val Thr His Ser Lys Gly Leu Tyr Arg Lys Cys
705                 710                 715                 720

Val Lys Ser Arg Glu Glu Thr Gly Leu Leu Met Pro Leu Lys Ala Pro
                725                 730                 735

Lys Glu Ile Ile Phe Leu Glu Gly Glu Thr Leu Pro Thr Glu Val Leu
            740                 745                 750

Thr Glu Glu Val Val Leu Lys Thr Gly Asp Leu Gln Pro Leu Glu Gln
        755                 760                 765

Pro Thr Ser Glu Ala Val Glu Ala Pro Leu Val Gly Thr Pro Val Cys
    770                 775                 780

Ile Asn Gly Leu Met Leu Leu Glu Ile Lys Asp Thr Glu Lys Tyr Cys
785                 790                 795                 800
```

```
Ala Leu Ala Pro Asn Met Met Val Thr Asn Asn Thr Phe Thr Leu Lys
                805                 810                 815

Gly Gly Ala Pro Thr Lys Val Thr Phe Gly Asp Asp Thr Val Ile Glu
            820                 825                 830

Val Gln Gly Tyr Lys Ser Val Asn Ile Thr Phe Glu Leu Asp Glu Arg
        835                 840                 845

Ile Asp Lys Val Leu Asn Glu Lys Cys Ser Ala Tyr Thr Val Glu Leu
    850                 855                 860

Gly Thr Glu Val Asn Glu Phe Ala Cys Val Val Ala Asp Ala Val Ile
865                 870                 875                 880

Lys Thr Leu Gln Pro Val Ser Glu Leu Leu Thr Pro Leu Gly Ile Asp
                885                 890                 895

Leu Asp Glu Trp Ser Met Ala Thr Tyr Tyr Leu Phe Asp Glu Ser Gly
            900                 905                 910

Glu Phe Lys Leu Ala Ser His Met Tyr Cys Ser Phe Tyr Pro Pro Asp
        915                 920                 925

Glu Asp Glu Glu Glu Gly Asp Cys Glu Glu Glu Glu Phe Glu Pro Ser
    930                 935                 940

Thr Gln Tyr Glu Tyr Gly Thr Glu Asp Asp Tyr Gln Gly Lys Pro Leu
945                 950                 955                 960

Glu Phe Gly Ala Thr Ser Ala Ala Leu Gln Pro Glu Glu Glu Gln Glu
                965                 970                 975

Glu Asp Trp Leu Asp Asp Asp Ser Gln Gln Thr Val Gly Gln Gln Asp
            980                 985                 990

Gly Ser Glu Asp Asn Gln Thr Thr  Thr Ile Gln Thr Ile  Val Glu Val
        995                 1000                1005

Gln Pro  Gln Leu Glu Met Glu  Leu Thr Pro Val Val  Gln Thr Ile
    1010                1015                1020
```

```
Glu Val  Asn Ser Phe Ser Gly  Tyr Leu Lys Leu Thr  Asp Asn Val
    1025                1030                1035

Tyr Ile  Lys Asn Ala Asp Ile  Val Glu Glu Ala Lys  Lys Val Lys
    1040                1045                1050

Pro Thr  Val Val Val Asn Ala  Ala Asn Val Tyr Leu  Lys His Gly
    1055                1060                1065

Gly Gly  Val Ala Gly Ala Leu  Asn Lys Ala Thr Asn  Asn Ala Met
    1070                1075                1080

Gln Val  Glu Ser Asp Asp Tyr  Ile Ala Thr Asn Gly  Pro Leu Lys
    1085                1090                1095

Val Gly  Gly Ser Cys Val Leu  Ser Gly His Asn Leu  Ala Lys His
    1100                1105                1110

Cys Leu  His Val Val Gly Pro  Asn Val Asn Lys Gly  Glu Asp Ile
    1115                1120                1125

Gln Leu  Leu Lys Ser Ala Tyr  Glu Asn Phe Asn Gln  His Glu Val
    1130                1135                1140

Leu Leu  Ala Pro Leu Leu Ser  Ala Gly Ile Phe Gly  Ala Asp Pro
    1145                1150                1155

Ile His  Ser Leu Arg Val Cys  Val Asp Thr Val Arg  Thr Asn Val
    1160                1165                1170

Tyr Leu  Ala Val Phe Asp Lys  Asn Leu Tyr Asp Lys  Leu Val Ser
    1175                1180                1185

Ser Phe  Leu Glu Met Lys Ser  Glu Lys Gln Val Glu  Gln Lys Ile
    1190                1195                1200

Ala Glu  Ile Pro Lys Glu Glu  Val Lys Pro Phe Ile  Thr Glu Ser
    1205                1210                1215
```

```
Lys Pro  Ser Val Glu Gln Arg  Lys Gln Asp Asp Lys  Lys Ile Lys
    1220                1225                1230

Ala Cys  Val Glu Glu Val Thr  Thr Thr Leu Glu Glu  Thr Lys Phe
    1235                1240                1245

Leu Thr  Glu Asn Leu Leu Leu  Tyr Ile Asp Ile Asn  Gly Asn Leu
    1250                1255                1260

His Pro  Asp Ser Ala Thr Leu  Val Ser Asp Ile Asp  Ile Thr Phe
    1265                1270                1275

Leu Lys  Lys Asp Ala Pro Tyr  Ile Val Gly Asp Val  Val Gln Glu
    1280                1285                1290

Gly Val  Leu Thr Ala Val Val  Ile Pro Thr Lys Lys  Ala Gly Gly
    1295                1300                1305

Thr Thr  Glu Met Leu Ala Lys  Ala Leu Arg Lys Val  Pro Thr Asp
    1310                1315                1320

Asn Tyr  Ile Thr Thr Tyr Pro  Gly Gln Gly Leu Asn  Gly Tyr Thr
    1325                1330                1335

Val Glu  Glu Ala Lys Thr Val  Leu Lys Lys Cys Lys  Ser Ala Phe
    1340                1345                1350

Tyr Ile  Leu Pro Ser Ile Ile  Ser Asn Glu Lys Gln  Glu Ile Leu
    1355                1360                1365

Gly Thr  Val Ser Trp Asn Leu  Arg Glu Met Leu Ala  His Ala Glu
    1370                1375                1380

Glu Thr  Arg Lys Leu Met Pro  Val Cys Val Glu Thr  Lys Ala Ile
    1385                1390                1395

Val Ser  Thr Ile Gln Arg Lys  Tyr Lys Gly Ile Lys  Ile Gln Glu
    1400                1405                1410

Gly Val  Val Asp Tyr Gly Ala  Arg Phe Tyr Phe Tyr  Thr Ser Lys
    1415                1420                1425
```

```
Thr Thr  Val Ala Ser Leu Ile  Asn Thr Leu Asn Asp  Leu Asn Glu
    1430                1435                1440

Thr Leu  Val Thr Met Pro Leu  Gly Tyr Val Thr His  Gly Leu Asn
    1445                1450                1455

Leu Glu  Glu Ala Ala Arg Tyr  Met Arg Ser Leu Lys  Val Pro Ala
    1460                1465                1470

Thr Val  Ser Val Ser Ser Pro  Asp Ala Val Thr Ala  Tyr Asn Gly
    1475                1480                1485

Tyr Leu  Thr Ser Ser Ser Lys  Thr Pro Glu Glu His  Phe Ile Glu
    1490                1495                1500

Thr Ile  Ser Leu Ala Gly Ser  Tyr Lys Asp Trp Ser  Tyr Ser Gly
    1505                1510                1515

Gln Ser  Thr Gln Leu Gly Ile  Glu Phe Leu Lys Arg  Gly Asp Lys
    1520                1525                1530

Ser Val  Tyr Tyr Thr Ser Asn  Pro Thr Thr Phe His  Leu Asp Gly
    1535                1540                1545

Glu Val  Ile Thr Phe Asp Asn  Leu Lys Thr Leu Leu  Ser Leu Arg
    1550                1555                1560

Glu Val  Arg Thr Ile Lys Val  Phe Thr Thr Val Asp  Asn Ile Asn
    1565                1570                1575

Leu His  Thr Gln Val Val Asp  Met Ser Met Thr Tyr  Gly Gln Gln
    1580                1585                1590

Phe Gly  Pro Thr Tyr Leu Asp  Gly Ala Asp Val Thr  Lys Ile Lys
    1595                1600                1605

Pro His  Asn Ser His Glu Gly  Lys Thr Phe Tyr Val  Leu Pro Asn
    1610                1615                1620
```

```
Asp Asp  Thr Leu Arg Val Glu  Ala Phe Glu Tyr Tyr  His Thr Thr
    1625                1630                1635

Asp Pro  Ser Phe Leu Gly Arg  Tyr Met Ser Ala Leu  Asn His Thr
    1640                1645                1650

Lys Lys  Trp Lys Tyr Pro Gln  Val Asn Gly Leu Thr  Ser Ile Lys
    1655                1660                1665

Trp Ala  Asp Asn Asn Cys Tyr  Leu Ala Thr Ala Leu  Leu Thr Leu
    1670                1675                1680

Gln Gln  Ile Glu Leu Lys Phe  Asn Pro Pro Ala Leu  Gln Asp Ala
    1685                1690                1695

Tyr Tyr  Arg Ala Arg Ala Gly  Glu Ala Ala Asn Phe  Cys Ala Leu
    1700                1705                1710

Ile Leu  Ala Tyr Cys Asn Lys  Thr Val Gly Glu Leu  Gly Asp Val
    1715                1720                1725

Arg Glu  Thr Met Ser Tyr Leu  Phe Gln His Ala Asn  Leu Asp Ser
    1730                1735                1740

Cys Lys  Arg Val Leu Asn Val  Val Cys Lys Thr Cys  Gly Gln Gln
    1745                1750                1755

Gln Thr  Thr Leu Lys Gly Val  Glu Ala Val Met Tyr  Met Gly Thr
    1760                1765                1770

Leu Ser  Tyr Glu Gln Phe Lys  Lys Gly Val Gln Ile  Pro Cys Thr
    1775                1780                1785

Cys Gly  Lys Gln Ala Thr Lys  Tyr Leu Val Gln Gln  Glu Ser Pro
    1790                1795                1800

Phe Val  Met Met Ser Ala Pro  Pro Ala Gln Tyr Glu  Leu Lys His
    1805                1810                1815

Gly Thr  Phe Thr Cys Ala Ser  Glu Tyr Thr Gly Asn  Tyr Gln Cys
    1820                1825                1830
```

```
Gly His  Tyr Lys His Ile Thr  Ser Lys Glu Thr Leu  Tyr Cys Ile
    1835                1840                1845

Asp Gly  Ala Leu Leu Thr Lys  Ser Ser Glu Tyr Lys  Gly Pro Ile
    1850                1855                1860

Thr Asp  Val Phe Tyr Lys Glu  Asn Ser Tyr Thr Thr  Thr Ile Lys
    1865                1870                1875

Pro Val  Thr Tyr Lys Leu Asp  Gly Val Val Cys Thr  Glu Ile Asp
    1880                1885                1890

Pro Lys  Leu Asp Asn Tyr Tyr  Lys Lys Asp Asn Ser  Tyr Phe Thr
    1895                1900                1905

Glu Gln  Pro Ile Asp Leu Val  Pro Asn Gln Pro Tyr  Pro Asn Ala
    1910                1915                1920

Ser Phe  Asp Asn Phe Lys Phe  Val Cys Asp Asn Ile  Lys Phe Ala
    1925                1930                1935

Asp Asp  Leu Asn Gln Leu Thr  Gly Tyr Lys Lys Pro  Ala Ser Arg
    1940                1945                1950

Glu Leu  Lys Val Thr Phe Phe  Pro Asp Leu Asn Gly  Asp Val Val
    1955                1960                1965

Ala Ile  Asp Tyr Lys His Tyr  Thr Pro Ser Phe Lys  Lys Gly Ala
    1970                1975                1980

Lys Leu  Leu His Lys Pro Ile  Val Trp His Val Asn  Asn Ala Thr
    1985                1990                1995

Asn Lys  Ala Thr Tyr Lys Pro  Asn Thr Trp Cys Ile  Arg Cys Leu
    2000                2005                2010

Trp Ser  Thr Lys Pro Val Glu  Thr Ser Asn Ser Phe  Asp Val Leu
    2015                2020                2025
```

```
Lys Ser  Glu Asp Ala Gln Gly  Met Asp Asn Leu Ala  Cys Glu Asp
    2030                2035                2040

Leu Lys  Pro Val Ser Glu Glu  Val Val Glu Asn Pro  Thr Ile Gln
    2045                2050                2055

Lys Asp  Val Leu Glu Cys Asn  Val Lys Thr Thr Glu  Val Val Gly
    2060                2065                2070

Asp Ile  Ile Leu Lys Pro Ala  Asn Asn Ser Leu Lys  Ile Thr Glu
    2075                2080                2085

Glu Val  Gly His Thr Asp Leu  Met Ala Ala Tyr Val  Asp Asn Ser
    2090                2095                2100

Ser Leu  Thr Ile Lys Lys Pro  Asn Glu Leu Ser Arg  Val Leu Gly
    2105                2110                2115

Leu Lys  Thr Leu Ala Thr His  Gly Leu Ala Ala Val  Asn Ser Val
    2120                2125                2130

Pro Trp  Asp Thr Ile Ala Asn  Tyr Ala Lys Pro Phe  Leu Asn Lys
    2135                2140                2145

Val Val  Ser Thr Thr Thr Asn  Ile Val Thr Arg Cys  Leu Asn Arg
    2150                2155                2160

Val Cys  Thr Asn Tyr Met Pro  Tyr Phe Phe Thr Leu  Leu Leu Gln
    2165                2170                2175

Leu Cys  Thr Phe Thr Arg Ser  Thr Asn Ser Arg Ile  Lys Ala Ser
    2180                2185                2190

Met Pro  Thr Thr Ile Ala Lys  Asn Thr Val Lys Ser  Val Gly Lys
    2195                2200                2205

Phe Cys  Leu Glu Ala Ser Phe  Asn Tyr Leu Lys Ser  Pro Asn Phe
    2210                2215                2220

Ser Lys  Leu Ile Asn Ile Ile  Ile Trp Phe Leu Leu  Leu Ser Val
    2225                2230                2235
```

```
Cys Leu  Gly Ser Leu Ile Tyr  Ser Thr Ala Ala Leu  Gly Val Leu
    2240                2245                2250

Met Ser  Asn Leu Gly Met Pro  Ser Tyr Cys Thr Gly  Tyr Arg Glu
    2255                2260                2265

Gly Tyr  Leu Asn Ser Thr Asn  Val Thr Ile Ala Thr  Tyr Cys Thr
    2270                2275                2280

Gly Ser  Ile Pro Cys Ser Val  Cys Leu Ser Gly Leu  Asp Ser Leu
    2285                2290                2295

Asp Thr  Tyr Pro Ser Leu Glu  Thr Ile Gln Ile Thr  Ile Ser Ser
    2300                2305                2310

Phe Lys  Trp Asp Leu Thr Ala  Phe Gly Leu Val Ala  Glu Trp Phe
    2315                2320                2325

Leu Ala  Tyr Ile Leu Phe Thr  Arg Phe Phe Tyr Val  Leu Gly Leu
    2330                2335                2340

Ala Ala  Ile Met Gln Leu Phe  Phe Ser Tyr Phe Ala  Val His Phe
    2345                2350                2355

Ile Ser  Asn Ser Trp Leu Met  Trp Leu Ile Ile Asn  Leu Val Gln
    2360                2365                2370

Met Ala  Pro Ile Ser Ala Met  Val Arg Met Tyr Ile  Phe Phe Ala
    2375                2380                2385

Ser Phe  Tyr Tyr Val Trp Lys  Ser Tyr Val His Val  Val Asp Gly
    2390                2395                2400

Cys Asn  Ser Ser Thr Cys Met  Met Cys Tyr Lys Arg  Asn Arg Ala
    2405                2410                2415

Thr Arg  Val Glu Cys Thr Thr  Ile Val Asn Gly Val  Arg Arg Ser
    2420                2425                2430
```

```
Phe Tyr  Val Tyr Ala Asn Gly  Gly Lys Gly Phe Cys  Lys Leu His
    2435                2440                2445

Asn Trp  Asn Cys Val Asn Cys  Asp Thr Phe Cys Ala  Gly Ser Thr
    2450                2455                2460

Phe Ile  Ser Asp Glu Val Ala  Arg Asp Leu Ser Leu  Gln Phe Lys
    2465                2470                2475

Arg Pro  Ile Asn Pro Thr Asp  Gln Ser Ser Tyr Ile  Val Asp Ser
    2480                2485                2490

Val Thr  Val Lys Asn Gly Ser  Ile His Leu Tyr Phe  Asp Lys Ala
    2495                2500                2505

Gly Gln  Lys Thr Tyr Glu Arg  His Ser Leu Ser His  Phe Val Asn
    2510                2515                2520

Leu Asp  Asn Leu Arg Ala Asn  Asn Thr Lys Gly Ser  Leu Pro Ile
    2525                2530                2535

Asn Val  Ile Val Phe Asp Gly  Lys Ser Lys Cys Glu  Glu Ser Ser
    2540                2545                2550

Ala Lys  Ser Ala Ser Val Tyr  Tyr Ser Gln Leu Met  Cys Gln Pro
    2555                2560                2565

Ile Leu  Leu Leu Asp Gln Ala  Leu Val Ser Asp Val  Gly Asp Ser
    2570                2575                2580

Ala Glu  Val Ala Val Lys Met  Phe Asp Ala Tyr Val  Asn Thr Phe
    2585                2590                2595

Ser Ser  Thr Phe Asn Val Pro  Met Glu Lys Leu Lys  Thr Leu Val
    2600                2605                2610

Ala Thr  Ala Glu Ala Glu Leu  Ala Lys Asn Val Ser  Leu Asp Asn
    2615                2620                2625

Val Leu  Ser Thr Phe Ile Ser  Ala Ala Arg Gln Gly  Phe Val Asp
    2630                2635                2640
```

```
Ser Asp  Val Glu Thr Lys Asp  Val Val Glu Cys Leu  Lys Leu Ser
    2645                 2650                 2655

His Gln  Ser Asp Ile Glu Val  Thr Gly Asp Ser Cys  Asn Asn Tyr
    2660                 2665                 2670

Met Leu  Thr Tyr Asn Lys Val  Glu Asn Met Thr Pro  Arg Asp Leu
    2675                 2680                 2685

Gly Ala  Cys Ile Asp Cys Ser  Ala Arg His Ile Asn  Ala Gln Val
    2690                 2695                 2700

Ala Lys  Ser His Asn Ile Ala  Leu Ile Trp Asn Val  Lys Asp Phe
    2705                 2710                 2715

Met Ser  Leu Ser Glu Gln Leu  Arg Lys Gln Ile Arg  Ser Ala Ala
    2720                 2725                 2730

Lys Lys  Asn Asn Leu Pro Phe  Lys Leu Thr Cys Ala  Thr Thr Arg
    2735                 2740                 2745

Gln Val  Val Asn Val Val Thr  Thr Lys Ile Ala Leu  Lys Gly Gly
    2750                 2755                 2760

Lys Ile  Val Asn Asn Trp Leu  Lys Gln Leu Ile Lys  Val Thr Leu
    2765                 2770                 2775

Val Phe  Leu Phe Val Ala Ala  Ile Phe Tyr Leu Ile  Thr Pro Val
    2780                 2785                 2790

His Val  Met Ser Lys His Thr  Asp Phe Ser Ser Glu  Ile Ile Gly
    2795                 2800                 2805

Tyr Lys  Ala Ile Asp Gly Gly  Val Thr Arg Asp Ile  Ala Ser Thr
    2810                 2815                 2820

Asp Thr  Cys Phe Ala Asn Lys  His Ala Asp Phe Asp  Thr Trp Phe
    2825                 2830                 2835
```

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Ser Gln  Arg Gly Gly Ser Tyr  Thr Asn Asp Lys Ala  Cys Pro Leu
    2840                 2845                 2850

Ile Ala  Ala Val Ile Thr Arg  Glu Val Gly Phe Val  Val Pro Gly
    2855                 2860                 2865

Leu Pro  Gly Thr Ile Leu Arg  Thr Thr Asn Gly Asp  Phe Leu His
    2870                 2875                 2880

Phe Leu  Pro Arg Val Phe Ser  Ala Val Gly Asn Ile  Cys Tyr Thr
    2885                 2890                 2895

Pro Ser  Lys Leu Ile Glu Tyr  Thr Asp Phe Ala Thr  Ser Ala Cys
    2900                 2905                 2910

Val Leu  Ala Ala Glu Cys Thr  Ile Phe Lys Asp Ala  Ser Gly Lys
    2915                 2920                 2925

Pro Val  Pro Tyr Cys Tyr Asp  Thr Asn Val Leu Glu  Gly Ser Val
    2930                 2935                 2940

Ala Tyr  Glu Ser Leu Arg Pro  Asp Thr Arg Tyr Val  Leu Met Asp
    2945                 2950                 2955

Gly Ser  Ile Ile Gln Phe Pro  Asn Thr Tyr Leu Glu  Gly Ser Val
    2960                 2965                 2970

Arg Val  Val Thr Thr Phe Asp  Ser Glu Tyr Cys Arg  His Gly Thr
    2975                 2980                 2985

Cys Glu  Arg Ser Glu Ala Gly  Val Cys Val Ser Thr  Ser Gly Arg
    2990                 2995                 3000

Trp Val  Leu Asn Asn Asp Tyr  Tyr Arg Ser Leu Pro  Gly Val Phe
    3005                 3010                 3015

Cys Gly  Val Asp Ala Val Asn  Leu Leu Thr Asn Met  Phe Thr Pro
    3020                 3025                 3030

Leu Ile  Gln Pro Ile Gly Ala  Leu Asp Ile Ser Ala  Ser Ile Val
    3035                 3040                 3045
```

```
Ala Gly  Gly Ile Val Ala Ile  Val Val Thr Cys Leu  Ala Tyr Tyr
    3050                 3055                 3060

Phe Met  Arg Phe Arg Arg Ala  Phe Gly Glu Tyr Ser  His Val Val
    3065                 3070                 3075

Ala Phe  Asn Thr Leu Leu Phe  Leu Met Ser Phe Thr  Val Leu Cys
    3080                 3085                 3090

Leu Thr  Pro Val Tyr Ser Phe  Leu Pro Gly Val Tyr  Ser Val Ile
    3095                 3100                 3105

Tyr Leu  Tyr Leu Thr Phe Tyr  Leu Thr Asn Asp Val  Ser Phe Leu
    3110                 3115                 3120

Ala His  Ile Gln Trp Met Val  Met Phe Thr Pro Leu  Val Pro Phe
    3125                 3130                 3135

Trp Ile  Thr Ile Ala Tyr Ile  Ile Cys Ile Ser Thr  Lys His Phe
    3140                 3145                 3150

Tyr Trp  Phe Phe Ser Asn Tyr  Leu Lys Arg Arg Val  Val Phe Asn
    3155                 3160                 3165

Gly Val  Ser Phe Ser Thr Phe  Glu Glu Ala Ala Leu  Cys Thr Phe
    3170                 3175                 3180

Leu Leu  Asn Lys Glu Met Tyr  Leu Lys Leu Arg Ser  Asp Val Leu
    3185                 3190                 3195

Leu Pro  Leu Thr Gln Tyr Asn  Arg Tyr Leu Ala Leu  Tyr Asn Lys
    3200                 3205                 3210

Tyr Lys  Tyr Phe Ser Gly Ala  Met Asp Thr Thr Ser  Tyr Arg Glu
    3215                 3220                 3225

Ala Ala  Cys Cys His Leu Ala  Lys Ala Leu Asn Asp  Phe Ser Asn
    3230                 3235                 3240
```

```
Ser Gly  Ser Asp Val Leu Tyr  Gln Pro Pro Gln Thr  Ser Ile Thr
    3245                 3250                 3255

Ser Ala  Val Leu Gln Ser Gly  Phe Arg Lys Met Ala  Phe Pro Ser
    3260                 3265                 3270

Gly Lys  Val Glu Gly Cys Met  Val Gln Val Thr Cys  Gly Thr Thr
    3275                 3280                 3285

Thr Leu  Asn Gly Leu Trp Leu  Asp Asp Val Val Tyr  Cys Pro Arg
    3290                 3295                 3300

His Val  Ile Cys Thr Ser Glu  Asp Met Leu Asn Pro  Asn Tyr Glu
    3305                 3310                 3315

Asp Leu  Leu Ile Arg Lys Ser  Asn His Asn Phe Leu  Val Gln Ala
    3320                 3325                 3330

Gly Asn  Val Gln Leu Arg Val  Ile Gly His Ser Met  Gln Asn Cys
    3335                 3340                 3345

Val Leu  Lys Leu Lys Val Asp  Thr Ala Asn Pro Lys  Thr Pro Lys
    3350                 3355                 3360

Tyr Lys  Phe Val Arg Ile Gln  Pro Gly Gln Thr Phe  Ser Val Leu
    3365                 3370                 3375

Ala Cys  Tyr Asn Gly Ser Pro  Ser Gly Val Tyr Gln  Cys Ala Met
    3380                 3385                 3390

Arg Pro  Asn Phe Thr Ile Lys  Gly Ser Phe Leu Asn  Gly Ser Cys
    3395                 3400                 3405

Gly Ser  Val Gly Phe Asn Ile  Asp Tyr Asp Cys Val  Ser Phe Cys
    3410                 3415                 3420

Tyr Met  His His Met Glu Leu  Pro Thr Gly Val His  Ala Gly Thr
    3425                 3430                 3435

Asp Leu  Glu Gly Asn Phe Tyr  Gly Pro Phe Val Asp  Arg Gln Thr
    3440                 3445                 3450
```

```
Ala Gln  Ala Ala Gly Thr Asp  Thr Thr Ile Thr Val  Asn Val Leu
    3455                 3460                 3465

Ala Trp  Leu Tyr Ala Ala Val  Ile Asn Gly Asp Arg  Trp Phe Leu
    3470                 3475                 3480

Asn Arg  Phe Thr Thr Thr Leu  Asn Asp Phe Asn Leu  Val Ala Met
    3485                 3490                 3495

Lys Tyr  Asn Tyr Glu Pro Leu  Thr Gln Asp His Val  Asp Ile Leu
    3500                 3505                 3510

Gly Pro  Leu Ser Ala Gln Thr  Gly Ile Ala Val Leu  Asp Met Cys
    3515                 3520                 3525

Ala Ser  Leu Lys Glu Leu Leu  Gln Asn Gly Met Asn  Gly Arg Thr
    3530                 3535                 3540

Ile Leu  Gly Ser Ala Leu Leu  Glu Asp Glu Phe Thr  Pro Phe Asp
    3545                 3550                 3555

Val Val  Arg Gln Cys Ser Gly  Val Thr Phe Gln Ser  Ala Val Lys
    3560                 3565                 3570

Arg Thr  Ile Lys Gly Thr His  His Trp Leu Leu Leu  Thr Ile Leu
    3575                 3580                 3585

Thr Ser  Leu Leu Val Leu Val  Gln Ser Thr Gln Trp  Ser Leu Phe
    3590                 3595                 3600

Phe Phe  Leu Tyr Glu Asn Ala  Phe Leu Pro Phe Ala  Met Gly Ile
    3605                 3610                 3615

Ile Ala  Met Ser Ala Phe Ala  Met Met Phe Val Lys  His Lys His
    3620                 3625                 3630

Ala Phe  Leu Cys Leu Phe Leu  Leu Pro Ser Leu Ala  Thr Val Ala
    3635                 3640                 3645
```

```
Tyr Phe  Asn Met Val Tyr Met  Pro Ala Ser Trp Val  Met Arg Ile
    3650                3655                3660

Met Thr  Trp Leu Asp Met Val  Asp Thr Ser Leu Ser  Gly Phe Lys
    3665                3670                3675

Leu Lys  Asp Cys Val Met Tyr  Ala Ser Ala Val Val  Leu Leu Ile
    3680                3685                3690

Leu Met  Thr Ala Arg Thr Val  Tyr Asp Asp Gly Ala  Arg Arg Val
    3695                3700                3705

Trp Thr  Leu Met Asn Val Leu  Thr Leu Val Tyr Lys  Val Tyr Tyr
    3710                3715                3720

Gly Asn  Ala Leu Asp Gln Ala  Ile Ser Met Trp Ala  Leu Ile Ile
    3725                3730                3735

Ser Val  Thr Ser Asn Tyr Ser  Gly Val Val Thr Thr  Val Met Phe
    3740                3745                3750

Leu Ala  Arg Gly Ile Val Phe  Met Cys Val Glu Tyr  Cys Pro Ile
    3755                3760                3765

Phe Phe  Ile Thr Gly Asn Thr  Leu Gln Cys Ile Met  Leu Val Tyr
    3770                3775                3780

Cys Phe  Leu Gly Tyr Phe Cys  Thr Cys Tyr Phe Gly  Leu Phe Cys
    3785                3790                3795

Leu Leu  Asn Arg Tyr Phe Arg  Leu Thr Leu Gly Val  Tyr Asp Tyr
    3800                3805                3810

Leu Val  Ser Thr Gln Glu Phe  Arg Tyr Met Asn Ser  Gln Gly Leu
    3815                3820                3825

Leu Pro  Pro Lys Asn Ser Ile  Asp Ala Phe Lys Leu  Asn Ile Lys
    3830                3835                3840

Leu Leu  Gly Val Gly Gly Lys  Pro Cys Ile Lys Val  Ala Thr Val
    3845                3850                3855
```

```
Gln Ser  Lys Met Ser Asp Val  Lys Cys Thr Ser Val  Val Leu Leu
    3860                3865                3870

Ser Val  Leu Gln Gln Leu Arg  Val Glu Ser Ser Ser  Lys Leu Trp
    3875                3880                3885

Ala Gln  Cys Val Gln Leu His  Asn Asp Ile Leu Leu  Ala Lys Asp
    3890                3895                3900

Thr Thr  Glu Ala Phe Glu Lys  Met Val Ser Leu Leu  Ser Val Leu
    3905                3910                3915

Leu Ser  Met Gln Gly Ala Val  Asp Ile Asn Lys Leu  Cys Glu Glu
    3920                3925                3930

Met Leu  Asp Asn Arg Ala Thr  Leu Gln Ala Ile Ala  Ser Glu Phe
    3935                3940                3945

Ser Ser  Leu Pro Ser Tyr Ala  Ala Phe Ala Thr Ala  Gln Glu Ala
    3950                3955                3960

Tyr Glu  Gln Ala Val Ala Asn  Gly Asp Ser Glu Val  Val Leu Lys
    3965                3970                3975

Lys Leu  Lys Lys Ser Leu Asn  Val Ala Lys Ser Glu  Phe Asp Arg
    3980                3985                3990

Asp Ala  Ala Met Gln Arg Lys  Leu Glu Lys Met Ala  Asp Gln Ala
    3995                4000                4005

Met Thr  Gln Met Tyr Lys Gln  Ala Arg Ser Glu Asp  Lys Arg Ala
    4010                4015                4020

Lys Val  Thr Ser Ala Met Gln  Thr Met Leu Phe Thr  Met Leu Arg
    4025                4030                4035

Lys Leu  Asp Asn Asp Ala Leu  Asn Asn Ile Ile Asn  Asn Ala Arg
    4040                4045                4050
```

```
Asp Gly  Cys Val Pro Leu Asn  Ile Ile Pro Leu Thr  Thr Ala Ala
    4055                4060                4065

Lys Leu  Met Val Val Ile Pro  Asp Tyr Asn Thr Tyr  Lys Asn Thr
    4070                4075                4080

Cys Asp  Gly Thr Thr Phe Thr  Tyr Ala Ser Ala Leu  Trp Glu Ile
    4085                4090                4095

Gln Gln  Val Val Asp Ala Asp  Ser Lys Ile Val Gln  Leu Ser Glu
    4100                4105                4110

Ile Ser  Met Asp Asn Ser Pro  Asn Leu Ala Trp Pro  Leu Ile Val
    4115                4120                4125

Thr Ala  Leu Arg Ala Asn Ser  Ala Val Lys Leu Gln  Asn Asn Glu
    4130                4135                4140

Leu Ser  Pro Val Ala Leu Arg  Gln Met Ser Cys Ala  Ala Gly Thr
    4145                4150                4155

Thr Gln  Thr Ala Cys Thr Asp  Asp Asn Ala Leu Ala  Tyr Tyr Asn
    4160                4165                4170

Thr Thr  Lys Gly Gly Arg Phe  Val Leu Ala Leu Leu  Ser Asp Leu
    4175                4180                4185

Gln Asp  Leu Lys Trp Ala Arg  Phe Pro Lys Ser Asp  Gly Thr Gly
    4190                4195                4200

Thr Ile  Tyr Thr Glu Leu Glu  Pro Pro Cys Arg Phe  Val Thr Asp
    4205                4210                4215

Thr Pro  Lys Gly Pro Lys Val  Lys Tyr Leu Tyr Phe  Ile Lys Gly
    4220                4225                4230

Leu Asn  Asn Leu Asn Arg Gly  Met Val Leu Gly Ser  Leu Ala Ala
    4235                4240                4245

Thr Val  Arg Leu Gln Ala Gly  Asn Ala Thr Glu Val  Pro Ala Asn
    4250                4255                4260
```

```
Ser Thr  Val Leu Ser Phe Cys  Ala Phe Ala Val Asp  Ala Ala Lys
    4265                4270                4275

Ala Tyr  Lys Asp Tyr Leu Ala  Ser Gly Gly Gln Pro  Ile Thr Asn
    4280                4285                4290

Cys Val  Lys Met Leu Cys Thr  His Thr Gly Thr Gly  Gln Ala Ile
    4295                4300                4305

Thr Val  Thr Pro Glu Ala Asn  Met Asp Gln Glu Ser  Phe Gly Gly
    4310                4315                4320

Ala Ser  Cys Cys Leu Tyr Cys  Arg Cys His Ile Asp  His Pro Asn
    4325                4330                4335

Pro Lys  Gly Phe Cys Asp Leu  Lys Gly Lys Tyr Val  Gln Ile Pro
    4340                4345                4350

Thr Thr  Cys Ala Asn Asp Pro  Val Gly Phe Thr Leu  Lys Asn Thr
    4355                4360                4365

Val Cys  Thr Val Cys Gly Met  Trp Lys Gly Tyr Gly  Cys Ser Cys
    4370                4375                4380

Asp Gln  Leu Arg Glu Pro Met  Leu Gln Ser Ala Asp  Ala Gln Ser
    4385                4390                4395

Phe Leu  Asn Arg Val Cys Gly  Val Ser Ala Ala Arg  Leu Thr Pro
    4400                4405                4410

Cys Gly  Thr Gly Thr Ser Thr  Asp Val Val Tyr Arg  Ala Phe Asp
    4415                4420                4425

Ile Tyr  Asn Asp Lys Val Ala  Gly Phe Ala Lys Phe  Leu Lys Thr
    4430                4435                4440

Asn Cys  Cys Arg Phe Gln Glu  Lys Asp Glu Asp Asp  Asn Leu Ile
    4445                4450                4455
```

```
Asp Ser  Tyr Phe Val Val Lys  Arg His Thr Phe Ser  Asn Tyr Gln
    4460                 4465                 4470

His Glu  Glu Thr Ile Tyr Asn  Leu Leu Lys Asp Cys  Pro Ala Val
    4475                 4480                 4485

Ala Lys  His Asp Phe Phe Lys  Phe Arg Ile Asp Gly  Asp Met Val
    4490                 4495                 4500

Pro His  Ile Ser Arg Gln Arg  Leu Thr Lys Tyr Thr  Met Ala Asp
    4505                 4510                 4515

Leu Val  Tyr Ala Leu Arg His  Phe Asp Glu Gly Asn  Cys Asp Thr
    4520                 4525                 4530

Leu Lys  Glu Ile Leu Val Thr  Tyr Asn Cys Cys Asp  Asp Asp Tyr
    4535                 4540                 4545

Phe Asn  Lys Lys Asp Trp Tyr  Asp Phe Val Glu Asn  Pro Asp Ile
    4550                 4555                 4560

Leu Arg  Val Tyr Ala Asn Leu  Gly Glu Arg Val Arg  Gln Ala Leu
    4565                 4570                 4575

Leu Lys  Thr Val Gln Phe Cys  Asp Ala Met Arg Asn  Ala Gly Ile
    4580                 4585                 4590

Val Gly  Val Leu Thr Leu Asp  Asn Gln Asp Leu Asn  Gly Asn Trp
    4595                 4600                 4605

Tyr Asp  Phe Gly Asp Phe Ile  Gln Thr Thr Pro Gly  Ser Gly Val
    4610                 4615                 4620

Pro Val  Val Asp Ser Tyr Tyr  Ser Leu Leu Met Pro  Ile Leu Thr
    4625                 4630                 4635

Leu Thr  Arg Ala Leu Thr Ala  Glu Ser His Val Asp  Thr Asp Leu
    4640                 4645                 4650

Thr Lys  Pro Tyr Ile Lys Trp  Asp Leu Leu Lys Tyr  Asp Phe Thr
    4655                 4660                 4665
```

```
Glu Glu  Arg Leu Lys Leu Phe  Asp Arg Tyr Phe Lys  Tyr Trp Asp
    4670                4675                4680

Gln Thr  Tyr His Pro Asn Cys  Val Asn Cys Leu Asp  Asp Arg Cys
    4685                4690                4695

Ile Leu  His Cys Ala Asn Phe  Asn Val Leu Phe Ser  Thr Val Phe
    4700                4705                4710

Pro Pro  Thr Ser Phe Gly Pro  Leu Val Arg Lys Ile  Phe Val Asp
    4715                4720                4725

Gly Val  Pro Phe Val Val Ser  Thr Gly Tyr His Phe  Arg Glu Leu
    4730                4735                4740

Gly Val  Val His Asn Gln Asp  Val Asn Leu His Ser  Ser Arg Leu
    4745                4750                4755

Ser Phe  Lys Glu Leu Leu Val  Tyr Ala Ala Asp Pro  Ala Met His
    4760                4765                4770

Ala Ala  Ser Gly Asn Leu Leu  Leu Asp Lys Arg Thr  Thr Cys Phe
    4775                4780                4785

Ser Val  Ala Ala Leu Thr Asn  Asn Val Ala Phe Gln  Thr Val Lys
    4790                4795                4800

Pro Gly  Asn Phe Asn Lys Asp  Phe Tyr Asp Phe Ala  Val Ser Lys
    4805                4810                4815

Gly Phe  Phe Lys Glu Gly Ser  Ser Val Glu Leu Lys  His Phe Phe
    4820                4825                4830

Phe Ala  Gln Asp Gly Asn Ala  Ala Ile Ser Asp Tyr  Asp Tyr Tyr
    4835                4840                4845

Arg Tyr  Asn Leu Pro Thr Met  Cys Asp Ile Arg Gln  Leu Leu Phe
    4850                4855                4860
```

```
Val Val  Glu Val Val Asp Lys  Tyr Phe Asp Cys Tyr  Asp Gly Gly
    4865                4870                4875

Cys Ile  Asn Ala Asn Gln Val  Ile Val Asn Asn Leu  Asp Lys Ser
    4880                4885                4890

Ala Gly  Phe Pro Phe Asn Lys  Trp Gly Lys Ala Arg  Leu Tyr Tyr
    4895                4900                4905

Asp Ser  Met Ser Tyr Glu Asp  Gln Asp Ala Leu Phe  Ala Tyr Thr
    4910                4915                4920

Lys Arg  Asn Val Ile Pro Thr  Ile Thr Gln Met Asn  Leu Lys Tyr
    4925                4930                4935

Ala Ile  Ser Ala Lys Asn Arg  Ala Arg Thr Val Ala  Gly Val Ser
    4940                4945                4950

Ile Cys  Ser Thr Met Thr Asn  Arg Gln Phe His Gln  Lys Leu Leu
    4955                4960                4965

Lys Ser  Ile Ala Ala Thr Arg  Gly Ala Thr Val Val  Ile Gly Thr
    4970                4975                4980

Ser Lys  Phe Tyr Gly Gly Trp  His Asn Met Leu Lys  Thr Val Tyr
    4985                4990                4995

Ser Asp  Val Glu Asn Pro His  Leu Met Gly Trp Asp  Tyr Pro Lys
    5000                5005                5010

Cys Asp  Arg Ala Met Pro Asn  Met Leu Arg Ile Met  Ala Ser Leu
    5015                5020                5025

Val Leu  Ala Arg Lys His Thr  Thr Cys Cys Ser Leu  Ser His Arg
    5030                5035                5040

Phe Tyr  Arg Leu Ala Asn Glu  Cys Ala Gln Val Leu  Ser Glu Met
    5045                5050                5055

Val Met  Cys Gly Gly Ser Leu  Tyr Val Lys Pro Gly  Gly Thr Ser
    5060                5065                5070
```

```
Ser Gly  Asp Ala Thr Thr Ala  Tyr Ala Asn Ser Val  Phe Asn Ile
    5075                5080                5085

Cys Gln  Ala Val Thr Ala Asn  Val Asn Ala Leu Leu  Ser Thr Asp
    5090                5095                5100

Gly Asn  Lys Ile Ala Asp Lys  Tyr Val Arg Asn Leu  Gln His Arg
    5105                5110                5115

Leu Tyr  Glu Cys Leu Tyr Arg  Asn Arg Asp Val Asp  Thr Asp Phe
    5120                5125                5130

Val Asn  Glu Phe Tyr Ala Tyr  Leu Arg Lys His Phe  Ser Met Met
    5135                5140                5145

Ile Leu  Ser Asp Asp Ala Val  Val Cys Phe Asn Ser  Thr Tyr Ala
    5150                5155                5160

Ser Gln  Gly Leu Val Ala Ser  Ile Lys Asn Phe Lys  Ser Val Leu
    5165                5170                5175

Tyr Tyr  Gln Asn Asn Val Phe  Met Ser Glu Ala Lys  Cys Trp Thr
    5180                5185                5190

Glu Thr  Asp Leu Thr Lys Gly  Pro His Glu Phe Cys  Ser Gln His
    5195                5200                5205

Thr Met  Leu Val Lys Gln Gly  Asp Asp Tyr Val Tyr  Leu Pro Tyr
    5210                5215                5220

Pro Asp  Pro Ser Arg Ile Leu  Gly Ala Gly Cys Phe  Val Asp Asp
    5225                5230                5235

Ile Val  Lys Thr Asp Gly Thr  Leu Met Ile Glu Arg  Phe Val Ser
    5240                5245                5250

Leu Ala  Ile Asp Ala Tyr Pro  Leu Thr Lys His Pro  Asn Gln Glu
    5255                5260                5265
```

```
Tyr Ala  Asp Val Phe His Leu  Tyr Leu Gln Tyr Ile  Arg Lys Leu
    5270                5275                5280

His Asp  Glu Leu Thr Gly His  Met Leu Asp Met Tyr  Ser Val Met
    5285                5290                5295

Leu Thr  Asn Asp Asn Thr Ser  Arg Tyr Trp Glu Pro  Glu Phe Tyr
    5300                5305                5310

Glu Ala  Met Tyr Thr Pro His  Thr Val Leu Gln Ala  Val Gly Ala
    5315                5320                5325

Cys Val  Leu Cys Asn Ser Gln  Thr Ser Leu Arg Cys  Gly Ala Cys
    5330                5335                5340

Ile Arg  Arg Pro Phe Leu Cys  Cys Lys Cys Cys Tyr  Asp His Val
    5345                5350                5355

Ile Ser  Thr Ser His Lys Leu  Val Leu Ser Val Asn  Pro Tyr Val
    5360                5365                5370

Cys Asn  Ala Pro Gly Cys Asp  Val Thr Asp Val Thr  Gln Leu Tyr
    5375                5380                5385

Leu Gly  Gly Met Ser Tyr Tyr  Cys Lys Ser His Lys  Pro Pro Ile
    5390                5395                5400

Ser Phe  Pro Leu Cys Ala Asn  Gly Gln Val Phe Gly  Leu Tyr Lys
    5405                5410                5415

Asn Thr  Cys Val Gly Ser Asp  Asn Val Thr Asp Phe  Asn Ala Ile
    5420                5425                5430

Ala Thr  Cys Asp Trp Thr Asn  Ala Gly Asp Tyr Ile  Leu Ala Asn
    5435                5440                5445

Thr Cys  Thr Glu Arg Leu Lys  Leu Phe Ala Ala Glu  Thr Leu Lys
    5450                5455                5460

Ala Thr  Glu Glu Thr Phe Lys  Leu Ser Tyr Gly Ile  Ala Thr Val
    5465                5470                5475
```

```
Arg Glu  Val Leu Ser Asp Arg  Glu Leu His Leu Ser  Trp Glu Val
    5480                5485                5490

Gly Lys  Pro Arg Pro Pro Leu  Asn Arg Asn Tyr Val  Phe Thr Gly
    5495                5500                5505

Tyr Arg  Val Thr Lys Asn Ser  Lys Val Gln Ile Gly  Glu Tyr Thr
    5510                5515                5520

Phe Glu  Lys Gly Asp Tyr Gly  Asp Ala Val Val Tyr  Arg Gly Thr
    5525                5530                5535

Thr Thr  Tyr Lys Leu Asn Val  Gly Asp Tyr Phe Val  Leu Thr Ser
    5540                5545                5550

His Thr  Val Met Pro Leu Ser  Ala Pro Thr Leu Val  Pro Gln Glu
    5555                5560                5565

His Tyr  Val Arg Ile Thr Gly  Leu Tyr Pro Thr Leu  Asn Ile Ser
    5570                5575                5580

Asp Glu  Phe Ser Ser Asn Val  Ala Asn Tyr Gln Lys  Val Gly Met
    5585                5590                5595

Gln Lys  Tyr Ser Thr Leu Gln  Gly Pro Pro Gly Thr  Gly Lys Ser
    5600                5605                5610

His Phe  Ala Ile Gly Leu Ala  Leu Tyr Tyr Pro Ser  Ala Arg Ile
    5615                5620                5625

Val Tyr  Thr Ala Cys Ser His  Ala Ala Val Asp Ala  Leu Cys Glu
    5630                5635                5640

Lys Ala  Leu Lys Tyr Leu Pro  Ile Asp Lys Cys Ser  Arg Ile Ile
    5645                5650                5655

Pro Ala  Arg Ala Arg Val Glu  Cys Phe Asp Lys Phe  Lys Val Asn
    5660                5665                5670
```

```
Ser Thr  Leu Glu Gln Tyr Val  Phe Cys Thr Val Asn  Ala Leu Pro
    5675                5680                5685

Glu Thr  Thr Ala Asp Ile Val  Val Phe Asp Glu Ile  Ser Met Ala
    5690                5695                5700

Thr Asn  Tyr Asp Leu Ser Val  Val Asn Ala Arg Leu  Arg Ala Lys
    5705                5710                5715

His Tyr  Val Tyr Ile Gly Asp  Pro Ala Gln Leu Pro  Ala Pro Arg
    5720                5725                5730

Thr Leu  Leu Thr Lys Gly Thr  Leu Glu Pro Glu Tyr  Phe Asn Ser
    5735                5740                5745

Val Cys  Arg Leu Met Lys Thr  Ile Gly Pro Asp Met  Phe Leu Gly
    5750                5755                5760

Thr Cys  Arg Arg Cys Pro Ala  Glu Ile Val Asp Thr  Val Ser Ala
    5765                5770                5775

Leu Val  Tyr Asp Asn Lys Leu  Lys Ala His Lys Asp  Lys Ser Ala
    5780                5785                5790

Gln Cys  Phe Lys Met Phe Tyr  Lys Gly Val Ile Thr  His Asp Val
    5795                5800                5805

Ser Ser  Ala Ile Asn Arg Pro  Gln Ile Gly Val Val  Arg Glu Phe
    5810                5815                5820

Leu Thr  Arg Asn Pro Ala Trp  Arg Lys Ala Val Phe  Ile Ser Pro
    5825                5830                5835

Tyr Asn  Ser Gln Asn Ala Val  Ala Ser Lys Ile Leu  Gly Leu Pro
    5840                5845                5850

Thr Gln  Thr Val Asp Ser Ser  Gln Gly Ser Glu Tyr  Asp Tyr Val
    5855                5860                5865

Ile Phe  Thr Gln Thr Thr Glu  Thr Ala His Ser Cys  Asn Val Asn
    5870                5875                5880
```

```
Arg Phe  Asn Val Ala Ile Thr  Arg Ala Lys Val Gly  Ile Leu Cys
    5885                5890                5895

Ile Met  Ser Asp Arg Asp Leu  Tyr Asp Lys Leu Gln  Phe Thr Ser
    5900                5905                5910

Leu Glu  Ile Pro Arg Arg Asn  Val Ala Thr Leu Gln  Ala Glu Asn
    5915                5920                5925

Val Thr  Gly Leu Phe Lys Asp  Cys Ser Lys Val Ile  Thr Gly Leu
    5930                5935                5940

His Pro  Thr Gln Ala Pro Thr  His Leu Ser Val Asp  Thr Lys Phe
    5945                5950                5955

Lys Thr  Glu Gly Leu Cys Val  Asp Ile Pro Gly Ile  Pro Lys Asp
    5960                5965                5970

Met Thr  Tyr Arg Arg Leu Ile  Ser Met Met Gly Phe  Lys Met Asn
    5975                5980                5985

Tyr Gln  Val Asn Gly Tyr Pro  Asn Met Phe Ile Thr  Arg Glu Glu
    5990                5995                6000

Ala Ile  Arg His Val Arg Ala  Trp Ile Gly Phe Asp  Val Glu Gly
    6005                6010                6015

Cys His  Ala Thr Arg Glu Ala  Val Gly Thr Asn Leu  Pro Leu Gln
    6020                6025                6030

Leu Gly  Phe Ser Thr Gly Val  Asn Leu Val Ala Val  Pro Thr Gly
    6035                6040                6045

Tyr Val  Asp Thr Pro Asn Asn  Thr Asp Phe Ser Arg  Val Ser Ala
    6050                6055                6060

Lys Pro  Pro Pro Gly Asp Gln  Phe Lys His Leu Ile  Pro Leu Met
    6065                6070                6075
```

```
Tyr Lys  Gly Leu Pro Trp Asn  Val Val Arg Ile Lys  Ile Val Gln
    6080                6085                6090

Met Leu  Ser Asp Thr Leu Lys  Asn Leu Ser Asp Arg  Val Val Phe
    6095                6100                6105

Val Leu  Trp Ala His Gly Phe  Glu Leu Thr Ser Met  Lys Tyr Phe
    6110                6115                6120

Val Lys  Ile Gly Pro Glu Arg  Thr Cys Cys Leu Cys  Asp Arg Arg
    6125                6130                6135

Ala Thr  Cys Phe Ser Thr Ala  Ser Asp Thr Tyr Ala  Cys Trp His
    6140                6145                6150

His Ser  Ile Gly Phe Asp Tyr  Val Tyr Asn Pro Phe  Met Ile Asp
    6155                6160                6165

Val Gln  Gln Trp Gly Phe Thr  Gly Asn Leu Gln Ser  Asn His Asp
    6170                6175                6180

Leu Tyr  Cys Gln Val His Gly  Asn Ala His Val Ala  Ser Cys Asp
    6185                6190                6195

Ala Ile  Met Thr Arg Cys Leu  Ala Val His Glu Cys  Phe Val Lys
    6200                6205                6210

Arg Val  Asp Trp Thr Ile Glu  Tyr Pro Ile Ile Gly  Asp Glu Leu
    6215                6220                6225

Lys Ile  Asn Ala Ala Cys Arg  Lys Val Gln His Met  Val Val Lys
    6230                6235                6240

Ala Ala  Leu Leu Ala Asp Lys  Phe Pro Val Leu His  Asp Ile Gly
    6245                6250                6255

Asn Pro  Lys Ala Ile Lys Cys  Val Pro Gln Ala Asp  Val Glu Trp
    6260                6265                6270

Lys Phe  Tyr Asp Ala Gln Pro  Cys Ser Asp Lys Ala  Tyr Lys Ile
    6275                6280                6285
```

```
Glu Glu  Leu Phe Tyr Ser Tyr  Ala Thr His Ser Asp  Lys Phe Thr
    6290                 6295                 6300

Asp Gly  Val Cys Leu Phe Trp  Asn Cys Asn Val Asp  Arg Tyr Pro
    6305                 6310                 6315

Ala Asn  Ser Ile Val Cys Arg  Phe Asp Thr Arg Val  Leu Ser Asn
    6320                 6325                 6330

Leu Asn  Leu Pro Gly Cys Asp  Gly Gly Ser Leu Tyr  Val Asn Lys
    6335                 6340                 6345

His Ala  Phe His Thr Pro Ala  Phe Asp Lys Ser Ala  Phe Val Asn
    6350                 6355                 6360

Leu Lys  Gln Leu Pro Phe Phe  Tyr Tyr Ser Asp Ser  Pro Cys Glu
    6365                 6370                 6375

Ser His  Gly Lys Gln Val Val  Ser Asp Ile Asp Tyr  Val Pro Leu
    6380                 6385                 6390

Lys Ser  Ala Thr Cys Ile Thr  Arg Cys Asn Leu Gly  Gly Ala Val
    6395                 6400                 6405

Cys Arg  His His Ala Asn Glu  Tyr Arg Leu Tyr Leu  Asp Ala Tyr
    6410                 6415                 6420

Asn Met  Met Ile Ser Ala Gly  Phe Ser Leu Trp Val  Tyr Lys Gln
    6425                 6430                 6435

Phe Asp  Thr Tyr Asn Leu Trp  Asn Thr Phe Thr Arg  Leu Gln Ser
    6440                 6445                 6450

Leu Glu  Asn Val Ala Phe Asn  Val Val Asn Lys Gly  His Phe Asp
    6455                 6460                 6465

Gly Gln  Gln Gly Glu Val Pro  Val Ser Ile Ile Asn  Asn Thr Val
    6470                 6475                 6480
```

```
Tyr Thr  Lys Val Asp Gly Val  Asp Val Glu Leu Phe  Glu Asn Lys
    6485                6490                6495

Thr Thr  Leu Pro Val Asn Val  Ala Phe Glu Leu Trp  Ala Lys Arg
    6500                6505                6510

Asn Ile  Lys Pro Val Pro Glu  Val Lys Ile Leu Asn  Asn Leu Gly
    6515                6520                6525

Val Asp  Ile Ala Ala Asn Thr  Val Ile Trp Asp Tyr  Lys Arg Asp
    6530                6535                6540

Ala Pro  Ala His Ile Ser Thr  Ile Gly Val Cys Ser  Met Thr Asp
    6545                6550                6555

Ile Ala  Lys Lys Pro Thr Glu  Thr Ile Cys Ala Pro  Leu Thr Val
    6560                6565                6570

Phe Phe  Asp Gly Arg Val Asp  Gly Gln Val Asp Leu  Phe Arg Asn
    6575                6580                6585

Ala Arg  Asn Gly Val Leu Ile  Thr Glu Gly Ser Val  Lys Gly Leu
    6590                6595                6600

Gln Pro  Ser Val Gly Pro Lys  Gln Ala Ser Leu Asn  Gly Val Thr
    6605                6610                6615

Leu Ile  Gly Glu Ala Val Lys  Thr Gln Phe Asn Tyr  Tyr Lys Lys
    6620                6625                6630

Val Asp  Gly Val Val Gln Gln  Leu Pro Glu Thr Tyr  Phe Thr Gln
    6635                6640                6645

Ser Arg  Asn Leu Gln Glu Phe  Lys Pro Arg Ser Gln  Met Glu Ile
    6650                6655                6660

Asp Phe  Leu Glu Leu Ala Met  Asp Glu Phe Ile Glu  Arg Tyr Lys
    6665                6670                6675

Leu Glu  Gly Tyr Ala Phe Glu  His Ile Val Tyr Gly  Asp Phe Ser
    6680                6685                6690
```

```
His Ser  Gln Leu Gly Gly Leu  His Leu Leu Ile Gly  Leu Ala Lys
    6695                6700                6705

Arg Phe  Lys Glu Ser Pro Phe  Glu Leu Glu Asp Phe  Ile Pro Met
    6710                6715                6720

Asp Ser  Thr Val Lys Asn Tyr  Phe Ile Thr Asp Ala  Gln Thr Gly
    6725                6730                6735

Ser Ser  Lys Cys Val Cys Ser  Val Ile Asp Leu Leu  Leu Asp Asp
    6740                6745                6750

Phe Val  Glu Ile Ile Lys Ser  Gln Asp Leu Ser Val  Val Ser Lys
    6755                6760                6765

Val Val  Lys Val Thr Ile Asp  Tyr Thr Glu Ile Ser  Phe Met Leu
    6770                6775                6780

Trp Cys  Lys Asp Gly His Val  Glu Thr Phe Tyr Pro  Lys Leu Gln
    6785                6790                6795

Ser Ser  Gln Ala Trp Gln Pro  Gly Val Ala Met Pro  Asn Leu Tyr
    6800                6805                6810

Lys Met  Gln Arg Met Leu Leu  Glu Lys Cys Asp Leu  Gln Asn Tyr
    6815                6820                6825

Gly Asp  Ser Ala Thr Leu Pro  Lys Gly Ile Met Met  Asn Val Ala
    6830                6835                6840

Lys Tyr  Thr Gln Leu Cys Gln  Tyr Leu Asn Thr Leu  Thr Leu Ala
    6845                6850                6855

Val Pro  Tyr Asn Met Arg Val  Ile His Phe Gly Ala  Gly Ser Asp
    6860                6865                6870

Lys Gly  Val Ala Pro Gly Thr  Ala Val Leu Arg Gln  Trp Leu Pro
    6875                6880                6885
```

```
Thr Gly  Thr Leu Leu Val Asp  Ser Asp Leu Asn Asp  Phe Val Ser
    6890                 6895                 6900

Asp Ala  Asp Ser Thr Leu Ile  Gly Asp Cys Ala Thr  Val His Thr
    6905                 6910                 6915

Ala Asn  Lys Trp Asp Leu Ile  Ile Ser Asp Met Tyr  Asp Pro Lys
    6920                 6925                 6930

Thr Lys  Asn Val Thr Lys Glu  Asn Asp Ser Lys Glu  Gly Phe Phe
    6935                 6940                 6945

Thr Tyr  Ile Cys Gly Phe Ile  Gln Gln Lys Leu Ala  Leu Gly Gly
    6950                 6955                 6960

Ser Val  Ala Ile Lys Ile Thr  Glu His Ser Trp Asn  Ala Asp Leu
    6965                 6970                 6975

Tyr Lys  Leu Met Gly His Phe  Ala Trp Trp Thr Ala  Phe Val Thr
    6980                 6985                 6990

Asn Val  Asn Ala Ser Ser Ser  Glu Ala Phe Leu Ile  Gly Cys Asn
    6995                 7000                 7005

Tyr Leu  Gly Lys Pro Arg Glu  Gln Ile Asp Gly Tyr  Val Met His
    7010                 7015                 7020

Ala Asn  Tyr Ile Phe Trp Arg  Asn Thr Asn Pro Ile  Gln Leu Ser
    7025                 7030                 7035

Ser Tyr  Ser Leu Phe Asp Met  Ser Lys Phe Pro Leu  Lys Leu Arg
    7040                 7045                 7050

Gly Thr  Ala Val Met Ser Leu  Lys Glu Gly Gln Ile  Asn Asp Met
    7055                 7060                 7065

Ile Leu  Ser Leu Leu Ser Lys  Gly Arg Leu Ile Ile  Arg Glu Asn
    7070                 7075                 7080

Asn Arg  Val Val Ile Ser Ser  Asp Val Leu Val Asn  Asn
    7085                 7090                 7095
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<213> SARS-CoV2

<400> 3

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Met Phe Val Phe Leu Val Leu Leu Pro Leu Val Ser Ser Gln Cys Val
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Asn Leu Thr Thr Arg Thr Gln Leu Pro Pro Ala Tyr Thr Asn Ser Phe
            20                  25                  30


Thr Arg Gly Val Tyr Tyr Pro Asp Lys Val Phe Arg Ser Ser Val Leu
        35                  40                  45


His Ser Thr Gln Asp Leu Phe Leu Pro Phe Phe Ser Asn Val Thr Trp
    50                  55                  60


Phe His Ala Ile His Val Ser Gly Thr Asn Gly Thr Lys Arg Phe Asp
65                  70                  75                  80


Asn Pro Val Leu Pro Phe Asn Asp Gly Val Tyr Phe Ala Ser Thr Glu
                85                  90                  95


Lys Ser Asn Ile Ile Arg Gly Trp Ile Phe Gly Thr Thr Leu Asp Ser
            100                 105                 110


Lys Thr Gln Ser Leu Leu Ile Val Asn Asn Ala Thr Asn Val Val Ile
        115                 120                 125


Lys Val Cys Glu Phe Gln Phe Cys Asn Asp Pro Phe Leu Gly Val Tyr
    130                 135                 140


Tyr His Lys Asn Asn Lys Ser Trp Met Glu Ser Glu Phe Arg Val Tyr
145                 150                 155                 160


Ser Ser Ala Asn Asn Cys Thr Phe Glu Tyr Val Ser Gln Pro Phe Leu
                165                 170                 175


Met Asp Leu Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Arg Glu Phe
```

```
            180                 185                 190

Val Phe Lys Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His Thr
        195                 200                 205

Pro Ile Asn Leu Val Arg Asp Leu Pro Gln Gly Phe Ser Ala Leu Glu
    210                 215                 220

Pro Leu Val Asp Leu Pro Ile Gly Ile Asn Ile Thr Arg Phe Gln Thr
225                 230                 235                 240

Leu Leu Ala Leu His Arg Ser Tyr Leu Thr Pro Gly Asp Ser Ser Ser
                245                 250                 255

Gly Trp Thr Ala Gly Ala Ala Ala Tyr Tyr Val Gly Tyr Leu Gln Pro
            260                 265                 270

Arg Thr Phe Leu Leu Lys Tyr Asn Glu Asn Gly Thr Ile Thr Asp Ala
        275                 280                 285

Val Asp Cys Ala Leu Asp Pro Leu Ser Glu Thr Lys Cys Thr Leu Lys
    290                 295                 300

Ser Phe Thr Val Glu Lys Gly Ile Tyr Gln Thr Ser Asn Phe Arg Val
305                 310                 315                 320

Gln Pro Thr Glu Ser Ile Val Arg Phe Pro Asn Ile Thr Asn Leu Cys
                325                 330                 335

Pro Phe Gly Glu Val Phe Asn Ala Thr Arg Phe Ala Ser Val Tyr Ala
            340                 345                 350

Trp Asn Arg Lys Arg Ile Ser Asn Cys Val Ala Asp Tyr Ser Val Leu
        355                 360                 365

Tyr Asn Ser Ala Ser Phe Ser Thr Phe Lys Cys Tyr Gly Val Ser Pro
    370                 375                 380

Thr Lys Leu Asn Asp Leu Cys Phe Thr Asn Val Tyr Ala Asp Ser Phe
385                 390                 395                 400
```

```
Val Ile Arg Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr Gly
                405                 410                 415

Lys Ile Ala Asp Tyr Asn Tyr Lys Leu Pro Asp Asp Phe Thr Gly Cys
            420                 425                 430

Val Ile Ala Trp Asn Ser Asn Asn Leu Asp Ser Lys Val Gly Gly Asn
        435                 440                 445

Tyr Asn Tyr Leu Tyr Arg Leu Phe Arg Lys Ser Asn Leu Lys Pro Phe
    450                 455                 460

Glu Arg Asp Ile Ser Thr Glu Ile Tyr Gln Ala Gly Ser Thr Pro Cys
465                 470                 475                 480

Asn Gly Val Glu Gly Phe Asn Cys Tyr Phe Pro Leu Gln Ser Tyr Gly
                485                 490                 495

Phe Gln Pro Thr Asn Gly Val Gly Tyr Gln Pro Tyr Arg Val Val Val
            500                 505                 510

Leu Ser Phe Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro Lys
        515                 520                 525

Lys Ser Thr Asn Leu Val Lys Asn Lys Cys Val Asn Phe Asn Phe Asn
    530                 535                 540

Gly Leu Thr Gly Thr Gly Val Leu Thr Glu Ser Asn Lys Lys Phe Leu
545                 550                 555                 560

Pro Phe Gln Gln Phe Gly Arg Asp Ile Ala Asp Thr Thr Asp Ala Val
                565                 570                 575

Arg Asp Pro Gln Thr Leu Glu Ile Leu Asp Ile Thr Pro Cys Ser Phe
            580                 585                 590

Gly Gly Val Ser Val Ile Thr Pro Gly Thr Asn Thr Ser Asn Gln Val
        595                 600                 605

Ala Val Leu Tyr Gln Asp Val Asn Cys Thr Glu Val Pro Val Ala Ile
```

```
    610                 615                 620

His Ala Asp Gln Leu Thr Pro Thr Trp Arg Val Tyr Ser Thr Gly Ser
625                 630                 635                 640

Asn Val Phe Gln Thr Arg Ala Gly Cys Leu Ile Gly Ala Glu His Val
                645                 650                 655

Asn Asn Ser Tyr Glu Cys Asp Ile Pro Ile Gly Ala Gly Ile Cys Ala
            660                 665                 670

Ser Tyr Gln Thr Gln Thr Asn Ser Pro Arg Arg Ala Arg Ser Val Ala
        675                 680                 685

Ser Gln Ser Ile Ile Ala Tyr Thr Met Ser Leu Gly Ala Glu Asn Ser
    690                 695                 700

Val Ala Tyr Ser Asn Asn Ser Ile Ala Ile Pro Thr Asn Phe Thr Ile
705                 710                 715                 720

Ser Val Thr Thr Glu Ile Leu Pro Val Ser Met Thr Lys Thr Ser Val
                725                 730                 735

Asp Cys Thr Met Tyr Ile Cys Gly Asp Ser Thr Glu Cys Ser Asn Leu
            740                 745                 750

Leu Leu Gln Tyr Gly Ser Phe Cys Thr Gln Leu Asn Arg Ala Leu Thr
        755                 760                 765

Gly Ile Ala Val Glu Gln Asp Lys Asn Thr Gln Glu Val Phe Ala Gln
    770                 775                 780

Val Lys Gln Ile Tyr Lys Thr Pro Pro Ile Lys Asp Phe Gly Gly Phe
785                 790                 795                 800

Asn Phe Ser Gln Ile Leu Pro Asp Pro Ser Lys Pro Ser Lys Arg Ser
                805                 810                 815

Phe Ile Glu Asp Leu Leu Phe Asn Lys Val Thr Leu Ala Asp Ala Gly
            820                 825                 830
```

```
Phe Ile Lys Gln Tyr Gly Asp Cys Leu Gly Asp Ile Ala Ala Arg Asp
        835                 840                 845

Leu Ile Cys Ala Gln Lys Phe Asn Gly Leu Thr Val Leu Pro Pro Leu
    850                 855                 860

Leu Thr Asp Glu Met Ile Ala Gln Tyr Thr Ser Ala Leu Leu Ala Gly
865                 870                 875                 880

Thr Ile Thr Ser Gly Trp Thr Phe Gly Ala Gly Ala Ala Leu Gln Ile
                885                 890                 895

Pro Phe Ala Met Gln Met Ala Tyr Arg Phe Asn Gly Ile Gly Val Thr
            900                 905                 910

Gln Asn Val Leu Tyr Glu Asn Gln Lys Leu Ile Ala Asn Gln Phe Asn
        915                 920                 925

Ser Ala Ile Gly Lys Ile Gln Asp Ser Leu Ser Ser Thr Ala Ser Ala
    930                 935                 940

Leu Gly Lys Leu Gln Asp Val Val Asn Gln Asn Ala Gln Ala Leu Asn
945                 950                 955                 960

Thr Leu Val Lys Gln Leu Ser Ser Asn Phe Gly Ala Ile Ser Ser Val
                965                 970                 975

Leu Asn Asp Ile Leu Ser Arg Leu Asp Lys Val Glu Ala Glu Val Gln
            980                 985                 990

Ile Asp Arg Leu Ile Thr Gly Arg  Leu Gln Ser Leu Gln  Thr Tyr Val
        995                 1000                1005

Thr Gln  Gln Leu Ile Arg Ala  Ala Glu Ile Arg Ala  Ser Ala Asn
    1010                1015                1020

Leu Ala  Ala Thr Lys Met Ser  Glu Cys Val Leu Gly  Gln Ser Lys
    1025                1030                1035

Arg Val  Asp Phe Cys Gly Lys  Gly Tyr His Leu Met  Ser Phe Pro
```

```
    1040                1045                1050

Gln Ser  Ala Pro His Gly Val  Val Phe Leu His Val  Thr Tyr Val
    1055                1060                1065

Pro Ala  Gln Glu Lys Asn Phe  Thr Thr Ala Pro Ala  Ile Cys His
    1070                1075                1080

Asp Gly  Lys Ala His Phe Pro  Arg Glu Gly Val Phe  Val Ser Asn
    1085                1090                1095

Gly Thr  His Trp Phe Val Thr  Gln Arg Asn Phe Tyr  Glu Pro Gln
    1100                1105                1110

Ile Ile  Thr Thr Asp Asn Thr  Phe Val Ser Gly Asn  Cys Asp Val
    1115                1120                1125

Val Ile  Gly Ile Val Asn Asn  Thr Val Tyr Asp Pro  Leu Gln Pro
    1130                1135                1140

Glu Leu  Asp Ser Phe Lys Glu  Glu Leu Asp Lys Tyr  Phe Lys Asn
    1145                1150                1155

His Thr  Ser Pro Asp Val Asp  Leu Gly Asp Ile Ser  Gly Ile Asn
    1160                1165                1170

Ala Ser  Val Val Asn Ile Gln  Lys Glu Ile Asp Arg  Leu Asn Glu
    1175                1180                1185

Val Ala  Lys Asn Leu Asn Glu  Ser Leu Ile Asp Leu  Gln Glu Leu
    1190                1195                1200

Gly Lys  Tyr Glu Gln Tyr Ile  Lys Trp Pro Trp Tyr  Ile Trp Leu
    1205                1210                1215

Gly Phe  Ile Ala Gly Leu Ile  Ala Ile Val Met Val  Thr Ile Met
    1220                1225                1230

Leu Cys  Cys Met Thr Ser Cys  Cys Ser Cys Leu Lys  Gly Cys Cys
    1235                1240                1245
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Ser Cys Gly Ser Cys Cys Lys Phe Asp Glu Asp Asp Ser Glu Pro
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Val Leu Lys Gly Val Lys Leu His Tyr Thr
    1265   1270

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<210> 5
<211> 11
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<400> 5

Lys Leu Lys Leu Leu Leu Leu Leu Lys Leu Lys
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<223> n=deoxyinosine

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<220>
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<400> 8
tcgtcgtttt gtcgttttgt cgtt 24

<210> 9
<211> 29867
<212> DNA
<213> SARS-CoV2

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<223> n is a, c, g, or t

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gttctctaaa cgaactttaa aatctgtgtg gctgtcactc ggctgcatgc ttagtgcact 120

cacgcagtat aattaataac taattactgt cgttgacagg acacgagtaa ctcgtctatc 180

ttctgcaggc tgcttacggt ttcgtccgtg ttgcagccga tcatcagcac atctaggttt 240

cgtccgggtg tgaccgaaag gtaagatgga gagccttgtc cctggtttca acgagaaaac 300

acacgtccaa ctcagtttgc ctgttttaca ggttcgcgac gtgctcgtac gtggctttgg 360

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Gly Thr Cys Gly Leu Val Glu Val Glu Lys Gly Val Leu Pro Gln Leu
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Glu Ile Pro Val Ala Tyr Arg Lys Val Leu Leu Arg Lys Asn Gly Asn
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                645                 650                 655

Cys Glu Ile Val Gly Gly Gln Ile Val Thr Cys Ala Lys Glu Ile Lys
            660                 665                 670

Glu Ser Val Gln Thr Phe Phe Lys Leu Val Asn Lys Phe Leu Ala Leu
        675                 680                 685

Cys Ala Asp Ser Ile Ile Ile Gly Gly Ala Lys Leu Lys Ala Leu Asn
    690                 695                 700

Leu Gly Glu Thr Phe Val Thr His Ser Lys Gly Leu Tyr Arg Lys Cys
705                 710                 715                 720

Val Lys Ser Arg Glu Glu Thr Gly Leu Leu Met Pro Leu Lys Ala Pro
                725                 730                 735

Lys Glu Ile Ile Phe Leu Glu Gly Glu Thr Leu Pro Thr Glu Val Leu
            740                 745                 750

Thr Glu Glu Val Val Leu Lys Thr Gly Asp Leu Gln Pro Leu Glu Gln
        755                 760                 765

Pro Thr Ser Glu Ala Val Glu Ala Pro Leu Val Gly Thr Pro Val Cys
    770                 775                 780

Ile Asn Gly Leu Met Leu Leu Glu Ile Lys Asp Thr Glu Lys Tyr Cys
```

785 790 795 800

Ala Leu Ala Pro Asn Met Met Val Thr Asn Asn Thr Phe Thr Leu Lys
805 810 815

Gly Gly Ala Pro Thr Lys Val Thr Phe Gly Asp Asp Thr Val Ile Glu
820 825 830

Val Gln Gly Tyr Lys Ser Val Asn Ile Thr Phe Glu Leu Asp Glu Arg
835 840 845

Ile Asp Lys Val Leu Asn Glu Lys Cys Ser Ala Tyr Thr Val Glu Leu
850 855 860

Gly Thr Glu Val Asn Glu Phe Ala Cys Val Val Ala Asp Ala Val Ile
865 870 875 880

Lys Thr Leu Gln Pro Val Ser Glu Leu Leu Thr Pro Leu Gly Ile Asp
885 890 895

Leu Asp Glu Trp Ser Met Ala Thr Tyr Tyr Leu Phe Asp Glu Ser Gly
900 905 910

Glu Phe Lys Leu Ala Ser His Met Tyr Cys Ser Phe Tyr Pro Pro Asp
915 920 925

Glu Asp Glu Glu Glu Gly Asp Cys Glu Glu Glu Glu Phe Glu Pro Ser
930 935 940

Thr Gln Tyr Glu Tyr Gly Thr Glu Asp Asp Tyr Gln Gly Lys Pro Leu
945 950 955 960

Glu Phe Gly Ala Thr Ser Ala Ala Leu Gln Pro Glu Glu Glu Gln Glu
965 970 975

Glu Asp Trp Leu Asp Asp Asp Ser Gln Gln Thr Val Gly Gln Gln Asp
980 985 990

Gly Ser Glu Asp Asn Gln Thr Thr Thr Ile Gln Thr Ile Val Glu Val
995 1000 1005

```
Gln Pro  Gln Leu Glu Met Glu  Leu Thr Pro Val Val  Gln Thr Ile
    1010                1015                1020

Glu Val  Asn Ser Phe Ser Gly  Tyr Leu Lys Leu Thr  Asp Asn Val
    1025                1030                1035

Tyr Ile  Lys Asn Ala Asp Ile  Val Glu Glu Ala Lys  Lys Val Lys
    1040                1045                1050

Pro Thr  Val Val Val Asn Ala  Ala Asn Val Tyr Leu  Lys His Gly
    1055                1060                1065

Gly Gly  Val Ala Gly Ala Leu  Asn Lys Ala Thr Asn  Asn Ala Met
    1070                1075                1080

Gln Val  Glu Ser Asp Asp Tyr  Ile Ala Thr Asn Gly  Pro Leu Lys
    1085                1090                1095

Val Gly  Gly Ser Cys Val Leu  Ser Gly His Asn Leu  Ala Lys His
    1100                1105                1110

Cys Leu  His Val Val Gly Pro  Asn Val Asn Lys Gly  Glu Asp Ile
    1115                1120                1125

Gln Leu  Leu Lys Ser Ala Tyr  Glu Asn Phe Asn Gln  His Glu Val
    1130                1135                1140

Leu Leu  Ala Pro Leu Leu Ser  Ala Gly Ile Phe Gly  Ala Asp Pro
    1145                1150                1155

Ile His  Ser Leu Arg Val Cys  Val Asp Thr Val Arg  Thr Asn Val
    1160                1165                1170

Tyr Leu  Ala Val Phe Asp Lys  Asn Leu Tyr Asp Lys  Leu Val Ser
    1175                1180                1185

Ser Phe  Leu Glu Met Lys Ser  Glu Lys Gln Val Glu  Gln Lys Ile
    1190                1195                1200

Ala Glu  Ile Pro Lys Glu Glu  Val Lys Pro Phe Ile  Thr Glu Ser
```

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    1205                1210                1215

Lys Pro  Ser Val Glu Gln Arg  Lys Gln Asp Asp Lys  Lys Ile Lys
    1220                1225                1230

Ala Cys  Val Glu Glu Val Thr  Thr Thr Leu Glu Glu  Thr Lys Phe
    1235                1240                1245

Leu Thr  Glu Asn Leu Leu Leu  Tyr Ile Asp Ile Asn  Gly Asn Leu
    1250                1255                1260

His Pro  Asp Ser Ala Thr Leu  Val Ser Asp Ile Asp  Ile Thr Phe
    1265                1270                1275

Leu Lys  Lys Asp Ala Pro Tyr  Ile Val Gly Asp Val  Val Gln Glu
    1280                1285                1290

Gly Val  Leu Thr Ala Val Val  Ile Pro Thr Lys Lys  Ala Gly Gly
    1295                1300                1305

Thr Thr  Glu Met Leu Ala Lys  Ala Leu Arg Lys Val  Pro Thr Asp
    1310                1315                1320

Asn Tyr  Ile Thr Thr Tyr Pro  Gly Gln Gly Leu Asn  Gly Tyr Thr
    1325                1330                1335

Val Glu  Glu Ala Lys Thr Val  Leu Lys Lys Cys Lys  Ser Ala Phe
    1340                1345                1350

Tyr Ile  Leu Pro Ser Ile Ile  Ser Asn Glu Lys Gln  Glu Ile Leu
    1355                1360                1365

Gly Thr  Val Ser Trp Asn Leu  Arg Glu Met Leu Ala  His Ala Glu
    1370                1375                1380

Glu Thr  Arg Lys Leu Met Pro  Val Cys Val Glu Thr  Lys Ala Ile
    1385                1390                1395

Val Ser  Thr Ile Gln Arg Lys  Tyr Lys Gly Ile Lys  Ile Gln Glu
    1400                1405                1410
```

```
Gly Val  Val Asp Tyr Gly Ala  Arg Phe Tyr Phe Tyr  Thr Ser Lys
    1415                1420                1425

Thr Thr  Val Ala Ser Leu Ile  Asn Thr Leu Asn Asp  Leu Asn Glu
    1430                1435                1440

Thr Leu  Val Thr Met Pro Leu  Gly Tyr Val Thr His  Gly Leu Asn
    1445                1450                1455

Leu Glu  Glu Ala Ala Arg Tyr  Met Arg Ser Leu Lys  Val Pro Ala
    1460                1465                1470

Thr Val  Ser Val Ser Ser Pro  Asp Ala Val Thr Ala  Tyr Asn Gly
    1475                1480                1485

Tyr Leu  Thr Ser Ser Ser Lys  Thr Pro Glu Glu His  Phe Ile Glu
    1490                1495                1500

Thr Ile  Ser Leu Ala Gly Ser  Tyr Lys Asp Trp Ser  Tyr Ser Gly
    1505                1510                1515

Gln Ser  Thr Gln Leu Gly Ile  Glu Phe Leu Lys Arg  Gly Asp Lys
    1520                1525                1530

Ser Val  Tyr Tyr Thr Ser Asn  Pro Thr Thr Phe His  Leu Asp Gly
    1535                1540                1545

Glu Val  Ile Thr Phe Asp Asn  Leu Lys Thr Leu Leu  Ser Leu Arg
    1550                1555                1560

Glu Val  Arg Thr Ile Lys Val  Phe Thr Thr Val Asp  Asn Ile Asn
    1565                1570                1575

Leu His  Thr Gln Val Val Asp  Met Ser Met Thr Tyr  Gly Gln Gln
    1580                1585                1590

Phe Gly  Pro Thr Tyr Leu Asp  Gly Ala Asp Val Thr  Lys Ile Lys
    1595                1600                1605

Pro His  Asn Ser His Glu Gly  Lys Thr Phe Tyr Val  Leu Pro Asn
```

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    1610                1615                1620

Asp Asp  Thr Leu Arg Val Glu  Ala Phe Glu Tyr Tyr  His Thr Thr
    1625                1630                1635

Asp Pro  Ser Phe Leu Gly Arg  Tyr Met Ser Ala Leu  Asn His Thr
    1640                1645                1650

Lys Lys  Trp Lys Tyr Pro Gln  Val Asn Gly Leu Thr  Ser Ile Lys
    1655                1660                1665

Trp Ala  Asp Asn Asn Cys Tyr  Leu Ala Thr Ala Leu  Leu Thr Leu
    1670                1675                1680

Gln Gln  Ile Glu Leu Lys Phe  Asn Pro Pro Ala Leu  Gln Asp Ala
    1685                1690                1695

Tyr Tyr  Arg Ala Arg Ala Gly  Glu Ala Ala Asn Phe  Cys Ala Leu
    1700                1705                1710

Ile Leu  Ala Tyr Cys Asn Lys  Thr Val Gly Glu Leu  Gly Asp Val
    1715                1720                1725

Arg Glu  Thr Met Ser Tyr Leu  Phe Gln His Ala Asn  Leu Asp Ser
    1730                1735                1740

Cys Lys  Arg Val Leu Asn Val  Val Cys Lys Thr Cys  Gly Gln Gln
    1745                1750                1755

Gln Thr  Thr Leu Lys Gly Val  Glu Ala Val Met Tyr  Met Gly Thr
    1760                1765                1770

Leu Ser  Tyr Glu Gln Phe Lys  Lys Gly Val Gln Ile  Pro Cys Thr
    1775                1780                1785

Cys Gly  Lys Gln Ala Thr Lys  Tyr Leu Val Gln Gln  Glu Ser Pro
    1790                1795                1800

Phe Val  Met Met Ser Ala Pro  Pro Ala Gln Tyr Glu  Leu Lys His
    1805                1810                1815
```

```
Gly Thr  Phe Thr Cys Ala Ser  Glu Tyr Thr Gly Asn  Tyr Gln Cys
    1820                1825                1830

Gly His  Tyr Lys His Ile Thr  Ser Lys Glu Thr Leu  Tyr Cys Ile
    1835                1840                1845

Asp Gly  Ala Leu Leu Thr Lys  Ser Ser Glu Tyr Lys  Gly Pro Ile
    1850                1855                1860

Thr Asp  Val Phe Tyr Lys Glu  Asn Ser Tyr Thr Thr  Thr Ile Lys
    1865                1870                1875

Pro Val  Thr Tyr Lys Leu Asp  Gly Val Val Cys Thr  Glu Ile Asp
    1880                1885                1890

Pro Lys  Leu Asp Asn Tyr Tyr  Lys Lys Asp Asn Ser  Tyr Phe Thr
    1895                1900                1905

Glu Gln  Pro Ile Asp Leu Val  Pro Asn Gln Pro Tyr  Pro Asn Ala
    1910                1915                1920

Ser Phe  Asp Asn Phe Lys Phe  Val Cys Asp Asn Ile  Lys Phe Ala
    1925                1930                1935

Asp Asp  Leu Asn Gln Leu Thr  Gly Tyr Lys Lys Pro  Ala Ser Arg
    1940                1945                1950

Glu Leu  Lys Val Thr Phe Phe  Pro Asp Leu Asn Gly  Asp Val Val
    1955                1960                1965

Ala Ile  Asp Tyr Lys His Tyr  Thr Pro Ser Phe Lys  Lys Gly Ala
    1970                1975                1980

Lys Leu  Leu His Lys Pro Ile  Val Trp His Val Asn  Asn Ala Thr
    1985                1990                1995

Asn Lys  Ala Thr Tyr Lys Pro  Asn Thr Trp Cys Ile  Arg Cys Leu
    2000                2005                2010

Trp Ser  Thr Lys Pro Val Glu  Thr Ser Asn Ser Phe  Asp Val Leu
```

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    2015                2020                2025

Lys Ser  Glu Asp Ala Gln Gly  Met Asp Asn Leu Ala  Cys Glu Asp
    2030                2035                2040

Leu Lys  Pro Val Ser Glu Glu  Val Val Glu Asn Pro  Thr Ile Gln
    2045                2050                2055

Lys Asp  Val Leu Glu Cys Asn  Val Lys Thr Thr Glu  Val Val Gly
    2060                2065                2070

Asp Ile  Ile Leu Lys Pro Ala  Asn Asn Ser Leu Lys  Ile Thr Glu
    2075                2080                2085

Glu Val  Gly His Thr Asp Leu  Met Ala Ala Tyr Val  Asp Asn Ser
    2090                2095                2100

Ser Leu  Thr Ile Lys Lys Pro  Asn Glu Leu Ser Arg  Val Leu Gly
    2105                2110                2115

Leu Lys  Thr Leu Ala Thr His  Gly Leu Ala Ala Val  Asn Ser Val
    2120                2125                2130

Pro Trp  Asp Thr Ile Ala Asn  Tyr Ala Lys Pro Phe  Leu Asn Lys
    2135                2140                2145

Val Val  Ser Thr Thr Thr Asn  Ile Val Thr Arg Cys  Leu Asn Arg
    2150                2155                2160

Val Cys  Thr Asn Tyr Met Pro  Tyr Phe Phe Thr Leu  Leu Leu Gln
    2165                2170                2175

Leu Cys  Thr Phe Thr Arg Ser  Thr Asn Ser Arg Ile  Lys Ala Ser
    2180                2185                2190

Met Pro  Thr Thr Ile Ala Lys  Asn Thr Val Lys Ser  Val Gly Lys
    2195                2200                2205

Phe Cys  Leu Glu Ala Ser Phe  Asn Tyr Leu Lys Ser  Pro Asn Phe
    2210                2215                2220
```

```
Ser Lys  Leu Ile Asn Ile Ile  Ile Trp Phe Leu Leu  Leu Ser Val
    2225                2230                2235

Cys Leu  Gly Ser Leu Ile Tyr  Ser Thr Ala Ala Leu  Gly Val Leu
    2240                2245                2250

Met Ser  Asn Leu Gly Met Pro  Ser Tyr Cys Thr Gly  Tyr Arg Glu
    2255                2260                2265

Gly Tyr  Leu Asn Ser Thr Asn  Val Thr Ile Ala Thr  Tyr Cys Thr
    2270                2275                2280

Gly Ser  Ile Pro Cys Ser Val  Cys Leu Ser Gly Leu  Asp Ser Leu
    2285                2290                2295

Asp Thr  Tyr Pro Ser Leu Glu  Thr Ile Gln Ile Thr  Ile Ser Ser
    2300                2305                2310

Phe Lys  Trp Asp Leu Thr Ala  Phe Gly Leu Val Ala  Glu Trp Phe
    2315                2320                2325

Leu Ala  Tyr Ile Leu Phe Thr  Arg Phe Phe Tyr Val  Leu Gly Leu
    2330                2335                2340

Ala Ala  Ile Met Gln Leu Phe  Phe Ser Tyr Phe Ala  Val His Phe
    2345                2350                2355

Ile Ser  Asn Ser Trp Leu Met  Trp Leu Ile Ile Asn  Leu Val Gln
    2360                2365                2370

Met Ala  Pro Ile Ser Ala Met  Val Arg Met Tyr Ile  Phe Phe Ala
    2375                2380                2385

Ser Phe  Tyr Tyr Val Trp Lys  Ser Tyr Val His Val  Val Asp Gly
    2390                2395                2400

Cys Asn  Ser Ser Thr Cys Met  Met Cys Tyr Lys Arg  Asn Arg Ala
    2405                2410                2415

Thr Arg  Val Glu Cys Thr Thr  Ile Val Asn Gly Val  Arg Arg Ser
```

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    2420                2425                2430

Phe Tyr  Val Tyr Ala Asn Gly  Gly Lys Gly Phe Cys  Lys Leu His
    2435                2440                2445

Asn Trp  Asn Cys Val Asn Cys  Asp Thr Phe Cys Ala  Gly Ser Thr
    2450                2455                2460

Phe Ile  Ser Asp Glu Val Ala  Arg Asp Leu Ser Leu  Gln Phe Lys
    2465                2470                2475

Arg Pro  Ile Asn Pro Thr Asp  Gln Ser Ser Tyr Ile  Val Asp Ser
    2480                2485                2490

Val Thr  Val Lys Asn Gly Ser  Ile His Leu Tyr Phe  Asp Lys Ala
    2495                2500                2505

Gly Gln  Lys Thr Tyr Glu Arg  His Ser Leu Ser His  Phe Val Asn
    2510                2515                2520

Leu Asp  Asn Leu Arg Ala Asn  Asn Thr Lys Gly Ser  Leu Pro Ile
    2525                2530                2535

Asn Val  Ile Val Phe Asp Gly  Lys Ser Lys Cys Glu  Glu Ser Ser
    2540                2545                2550

Ala Lys  Ser Ala Ser Val Tyr  Tyr Ser Gln Leu Met  Cys Gln Pro
    2555                2560                2565

Ile Leu  Leu Leu Asp Gln Ala  Leu Val Ser Asp Val  Gly Asp Ser
    2570                2575                2580

Ala Glu  Val Ala Val Lys Met  Phe Asp Ala Tyr Val  Asn Thr Phe
    2585                2590                2595

Ser Ser  Thr Phe Asn Val Pro  Met Glu Lys Leu Lys  Thr Leu Val
    2600                2605                2610

Ala Thr  Ala Glu Ala Glu Leu  Ala Lys Asn Val Ser  Leu Asp Asn
    2615                2620                2625
```

```
Val Leu  Ser Thr Phe Ile Ser  Ala Ala Arg Gln Gly  Phe Val Asp
    2630                2635                2640

Ser Asp  Val Glu Thr Lys Asp  Val Val Glu Cys Leu  Lys Leu Ser
    2645                2650                2655

His Gln  Ser Asp Ile Glu Val  Thr Gly Asp Ser Cys  Asn Asn Tyr
    2660                2665                2670

Met Leu  Thr Tyr Asn Lys Val  Glu Asn Met Thr Pro  Arg Asp Leu
    2675                2680                2685

Gly Ala  Cys Ile Asp Cys Ser  Ala Arg His Ile Asn  Ala Gln Val
    2690                2695                2700

Ala Lys  Ser His Asn Ile Ala  Leu Ile Trp Asn Val  Lys Asp Phe
    2705                2710                2715

Met Ser  Leu Ser Glu Gln Leu  Arg Lys Gln Ile Arg  Ser Ala Ala
    2720                2725                2730

Lys Lys  Asn Asn Leu Pro Phe  Lys Leu Thr Cys Ala  Thr Thr Arg
    2735                2740                2745

Gln Val  Val Asn Val Val Thr  Thr Lys Ile Ala Leu  Lys Gly Gly
    2750                2755                2760

Lys Ile  Val Asn Asn Trp Leu  Lys Gln Leu Ile Lys  Val Thr Leu
    2765                2770                2775

Val Phe  Leu Phe Val Ala Ala  Ile Phe Tyr Leu Ile  Thr Pro Val
    2780                2785                2790

His Val  Met Ser Lys His Thr  Asp Phe Ser Ser Glu  Ile Ile Gly
    2795                2800                2805

Tyr Lys  Ala Ile Asp Gly Gly  Val Thr Arg Asp Ile  Ala Ser Thr
    2810                2815                2820

Asp Thr  Cys Phe Ala Asn Lys  His Ala Asp Phe Asp  Thr Trp Phe
```

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    2825                2830                2835

Ser Gln  Arg Gly Gly Ser Tyr  Thr Asn Asp Lys Ala  Cys Pro Leu
    2840                2845                2850

Ile Ala  Ala Val Ile Thr Arg  Glu Val Gly Phe Val  Val Pro Gly
    2855                2860                2865

Leu Pro  Gly Thr Ile Leu Arg  Thr Thr Asn Gly Asp  Phe Leu His
    2870                2875                2880

Phe Leu  Pro Arg Val Phe Ser  Ala Val Gly Asn Ile  Cys Tyr Thr
    2885                2890                2895

Pro Ser  Lys Leu Ile Glu Tyr  Thr Asp Phe Ala Thr  Ser Ala Cys
    2900                2905                2910

Val Leu  Ala Ala Glu Cys Thr  Ile Phe Lys Asp Ala  Ser Gly Lys
    2915                2920                2925

Pro Val  Pro Tyr Cys Tyr Asp  Thr Asn Val Leu Glu  Gly Ser Val
    2930                2935                2940

Ala Tyr  Glu Ser Leu Arg Pro  Asp Thr Arg Tyr Val  Leu Met Asp
    2945                2950                2955

Gly Ser  Ile Ile Gln Phe Pro  Asn Thr Tyr Leu Glu  Gly Ser Val
    2960                2965                2970

Arg Val  Val Thr Thr Phe Asp  Ser Glu Tyr Cys Arg  His Gly Thr
    2975                2980                2985

Cys Glu  Arg Ser Glu Ala Gly  Val Cys Val Ser Thr  Ser Gly Arg
    2990                2995                3000

Trp Val  Leu Asn Asn Asp Tyr  Tyr Arg Ser Leu Pro  Gly Val Phe
    3005                3010                3015

Cys Gly  Val Asp Ala Val Asn  Leu Leu Thr Asn Met  Phe Thr Pro
    3020                3025                3030
```

```
Leu Ile  Gln Pro Ile Gly Ala  Leu Asp Ile Ser Ala  Ser Ile Val
    3035                3040                3045

Ala Gly  Gly Ile Val Ala Ile  Val Val Thr Cys Leu  Ala Tyr Tyr
    3050                3055                3060

Phe Met  Arg Phe Arg Arg Ala  Phe Gly Glu Tyr Ser  His Val Val
    3065                3070                3075

Ala Phe  Asn Thr Leu Leu Phe  Leu Met Ser Phe Thr  Val Leu Cys
    3080                3085                3090

Leu Thr  Pro Val Tyr Ser Phe  Leu Pro Gly Val Tyr  Ser Val Ile
    3095                3100                3105

Tyr Leu  Tyr Leu Thr Phe Tyr  Leu Thr Asn Asp Val  Ser Phe Leu
    3110                3115                3120

Ala His  Ile Gln Trp Met Val  Met Phe Thr Pro Leu  Val Pro Phe
    3125                3130                3135

Trp Ile  Thr Ile Ala Tyr Ile  Ile Cys Ile Ser Thr  Lys His Phe
    3140                3145                3150

Tyr Trp  Phe Phe Ser Asn Tyr  Leu Lys Arg Arg Val  Val Phe Asn
    3155                3160                3165

Gly Val  Ser Phe Ser Thr Phe  Glu Glu Ala Ala Leu  Cys Thr Phe
    3170                3175                3180

Leu Leu  Asn Lys Glu Met Tyr  Leu Lys Leu Arg Ser  Asp Val Leu
    3185                3190                3195

Leu Pro  Leu Thr Gln Tyr Asn  Arg Tyr Leu Ala Leu  Tyr Asn Lys
    3200                3205                3210

Tyr Lys  Tyr Phe Ser Gly Ala  Met Asp Thr Thr Ser  Tyr Arg Glu
    3215                3220                3225

Ala Ala  Cys Cys His Leu Ala  Lys Ala Leu Asn Asp  Phe Ser Asn
```

```
    3230                3235                3240

Ser Gly  Ser Asp Val Leu Tyr  Gln Pro Pro Gln Thr  Ser Ile Thr
    3245                3250                3255

Ser Ala  Val Leu Gln Ser Gly  Phe Arg Lys Met Ala  Phe Pro Ser
    3260                3265                3270

Gly Lys  Val Glu Gly Cys Met  Val Gln Val Thr Cys  Gly Thr Thr
    3275                3280                3285

Thr Leu  Asn Gly Leu Trp Leu  Asp Asp Val Val Tyr  Cys Pro Arg
    3290                3295                3300

His Val  Ile Cys Thr Ser Glu  Asp Met Leu Asn Pro  Asn Tyr Glu
    3305                3310                3315

Asp Leu  Leu Ile Arg Lys Ser  Asn His Asn Phe Leu  Val Gln Ala
    3320                3325                3330

Gly Asn  Val Gln Leu Arg Val  Ile Gly His Ser Met  Gln Asn Cys
    3335                3340                3345

Val Leu  Lys Leu Lys Val Asp  Thr Ala Asn Pro Lys  Thr Pro Lys
    3350                3355                3360

Tyr Lys  Phe Val Arg Ile Gln  Pro Gly Gln Thr Phe  Ser Val Leu
    3365                3370                3375

Ala Cys  Tyr Asn Gly Ser Pro  Ser Gly Val Tyr Gln  Cys Ala Met
    3380                3385                3390

Arg Pro  Asn Phe Thr Ile Lys  Gly Ser Phe Leu Asn  Gly Ser Cys
    3395                3400                3405

Gly Ser  Val Gly Phe Asn Ile  Asp Tyr Asp Cys Val  Ser Phe Cys
    3410                3415                3420

Tyr Met  His His Met Glu Leu  Pro Thr Gly Val His  Ala Gly Thr
    3425                3430                3435
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```
Asp Leu  Glu Gly Asn Phe Tyr  Gly Pro Phe Val Asp  Arg Gln Thr
    3440                 3445                 3450

Ala Gln  Ala Ala Gly Thr Asp  Thr Thr Ile Thr Val  Asn Val Leu
    3455                 3460                 3465

Ala Trp  Leu Tyr Ala Ala Val  Ile Asn Gly Asp Arg  Trp Phe Leu
    3470                 3475                 3480

Asn Arg  Phe Thr Thr Thr Leu  Asn Asp Phe Asn Leu  Val Ala Met
    3485                 3490                 3495

Lys Tyr  Asn Tyr Glu Pro Leu  Thr Gln Asp His Val  Asp Ile Leu
    3500                 3505                 3510

Gly Pro  Leu Ser Ala Gln Thr  Gly Ile Ala Val Leu  Asp Met Cys
    3515                 3520                 3525

Ala Ser  Leu Lys Glu Leu Leu  Gln Asn Gly Met Asn  Gly Arg Thr
    3530                 3535                 3540

Ile Leu  Gly Ser Ala Leu Leu  Glu Asp Glu Phe Thr  Pro Phe Asp
    3545                 3550                 3555

Val Val  Arg Gln Cys Ser Gly  Val Thr Phe Gln Ser  Ala Val Lys
    3560                 3565                 3570

Arg Thr  Ile Lys Gly Thr His  His Trp Leu Leu Leu  Thr Ile Leu
    3575                 3580                 3585

Thr Ser  Leu Leu Val Leu Val  Gln Ser Thr Gln Trp  Ser Leu Phe
    3590                 3595                 3600

Phe Phe  Xaa Tyr Glu Asn Ala  Phe Leu Pro Phe Ala  Met Gly Ile
    3605                 3610                 3615

Ile Ala  Met Ser Ala Phe Ala  Met Met Phe Val Lys  His Lys His
    3620                 3625                 3630

Ala Phe  Leu Cys Leu Phe Leu  Leu Pro Ser Leu Ala  Thr Val Ala
```

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    3635                3640                3645

Tyr Phe  Asn Met Val Tyr Met  Pro Ala Ser Trp Val  Met Arg Ile
    3650                3655                3660

Met Thr  Trp Leu Asp Met Val  Asp Thr Ser Leu Ser  Gly Phe Lys
    3665                3670                3675

Leu Lys  Asp Cys Val Met Tyr  Ala Ser Ala Val Val  Leu Leu Ile
    3680                3685                3690

Leu Met  Thr Ala Arg Thr Val  Tyr Asp Asp Gly Ala  Arg Arg Val
    3695                3700                3705

Trp Thr  Leu Met Asn Val Leu  Thr Leu Val Tyr Lys  Val Tyr Tyr
    3710                3715                3720

Gly Asn  Ala Leu Asp Gln Ala  Ile Ser Met Trp Ala  Leu Ile Ile
    3725                3730                3735

Ser Val  Thr Ser Asn Tyr Ser  Gly Val Val Thr Thr  Val Met Phe
    3740                3745                3750

Leu Ala  Arg Gly Ile Val Phe  Met Cys Val Glu Tyr  Cys Pro Ile
    3755                3760                3765

Phe Phe  Ile Thr Gly Asn Thr  Leu Gln Cys Ile Met  Leu Val Tyr
    3770                3775                3780

Cys Phe  Leu Gly Tyr Phe Cys  Thr Cys Tyr Phe Gly  Leu Phe Cys
    3785                3790                3795

Leu Leu  Asn Arg Tyr Phe Arg  Leu Thr Leu Gly Val  Tyr Asp Tyr
    3800                3805                3810

Leu Val  Ser Thr Gln Glu Phe  Arg Tyr Met Asn Ser  Gln Gly Leu
    3815                3820                3825

Leu Pro  Pro Lys Asn Ser Ile  Asp Ala Phe Lys Leu  Asn Ile Lys
    3830                3835                3840
```

```
Leu Leu  Gly Val Gly Gly Lys  Pro Cys Ile Lys Val  Ala Thr Val
    3845                3850                3855

Gln Ser  Lys Met Ser Asp Val  Lys Cys Thr Ser Val  Val Leu Leu
    3860                3865                3870

Ser Val  Leu Gln Gln Leu Arg  Val Glu Ser Ser Ser  Lys Leu Trp
    3875                3880                3885

Ala Gln  Cys Val Gln Leu His  Asn Asp Ile Leu Leu  Ala Lys Asp
    3890                3895                3900

Thr Thr  Glu Ala Phe Glu Lys  Met Val Ser Leu Leu  Ser Val Leu
    3905                3910                3915

Leu Ser  Met Gln Gly Ala Val  Asp Ile Asn Lys Leu  Cys Glu Glu
    3920                3925                3930

Met Leu  Asp Asn Arg Ala Thr  Leu Gln Ala Ile Ala  Ser Glu Phe
    3935                3940                3945

Ser Ser  Leu Pro Ser Tyr Ala  Ala Phe Ala Thr Ala  Gln Glu Ala
    3950                3955                3960

Tyr Glu  Gln Ala Val Ala Asn  Gly Asp Ser Glu Val  Val Leu Lys
    3965                3970                3975

Lys Leu  Lys Lys Ser Leu Asn  Val Ala Lys Ser Glu  Phe Asp Arg
    3980                3985                3990

Asp Ala  Ala Met Gln Arg Lys  Leu Glu Lys Met Ala  Asp Gln Ala
    3995                4000                4005

Met Thr  Gln Met Tyr Lys Gln  Ala Arg Ser Glu Asp  Lys Arg Ala
    4010                4015                4020

Lys Val  Thr Ser Ala Met Gln  Thr Met Leu Phe Thr  Met Leu Arg
    4025                4030                4035

Lys Leu  Asp Asn Asp Ala Leu  Asn Asn Ile Ile Asn  Asn Ala Arg
```

```
    4040                4045                4050

Asp Gly  Cys Val Pro Leu Asn  Ile Ile Pro Leu Thr  Thr Ala Ala
    4055                4060                4065

Lys Leu  Met Val Val Ile Pro  Asp Tyr Asn Thr Tyr  Lys Asn Thr
    4070                4075                4080

Cys Asp  Gly Thr Thr Phe Thr  Tyr Ala Ser Ala Leu  Trp Glu Ile
    4085                4090                4095

Gln Gln  Val Val Asp Ala Asp  Ser Lys Ile Val Gln  Leu Ser Glu
    4100                4105                4110

Ile Ser  Met Asp Asn Ser Pro  Asn Leu Ala Trp Pro  Leu Ile Val
    4115                4120                4125

Thr Ala  Leu Arg Ala Asn Ser  Ala Val Lys Leu Gln  Asn Asn Glu
    4130                4135                4140

Leu Ser  Pro Val Ala Leu Arg  Gln Met Ser Cys Ala  Ala Gly Thr
    4145                4150                4155

Thr Gln  Thr Ala Cys Thr Asp  Asp Asn Ala Leu Ala  Tyr Tyr Asn
    4160                4165                4170

Thr Thr  Lys Gly Gly Arg Phe  Val Leu Ala Leu Leu  Ser Asp Leu
    4175                4180                4185

Gln Asp  Leu Lys Trp Ala Arg  Phe Pro Lys Ser Asp  Gly Thr Gly
    4190                4195                4200

Thr Ile  Tyr Thr Glu Leu Glu  Pro Pro Cys Arg Phe  Val Thr Asp
    4205                4210                4215

Thr Pro  Lys Gly Pro Lys Val  Lys Tyr Leu Tyr Phe  Ile Lys Gly
    4220                4225                4230

Leu Asn  Asn Leu Asn Arg Gly  Met Val Leu Gly Ser  Leu Ala Ala
    4235                4240                4245
```

```
Thr Val  Arg Leu Gln Ala Gly  Asn Ala Thr Glu Val  Pro Ala Asn
    4250                4255                4260

Ser Thr  Val Leu Ser Phe Cys  Ala Phe Ala Val Asp  Ala Ala Lys
    4265                4270                4275

Ala Tyr  Lys Asp Tyr Leu Ala  Ser Gly Gly Gln Pro  Ile Thr Asn
    4280                4285                4290

Cys Val  Lys Met Leu Cys Thr  His Thr Gly Thr Gly  Gln Ala Ile
    4295                4300                4305

Thr Val  Thr Pro Glu Ala Asn  Met Asp Gln Glu Ser  Phe Gly Gly
    4310                4315                4320

Ala Ser  Cys Cys Leu Tyr Cys  Arg Cys His Ile Asp  His Pro Asn
    4325                4330                4335

Pro Lys  Gly Phe Cys Asp Leu  Lys Gly Lys Tyr Val  Gln Ile Pro
    4340                4345                4350

Thr Thr  Cys Ala Asn Asp Pro  Val Gly Phe Thr Leu  Lys Asn Thr
    4355                4360                4365

Val Cys  Thr Val Cys Gly Met  Trp Lys Gly Tyr Gly  Cys Ser Cys
    4370                4375                4380

Asp Gln  Leu Arg Glu Pro Met  Leu Gln Ser Ala Asp  Ala Gln Ser
    4385                4390                4395

Phe Leu  Asn Arg Val Cys Gly  Val Ser Ala Ala Arg  Leu Thr Pro
    4400                4405                4410

Cys Gly  Thr Gly Thr Ser Thr  Asp Val Val Tyr Arg  Ala Phe Asp
    4415                4420                4425

Ile Tyr  Asn Asp Lys Val Ala  Gly Phe Ala Lys Phe  Leu Lys Thr
    4430                4435                4440

Asn Cys  Cys Arg Phe Gln Glu  Lys Asp Glu Asp Asp  Asn Leu Ile
```

```
    4445                4450                4455

Asp Ser  Tyr Phe Val Val Lys  Arg His Thr Phe Ser  Asn Tyr Gln
    4460                4465                4470

His Glu  Glu Thr Ile Tyr Asn  Leu Leu Lys Asp Cys  Pro Ala Val
    4475                4480                4485

Ala Lys  His Asp Phe Phe Lys  Phe Arg Ile Asp Gly  Asp Met Val
    4490                4495                4500

Pro His  Ile Ser Arg Gln Arg  Leu Thr Lys Tyr Thr  Met Ala Asp
    4505                4510                4515

Leu Val  Tyr Ala Leu Arg His  Phe Asp Glu Gly Asn  Cys Asp Thr
    4520                4525                4530

Leu Lys  Glu Ile Leu Val Thr  Tyr Asn Cys Cys Asp  Asp Asp Tyr
    4535                4540                4545

Phe Asn  Lys Lys Asp Trp Tyr  Asp Phe Val Glu Asn  Pro Asp Ile
    4550                4555                4560

Leu Arg  Val Tyr Ala Asn Leu  Gly Glu Arg Val Arg  Gln Ala Leu
    4565                4570                4575

Leu Lys  Thr Val Gln Phe Cys  Asp Ala Met Arg Asn  Ala Gly Ile
    4580                4585                4590

Val Gly  Val Leu Thr Leu Asp  Asn Gln Asp Leu Asn  Gly Asn Trp
    4595                4600                4605

Tyr Asp  Phe Gly Asp Phe Ile  Gln Thr Thr Pro Gly  Ser Gly Val
    4610                4615                4620

Pro Val  Val Asp Ser Tyr Tyr  Ser Leu Leu Met Pro  Ile Leu Thr
    4625                4630                4635

Leu Thr  Arg Ala Leu Thr Ala  Glu Ser His Val Asp  Thr Asp Leu
    4640                4645                4650
```

```
Thr Lys  Pro Tyr Ile Lys Trp  Asp Leu Leu Lys Tyr  Asp Phe Thr
    4655                4660                4665

Glu Glu  Arg Leu Lys Leu Phe  Asp Arg Tyr Phe Lys  Tyr Trp Asp
    4670                4675                4680

Gln Thr  Tyr His Pro Asn Cys  Val Asn Cys Leu Asp  Asp Arg Cys
    4685                4690                4695

Ile Leu  His Cys Ala Asn Phe  Asn Val Leu Phe Ser  Thr Val Phe
    4700                4705                4710

Pro Pro  Thr Ser Phe Gly Pro  Leu Val Arg Lys Ile  Phe Val Asp
    4715                4720                4725

Gly Val  Pro Phe Val Val Ser  Thr Gly Tyr His Phe  Arg Glu Leu
    4730                4735                4740

Gly Val  Val His Asn Gln Asp  Val Asn Leu His Ser  Ser Arg Leu
    4745                4750                4755

Ser Phe  Lys Glu Leu Leu Val  Tyr Ala Ala Asp Pro  Ala Met His
    4760                4765                4770

Ala Ala  Ser Gly Asn Leu Leu  Leu Asp Lys Arg Thr  Thr Cys Phe
    4775                4780                4785

Ser Val  Ala Ala Leu Thr Asn  Asn Val Ala Phe Gln  Thr Val Lys
    4790                4795                4800

Pro Gly  Asn Phe Asn Lys Asp  Phe Tyr Asp Phe Ala  Val Ser Lys
    4805                4810                4815

Gly Phe  Phe Lys Glu Gly Ser  Ser Val Glu Leu Lys  His Phe Phe
    4820                4825                4830

Phe Ala  Gln Asp Gly Asn Ala  Ala Ile Ser Asp Tyr  Asp Tyr Tyr
    4835                4840                4845

Arg Tyr  Asn Leu Pro Thr Met  Cys Asp Ile Arg Gln  Leu Leu Phe
```

```
    4850                4855                4860

Val Val  Glu Val Val Asp Lys  Tyr Phe Asp Cys Tyr  Asp Gly Gly
    4865                4870                4875

Cys Ile  Asn Ala Asn Gln Val  Ile Val Asn Asn Leu  Asp Lys Ser
    4880                4885                4890

Ala Gly  Phe Pro Phe Asn Lys  Trp Gly Lys Ala Arg  Leu Tyr Tyr
    4895                4900                4905

Asp Ser  Met Ser Tyr Glu Asp  Gln Asp Ala Leu Phe  Ala Tyr Thr
    4910                4915                4920

Lys Arg  Asn Val Ile Pro Thr  Ile Thr Gln Met Asn  Leu Lys Tyr
    4925                4930                4935

Ala Ile  Ser Ala Lys Asn Arg  Ala Arg Thr Val Ala  Gly Val Ser
    4940                4945                4950

Ile Cys  Ser Thr Met Thr Asn  Arg Gln Phe His Gln  Lys Leu Leu
    4955                4960                4965

Lys Ser  Ile Ala Ala Thr Arg  Gly Ala Thr Val Val  Ile Gly Thr
    4970                4975                4980

Ser Lys  Phe Tyr Gly Gly Trp  His Asn Met Leu Lys  Thr Val Tyr
    4985                4990                4995

Ser Asp  Val Glu Asn Pro His  Leu Met Gly Trp Asp  Tyr Pro Lys
    5000                5005                5010

Cys Asp  Arg Ala Met Pro Asn  Met Leu Arg Ile Met  Ala Ser Leu
    5015                5020                5025

Val Leu  Ala Arg Lys His Thr  Thr Cys Cys Ser Leu  Ser His Arg
    5030                5035                5040

Phe Tyr  Arg Leu Ala Asn Glu  Cys Ala Gln Val Leu  Ser Glu Met
    5045                5050                5055
```

```
Val Met  Cys Gly Gly Ser Leu  Tyr Val Lys Pro Gly  Gly Thr Ser
    5060                5065                5070

Ser Gly  Asp Ala Thr Thr Ala  Tyr Ala Asn Ser Val  Phe Asn Ile
    5075                5080                5085

Cys Gln  Ala Val Thr Ala Asn  Val Asn Ala Leu Leu  Ser Thr Asp
    5090                5095                5100

Gly Asn  Lys Ile Ala Asp Lys  Tyr Val Arg Asn Leu  Gln His Arg
    5105                5110                5115

Leu Tyr  Glu Cys Leu Tyr Arg  Asn Arg Asp Val Asp  Thr Asp Phe
    5120                5125                5130

Val Asn  Glu Phe Tyr Ala Tyr  Leu Arg Lys His Phe  Ser Met Met
    5135                5140                5145

Ile Leu  Ser Asp Asp Ala Val  Val Cys Phe Asn Ser  Thr Tyr Ala
    5150                5155                5160

Ser Gln  Gly Leu Val Ala Ser  Ile Lys Asn Phe Lys  Ser Val Leu
    5165                5170                5175

Tyr Tyr  Gln Asn Asn Val Phe  Met Ser Glu Ala Lys  Cys Trp Thr
    5180                5185                5190

Glu Thr  Asp Leu Thr Lys Gly  Pro His Glu Phe Cys  Ser Gln His
    5195                5200                5205

Thr Met  Leu Val Lys Gln Gly  Asp Asp Tyr Val Tyr  Leu Pro Tyr
    5210                5215                5220

Pro Asp  Pro Ser Arg Ile Leu  Gly Ala Gly Cys Phe  Val Asp Asp
    5225                5230                5235

Ile Val  Lys Thr Asp Gly Thr  Leu Met Ile Glu Arg  Phe Val Ser
    5240                5245                5250

Leu Ala  Ile Asp Ala Tyr Pro  Leu Thr Lys His Pro  Asn Gln Glu
```

```
    5255                5260                5265

Tyr Ala  Asp Val Phe His Leu  Tyr Leu Gln Tyr Ile  Arg Lys Leu
    5270                5275                5280

His Asp  Glu Leu Thr Gly His  Met Leu Asp Met Tyr  Ser Val Met
    5285                5290                5295

Leu Thr  Asn Asp Asn Thr Ser  Arg Tyr Trp Glu Pro  Glu Phe Tyr
    5300                5305                5310

Glu Ala  Met Tyr Thr Pro His  Thr Val Leu Gln Ala  Val Gly Ala
    5315                5320                5325

Cys Val  Leu Cys Asn Ser Gln  Thr Ser Leu Arg Cys  Gly Ala Cys
    5330                5335                5340

Ile Arg  Arg Pro Phe Leu Cys  Cys Lys Cys Cys Tyr  Asp His Val
    5345                5350                5355

Ile Ser  Thr Ser His Lys Leu  Val Leu Ser Val Asn  Pro Tyr Val
    5360                5365                5370

Cys Asn  Ala Pro Gly Cys Asp  Val Thr Asp Val Thr  Gln Leu Tyr
    5375                5380                5385

Leu Gly  Gly Met Ser Tyr Tyr  Cys Lys Ser His Lys  Pro Pro Ile
    5390                5395                5400

Ser Phe  Pro Leu Cys Ala Asn  Gly Gln Val Phe Gly  Leu Tyr Lys
    5405                5410                5415

Asn Thr  Cys Val Gly Ser Asp  Asn Val Thr Asp Phe  Asn Ala Ile
    5420                5425                5430

Ala Thr  Cys Asp Trp Thr Asn  Ala Gly Asp Tyr Ile  Leu Ala Asn
    5435                5440                5445

Thr Cys  Thr Glu Arg Leu Lys  Leu Phe Ala Ala Glu  Thr Leu Lys
    5450                5455                5460
```

```
Ala Thr  Glu Glu Thr Phe Lys  Leu Ser Tyr Gly Ile  Ala Thr Val
    5465                5470                5475

Arg Glu  Val Leu Ser Asp Arg  Glu Leu His Leu Ser  Trp Glu Val
    5480                5485                5490

Gly Lys  Pro Arg Pro Pro Leu  Asn Arg Asn Tyr Val  Phe Thr Gly
    5495                5500                5505

Tyr Arg  Val Thr Lys Asn Ser  Lys Val Gln Ile Gly  Glu Tyr Thr
    5510                5515                5520

Phe Glu  Lys Gly Asp Tyr Gly  Asp Ala Val Val Tyr  Arg Gly Thr
    5525                5530                5535

Thr Thr  Tyr Lys Leu Asn Val  Gly Asp Tyr Phe Val  Leu Thr Ser
    5540                5545                5550

His Thr  Val Met Pro Leu Ser  Ala Pro Thr Leu Val  Pro Gln Glu
    5555                5560                5565

His Tyr  Val Arg Ile Thr Gly  Leu Tyr Pro Thr Leu  Asn Ile Ser
    5570                5575                5580

Asp Glu  Phe Ser Ser Asn Val  Ala Asn Tyr Gln Lys  Val Gly Met
    5585                5590                5595

Gln Lys  Tyr Ser Thr Leu Gln  Gly Pro Pro Gly Thr  Gly Lys Ser
    5600                5605                5610

His Phe  Ala Ile Gly Leu Ala  Leu Tyr Tyr Pro Ser  Ala Arg Ile
    5615                5620                5625

Val Tyr  Thr Ala Cys Ser His  Ala Ala Val Asp Ala  Leu Cys Glu
    5630                5635                5640

Lys Ala  Leu Lys Tyr Leu Pro  Ile Asp Lys Cys Ser  Arg Ile Ile
    5645                5650                5655

Pro Ala  Arg Ala Arg Val Glu  Cys Phe Asp Lys Phe  Lys Val Asn
```

```
    5660                5665                5670

Ser Thr  Leu Glu Gln Tyr Val  Phe Cys Thr Val Asn  Ala Leu Pro
    5675                5680                5685

Glu Thr  Thr Ala Asp Ile Val  Val Phe Asp Glu Ile  Ser Met Ala
    5690                5695                5700

Thr Asn  Tyr Asp Leu Ser Val  Val Asn Ala Arg Leu  Arg Ala Lys
    5705                5710                5715

His Tyr  Val Tyr Ile Gly Asp  Pro Ala Gln Leu Pro  Ala Pro Arg
    5720                5725                5730

Thr Leu  Leu Thr Lys Gly Thr  Leu Glu Pro Glu Tyr  Phe Asn Ser
    5735                5740                5745

Val Cys  Arg Leu Met Lys Thr  Ile Gly Pro Asp Met  Phe Leu Gly
    5750                5755                5760

Thr Cys  Arg Arg Cys Pro Ala  Glu Ile Val Asp Thr  Val Ser Ala
    5765                5770                5775

Leu Val  Tyr Asp Asn Lys Leu  Lys Ala His Lys Asp  Lys Ser Ala
    5780                5785                5790

Gln Cys  Phe Lys Met Phe Tyr  Lys Gly Val Ile Thr  His Asp Val
    5795                5800                5805

Ser Ser  Ala Ile Asn Arg Pro  Gln Ile Gly Val Val  Arg Glu Phe
    5810                5815                5820

Leu Thr  Arg Asn Pro Ala Trp  Arg Lys Ala Val Phe  Ile Ser Pro
    5825                5830                5835

Tyr Asn  Ser Gln Asn Ala Val  Ala Ser Lys Ile Leu  Gly Leu Pro
    5840                5845                5850

Thr Gln  Thr Val Asp Ser Ser  Gln Gly Ser Glu Tyr  Asp Tyr Val
    5855                5860                5865
```

```
Ile Phe  Thr Gln Thr Thr Glu  Thr Ala His Ser Cys  Asn Val Asn
    5870                5875                5880

Arg Phe  Asn Val Ala Ile Thr  Arg Ala Lys Val Gly  Ile Leu Cys
    5885                5890                5895

Ile Met  Ser Asp Arg Asp Leu  Tyr Asp Lys Leu Gln  Phe Thr Ser
    5900                5905                5910

Leu Glu  Ile Pro Arg Arg Asn  Val Ala Thr Leu Gln  Ala Glu Asn
    5915                5920                5925

Val Thr  Gly Leu Phe Lys Asp  Cys Ser Lys Val Ile  Thr Gly Leu
    5930                5935                5940

His Pro  Thr Gln Ala Pro Thr  His Leu Ser Val Asp  Thr Lys Phe
    5945                5950                5955

Lys Thr  Glu Gly Leu Cys Val  Asp Ile Pro Gly Ile  Pro Lys Asp
    5960                5965                5970

Met Thr  Tyr Arg Arg Leu Ile  Ser Met Met Gly Phe  Lys Met Asn
    5975                5980                5985

Tyr Gln  Val Asn Gly Tyr Pro  Asn Met Phe Ile Thr  Arg Glu Glu
    5990                5995                6000

Ala Ile  Arg His Val Arg Ala  Trp Ile Gly Phe Asp  Val Glu Gly
    6005                6010                6015

Cys His  Ala Thr Arg Glu Ala  Val Gly Thr Asn Leu  Pro Leu Gln
    6020                6025                6030

Leu Gly  Phe Ser Thr Gly Val  Asn Leu Val Ala Val  Pro Thr Gly
    6035                6040                6045

Tyr Val  Asp Thr Pro Asn Asn  Thr Asp Phe Ser Arg  Val Ser Ala
    6050                6055                6060

Lys Pro  Pro Pro Gly Asp Gln  Phe Lys His Leu Ile  Pro Leu Met
```

```
    6065                6070                6075

Tyr Lys  Gly Leu Pro Trp Asn  Val Val Arg Ile Lys  Ile Val Gln
    6080                6085                6090

Met Leu  Ser Asp Thr Leu Lys  Asn Leu Ser Asp Arg  Val Val Phe
    6095                6100                6105

Val Leu  Trp Ala His Gly Phe  Glu Leu Thr Ser Met  Lys Tyr Phe
    6110                6115                6120

Val Lys  Ile Gly Pro Glu Arg  Thr Cys Cys Leu Cys  Asp Arg Arg
    6125                6130                6135

Ala Thr  Cys Phe Ser Thr Ala  Ser Asp Thr Tyr Ala  Cys Trp His
    6140                6145                6150

His Ser  Ile Gly Phe Asp Tyr  Val Tyr Asn Pro Phe  Met Ile Asp
    6155                6160                6165

Val Gln  Gln Trp Gly Phe Thr  Gly Asn Leu Gln Ser  Asn His Asp
    6170                6175                6180

Leu Tyr  Cys Gln Val His Gly  Asn Ala His Val Ala  Ser Cys Asp
    6185                6190                6195

Ala Ile  Met Thr Arg Cys Leu  Ala Val His Glu Cys  Phe Val Lys
    6200                6205                6210

Arg Val  Asp Trp Thr Ile Glu  Tyr Pro Ile Ile Gly  Asp Glu Leu
    6215                6220                6225

Lys Ile  Asn Ala Ala Cys Arg  Lys Val Gln His Met  Val Val Lys
    6230                6235                6240

Ala Ala  Leu Leu Ala Asp Lys  Phe Pro Val Leu His  Asp Ile Gly
    6245                6250                6255

Asn Pro  Lys Ala Ile Lys Cys  Val Pro Gln Ala Asp  Val Glu Trp
    6260                6265                6270
```

```
Lys Phe  Tyr Asp Ala Gln Pro  Cys Ser Asp Lys Ala  Tyr Lys Ile
    6275                6280                6285

Glu Glu  Leu Phe Tyr Ser Tyr  Ala Thr His Ser Asp  Lys Phe Thr
    6290                6295                6300

Asp Gly  Val Cys Leu Phe Trp  Asn Cys Asn Val Asp  Arg Tyr Pro
    6305                6310                6315

Ala Asn  Ser Ile Val Cys Arg  Phe Asp Thr Arg Val  Leu Ser Asn
    6320                6325                6330

Leu Asn  Leu Pro Gly Cys Asp  Gly Gly Ser Leu Tyr  Val Asn Lys
    6335                6340                6345

His Ala  Phe His Thr Pro Ala  Phe Asp Lys Ser Ala  Phe Val Asn
    6350                6355                6360

Leu Lys  Gln Leu Pro Phe Phe  Tyr Tyr Ser Asp Ser  Pro Cys Glu
    6365                6370                6375

Ser His  Gly Lys Gln Val Val  Ser Asp Ile Asp Tyr  Val Pro Leu
    6380                6385                6390

Lys Ser  Ala Thr Cys Ile Thr  Arg Cys Asn Leu Gly  Gly Ala Val
    6395                6400                6405

Cys Arg  His His Ala Asn Glu  Tyr Arg Leu Tyr Leu  Asp Ala Tyr
    6410                6415                6420

Asn Met  Met Ile Ser Ala Gly  Phe Ser Leu Trp Val  Tyr Lys Gln
    6425                6430                6435

Phe Asp  Thr Tyr Asn Leu Trp  Asn Thr Phe Thr Arg  Leu Gln Ser
    6440                6445                6450

Leu Glu  Asn Val Ala Phe Asn  Val Val Asn Lys Gly  His Phe Asp
    6455                6460                6465

Gly Gln  Gln Gly Glu Val Pro  Val Ser Ile Ile Asn  Asn Thr Val
```

```
    6470                6475                6480

Tyr Thr  Lys Val Asp Gly Val  Asp Val Glu Leu Phe  Glu Asn Lys
    6485                6490                6495

Thr Thr  Leu Pro Val Asn Val  Ala Phe Glu Leu Trp  Ala Lys Arg
    6500                6505                6510

Asn Ile  Lys Pro Val Pro Glu  Val Lys Ile Leu Asn  Asn Leu Gly
    6515                6520                6525

Val Asp  Ile Ala Ala Asn Thr  Val Ile Trp Asp Tyr  Lys Arg Asp
    6530                6535                6540

Ala Pro  Ala His Ile Ser Thr  Ile Gly Val Cys Ser  Met Thr Asp
    6545                6550                6555

Ile Ala  Lys Lys Pro Thr Glu  Thr Ile Cys Ala Pro  Leu Thr Val
    6560                6565                6570

Phe Phe  Asp Gly Arg Val Asp  Gly Gln Val Asp Leu  Phe Arg Asn
    6575                6580                6585

Ala Arg  Asn Gly Val Leu Ile  Thr Glu Gly Ser Val  Lys Gly Leu
    6590                6595                6600

Gln Pro  Ser Val Gly Pro Lys  Gln Ala Ser Leu Asn  Gly Val Thr
    6605                6610                6615

Leu Ile  Gly Glu Ala Val Lys  Thr Gln Phe Asn Tyr  Tyr Lys Lys
    6620                6625                6630

Val Asp  Gly Val Val Gln Gln  Leu Pro Glu Thr Tyr  Phe Thr Gln
    6635                6640                6645

Ser Arg  Asn Leu Gln Glu Phe  Lys Pro Arg Ser Gln  Met Glu Ile
    6650                6655                6660

Asp Phe  Leu Glu Leu Ala Met  Asp Glu Phe Ile Glu  Arg Tyr Lys
    6665                6670                6675
```

```
Leu Glu  Gly Tyr Ala Phe Glu  His Ile Val Tyr Gly  Asp Phe Ser
    6680                6685                6690

His Ser  Gln Leu Gly Gly Leu  His Leu Leu Ile Gly  Leu Ala Lys
    6695                6700                6705

Arg Phe  Lys Glu Ser Pro Phe  Glu Leu Glu Asp Phe  Ile Pro Met
    6710                6715                6720

Asp Ser  Thr Val Lys Asn Tyr  Phe Ile Thr Asp Ala  Gln Thr Gly
    6725                6730                6735

Ser Ser  Lys Cys Val Cys Ser  Val Ile Asp Leu Leu  Leu Asp Asp
    6740                6745                6750

Phe Val  Glu Ile Ile Lys Ser  Gln Asp Leu Ser Val  Val Ser Lys
    6755                6760                6765

Val Val  Lys Val Thr Ile Asp  Tyr Thr Glu Ile Ser  Phe Met Leu
    6770                6775                6780

Trp Cys  Lys Asp Gly His Val  Glu Thr Phe Tyr Pro  Lys Leu Gln
    6785                6790                6795

Ser Ser  Gln Ala Trp Gln Pro  Gly Val Ala Met Pro  Asn Leu Tyr
    6800                6805                6810

Lys Met  Gln Arg Met Leu Leu  Glu Lys Cys Asp Leu  Gln Asn Tyr
    6815                6820                6825

Gly Asp  Ser Ala Thr Leu Pro  Lys Gly Ile Met Met  Asn Val Ala
    6830                6835                6840

Lys Tyr  Thr Gln Leu Cys Gln  Tyr Leu Asn Thr Leu  Thr Leu Ala
    6845                6850                6855

Val Pro  Tyr Asn Met Arg Val  Ile His Phe Gly Ala  Gly Ser Asp
    6860                6865                6870

Lys Gly  Val Ala Pro Gly Thr  Ala Val Leu Arg Gln  Trp Leu Pro
```

```
    6875                6880                6885

Thr Gly  Thr Leu Leu Val Asp  Ser Asp Leu Asn Asp  Phe Val Ser
    6890                6895                6900

Asp Ala  Asp Ser Thr Leu Ile  Gly Asp Cys Ala Thr  Val His Thr
    6905                6910                6915

Ala Asn  Lys Trp Asp Leu Ile  Ile Ser Asp Met Tyr  Asp Pro Lys
    6920                6925                6930

Thr Lys  Asn Val Thr Lys Glu  Asn Asp Ser Lys Glu  Gly Phe Phe
    6935                6940                6945

Thr Tyr  Ile Cys Gly Phe Ile  Gln Gln Lys Leu Ala  Leu Gly Gly
    6950                6955                6960

Ser Val  Ala Ile Lys Ile Thr  Glu His Ser Trp Asn  Ala Asp Leu
    6965                6970                6975

Tyr Lys  Leu Met Gly His Phe  Ala Trp Trp Thr Ala  Phe Val Thr
    6980                6985                6990

Asn Val  Asn Ala Ser Ser Ser  Glu Ala Phe Leu Ile  Gly Cys Asn
    6995                7000                7005

Tyr Leu  Gly Lys Pro Arg Glu  Gln Ile Asp Gly Tyr  Val Met His
    7010                7015                7020

Ala Asn  Tyr Ile Phe Trp Arg  Asn Thr Asn Pro Ile  Gln Leu Ser
    7025                7030                7035

Ser Tyr  Ser Leu Phe Asp Met  Ser Lys Phe Pro Leu  Lys Leu Arg
    7040                7045                7050

Gly Thr  Ala Val Met Ser Leu  Lys Glu
    7055                7060

<210>  11
<211>  1273
<212>  PRT
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<213> SARS-CoV2

<400> 11

```
Met Phe Val Phe Leu Val Leu Leu Pro Leu Val Ser Ser Gln Cys Val
1               5                  10                  15


Asn Leu Thr Thr Arg Thr Gln Leu Pro Pro Ala Tyr Thr Asn Ser Phe
            20                  25                  30


Thr Arg Gly Val Tyr Tyr Pro Asp Lys Val Phe Arg Ser Ser Val Leu
        35                  40                  45


His Ser Thr Gln Asp Leu Phe Leu Pro Phe Phe Ser Asn Val Thr Trp
    50                  55                  60


Phe His Ala Ile His Val Ser Gly Thr Asn Gly Thr Lys Arg Phe Asp
65                  70                  75                  80


Asn Pro Val Leu Pro Phe Asn Asp Gly Val Tyr Phe Ala Ser Thr Glu
                85                  90                  95


Lys Ser Asn Ile Ile Arg Gly Trp Ile Phe Gly Thr Thr Leu Asp Ser
            100                 105                 110


Lys Thr Gln Ser Leu Leu Ile Val Asn Asn Ala Thr Asn Val Val Ile
        115                 120                 125


Lys Val Cys Glu Phe Gln Phe Cys Asn Asp Pro Phe Leu Gly Val Tyr
    130                 135                 140


Tyr His Lys Asn Asn Lys Ser Trp Met Glu Ser Glu Phe Arg Val Tyr
145                 150                 155                 160


Ser Ser Ala Asn Asn Cys Thr Phe Glu Tyr Val Ser Gln Pro Phe Leu
                165                 170                 175


Met Asp Leu Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Arg Glu Phe
            180                 185                 190


Val Phe Lys Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His Thr
        195                 200                 205
```

```
Pro Ile Asn Leu Val Arg Asp Leu Pro Gln Gly Phe Ser Ala Leu Glu
    210                 215                 220

Pro Leu Val Asp Leu Pro Ile Gly Ile Asn Ile Thr Arg Phe Gln Thr
225                 230                 235                 240

Leu Leu Ala Leu His Arg Ser Tyr Leu Thr Pro Gly Asp Ser Ser Ser
                245                 250                 255

Gly Trp Thr Ala Gly Ala Ala Ala Tyr Tyr Val Gly Tyr Leu Gln Pro
            260                 265                 270

Arg Thr Phe Leu Leu Lys Tyr Asn Glu Asn Gly Thr Ile Thr Asp Ala
        275                 280                 285

Val Asp Cys Ala Leu Asp Pro Leu Ser Glu Thr Lys Cys Thr Leu Lys
    290                 295                 300

Ser Phe Thr Val Glu Lys Gly Ile Tyr Gln Thr Ser Asn Phe Arg Val
305                 310                 315                 320

Gln Pro Thr Glu Ser Ile Val Arg Phe Pro Asn Ile Thr Asn Leu Cys
                325                 330                 335

Pro Phe Gly Glu Val Phe Asn Ala Thr Arg Phe Ala Ser Val Tyr Ala
            340                 345                 350

Trp Asn Arg Lys Arg Ile Ser Asn Cys Val Ala Asp Tyr Ser Val Leu
        355                 360                 365

Tyr Asn Ser Ala Ser Phe Ser Thr Phe Lys Cys Tyr Gly Val Ser Pro
    370                 375                 380

Thr Lys Leu Asn Asp Leu Cys Phe Thr Asn Val Tyr Ala Asp Ser Phe
385                 390                 395                 400

Val Ile Arg Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr Gly
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Phe Gln Pro Thr Asn Gly Val Gly Tyr Gln Pro Tyr Arg Val Val Val
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Leu Ser Phe Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro Lys
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Ile Ile  Thr Thr Asp Asn Thr  Phe Val Ser Gly Asn  Cys Asp Val
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His Thr  Ser Pro Asp Val Asp  Leu Gly Asp Ile Ser  Gly Ile Asn
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Val Ala  Lys Asn Leu Asn Glu  Ser Leu Ile Asp Leu  Gln Glu Leu
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Ser Leu Pro Val Leu Gln Val Arg Asp Val Leu Val Arg Gly Phe Gly
20 25 30

Asp Ser Val Glu Glu Val Leu Ser Glu Ala Arg Gln His Leu Lys Asp
35 40 45

```
Gly Thr Cys Gly Leu Val Glu Val Glu Lys Gly Val Leu Pro Gln Leu
    50                  55                  60

Glu Gln Pro Tyr Val Phe Ile Lys Arg Ser Asp Ala Arg Thr Ala Pro
65                  70                  75                  80

His Gly His Val Met Val Glu Leu Val Ala Glu Leu Glu Gly Ile Gln
                85                  90                  95

Tyr Gly Arg Ser Gly Glu Thr Leu Gly Val Leu Val Pro His Val Gly
            100                 105                 110

Glu Ile Pro Val Ala Tyr Arg Lys Val Leu Leu Arg Lys Asn Gly Asn
        115                 120                 125

Lys Gly Ala Gly Gly His Ser Tyr Gly Ala Asp Leu Lys Ser Phe Asp
    130                 135                 140

Leu Gly Asp Glu Leu Gly Thr Asp Pro Tyr Glu Asp Phe Gln Glu Asn
145                 150                 155                 160

Trp Asn Thr Lys His Ser Ser Gly Val Thr Arg Glu Leu Met Arg Glu
                165                 170                 175

Leu Asn Gly Gly Ala Tyr Thr Arg Tyr Val Asp Asn Asn Phe Cys Gly
            180                 185                 190

Pro Asp Gly Tyr Pro Leu Glu Cys Ile Lys Asp Leu Leu Ala Arg Ala
        195                 200                 205

Gly Lys Ala Ser Cys Thr Leu Ser Glu Gln Leu Asp Phe Ile Asp Thr
    210                 215                 220

Lys Arg Gly Val Tyr Cys Cys Arg Glu His Glu His Glu Ile Ala Trp
225                 230                 235                 240

Tyr Thr Glu Arg Ser Glu Lys Ser Tyr Glu Leu Gln Thr Pro Phe Glu
                245                 250                 255

Ile Lys Leu Ala Lys Lys Phe Asp Thr Phe Asn Gly Glu Cys Pro Asn
            260                 265                 270
```

```
Phe Val Phe Pro Leu Asn Ser Ile Ile Lys Thr Ile Gln Pro Arg Val
        275                 280                 285

Glu Lys Lys Lys Leu Asp Gly Phe Met Gly Arg Ile Arg Ser Val Tyr
    290                 295                 300

Pro Val Ala Ser Pro Asn Glu Cys Asn Gln Met Cys Leu Ser Thr Leu
305                 310                 315                 320

Met Lys Cys Asp His Cys Gly Glu Thr Ser Trp Gln Thr Gly Asp Phe
                325                 330                 335

Val Lys Ala Thr Cys Glu Phe Cys Gly Thr Glu Asn Leu Thr Lys Glu
            340                 345                 350

Gly Ala Thr Thr Cys Gly Tyr Leu Pro Gln Asn Ala Val Val Lys Ile
        355                 360                 365

Tyr Cys Pro Ala Cys His Asn Ser Glu Val Gly Pro Glu His Ser Leu
    370                 375                 380

Ala Glu Tyr His Asn Glu Ser Gly Leu Lys Thr Ile Leu Arg Lys Gly
385                 390                 395                 400

Gly Arg Thr Ile Ala Phe Gly Gly Cys Val Phe Ser Tyr Val Gly Cys
                405                 410                 415

His Asn Lys Cys Ala Tyr Trp Val Pro Arg Ala Ser Ala Asn Ile Gly
            420                 425                 430

Cys Asn His Thr Gly Val Val Gly Glu Gly Ser Glu Gly Leu Asn Asp
        435                 440                 445

Asn Leu Leu Glu Ile Leu Gln Lys Glu Lys Val Asn Ile Asn Ile Val
    450                 455                 460

Gly Asp Phe Lys Leu Asn Glu Glu Ile Ala Ile Ile Leu Ala Ser Phe
465                 470                 475                 480
```

```
Ser Ala Ser Thr Ser Ala Phe Val Glu Thr Val Lys Gly Leu Asp Tyr
                485                 490                 495

Lys Ala Phe Lys Gln Ile Val Glu Ser Cys Gly Asn Phe Lys Val Thr
            500                 505                 510

Lys Gly Lys Ala Lys Lys Gly Ala Trp Asn Ile Gly Glu Gln Lys Ser
        515                 520                 525

Ile Leu Ser Pro Leu Tyr Ala Phe Ala Ser Glu Ala Ala Arg Val Val
    530                 535                 540

Arg Ser Ile Phe Ser Arg Thr Leu Glu Thr Ala Gln Asn Ser Val Arg
545                 550                 555                 560

Val Leu Gln Lys Ala Ala Ile Thr Ile Leu Asp Gly Ile Ser Gln Tyr
                565                 570                 575

Ser Leu Arg Leu Ile Asp Ala Met Met Phe Thr Ser Asp Leu Ala Thr
            580                 585                 590

Asn Asn Leu Val Val Met Ala Tyr Ile Thr Gly Gly Val Val Gln Leu
        595                 600                 605

Thr Ser Gln Trp Leu Thr Asn Ile Phe Gly Thr Val Tyr Glu Lys Leu
    610                 615                 620

Lys Pro Val Leu Asp Trp Leu Glu Glu Lys Phe Lys Glu Gly Val Glu
625                 630                 635                 640

Phe Leu Arg Asp Gly Trp Glu Ile Val Lys Phe Ile Ser Thr Cys Ala
                645                 650                 655

Cys Glu Ile Val Gly Gly Gln Ile Val Thr Cys Ala Lys Glu Ile Lys
            660                 665                 670

Glu Ser Val Gln Thr Phe Phe Lys Leu Val Asn Lys Phe Leu Ala Leu
        675                 680                 685

Cys Ala Asp Ser Ile Ile Ile Gly Gly Ala Lys Leu Lys Ala Leu Asn
    690                 695                 700
```

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Leu Gly Glu Thr Phe Val Thr His Ser Lys Gly Leu Tyr Arg Lys Cys
705                 710                 715                 720


Val Lys Ser Arg Glu Glu Thr Gly Leu Leu Met Pro Leu Lys Ala Pro
                725                 730                 735


Lys Glu Ile Ile Phe Leu Glu Gly Glu Thr Leu Pro Thr Glu Val Leu
            740                 745                 750


Thr Glu Glu Val Val Leu Lys Thr Gly Asp Leu Gln Pro Leu Glu Gln
        755                 760                 765


Pro Thr Ser Glu Ala Val Glu Ala Pro Leu Val Gly Thr Pro Val Cys
    770                 775                 780


Ile Asn Gly Leu Met Leu Leu Glu Ile Lys Asp Thr Glu Lys Tyr Cys
785                 790                 795                 800


Ala Leu Ala Pro Asn Met Met Val Thr Asn Asn Thr Phe Thr Leu Lys
                805                 810                 815


Gly Gly Ala Pro Thr Lys Val Thr Phe Gly Asp Asp Thr Val Ile Glu
            820                 825                 830


Val Gln Gly Tyr Lys Ser Val Asn Ile Thr Phe Glu Leu Asp Glu Arg
        835                 840                 845


Ile Asp Lys Val Leu Asn Glu Lys Cys Ser Ala Tyr Thr Val Glu Leu
    850                 855                 860


Gly Thr Glu Val Asn Glu Phe Ala Cys Val Val Ala Asp Ala Val Ile
865                 870                 875                 880


Lys Thr Leu Gln Pro Val Ser Glu Leu Leu Thr Pro Leu Gly Ile Asp
                885                 890                 895


Leu Asp Glu Trp Ser Met Ala Thr Tyr Tyr Leu Phe Asp Glu Ser Gly
            900                 905                 910
```

```
Glu Phe Lys Leu Ala Ser His Met Tyr Cys Ser Phe Tyr Pro Pro Asp
        915                 920                 925


Glu Asp Glu Glu Glu Gly Asp Cys Glu Glu Glu Glu Phe Glu Pro Ser
    930                 935                 940


Thr Gln Tyr Glu Tyr Gly Thr Glu Asp Asp Tyr Gln Gly Lys Pro Leu
945                 950                 955                 960


Glu Phe Gly Ala Thr Ser Ala Ala Leu Gln Pro Glu Glu Glu Gln Glu
                965                 970                 975


Glu Asp Trp Leu Asp Asp Asp Ser Gln Gln Thr Val Gly Gln Gln Asp
            980                 985                 990


Gly Ser Glu Asp Asn Gln Thr Thr  Thr Ile Gln Thr Ile  Val Glu Val
        995                 1000                1005


Gln Pro  Gln Leu Glu Met Glu  Leu Thr Pro Val Val  Gln Thr Ile
    1010                1015                1020


Glu Val  Asn Ser Phe Ser Gly  Tyr Leu Lys Leu Thr  Asp Asn Val
    1025                1030                1035


Tyr Ile  Lys Asn Ala Asp Ile  Val Glu Glu Ala Lys  Lys Val Lys
    1040                1045                1050


Pro Thr  Val Val Val Asn Ala  Ala Asn Val Tyr Leu  Lys His Gly
    1055                1060                1065


Gly Gly  Val Ala Gly Ala Leu  Asn Lys Ala Thr Asn  Asn Ala Met
    1070                1075                1080


Gln Val  Glu Ser Asp Asp Tyr  Ile Ala Thr Asn Gly  Pro Leu Lys
    1085                1090                1095


Val Gly  Gly Ser Cys Val Leu  Ser Gly His Asn Leu  Ala Lys His
    1100                1105                1110


Cys Leu  His Val Val Gly Pro  Asn Val Asn Lys Gly  Glu Asp Ile
    1115                1120                1125
```

```
Gln Leu  Leu Lys Ser Ala Tyr  Glu Asn Phe Asn Gln  His Glu Val
    1130                1135                1140

Leu Leu  Ala Pro Leu Leu Ser  Ala Gly Ile Phe Gly  Ala Asp Pro
    1145                1150                1155

Ile His  Ser Leu Arg Val Cys  Val Asp Thr Val Arg  Thr Asn Val
    1160                1165                1170

Tyr Leu  Ala Val Phe Asp Lys  Asn Leu Tyr Asp Lys  Leu Val Ser
    1175                1180                1185

Ser Phe  Leu Glu Met Lys Ser  Glu Lys Gln Val Glu  Gln Lys Ile
    1190                1195                1200

Ala Glu  Ile Pro Lys Glu Glu  Val Lys Pro Phe Ile  Thr Glu Ser
    1205                1210                1215

Lys Pro  Ser Val Glu Gln Arg  Lys Gln Asp Asp Lys  Lys Ile Lys
    1220                1225                1230

Ala Cys  Val Glu Glu Val Thr  Thr Thr Leu Glu Glu  Thr Lys Phe
    1235                1240                1245

Leu Thr  Glu Asn Leu Leu Leu  Tyr Ile Asp Ile Asn  Gly Asn Leu
    1250                1255                1260

His Pro  Asp Ser Ala Thr Leu  Val Ser Asp Ile Asp  Ile Thr Phe
    1265                1270                1275

Leu Lys  Lys Asp Ala Pro Tyr  Ile Val Gly Asp Val  Val Gln Glu
    1280                1285                1290

Gly Val  Leu Thr Ala Val Val  Ile Pro Thr Lys Lys  Ala Gly Gly
    1295                1300                1305

Thr Thr  Glu Met Leu Ala Lys  Ala Leu Arg Lys Val  Pro Thr Asp
    1310                1315                1320
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Asn Tyr  Ile Thr Thr Tyr Pro  Gly Gln Gly Leu Asn  Gly Tyr Thr
    1325                1330                1335

Val Glu  Glu Ala Lys Thr Val  Leu Lys Lys Cys Lys  Ser Ala Phe
    1340                1345                1350

Tyr Ile  Leu Pro Ser Ile Ile  Ser Asn Glu Lys Gln  Glu Ile Leu
    1355                1360                1365

Gly Thr  Val Ser Trp Asn Leu  Arg Glu Met Leu Ala  His Ala Glu
    1370                1375                1380

Glu Thr  Arg Lys Leu Met Pro  Val Cys Val Glu Thr  Lys Ala Ile
    1385                1390                1395

Val Ser  Thr Ile Gln Arg Lys  Tyr Lys Gly Ile Lys  Ile Gln Glu
    1400                1405                1410

Gly Val  Val Asp Tyr Gly Ala  Arg Phe Tyr Phe Tyr  Thr Ser Lys
    1415                1420                1425

Thr Thr  Val Ala Ser Leu Ile  Asn Thr Leu Asn Asp  Leu Asn Glu
    1430                1435                1440

Thr Leu  Val Thr Met Pro Leu  Gly Tyr Val Thr His  Gly Leu Asn
    1445                1450                1455

Leu Glu  Glu Ala Ala Arg Tyr  Met Arg Ser Leu Lys  Val Pro Ala
    1460                1465                1470

Thr Val  Ser Val Ser Ser Pro  Asp Ala Val Thr Ala  Tyr Asn Gly
    1475                1480                1485

Tyr Leu  Thr Ser Ser Ser Lys  Thr Pro Glu Glu His  Phe Ile Glu
    1490                1495                1500

Thr Ile  Ser Leu Ala Gly Ser  Tyr Lys Asp Trp Ser  Tyr Ser Gly
    1505                1510                1515

Gln Ser  Thr Gln Leu Gly Ile  Glu Phe Leu Lys Arg  Gly Asp Lys
    1520                1525                1530
```

```
Ser Val  Tyr Tyr Thr Ser Asn  Pro Thr Thr Phe His  Leu Asp Gly
    1535                1540                1545

Glu Val  Ile Thr Phe Asp Asn  Leu Lys Thr Leu Leu  Ser Leu Arg
    1550                1555                1560

Glu Val  Arg Thr Ile Lys Val  Phe Thr Thr Val Asp  Asn Ile Asn
    1565                1570                1575

Leu His  Thr Gln Val Val Asp  Met Ser Met Thr Tyr  Gly Gln Gln
    1580                1585                1590

Phe Gly  Pro Thr Tyr Leu Asp  Gly Ala Asp Val Thr  Lys Ile Lys
    1595                1600                1605

Pro His  Asn Ser His Glu Gly  Lys Thr Phe Tyr Val  Leu Pro Asn
    1610                1615                1620

Asp Asp  Thr Leu Arg Val Glu  Ala Phe Glu Tyr Tyr  His Thr Thr
    1625                1630                1635

Asp Pro  Ser Phe Leu Gly Arg  Tyr Met Ser Ala Leu  Asn His Thr
    1640                1645                1650

Lys Lys  Trp Lys Tyr Pro Gln  Val Asn Gly Leu Thr  Ser Ile Lys
    1655                1660                1665

Trp Ala  Asp Asn Asn Cys Tyr  Leu Ala Thr Ala Leu  Leu Thr Leu
    1670                1675                1680

Gln Gln  Ile Glu Leu Lys Phe  Asn Pro Pro Ala Leu  Gln Asp Ala
    1685                1690                1695

Tyr Tyr  Arg Ala Arg Ala Gly  Glu Ala Ala Asn Phe  Cys Ala Leu
    1700                1705                1710

Ile Leu  Ala Tyr Cys Asn Lys  Thr Val Gly Glu Leu  Gly Asp Val
    1715                1720                1725
```

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Arg Glu  Thr Met Ser Tyr Leu  Phe Gln His Ala Asn  Leu Asp Ser
    1730                1735                1740

Cys Lys  Arg Val Leu Asn Val  Val Cys Lys Thr Cys  Gly Gln Gln
    1745                1750                1755

Gln Thr  Thr Leu Lys Gly Val  Glu Ala Val Met Tyr  Met Gly Thr
    1760                1765                1770

Leu Ser  Tyr Glu Gln Phe Lys  Lys Gly Val Gln Ile  Pro Cys Thr
    1775                1780                1785

Cys Gly  Lys Gln Ala Thr Lys  Tyr Leu Val Gln Gln  Glu Ser Pro
    1790                1795                1800

Phe Val  Met Met Ser Ala Pro  Pro Ala Gln Tyr Glu  Leu Lys His
    1805                1810                1815

Gly Thr  Phe Thr Cys Ala Ser  Glu Tyr Thr Gly Asn  Tyr Gln Cys
    1820                1825                1830

Gly His  Tyr Lys His Ile Thr  Ser Lys Glu Thr Leu  Tyr Cys Ile
    1835                1840                1845

Asp Gly  Ala Leu Leu Thr Lys  Ser Ser Glu Tyr Lys  Gly Pro Ile
    1850                1855                1860

Thr Asp  Val Phe Tyr Lys Glu  Asn Ser Tyr Thr Thr  Thr Ile Lys
    1865                1870                1875

Pro Val  Thr Tyr Lys Leu Asp  Gly Val Val Cys Thr  Glu Ile Asp
    1880                1885                1890

Pro Lys  Leu Asp Asn Tyr Tyr  Lys Lys Asp Asn Ser  Tyr Phe Thr
    1895                1900                1905

Glu Gln  Pro Ile Asp Leu Val  Pro Asn Gln Pro Tyr  Pro Asn Ala
    1910                1915                1920

Ser Phe  Asp Asn Phe Lys Phe  Val Cys Asp Asn Ile  Lys Phe Ala
    1925                1930                1935
```

```
Asp Asp  Leu Asn Gln Leu Thr  Gly Tyr Lys Lys Pro  Ala Ser Arg
    1940                1945                1950

Glu Leu  Lys Val Thr Phe Phe  Pro Asp Leu Asn Gly  Asp Val Val
    1955                1960                1965

Ala Ile  Asp Tyr Lys His Tyr  Thr Pro Ser Phe Lys  Lys Gly Ala
    1970                1975                1980

Lys Leu  Leu His Lys Pro Ile  Val Trp His Val Asn  Asn Ala Thr
    1985                1990                1995

Asn Lys  Ala Thr Tyr Lys Pro  Asn Thr Trp Cys Ile  Arg Cys Leu
    2000                2005                2010

Trp Ser  Thr Lys Pro Val Glu  Thr Ser Asn Ser Phe  Asp Val Leu
    2015                2020                2025

Lys Ser  Glu Asp Ala Gln Gly  Met Asp Asn Leu Ala  Cys Glu Asp
    2030                2035                2040

Leu Lys  Pro Val Ser Glu Glu  Val Val Glu Asn Pro  Thr Ile Gln
    2045                2050                2055

Lys Asp  Val Leu Glu Cys Asn  Val Lys Thr Thr Glu  Val Val Gly
    2060                2065                2070

Asp Ile  Ile Leu Lys Pro Ala  Asn Asn Ser Leu Lys  Ile Thr Glu
    2075                2080                2085

Glu Val  Gly His Thr Asp Leu  Met Ala Ala Tyr Val  Asp Asn Ser
    2090                2095                2100

Ser Leu  Thr Ile Lys Lys Pro  Asn Glu Leu Ser Arg  Val Leu Gly
    2105                2110                2115

Leu Lys  Thr Leu Ala Thr His  Gly Leu Ala Ala Val  Asn Ser Val
    2120                2125                2130
```

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Pro Trp  Asp Thr Ile Ala Asn  Tyr Ala Lys Pro Phe  Leu Asn Lys
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Val Val  Ser Thr Thr Thr Asn  Ile Val Thr Arg Cys  Leu Asn Arg
    2150                2155                2160

Val Cys  Thr Asn Tyr Met Pro  Tyr Phe Phe Thr Leu  Leu Leu Gln
    2165                2170                2175

Leu Cys  Thr Phe Thr Arg Ser  Thr Asn Ser Arg Ile  Lys Ala Ser
    2180                2185                2190

Met Pro  Thr Thr Ile Ala Lys  Asn Thr Val Lys Ser  Val Gly Lys
    2195                2200                2205

Phe Cys  Leu Glu Ala Ser Phe  Asn Tyr Leu Lys Ser  Pro Asn Phe
    2210                2215                2220

Ser Lys  Leu Ile Asn Ile Ile  Ile Trp Phe Leu Leu  Leu Ser Val
    2225                2230                2235

Cys Leu  Gly Ser Leu Ile Tyr  Ser Thr Ala Ala Leu  Gly Val Leu
    2240                2245                2250

Met Ser  Asn Leu Gly Met Pro  Ser Tyr Cys Thr Gly  Tyr Arg Glu
    2255                2260                2265

Gly Tyr  Leu Asn Ser Thr Asn  Val Thr Ile Ala Thr  Tyr Cys Thr
    2270                2275                2280

Gly Ser  Ile Pro Cys Ser Val  Cys Leu Ser Gly Leu  Asp Ser Leu
    2285                2290                2295

Asp Thr  Tyr Pro Ser Leu Glu  Thr Ile Gln Ile Thr  Ile Ser Ser
    2300                2305                2310

Phe Lys  Trp Asp Leu Thr Ala  Phe Gly Leu Val Ala  Glu Trp Phe
    2315                2320                2325

Leu Ala  Tyr Ile Leu Phe Thr  Arg Phe Phe Tyr Val  Leu Gly Leu
    2330                2335                2340
```

```
Ala Ala  Ile Met Gln Leu Phe  Phe Ser Tyr Phe Ala  Val His Phe
    2345                2350                2355

Ile Ser  Asn Ser Trp Leu Met  Trp Leu Ile Ile Asn  Leu Val Gln
    2360                2365                2370

Met Ala  Pro Ile Ser Ala Met  Val Arg Met Tyr Ile  Phe Phe Ala
    2375                2380                2385

Ser Phe  Tyr Tyr Val Trp Lys  Ser Tyr Val His Val  Val Asp Gly
    2390                2395                2400

Cys Asn  Ser Ser Thr Cys Met  Met Cys Tyr Lys Arg  Asn Arg Ala
    2405                2410                2415

Thr Arg  Val Glu Cys Thr Thr  Ile Val Asn Gly Val  Arg Arg Ser
    2420                2425                2430

Phe Tyr  Val Tyr Ala Asn Gly  Gly Lys Gly Phe Cys  Lys Leu His
    2435                2440                2445

Asn Trp  Asn Cys Val Asn Cys  Asp Thr Phe Cys Ala  Gly Ser Thr
    2450                2455                2460

Phe Ile  Ser Asp Glu Val Ala  Arg Asp Leu Ser Leu  Gln Phe Lys
    2465                2470                2475

Arg Pro  Ile Asn Pro Thr Asp  Gln Ser Ser Tyr Ile  Val Asp Ser
    2480                2485                2490

Val Thr  Val Lys Asn Gly Ser  Ile His Leu Tyr Phe  Asp Lys Ala
    2495                2500                2505

Gly Gln  Lys Thr Tyr Glu Arg  His Ser Leu Ser His  Phe Val Asn
    2510                2515                2520

Leu Asp  Asn Leu Arg Ala Asn  Asn Thr Lys Gly Ser  Leu Pro Ile
    2525                2530                2535
```

```
Asn Val  Ile Val Phe Asp Gly  Lys Ser Lys Cys Glu  Glu Ser Ser
    2540                2545                2550

Ala Lys  Ser Ala Ser Val Tyr  Tyr Ser Gln Leu Met  Cys Gln Pro
    2555                2560                2565

Ile Leu  Leu Leu Asp Gln Ala  Leu Val Ser Asp Val  Gly Asp Ser
    2570                2575                2580

Ala Glu  Val Ala Val Lys Met  Phe Asp Ala Tyr Val  Asn Thr Phe
    2585                2590                2595

Ser Ser  Thr Phe Asn Val Pro  Met Glu Lys Leu Lys  Thr Leu Val
    2600                2605                2610

Ala Thr  Ala Glu Ala Glu Leu  Ala Lys Asn Val Ser  Leu Asp Asn
    2615                2620                2625

Val Leu  Ser Thr Phe Ile Ser  Ala Ala Arg Gln Gly  Phe Val Asp
    2630                2635                2640

Ser Asp  Val Glu Thr Lys Asp  Val Val Glu Cys Leu  Lys Leu Ser
    2645                2650                2655

His Gln  Ser Asp Ile Glu Val  Thr Gly Asp Ser Cys  Asn Asn Tyr
    2660                2665                2670

Met Leu  Thr Tyr Asn Lys Val  Glu Asn Met Thr Pro  Arg Asp Leu
    2675                2680                2685

Gly Ala  Cys Ile Asp Cys Ser  Ala Arg His Ile Asn  Ala Gln Val
    2690                2695                2700

Ala Lys  Ser His Asn Ile Ala  Leu Ile Trp Asn Val  Lys Asp Phe
    2705                2710                2715

Met Ser  Leu Ser Glu Gln Leu  Arg Lys Gln Ile Arg  Ser Ala Ala
    2720                2725                2730

Lys Lys  Asn Asn Leu Pro Phe  Lys Leu Thr Cys Ala  Thr Thr Arg
    2735                2740                2745
```

```
Gln Val  Val Asn Val Val Thr  Thr Lys Ile Ala Leu  Lys Gly Gly
    2750                2755                2760

Lys Ile  Val Asn Asn Trp Leu  Lys Gln Leu Ile Lys  Val Thr Leu
    2765                2770                2775

Val Phe  Leu Phe Val Ala Ala  Ile Phe Tyr Leu Ile  Thr Pro Val
    2780                2785                2790

His Val  Met Ser Lys His Thr  Asp Phe Ser Ser Glu  Ile Ile Gly
    2795                2800                2805

Tyr Lys  Ala Ile Asp Gly Gly  Val Thr Arg Asp Ile  Ala Ser Thr
    2810                2815                2820

Asp Thr  Cys Phe Ala Asn Lys  His Ala Asp Phe Asp  Thr Trp Phe
    2825                2830                2835

Ser Gln  Arg Gly Gly Ser Tyr  Thr Asn Asp Lys Ala  Cys Pro Leu
    2840                2845                2850

Ile Ala  Ala Val Ile Thr Arg  Glu Val Gly Phe Val  Val Pro Gly
    2855                2860                2865

Leu Pro  Gly Thr Ile Leu Arg  Thr Thr Asn Gly Asp  Phe Leu His
    2870                2875                2880

Phe Leu  Pro Arg Val Phe Ser  Ala Val Gly Asn Ile  Cys Tyr Thr
    2885                2890                2895

Pro Ser  Lys Leu Ile Glu Tyr  Thr Asp Phe Ala Thr  Ser Ala Cys
    2900                2905                2910

Val Leu  Ala Ala Glu Cys Thr  Ile Phe Lys Asp Ala  Ser Gly Lys
    2915                2920                2925

Pro Val  Pro Tyr Cys Tyr Asp  Thr Asn Val Leu Glu  Gly Ser Val
    2930                2935                2940
```

```
Ala Tyr  Glu Ser Leu Arg Pro  Asp Thr Arg Tyr Val  Leu Met Asp
    2945                2950                2955

Gly Ser  Ile Ile Gln Phe Pro  Asn Thr Tyr Leu Glu  Gly Ser Val
    2960                2965                2970

Arg Val  Val Thr Thr Phe Asp  Ser Glu Tyr Cys Arg  His Gly Thr
    2975                2980                2985

Cys Glu  Arg Ser Glu Ala Gly  Val Cys Val Ser Thr  Ser Gly Arg
    2990                2995                3000

Trp Val  Leu Asn Asn Asp Tyr  Tyr Arg Ser Leu Pro  Gly Val Phe
    3005                3010                3015

Cys Gly  Val Asp Ala Val Asn  Leu Leu Thr Asn Met  Phe Thr Pro
    3020                3025                3030

Leu Ile  Gln Pro Ile Gly Ala  Leu Asp Ile Ser Ala  Ser Ile Val
    3035                3040                3045

Ala Gly  Gly Ile Val Ala Ile  Val Val Thr Cys Leu  Ala Tyr Tyr
    3050                3055                3060

Phe Met  Arg Phe Arg Arg Ala  Phe Gly Glu Tyr Ser  His Val Val
    3065                3070                3075

Ala Phe  Asn Thr Leu Leu Phe  Leu Met Ser Phe Thr  Val Leu Cys
    3080                3085                3090

Leu Thr  Pro Val Tyr Ser Phe  Leu Pro Gly Val Tyr  Ser Val Ile
    3095                3100                3105

Tyr Leu  Tyr Leu Thr Phe Tyr  Leu Thr Asn Asp Val  Ser Phe Leu
    3110                3115                3120

Ala His  Ile Gln Trp Met Val  Met Phe Thr Pro Leu  Val Pro Phe
    3125                3130                3135

Trp Ile  Thr Ile Ala Tyr Ile  Ile Cys Ile Ser Thr  Lys His Phe
    3140                3145                3150
```

```
Tyr Trp  Phe Phe Ser Asn Tyr  Leu Lys Arg Arg Val  Val Phe Asn
    3155                3160                3165

Gly Val  Ser Phe Ser Thr Phe  Glu Glu Ala Ala Leu  Cys Thr Phe
    3170                3175                3180

Leu Leu  Asn Lys Glu Met Tyr  Leu Lys Leu Arg Ser  Asp Val Leu
    3185                3190                3195

Leu Pro  Leu Thr Gln Tyr Asn  Arg Tyr Leu Ala Leu  Tyr Asn Lys
    3200                3205                3210

Tyr Lys  Tyr Phe Ser Gly Ala  Met Asp Thr Thr Ser  Tyr Arg Glu
    3215                3220                3225

Ala Ala  Cys Cys His Leu Ala  Lys Ala Leu Asn Asp  Phe Ser Asn
    3230                3235                3240

Ser Gly  Ser Asp Val Leu Tyr  Gln Pro Pro Gln Thr  Ser Ile Thr
    3245                3250                3255

Ser Ala  Val Leu Gln Ser Gly  Phe Arg Lys Met Ala  Phe Pro Ser
    3260                3265                3270

Gly Lys  Val Glu Gly Cys Met  Val Gln Val Thr Cys  Gly Thr Thr
    3275                3280                3285

Thr Leu  Asn Gly Leu Trp Leu  Asp Asp Val Val Tyr  Cys Pro Arg
    3290                3295                3300

His Val  Ile Cys Thr Ser Glu  Asp Met Leu Asn Pro  Asn Tyr Glu
    3305                3310                3315

Asp Leu  Leu Ile Arg Lys Ser  Asn His Asn Phe Leu  Val Gln Ala
    3320                3325                3330

Gly Asn  Val Gln Leu Arg Val  Ile Gly His Ser Met  Gln Asn Cys
    3335                3340                3345
```

```
Val Leu  Lys Leu Lys Val Asp  Thr Ala Asn Pro Lys  Thr Pro Lys
    3350                 3355                 3360

Tyr Lys  Phe Val Arg Ile Gln  Pro Gly Gln Thr Phe  Ser Val Leu
    3365                 3370                 3375

Ala Cys  Tyr Asn Gly Ser Pro  Ser Gly Val Tyr Gln  Cys Ala Met
    3380                 3385                 3390

Arg Pro  Asn Phe Thr Ile Lys  Gly Ser Phe Leu Asn  Gly Ser Cys
    3395                 3400                 3405

Gly Ser  Val Gly Phe Asn Ile  Asp Tyr Asp Cys Val  Ser Phe Cys
    3410                 3415                 3420

Tyr Met  His His Met Glu Leu  Pro Thr Gly Val His  Ala Gly Thr
    3425                 3430                 3435

Asp Leu  Glu Gly Asn Phe Tyr  Gly Pro Phe Val Asp  Arg Gln Thr
    3440                 3445                 3450

Ala Gln  Ala Ala Gly Thr Asp  Thr Thr Ile Thr Val  Asn Val Leu
    3455                 3460                 3465

Ala Trp  Leu Tyr Ala Ala Val  Ile Asn Gly Asp Arg  Trp Phe Leu
    3470                 3475                 3480

Asn Arg  Phe Thr Thr Thr Leu  Asn Asp Phe Asn Leu  Val Ala Met
    3485                 3490                 3495

Lys Tyr  Asn Tyr Glu Pro Leu  Thr Gln Asp His Val  Asp Ile Leu
    3500                 3505                 3510

Gly Pro  Leu Ser Ala Gln Thr  Gly Ile Ala Val Leu  Asp Met Cys
    3515                 3520                 3525

Ala Ser  Leu Lys Glu Leu Leu  Gln Asn Gly Met Asn  Gly Arg Thr
    3530                 3535                 3540

Ile Leu  Gly Ser Ala Leu Leu  Glu Asp Glu Phe Thr  Pro Phe Asp
    3545                 3550                 3555
```

```
Val Val  Arg Gln Cys Ser Gly  Val Thr Phe Gln Ser  Ala Val Lys
    3560                3565                3570

Arg Thr  Ile Lys Gly Thr His  His Trp Leu Leu Leu  Thr Ile Leu
    3575                3580                3585

Thr Ser  Leu Leu Val Leu Val  Gln Ser Thr Gln Trp  Ser Leu Phe
    3590                3595                3600

Phe Phe  Leu Tyr Glu Asn Ala  Phe Leu Pro Phe Ala  Met Gly Ile
    3605                3610                3615

Ile Ala  Met Ser Ala Phe Ala  Met Met Phe Val Lys  His Lys His
    3620                3625                3630

Ala Phe  Leu Cys Leu Phe Leu  Leu Pro Ser Leu Ala  Thr Val Ala
    3635                3640                3645

Tyr Phe  Asn Met Val Tyr Met  Pro Ala Ser Trp Val  Met Arg Ile
    3650                3655                3660

Met Thr  Trp Leu Asp Met Val  Asp Thr Ser Leu Ser  Gly Phe Lys
    3665                3670                3675

Leu Lys  Asp Cys Val Met Tyr  Ala Ser Ala Val Val  Leu Leu Ile
    3680                3685                3690

Leu Met  Thr Ala Arg Thr Val  Tyr Asp Asp Gly Ala  Arg Arg Val
    3695                3700                3705

Trp Thr  Leu Met Asn Val Leu  Thr Leu Val Tyr Lys  Val Tyr Tyr
    3710                3715                3720

Gly Asn  Ala Leu Asp Gln Ala  Ile Ser Met Trp Ala  Leu Ile Ile
    3725                3730                3735

Ser Val  Thr Ser Asn Tyr Ser  Gly Val Val Thr Thr  Val Met Phe
    3740                3745                3750
```

```
Leu Ala  Arg Gly Ile Val Phe  Met Cys Val Glu Tyr  Cys Pro Ile
    3755                 3760                 3765

Phe Phe  Ile Thr Gly Asn Thr  Leu Gln Cys Ile Met  Leu Val Tyr
    3770                 3775                 3780

Cys Phe  Leu Gly Tyr Phe Cys  Thr Cys Tyr Phe Gly  Leu Phe Cys
    3785                 3790                 3795

Leu Leu  Asn Arg Tyr Phe Arg  Leu Thr Leu Gly Val  Tyr Asp Tyr
    3800                 3805                 3810

Leu Val  Ser Thr Gln Glu Phe  Arg Tyr Met Asn Ser  Gln Gly Leu
    3815                 3820                 3825

Leu Pro  Pro Lys Asn Ser Ile  Asp Ala Phe Lys Leu  Asn Ile Lys
    3830                 3835                 3840

Leu Leu  Gly Val Gly Gly Lys  Pro Cys Ile Lys Val  Ala Thr Val
    3845                 3850                 3855

Gln Ser  Lys Met Ser Asp Val  Lys Cys Thr Ser Val  Val Leu Leu
    3860                 3865                 3870

Ser Val  Leu Gln Gln Leu Arg  Val Glu Ser Ser Ser  Lys Leu Trp
    3875                 3880                 3885

Ala Gln  Cys Val Gln Leu His  Asn Asp Ile Leu Leu  Ala Lys Asp
    3890                 3895                 3900

Thr Thr  Glu Ala Phe Glu Lys  Met Val Ser Leu Leu  Ser Val Leu
    3905                 3910                 3915

Leu Ser  Met Gln Gly Ala Val  Asp Ile Asn Lys Leu  Cys Glu Glu
    3920                 3925                 3930

Met Leu  Asp Asn Arg Ala Thr  Leu Gln Ala Ile Ala  Ser Glu Phe
    3935                 3940                 3945

Ser Ser  Leu Pro Ser Tyr Ala  Ala Phe Ala Thr Ala  Gln Glu Ala
    3950                 3955                 3960
```

```
Tyr Glu  Gln Ala Val Ala Asn  Gly Asp Ser Glu Val  Val Leu Lys
    3965                 3970                 3975

Lys Leu  Lys Lys Ser Leu Asn  Val Ala Lys Ser Glu  Phe Asp Arg
    3980                 3985                 3990

Asp Ala  Ala Met Gln Arg Lys  Leu Glu Lys Met Ala  Asp Gln Ala
    3995                 4000                 4005

Met Thr  Gln Met Tyr Lys Gln  Ala Arg Ser Glu Asp  Lys Arg Ala
    4010                 4015                 4020

Lys Val  Thr Ser Ala Met Gln  Thr Met Leu Phe Thr  Met Leu Arg
    4025                 4030                 4035

Lys Leu  Asp Asn Asp Ala Leu  Asn Asn Ile Ile Asn  Asn Ala Arg
    4040                 4045                 4050

Asp Gly  Cys Val Pro Leu Asn  Ile Ile Pro Leu Thr  Thr Ala Ala
    4055                 4060                 4065

Lys Leu  Met Val Val Ile Pro  Asp Tyr Asn Thr Tyr  Lys Asn Thr
    4070                 4075                 4080

Cys Asp  Gly Thr Thr Phe Thr  Tyr Ala Ser Ala Leu  Trp Glu Ile
    4085                 4090                 4095

Gln Gln  Val Val Asp Ala Asp  Ser Lys Ile Val Gln  Leu Ser Glu
    4100                 4105                 4110

Ile Ser  Met Asp Asn Ser Pro  Asn Leu Ala Trp Pro  Leu Ile Val
    4115                 4120                 4125

Thr Ala  Leu Arg Ala Asn Ser  Ala Val Lys Leu Gln  Asn Asn Glu
    4130                 4135                 4140

Leu Ser  Pro Val Ala Leu Arg  Gln Met Ser Cys Ala  Ala Gly Thr
    4145                 4150                 4155
```

```
Thr Gln  Thr Ala Cys Thr Asp  Asp Asn Ala Leu Ala  Tyr Tyr Asn
    4160                 4165                 4170

Thr Thr  Lys Gly Gly Arg Phe  Val Leu Ala Leu Leu  Ser Asp Leu
    4175                 4180                 4185

Gln Asp  Leu Lys Trp Ala Arg  Phe Pro Lys Ser Asp  Gly Thr Gly
    4190                 4195                 4200

Thr Ile  Tyr Thr Glu Leu Glu  Pro Pro Cys Arg Phe  Val Thr Asp
    4205                 4210                 4215

Thr Pro  Lys Gly Pro Lys Val  Lys Tyr Leu Tyr Phe  Ile Lys Gly
    4220                 4225                 4230

Leu Asn  Asn Leu Asn Arg Gly  Met Val Leu Gly Ser  Leu Ala Ala
    4235                 4240                 4245

Thr Val  Arg Leu Gln Ala Gly  Asn Ala Thr Glu Val  Pro Ala Asn
    4250                 4255                 4260

Ser Thr  Val Leu Ser Phe Cys  Ala Phe Ala Val Asp  Ala Ala Lys
    4265                 4270                 4275

Ala Tyr  Lys Asp Tyr Leu Ala  Ser Gly Gly Gln Pro  Ile Thr Asn
    4280                 4285                 4290

Cys Val  Lys Met Leu Cys Thr  His Thr Gly Thr Gly  Gln Ala Ile
    4295                 4300                 4305

Thr Val  Thr Pro Glu Ala Asn  Met Asp Gln Glu Ser  Phe Gly Gly
    4310                 4315                 4320

Ala Ser  Cys Cys Leu Tyr Cys  Arg Cys His Ile Asp  His Pro Asn
    4325                 4330                 4335

Pro Lys  Gly Phe Cys Asp Leu  Lys Gly Lys Tyr Val  Gln Ile Pro
    4340                 4345                 4350

Thr Thr  Cys Ala Asn Asp Pro  Val Gly Phe Thr Leu  Lys Asn Thr
    4355                 4360                 4365
```

Val Cys Thr Val Cys Gly Met Trp Lys Gly Tyr Gly Cys Ser Cys
    4370   4375   4380

Asp Gln Leu Arg Glu Pro Met Leu Gln Ser Ala Asp Ala Gln Ser
    4385   4390   4395

Phe Leu Asn Gly Phe Ala Val
    4400   4405

<210> 14
<211> 1273
<212> PRT
<213> SARS-CoV2

<400> 14

Met Phe Val Phe Leu Val Leu Leu Pro Leu Val Ser Ser Gln Cys Val
1   5   10   15

Asn Leu Thr Thr Arg Thr Gln Leu Pro Pro Ala Tyr Thr Asn Ser Phe
            20   25   30

Thr Arg Gly Val Tyr Tyr Pro Asp Lys Val Phe Arg Ser Ser Val Leu
        35   40   45

His Ser Thr Gln Asp Leu Phe Leu Pro Phe Phe Ser Asn Val Thr Trp
    50   55   60

Phe His Ala Ile His Val Ser Gly Thr Asn Gly Thr Lys Arg Phe Asp
65   70   75   80

Asn Pro Val Leu Pro Phe Asn Asp Gly Val Tyr Phe Ala Ser Thr Glu
                85   90   95

Lys Ser Asn Ile Ile Arg Gly Trp Ile Phe Gly Thr Thr Leu Asp Ser
            100   105   110

Lys Thr Gln Ser Leu Leu Ile Val Asn Asn Ala Thr Asn Val Val Ile
        115   120   125

Lys Val Cys Glu Phe Gln Phe Cys Asn Asp Pro Phe Leu Gly Val Tyr

```
    130                 135                 140

Tyr His Lys Asn Asn Lys Ser Trp Met Glu Ser Glu Phe Arg Val Tyr
145                 150                 155                 160

Ser Ser Ala Asn Asn Cys Thr Phe Glu Tyr Val Ser Gln Pro Phe Leu
                165                 170                 175

Met Asp Leu Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Arg Glu Phe
            180                 185                 190

Val Phe Lys Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His Thr
        195                 200                 205

Pro Ile Asn Leu Val Arg Asp Leu Pro Gln Gly Phe Ser Ala Leu Glu
    210                 215                 220

Pro Leu Val Asp Leu Pro Ile Gly Ile Asn Ile Thr Arg Phe Gln Thr
225                 230                 235                 240

Leu Leu Ala Leu His Arg Ser Tyr Leu Thr Pro Gly Asp Ser Ser Ser
                245                 250                 255

Gly Trp Thr Ala Gly Ala Ala Ala Tyr Tyr Val Gly Tyr Leu Gln Pro
            260                 265                 270

Arg Thr Phe Leu Leu Lys Tyr Asn Glu Asn Gly Thr Ile Thr Asp Ala
        275                 280                 285

Val Asp Cys Ala Leu Asp Pro Leu Ser Glu Thr Lys Cys Thr Leu Lys
    290                 295                 300

Ser Phe Thr Val Glu Lys Gly Ile Tyr Gln Thr Ser Asn Phe Arg Val
305                 310                 315                 320

Gln Pro Thr Glu Ser Ile Val Arg Phe Pro Asn Ile Thr Asn Leu Cys
                325                 330                 335

Pro Phe Gly Glu Val Phe Asn Ala Thr Arg Phe Ala Ser Val Tyr Ala
            340                 345                 350
```

```
Trp Asn Arg Lys Arg Ile Ser Asn Cys Val Ala Asp Tyr Ser Phe Leu
        355                 360                 365

Tyr Asn Ser Ala Ser Phe Ser Thr Phe Lys Cys Tyr Gly Val Ser Pro
    370                 375                 380

Thr Lys Leu Asn Asp Leu Cys Phe Thr Asn Val Tyr Ala Asp Ser Phe
385                 390                 395                 400

Val Ile Arg Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr Gly
                405                 410                 415

Lys Ile Ala Asp Tyr Asn Tyr Lys Leu Pro Asp Asp Phe Thr Gly Cys
            420                 425                 430

Val Ile Ala Trp Asn Ser Asn Asn Leu Asp Ser Lys Val Gly Gly Asn
        435                 440                 445

Tyr Asn Tyr Leu Tyr Arg Leu Phe Arg Lys Ser Asn Leu Lys Pro Phe
    450                 455                 460

Glu Arg Asp Ile Ser Thr Glu Ile Tyr Gln Ala Gly Ser Thr Pro Cys
465                 470                 475                 480

Asn Gly Val Glu Gly Phe Asn Cys Tyr Phe Pro Leu Gln Ser Tyr Gly
                485                 490                 495

Phe Gln Pro Thr Asn Gly Val Gly Tyr Gln Pro Tyr Arg Val Val Val
            500                 505                 510

Leu Ser Phe Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro Lys
        515                 520                 525

Lys Ser Thr Asn Leu Val Lys Asn Lys Cys Val Asn Phe Asn Phe Asn
    530                 535                 540

Gly Leu Thr Gly Thr Gly Val Leu Thr Glu Ser Asn Lys Lys Phe Leu
545                 550                 555                 560

Pro Phe Gln Gln Phe Gly Arg Asp Ile Ala Asp Thr Thr Asp Ala Val
```

```
                565                 570                 575

Arg Asp Pro Gln Thr Leu Glu Ile Leu Asp Ile Thr Pro Cys Ser Phe
            580                 585                 590

Gly Gly Val Ser Val Ile Thr Pro Gly Thr Asn Thr Ser Asn Gln Val
        595                 600                 605

Ala Val Leu Tyr Gln Asp Val Asn Cys Thr Glu Val Pro Val Ala Ile
    610                 615                 620

His Ala Asp Gln Leu Thr Pro Thr Trp Arg Val Tyr Ser Thr Gly Ser
625                 630                 635                 640

Asn Val Phe Gln Thr Arg Ala Gly Cys Leu Ile Gly Ala Glu His Val
                645                 650                 655

Asn Asn Ser Tyr Glu Cys Asp Ile Pro Ile Gly Ala Gly Ile Cys Ala
            660                 665                 670

Ser Tyr Gln Thr Gln Thr Asn Ser Pro Arg Arg Ala Arg Ser Val Ala
        675                 680                 685

Ser Gln Ser Ile Ile Ala Tyr Thr Met Ser Leu Gly Ala Glu Asn Ser
    690                 695                 700

Val Ala Tyr Ser Asn Asn Ser Ile Ala Ile Pro Thr Asn Phe Thr Ile
705                 710                 715                 720

Ser Val Thr Thr Glu Ile Leu Pro Val Ser Met Thr Lys Thr Ser Val
                725                 730                 735

Asp Cys Thr Met Tyr Ile Cys Gly Asp Ser Thr Glu Cys Ser Asn Leu
            740                 745                 750

Leu Leu Gln Tyr Gly Ser Phe Cys Thr Gln Leu Asn Arg Ala Leu Thr
        755                 760                 765

Gly Ile Ala Val Glu Gln Asp Lys Asn Thr Gln Glu Val Phe Ala Gln
    770                 775                 780
```

```
Val Lys Gln Ile Tyr Lys Thr Pro Pro Ile Lys Asp Phe Gly Gly Phe
785                 790                 795                 800


Asn Phe Ser Gln Ile Leu Pro Asp Pro Ser Lys Pro Ser Lys Arg Ser
                805                 810                 815


Phe Ile Glu Asp Leu Leu Phe Asn Lys Val Thr Leu Ala Asp Ala Gly
            820                 825                 830


Phe Ile Lys Gln Tyr Gly Asp Cys Leu Gly Asp Ile Ala Ala Arg Asp
        835                 840                 845


Leu Ile Cys Ala Gln Lys Phe Asn Gly Leu Thr Val Leu Pro Pro Leu
    850                 855                 860


Leu Thr Asp Glu Met Ile Ala Gln Tyr Thr Ser Ala Leu Leu Ala Gly
865                 870                 875                 880


Thr Ile Thr Ser Gly Trp Thr Phe Gly Ala Gly Ala Ala Leu Gln Ile
                885                 890                 895


Pro Phe Ala Met Gln Met Ala Tyr Arg Phe Asn Gly Ile Gly Val Thr
            900                 905                 910


Gln Asn Val Leu Tyr Glu Asn Gln Lys Leu Ile Ala Asn Gln Phe Asn
        915                 920                 925


Ser Ala Ile Gly Lys Ile Gln Asp Ser Leu Ser Ser Thr Ala Ser Ala
    930                 935                 940


Leu Gly Lys Leu Gln Asp Val Val Asn Gln Asn Ala Gln Ala Leu Asn
945                 950                 955                 960


Thr Leu Val Lys Gln Leu Ser Ser Asn Phe Gly Ala Ile Ser Ser Val
                965                 970                 975


Leu Asn Asp Ile Leu Ser Arg Leu Asp Lys Val Glu Ala Glu Val Gln
            980                 985                 990


Ile Asp Arg Leu Ile Thr Gly Arg  Leu Gln Ser Leu Gln  Thr Tyr Val
```

```
        995                 1000                1005

Thr Gln  Gln Leu Ile Arg Ala  Ala Glu Ile Arg Ala  Ser Ala Asn
    1010                1015                1020

Leu Ala  Ala Thr Lys Met Ser  Glu Cys Val Leu Gly  Gln Ser Lys
    1025                1030                1035

Arg Val  Asp Phe Cys Gly Lys  Gly Tyr His Leu Met  Ser Phe Pro
    1040                1045                1050

Gln Ser  Ala Pro His Gly Val  Val Phe Leu His Val  Thr Tyr Val
    1055                1060                1065

Pro Ala  Gln Glu Lys Asn Phe  Thr Thr Ala Pro Ala  Ile Cys His
    1070                1075                1080

Asp Gly  Lys Ala His Phe Pro  Arg Glu Gly Val Phe  Val Ser Asn
    1085                1090                1095

Gly Thr  His Trp Phe Val Thr  Gln Arg Asn Phe Tyr  Glu Pro Gln
    1100                1105                1110

Ile Ile  Thr Thr Asp Asn Thr  Phe Val Ser Gly Asn  Cys Asp Val
    1115                1120                1125

Val Ile  Gly Ile Val Asn Asn  Thr Val Tyr Asp Pro  Leu Gln Pro
    1130                1135                1140

Glu Leu  Asp Ser Phe Lys Glu  Glu Leu Asp Lys Tyr  Phe Lys Asn
    1145                1150                1155

His Thr  Ser Pro Asp Val Asp  Leu Gly Asp Ile Ser  Gly Ile Asn
    1160                1165                1170

Ala Ser  Val Val Asn Ile Gln  Lys Glu Ile Asp Arg  Leu Asn Glu
    1175                1180                1185

Val Ala  Lys Asn Leu Asn Glu  Ser Leu Ile Asp Leu  Gln Glu Leu
    1190                1195                1200
```

Gly Lys Tyr Glu Gln Tyr Ile Lys Trp Pro Trp Tyr Ile Trp Leu
1205 1210 1215

Gly Phe Ile Ala Gly Leu Ile Ala Ile Val Met Val Thr Ile Met
1220 1225 1230

Leu Cys Cys Met Thr Ser Cys Cys Ser Cys Leu Lys Gly Cys Cys
1235 1240 1245

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Ser Leu Pro Val Leu Gln Val Arg Asp Val Leu Val Arg Gly Phe Gly
20 25 30

Asp Ser Val Glu Glu Val Leu Ser Glu Ala Arg Gln His Leu Lys Asp
35 40 45

Gly Thr Cys Gly Leu Val Glu Val Glu Lys Gly Val Leu Pro Gln Leu
50 55 60

Glu Gln Pro Tyr Val Phe Ile Lys Arg Ser Asp Ala Arg Thr Ala Pro
65 70 75 80

His Gly His Val Met Val Glu Leu Val Ala Glu Leu Glu Gly Ile Gln
85 90 95

Tyr Gly Arg Ser Gly Glu Thr Leu Gly Val Leu Val Pro His Val Gly
100 105 110

Glu Ile Pro Val Ala Tyr Arg Lys Val Leu Leu Arg Lys Asn Gly Asn
115 120 125

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Lys Gly Ala Gly Gly His Ser Tyr Gly Ala Asp Leu Lys Ser Phe Asp
    130                 135                 140

Leu Gly Asp Glu Leu Gly Thr Asp Pro Tyr Glu Asp Phe Gln Glu Asn
145                 150                 155                 160

Trp Asn Thr Lys His Ser Ser Gly Val Thr Arg Glu Leu Met Arg Glu
                165                 170                 175

Leu Asn Gly Gly Ala Tyr Thr Arg Tyr Val Asp Asn Asn Phe Cys Gly
            180                 185                 190

Pro Asp Gly Tyr Pro Leu Glu Cys Ile Lys Asp Leu Leu Ala Arg Ala
        195                 200                 205

Gly Lys Ala Ser Cys Thr Leu Ser Glu Gln Leu Asp Phe Ile Asp Thr
    210                 215                 220

Lys Arg Gly Val Tyr Cys Cys Arg Glu His Glu His Glu Ile Ala Trp
225                 230                 235                 240

Tyr Thr Glu Arg Ser Glu Lys Ser Tyr Glu Leu Gln Thr Pro Phe Glu
                245                 250                 255

Ile Lys Leu Ala Lys Lys Phe Asp Thr Phe Asn Gly Glu Cys Pro Asn
            260                 265                 270

Phe Val Phe Pro Leu Asn Ser Ile Ile Lys Thr Ile Gln Pro Arg Val
        275                 280                 285

Glu Lys Lys Lys Leu Asp Gly Phe Met Gly Arg Ile Arg Ser Val Tyr
    290                 295                 300

Pro Val Ala Ser Pro Asn Glu Cys Asn Gln Met Cys Leu Ser Thr Leu
305                 310                 315                 320

Met Lys Cys Asp His Cys Gly Glu Thr Ser Trp Gln Thr Gly Asp Phe
                325                 330                 335

Val Lys Ala Thr Cys Glu Phe Cys Gly Thr Glu Asn Leu Thr Lys Glu
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            340                 345                 350

Gly Ala Thr Thr Cys Gly Tyr Leu Pro Gln Asn Ala Val Val Lys Ile
        355                 360                 365

Tyr Cys Pro Ala Cys His Asn Ser Glu Val Gly Pro Glu His Ser Leu
    370                 375                 380

Ala Glu Tyr His Asn Glu Ser Gly Leu Lys Thr Ile Leu Arg Lys Gly
385                 390                 395                 400

Gly Arg Thr Ile Ala Phe Gly Gly Cys Val Phe Ser Tyr Val Gly Cys
                405                 410                 415

His Asn Lys Cys Ala Tyr Trp Val Pro Arg Ala Ser Ala Asn Ile Gly
            420                 425                 430

Cys Asn His Thr Gly Val Val Gly Glu Gly Ser Glu Gly Leu Asn Asp
        435                 440                 445

Asn Leu Leu Glu Ile Leu Gln Lys Glu Lys Val Asn Ile Asn Ile Val
    450                 455                 460

Gly Asp Phe Lys Leu Asn Glu Glu Ile Ala Ile Ile Leu Ala Ser Phe
465                 470                 475                 480

Ser Ala Ser Thr Ser Ala Phe Val Glu Thr Val Lys Gly Leu Asp Tyr
                485                 490                 495

Lys Ala Phe Lys Gln Ile Val Glu Ser Cys Gly Asn Phe Lys Val Thr
            500                 505                 510

Lys Gly Lys Ala Lys Lys Gly Ala Trp Asn Ile Gly Glu Gln Lys Ser
        515                 520                 525

Ile Leu Ser Pro Leu Tyr Ala Phe Ala Ser Glu Ala Ala Arg Val Val
    530                 535                 540

Arg Ser Ile Phe Ser Arg Thr Leu Glu Thr Ala Gln Asn Ser Val Arg
545                 550                 555                 560
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Val Leu Gln Lys Ala Ala Ile Thr Ile Leu Asp Gly Ile Ser Gln Tyr
                565                 570                 575

Ser Leu Arg Leu Ile Asp Ala Met Met Phe Thr Ser Asp Leu Ala Thr
            580                 585                 590

Asn Asn Leu Val Val Met Ala Tyr Ile Thr Gly Gly Val Val Gln Leu
        595                 600                 605

Thr Ser Gln Trp Leu Thr Asn Ile Phe Gly Thr Val Tyr Glu Lys Leu
    610                 615                 620

Lys Pro Val Leu Asp Trp Leu Glu Glu Lys Phe Lys Glu Gly Val Glu
625                 630                 635                 640

Phe Leu Arg Asp Gly Trp Glu Ile Val Lys Phe Ile Ser Thr Cys Ala
                645                 650                 655

Cys Glu Ile Val Gly Gly Gln Ile Val Thr Cys Ala Lys Glu Ile Lys
            660                 665                 670

Glu Ser Val Gln Thr Phe Phe Lys Leu Val Asn Lys Phe Leu Ala Leu
        675                 680                 685

Cys Ala Asp Ser Ile Ile Ile Gly Gly Ala Lys Leu Lys Ala Leu Asn
    690                 695                 700

Leu Gly Glu Thr Phe Val Thr His Ser Lys Gly Leu Tyr Arg Lys Cys
705                 710                 715                 720

Val Lys Ser Arg Glu Glu Thr Gly Leu Leu Met Pro Leu Lys Ala Pro
                725                 730                 735

Lys Glu Ile Ile Phe Leu Glu Gly Glu Thr Leu Pro Thr Glu Val Leu
            740                 745                 750

Thr Glu Glu Val Val Leu Lys Thr Gly Asp Leu Gln Pro Leu Glu Gln
        755                 760                 765

Pro Thr Ser Glu Ala Val Glu Ala Pro Leu Val Gly Thr Pro Val Cys
```

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    770                 775                 780

Ile Asn Gly Leu Met Leu Leu Glu Ile Lys Asp Thr Glu Lys Tyr Cys
785                 790                 795                 800

Ala Leu Ala Pro Asn Met Met Val Thr Asn Asn Thr Phe Thr Leu Lys
                805                 810                 815

Gly Gly Ala Pro Thr Lys Val Thr Phe Gly Asp Asp Thr Val Ile Glu
            820                 825                 830

Val Gln Gly Tyr Lys Ser Val Asn Ile Thr Phe Glu Leu Asp Glu Arg
        835                 840                 845

Ile Asp Lys Val Leu Asn Glu Lys Cys Ser Ala Tyr Thr Val Glu Leu
    850                 855                 860

Gly Thr Glu Val Asn Glu Phe Ala Cys Val Val Ala Asp Ala Val Ile
865                 870                 875                 880

Lys Thr Leu Gln Pro Val Ser Glu Leu Leu Thr Pro Leu Gly Ile Asp
                885                 890                 895

Leu Asp Glu Trp Ser Met Ala Thr Tyr Tyr Leu Phe Asp Glu Ser Gly
            900                 905                 910

Glu Phe Lys Leu Ala Ser His Met Tyr Cys Ser Phe Tyr Pro Pro Asp
        915                 920                 925

Glu Asp Glu Glu Glu Gly Asp Cys Glu Glu Glu Glu Phe Glu Pro Ser
    930                 935                 940

Thr Gln Tyr Glu Tyr Gly Thr Glu Asp Asp Tyr Gln Gly Lys Pro Leu
945                 950                 955                 960

Glu Phe Gly Ala Thr Ser Ala Ala Leu Gln Pro Glu Glu Glu Gln Glu
                965                 970                 975

Glu Asp Trp Leu Asp Asp Asp Ser Gln Gln Thr Val Gly Gln Gln Asp
            980                 985                 990
```

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Gly Ser Glu Asp Asn Gln Thr Thr  Thr Ile Gln Thr Ile  Val Glu Val
        995                 1000                1005


Gln Pro  Gln Leu Glu Met Glu  Leu Thr Pro Val Val  Gln Thr Ile
    1010                1015                1020


Glu Val  Asn Ser Phe Ser Gly  Tyr Leu Lys Leu Thr  Asp Asn Val
    1025                1030                1035


Tyr Ile  Lys Asn Ala Asp Ile  Val Glu Glu Ala Lys  Lys Val Lys
    1040                1045                1050


Pro Thr  Val Val Val Asn Ala  Ala Asn Val Tyr Leu  Lys His Gly
    1055                1060                1065


Gly Gly  Val Ala Gly Ala Leu  Asn Lys Ala Thr Asn  Asn Ala Met
    1070                1075                1080


Gln Val  Glu Ser Asp Asp Tyr  Ile Ala Thr Asn Gly  Pro Leu Lys
    1085                1090                1095


Val Gly  Gly Ser Cys Val Leu  Ser Gly His Asn Leu  Ala Lys His
    1100                1105                1110


Cys Leu  His Val Val Gly Pro  Asn Val Asn Lys Gly  Glu Asp Ile
    1115                1120                1125


Gln Leu  Leu Lys Ser Ala Tyr  Glu Asn Phe Asn Gln  His Glu Val
    1130                1135                1140


Leu Leu  Ala Pro Leu Leu Ser  Ala Gly Ile Phe Gly  Ala Asp Pro
    1145                1150                1155


Ile His  Ser Leu Arg Val Cys  Val Asp Thr Val Arg  Thr Asn Val
    1160                1165                1170


Tyr Leu  Ala Val Phe Asp Lys  Asn Leu Tyr Asp Lys  Leu Val Ser
    1175                1180                1185


Ser Phe  Leu Glu Met Lys Ser  Glu Lys Gln Val Glu  Gln Lys Ile
```

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    1190                1195                1200

Ala Glu  Ile Pro Lys Glu Glu  Val Lys Pro Phe Ile  Thr Glu Ser
    1205                1210                1215

Lys Pro  Ser Val Glu Gln Arg  Lys Gln Asp Asp Lys  Lys Ile Lys
    1220                1225                1230

Ala Cys  Val Glu Glu Val Thr  Thr Thr Leu Glu Glu  Thr Lys Phe
    1235                1240                1245

Leu Thr  Glu Asn Leu Leu Leu  Tyr Ile Asp Ile Asn  Gly Asn Leu
    1250                1255                1260

His Pro  Asp Ser Ala Thr Leu  Val Ser Asp Ile Asp  Ile Thr Phe
    1265                1270                1275

Leu Lys  Lys Asp Ala Pro Tyr  Ile Val Gly Asp Val  Val Gln Glu
    1280                1285                1290

Gly Val  Leu Thr Ala Val Val  Ile Pro Thr Lys Lys  Ala Gly Gly
    1295                1300                1305

Thr Thr  Glu Met Leu Ala Lys  Ala Leu Arg Lys Val  Pro Thr Asp
    1310                1315                1320

Asn Tyr  Ile Thr Thr Tyr Pro  Gly Gln Gly Leu Asn  Gly Tyr Thr
    1325                1330                1335

Val Glu  Glu Ala Lys Thr Val  Leu Lys Lys Cys Lys  Ser Ala Phe
    1340                1345                1350

Tyr Ile  Leu Pro Ser Ile Ile  Ser Asn Glu Lys Gln  Glu Ile Leu
    1355                1360                1365

Gly Thr  Val Ser Trp Asn Leu  Arg Glu Met Leu Ala  His Ala Glu
    1370                1375                1380

Glu Thr  Arg Lys Leu Met Pro  Val Cys Val Glu Thr  Lys Ala Ile
    1385                1390                1395
```

```
Val Ser  Thr Ile Gln Arg Lys  Tyr Lys Gly Ile Lys  Ile Gln Glu
    1400                1405                1410

Gly Val  Val Asp Tyr Gly Ala  Arg Phe Tyr Phe Tyr  Thr Ser Lys
    1415                1420                1425

Thr Thr  Val Ala Ser Leu Ile  Asn Thr Leu Asn Asp  Leu Asn Glu
    1430                1435                1440

Thr Leu  Val Thr Met Pro Leu  Gly Tyr Val Thr His  Gly Leu Asn
    1445                1450                1455

Leu Glu  Glu Ala Ala Arg Tyr  Met Arg Ser Leu Lys  Val Pro Ala
    1460                1465                1470

Thr Val  Ser Val Ser Ser Pro  Asp Ala Val Thr Ala  Tyr Asn Gly
    1475                1480                1485

Tyr Leu  Thr Ser Ser Ser Lys  Thr Pro Glu Glu His  Phe Ile Glu
    1490                1495                1500

Thr Ile  Ser Leu Ala Gly Ser  Tyr Lys Asp Trp Ser  Tyr Ser Gly
    1505                1510                1515

Gln Ser  Thr Gln Leu Gly Ile  Glu Phe Leu Lys Arg  Gly Asp Lys
    1520                1525                1530

Ser Val  Tyr Tyr Thr Ser Asn  Pro Thr Thr Phe His  Leu Asp Gly
    1535                1540                1545

Glu Val  Ile Thr Phe Asp Asn  Leu Lys Thr Leu Leu  Ser Leu Arg
    1550                1555                1560

Glu Val  Arg Thr Ile Lys Val  Phe Thr Thr Val Asp  Asn Ile Asn
    1565                1570                1575

Leu His  Thr Gln Val Val Asp  Met Ser Met Thr Tyr  Gly Gln Gln
    1580                1585                1590

Phe Gly  Pro Thr Tyr Leu Asp  Gly Ala Asp Val Thr  Lys Ile Lys
```

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    1595                1600                1605

Pro His  Asn Ser His Glu Gly  Lys Thr Phe Tyr Val  Leu Pro Asn
    1610                1615                1620

Asp Asp  Thr Leu Arg Val Glu  Ala Phe Glu Tyr Tyr  His Thr Thr
    1625                1630                1635

Asp Pro  Ser Phe Leu Gly Arg  Tyr Met Ser Ala Leu  Asn His Thr
    1640                1645                1650

Lys Lys  Trp Lys Tyr Pro Gln  Val Asn Gly Leu Thr  Ser Ile Lys
    1655                1660                1665

Trp Ala  Asp Asn Asn Cys Tyr  Leu Ala Thr Ala Leu  Leu Thr Leu
    1670                1675                1680

Gln Gln  Ile Glu Leu Lys Phe  Asn Pro Pro Ala Leu  Gln Asp Ala
    1685                1690                1695

Tyr Tyr  Arg Ala Arg Ala Gly  Glu Ala Ala Asn Phe  Cys Ala Leu
    1700                1705                1710

Ile Leu  Ala Tyr Cys Asn Lys  Thr Val Gly Glu Leu  Gly Asp Val
    1715                1720                1725

Arg Glu  Thr Met Ser Tyr Leu  Phe Gln His Ala Asn  Leu Asp Ser
    1730                1735                1740

Cys Lys  Arg Val Leu Asn Val  Val Cys Lys Thr Cys  Gly Gln Gln
    1745                1750                1755

Gln Thr  Thr Leu Lys Gly Val  Glu Ala Val Met Tyr  Met Gly Thr
    1760                1765                1770

Leu Ser  Tyr Glu Gln Phe Lys  Lys Gly Val Gln Ile  Pro Cys Thr
    1775                1780                1785

Cys Gly  Lys Gln Ala Thr Lys  Tyr Leu Val Gln Gln  Glu Ser Pro
    1790                1795                1800
```

```
Phe Val  Met Met Ser Ala Pro  Pro Ala Gln Tyr Glu  Leu Lys His
    1805                1810                1815

Gly Thr  Phe Thr Cys Ala Ser  Glu Tyr Thr Gly Asn  Tyr Gln Cys
    1820                1825                1830

Gly His  Tyr Lys His Ile Thr  Ser Lys Glu Thr Leu  Tyr Cys Ile
    1835                1840                1845

Asp Gly  Ala Leu Leu Thr Lys  Ser Ser Glu Tyr Lys  Gly Pro Ile
    1850                1855                1860

Thr Asp  Val Phe Tyr Lys Glu  Asn Ser Tyr Thr Thr  Thr Ile Lys
    1865                1870                1875

Pro Val  Thr Tyr Lys Leu Asp  Gly Val Val Cys Thr  Glu Ile Asp
    1880                1885                1890

Pro Lys  Leu Asp Asn Tyr Tyr  Lys Lys Asp Asn Ser  Tyr Phe Thr
    1895                1900                1905

Glu Gln  Pro Ile Asp Leu Val  Pro Asn Gln Pro Tyr  Pro Asn Ala
    1910                1915                1920

Ser Phe  Asp Asn Phe Lys Phe  Val Cys Asp Asn Ile  Lys Phe Ala
    1925                1930                1935

Asp Asp  Leu Asn Gln Leu Thr  Gly Tyr Lys Lys Pro  Ala Ser Arg
    1940                1945                1950

Glu Leu  Lys Val Thr Phe Phe  Pro Asp Leu Asn Gly  Asp Val Val
    1955                1960                1965

Ala Ile  Asp Tyr Lys His Tyr  Thr Pro Ser Phe Lys  Lys Gly Ala
    1970                1975                1980

Lys Leu  Leu His Lys Pro Ile  Val Trp His Val Asn  Asn Ala Thr
    1985                1990                1995

Asn Lys  Ala Thr Tyr Lys Pro  Asn Thr Trp Cys Ile  Arg Cys Leu
```

```
    2000                2005                2010

Trp Ser  Thr Lys Pro Val Glu  Thr Ser Asn Ser Phe  Asp Val Leu
    2015                2020                2025

Lys Ser  Glu Asp Ala Gln Gly  Met Asp Asn Leu Ala  Cys Glu Asp
    2030                2035                2040

Leu Lys  Pro Val Ser Glu Glu  Val Val Glu Asn Pro  Thr Ile Gln
    2045                2050                2055

Lys Asp  Val Leu Glu Cys Asn  Val Lys Thr Thr Glu  Val Val Gly
    2060                2065                2070

Asp Ile  Ile Leu Lys Pro Ala  Asn Asn Ser Leu Lys  Ile Thr Glu
    2075                2080                2085

Glu Val  Gly His Thr Asp Leu  Met Ala Ala Tyr Val  Asp Asn Ser
    2090                2095                2100

Ser Leu  Thr Ile Lys Lys Pro  Asn Glu Leu Ser Arg  Val Leu Gly
    2105                2110                2115

Leu Lys  Thr Leu Ala Thr His  Gly Leu Ala Ala Val  Asn Ser Val
    2120                2125                2130

Pro Trp  Asp Thr Ile Ala Asn  Tyr Ala Lys Pro Phe  Leu Asn Lys
    2135                2140                2145

Val Val  Ser Thr Thr Thr Asn  Ile Val Thr Arg Cys  Leu Asn Arg
    2150                2155                2160

Val Cys  Thr Asn Tyr Met Pro  Tyr Phe Phe Thr Leu  Leu Leu Gln
    2165                2170                2175

Leu Cys  Thr Phe Thr Arg Ser  Thr Asn Ser Arg Ile  Lys Ala Ser
    2180                2185                2190

Met Pro  Thr Thr Ile Ala Lys  Asn Thr Val Lys Ser  Val Gly Lys
    2195                2200                2205
```

```
Phe Cys  Leu Glu Ala Ser Phe  Asn Tyr Leu Lys Ser  Pro Asn Phe
    2210                2215                2220

Ser Lys  Leu Ile Asn Ile Ile  Ile Trp Phe Leu Leu  Leu Ser Val
    2225                2230                2235

Cys Leu  Gly Ser Leu Ile Tyr  Ser Thr Ala Ala Leu  Gly Val Leu
    2240                2245                2250

Met Ser  Asn Leu Gly Met Pro  Ser Tyr Cys Thr Gly  Tyr Arg Glu
    2255                2260                2265

Gly Tyr  Leu Asn Ser Thr Asn  Val Thr Ile Ala Thr  Tyr Cys Thr
    2270                2275                2280

Gly Ser  Ile Pro Cys Ser Val  Cys Leu Ser Gly Leu  Asp Ser Leu
    2285                2290                2295

Asp Thr  Tyr Pro Ser Leu Glu  Thr Ile Gln Ile Thr  Ile Ser Ser
    2300                2305                2310

Phe Lys  Trp Asp Leu Thr Ala  Phe Gly Leu Val Ala  Glu Trp Phe
    2315                2320                2325

Leu Ala  Tyr Ile Leu Phe Thr  Arg Phe Phe Tyr Val  Leu Gly Leu
    2330                2335                2340

Ala Ala  Ile Met Gln Leu Phe  Phe Ser Tyr Phe Ala  Val His Phe
    2345                2350                2355

Ile Ser  Asn Ser Trp Leu Met  Trp Leu Ile Ile Asn  Leu Val Gln
    2360                2365                2370

Met Ala  Pro Ile Ser Ala Met  Val Arg Met Tyr Ile  Phe Phe Ala
    2375                2380                2385

Ser Phe  Tyr Tyr Val Trp Lys  Ser Tyr Val His Val  Val Asp Gly
    2390                2395                2400

Cys Asn  Ser Ser Thr Cys Met  Met Cys Tyr Lys Arg  Asn Arg Ala
```

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    2405                2410                2415

Thr Arg  Val Glu Cys Thr Thr  Ile Val Asn Gly Val  Arg Arg Ser
    2420                2425                2430

Phe Tyr  Val Tyr Ala Asn Gly  Gly Lys Gly Phe Cys  Lys Leu His
    2435                2440                2445

Asn Trp  Asn Cys Val Asn Cys  Asp Thr Phe Cys Ala  Gly Ser Thr
    2450                2455                2460

Phe Ile  Ser Asp Glu Val Ala  Arg Asp Leu Ser Leu  Gln Phe Lys
    2465                2470                2475

Arg Pro  Ile Asn Pro Thr Asp  Gln Ser Ser Tyr Ile  Val Asp Ser
    2480                2485                2490

Val Thr  Val Lys Asn Gly Ser  Ile His Leu Tyr Phe  Asp Lys Ala
    2495                2500                2505

Gly Gln  Lys Thr Tyr Glu Arg  His Ser Leu Ser His  Phe Val Asn
    2510                2515                2520

Leu Asp  Asn Leu Arg Ala Asn  Asn Thr Lys Gly Ser  Leu Pro Ile
    2525                2530                2535

Asn Val  Ile Val Phe Asp Gly  Lys Ser Lys Cys Glu  Glu Ser Ser
    2540                2545                2550

Ala Lys  Ser Ala Ser Val Tyr  Tyr Ser Gln Leu Met  Cys Gln Pro
    2555                2560                2565

Ile Leu  Leu Leu Asp Gln Ala  Leu Val Ser Asp Val  Gly Asp Ser
    2570                2575                2580

Ala Glu  Val Ala Val Lys Met  Phe Asp Ala Tyr Val  Asn Thr Phe
    2585                2590                2595

Ser Ser  Thr Phe Asn Val Pro  Met Glu Lys Leu Lys  Thr Leu Val
    2600                2605                2610
```

```
Ala Thr  Ala Glu Ala Glu Leu  Ala Lys Asn Val Ser  Leu Asp Asn
    2615                2620                2625

Val Leu  Ser Thr Phe Ile Ser  Ala Ala Arg Gln Gly  Phe Val Asp
    2630                2635                2640

Ser Asp  Val Glu Thr Lys Asp  Val Val Glu Cys Leu  Lys Leu Ser
    2645                2650                2655

His Gln  Ser Asp Ile Glu Val  Thr Gly Asp Ser Cys  Asn Asn Tyr
    2660                2665                2670

Met Leu  Thr Tyr Asn Lys Val  Glu Asn Met Thr Pro  Arg Asp Leu
    2675                2680                2685

Gly Ala  Cys Ile Asp Cys Ser  Ala Arg His Ile Asn  Ala Gln Val
    2690                2695                2700

Ala Lys  Ser His Asn Ile Ala  Leu Ile Trp Asn Val  Lys Asp Phe
    2705                2710                2715

Met Ser  Leu Ser Glu Gln Leu  Arg Lys Gln Ile Arg  Ser Ala Ala
    2720                2725                2730

Lys Lys  Asn Asn Leu Pro Phe  Lys Leu Thr Cys Ala  Thr Thr Arg
    2735                2740                2745

Gln Val  Val Asn Val Val Thr  Thr Lys Ile Ala Leu  Lys Gly Gly
    2750                2755                2760

Lys Ile  Val Asn Asn Trp Leu  Lys Gln Leu Ile Lys  Val Thr Leu
    2765                2770                2775

Val Phe  Leu Phe Val Ala Ala  Ile Phe Tyr Leu Ile  Thr Pro Val
    2780                2785                2790

His Val  Met Ser Lys His Thr  Asp Phe Ser Ser Glu  Ile Ile Gly
    2795                2800                2805

Tyr Lys  Ala Ile Asp Gly Gly  Val Thr Arg Asp Ile  Ala Ser Thr
```

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    2810                2815                2820

Asp Thr  Cys Phe Ala Asn Lys  His Ala Asp Phe Asp  Thr Trp Phe
    2825                2830                2835

Ser Gln  Arg Gly Gly Ser Tyr  Thr Asn Asp Lys Ala  Cys Pro Leu
    2840                2845                2850

Ile Ala  Ala Val Ile Thr Arg  Glu Val Gly Phe Val  Val Pro Gly
    2855                2860                2865

Leu Pro  Gly Thr Ile Leu Arg  Thr Thr Asn Gly Asp  Phe Leu His
    2870                2875                2880

Phe Leu  Pro Arg Val Phe Ser  Ala Val Gly Asn Ile  Cys Tyr Thr
    2885                2890                2895

Pro Ser  Lys Leu Ile Glu Tyr  Thr Asp Phe Ala Thr  Ser Ala Cys
    2900                2905                2910

Val Leu  Ala Ala Glu Cys Thr  Ile Phe Lys Asp Ala  Ser Gly Lys
    2915                2920                2925

Pro Val  Pro Tyr Cys Tyr Asp  Thr Asn Val Leu Glu  Gly Ser Val
    2930                2935                2940

Ala Tyr  Glu Ser Leu Arg Pro  Asp Thr Arg Tyr Val  Leu Met Asp
    2945                2950                2955

Gly Ser  Ile Ile Gln Phe Pro  Asn Thr Tyr Leu Glu  Gly Ser Val
    2960                2965                2970

Arg Val  Val Thr Thr Phe Asp  Ser Glu Tyr Cys Arg  His Gly Thr
    2975                2980                2985

Cys Glu  Arg Ser Glu Ala Gly  Val Cys Val Ser Thr  Ser Gly Arg
    2990                2995                3000

Trp Val  Leu Asn Asn Asp Tyr  Tyr Arg Ser Leu Pro  Gly Val Phe
    3005                3010                3015
```

```
Cys Gly  Val Asp Ala Val Asn  Leu Leu Thr Asn Met  Phe Thr Pro
    3020                3025                3030

Leu Ile  Gln Pro Ile Gly Ala  Leu Asp Ile Ser Ala  Ser Ile Val
    3035                3040                3045

Ala Gly  Gly Ile Val Ala Ile  Val Val Thr Cys Leu  Ala Tyr Tyr
    3050                3055                3060

Phe Met  Arg Phe Arg Arg Ala  Phe Gly Glu Tyr Ser  His Val Val
    3065                3070                3075

Ala Phe  Asn Thr Leu Leu Phe  Leu Met Ser Phe Thr  Val Leu Cys
    3080                3085                3090

Leu Thr  Pro Val Tyr Ser Phe  Leu Pro Gly Val Tyr  Ser Val Ile
    3095                3100                3105

Tyr Leu  Tyr Leu Thr Phe Tyr  Leu Thr Asn Asp Val  Ser Phe Leu
    3110                3115                3120

Ala His  Ile Gln Trp Met Val  Met Phe Thr Pro Leu  Val Pro Phe
    3125                3130                3135

Trp Ile  Thr Ile Ala Tyr Ile  Ile Cys Ile Ser Thr  Lys His Phe
    3140                3145                3150

Tyr Trp  Phe Phe Ser Asn Tyr  Leu Lys Arg Arg Val  Val Phe Asn
    3155                3160                3165

Gly Val  Ser Phe Ser Thr Phe  Glu Glu Ala Ala Leu  Cys Thr Phe
    3170                3175                3180

Leu Leu  Asn Lys Glu Met Tyr  Leu Lys Leu Arg Ser  Asp Val Leu
    3185                3190                3195

Leu Pro  Leu Thr Gln Tyr Asn  Arg Tyr Leu Ala Leu  Tyr Asn Lys
    3200                3205                3210

Tyr Lys  Tyr Phe Ser Gly Ala  Met Asp Thr Thr Ser  Tyr Arg Glu
```

```
    3215                3220                3225

Ala Ala  Cys Cys His Leu Ala  Lys Ala Leu Asn Asp  Phe Ser Asn
    3230                3235                3240

Ser Gly  Ser Asp Val Leu Tyr  Gln Pro Pro Gln Thr  Ser Ile Thr
    3245                3250                3255

Ser Ala  Val Leu Gln Ser Gly  Phe Arg Lys Met Ala  Phe Pro Ser
    3260                3265                3270

Gly Lys  Val Glu Gly Cys Met  Val Gln Val Thr Cys  Gly Thr Thr
    3275                3280                3285

Thr Leu  Asn Gly Leu Trp Leu  Asp Asp Val Val Tyr  Cys Pro Arg
    3290                3295                3300

His Val  Ile Cys Thr Ser Glu  Asp Met Leu Asn Pro  Asn Tyr Glu
    3305                3310                3315

Asp Leu  Leu Ile Arg Lys Ser  Asn His Asn Phe Leu  Val Gln Ala
    3320                3325                3330

Gly Asn  Val Gln Leu Arg Val  Ile Gly His Ser Met  Gln Asn Cys
    3335                3340                3345

Val Leu  Lys Leu Lys Val Asp  Thr Ala Asn Pro Lys  Thr Pro Lys
    3350                3355                3360

Tyr Lys  Phe Val Arg Ile Gln  Pro Gly Gln Thr Phe  Ser Val Leu
    3365                3370                3375

Ala Cys  Tyr Asn Gly Ser Pro  Ser Gly Val Tyr Gln  Cys Ala Met
    3380                3385                3390

Arg Pro  Asn Phe Thr Ile Lys  Gly Ser Phe Leu Asn  Gly Ser Cys
    3395                3400                3405

Gly Ser  Val Gly Phe Asn Ile  Asp Tyr Asp Cys Val  Ser Phe Cys
    3410                3415                3420
```

```
Tyr Met  His His Met Glu Leu  Pro Thr Gly Val His  Ala Gly Thr
    3425                3430                3435

Asp Leu  Glu Gly Asn Phe Tyr  Gly Pro Phe Val Asp  Arg Gln Thr
    3440                3445                3450

Ala Gln  Ala Ala Gly Thr Asp  Thr Thr Ile Thr Val  Asn Val Leu
    3455                3460                3465

Ala Trp  Leu Tyr Ala Ala Val  Ile Asn Gly Asp Arg  Trp Phe Leu
    3470                3475                3480

Asn Arg  Phe Thr Thr Thr Leu  Asn Asp Phe Asn Leu  Val Ala Met
    3485                3490                3495

Lys Tyr  Asn Tyr Glu Pro Leu  Thr Gln Asp His Val  Asp Ile Leu
    3500                3505                3510

Gly Pro  Leu Ser Ala Gln Thr  Gly Ile Ala Val Leu  Asp Met Cys
    3515                3520                3525

Ala Ser  Leu Lys Glu Leu Leu  Gln Asn Gly Met Asn  Gly Arg Thr
    3530                3535                3540

Ile Leu  Gly Ser Ala Leu Leu  Glu Asp Glu Phe Thr  Pro Phe Asp
    3545                3550                3555

Val Val  Arg Gln Cys Ser Gly  Val Thr Phe Gln Ser  Ala Val Lys
    3560                3565                3570

Arg Thr  Ile Lys Gly Thr His  His Trp Leu Leu Leu  Thr Ile Leu
    3575                3580                3585

Thr Ser  Leu Leu Val Leu Val  Gln Ser Thr Gln Trp  Ser Leu Phe
    3590                3595                3600

Phe Phe  Leu Tyr Glu Asn Ala  Phe Leu Pro Phe Ala  Met Gly Ile
    3605                3610                3615

Ile Ala  Met Ser Ala Phe Ala  Met Met Phe Val Lys  His Lys His
```

```
    3620                3625                3630

Ala Phe  Leu Cys Leu Phe Leu  Leu Pro Ser Leu Ala  Thr Val Ala
    3635                3640                3645

Tyr Phe  Asn Met Val Tyr Met  Pro Ala Ser Trp Val  Met Arg Ile
    3650                3655                3660

Met Thr  Trp Leu Asp Met Val  Asp Thr Ser Leu Ser  Gly Phe Lys
    3665                3670                3675

Leu Lys  Asp Cys Val Met Tyr  Ala Ser Ala Val Val  Leu Leu Ile
    3680                3685                3690

Leu Met  Thr Ala Arg Thr Val  Tyr Asp Asp Gly Ala  Arg Arg Val
    3695                3700                3705

Trp Thr  Leu Met Asn Val Leu  Thr Leu Val Tyr Lys  Val Tyr Tyr
    3710                3715                3720

Gly Asn  Ala Leu Asp Gln Ala  Ile Ser Met Trp Ala  Leu Ile Ile
    3725                3730                3735

Ser Val  Thr Ser Asn Tyr Ser  Gly Val Val Thr Thr  Val Met Phe
    3740                3745                3750

Leu Ala  Arg Gly Ile Val Phe  Met Cys Val Glu Tyr  Cys Pro Ile
    3755                3760                3765

Phe Phe  Ile Thr Gly Asn Thr  Leu Gln Cys Ile Met  Leu Val Tyr
    3770                3775                3780

Cys Phe  Leu Gly Tyr Phe Cys  Thr Cys Tyr Phe Gly  Leu Phe Cys
    3785                3790                3795

Leu Leu  Asn Arg Tyr Phe Arg  Leu Thr Leu Gly Val  Tyr Asp Tyr
    3800                3805                3810

Leu Val  Ser Thr Gln Glu Phe  Arg Tyr Met Asn Ser  Gln Gly Leu
    3815                3820                3825
```

```
Leu Pro  Pro Lys Asn Ser Ile  Asp Ala Phe Lys Leu  Asn Ile Lys
    3830                 3835                 3840

Leu Leu  Gly Val Gly Gly Lys  Pro Cys Ile Lys Val  Ala Thr Val
    3845                 3850                 3855

Gln Ser  Lys Met Ser Asp Val  Lys Cys Thr Ser Val  Val Leu Leu
    3860                 3865                 3870

Ser Val  Leu Gln Gln Leu Arg  Val Glu Ser Ser Ser  Lys Leu Trp
    3875                 3880                 3885

Ala Gln  Cys Val Gln Leu His  Asn Asp Ile Leu Leu  Ala Lys Asp
    3890                 3895                 3900

Thr Thr  Glu Ala Phe Glu Lys  Met Val Ser Leu Leu  Ser Val Leu
    3905                 3910                 3915

Leu Ser  Met Gln Gly Ala Val  Asp Ile Asn Lys Leu  Cys Glu Glu
    3920                 3925                 3930

Met Leu  Asp Asn Arg Ala Thr  Leu Gln Ala Ile Ala  Ser Glu Phe
    3935                 3940                 3945

Ser Ser  Leu Pro Ser Tyr Ala  Ala Phe Ala Thr Ala  Gln Glu Ala
    3950                 3955                 3960

Tyr Glu  Gln Ala Val Ala Asn  Gly Asp Ser Glu Val  Val Leu Lys
    3965                 3970                 3975

Lys Leu  Lys Lys Ser Leu Asn  Val Ala Lys Ser Glu  Phe Asp Arg
    3980                 3985                 3990

Asp Ala  Ala Met Gln Arg Lys  Leu Glu Lys Met Ala  Asp Gln Ala
    3995                 4000                 4005

Met Thr  Gln Met Tyr Lys Gln  Ala Arg Ser Glu Asp  Lys Arg Ala
    4010                 4015                 4020

Lys Val  Thr Ser Ala Met Gln  Thr Met Leu Phe Thr  Met Leu Arg
```

```
    4025                4030                4035

Lys Leu  Asp Asn Asp Ala Leu  Asn Asn Ile Ile Asn  Asn Ala Arg
    4040                4045                4050

Asp Gly  Cys Val Pro Leu Asn  Ile Ile Pro Leu Thr  Thr Ala Ala
    4055                4060                4065

Lys Leu  Met Val Val Ile Pro  Asp Tyr Asn Thr Tyr  Lys Asn Thr
    4070                4075                4080

Cys Asp  Gly Thr Thr Phe Thr  Tyr Ala Ser Ala Leu  Trp Glu Ile
    4085                4090                4095

Gln Gln  Val Val Asp Ala Asp  Ser Lys Ile Val Gln  Leu Ser Glu
    4100                4105                4110

Ile Ser  Met Asp Asn Ser Pro  Asn Leu Ala Trp Pro  Leu Ile Val
    4115                4120                4125

Thr Ala  Leu Arg Ala Asn Ser  Ala Val Lys Leu Gln  Asn Asn Glu
    4130                4135                4140

Leu Ser  Pro Val Ala Leu Arg  Gln Met Ser Cys Ala  Ala Gly Thr
    4145                4150                4155

Thr Gln  Thr Ala Cys Thr Asp  Asp Asn Ala Leu Ala  Tyr Tyr Asn
    4160                4165                4170

Thr Thr  Lys Gly Gly Arg Phe  Val Leu Ala Leu Leu  Ser Asp Leu
    4175                4180                4185

Gln Asp  Leu Lys Trp Ala Arg  Phe Pro Lys Ser Asp  Gly Thr Gly
    4190                4195                4200

Thr Ile  Tyr Thr Glu Leu Glu  Pro Pro Cys Arg Phe  Val Thr Asp
    4205                4210                4215

Thr Pro  Lys Gly Pro Lys Val  Lys Tyr Leu Tyr Phe  Ile Lys Gly
    4220                4225                4230
```

```
Leu Asn  Asn Leu Asn Arg Gly  Met Val Leu Gly Ser  Leu Ala Ala
    4235                4240                4245

Thr Val  Arg Leu Gln Ala Gly  Asn Ala Thr Glu Val  Pro Ala Asn
    4250                4255                4260

Ser Thr  Val Leu Ser Phe Cys  Ala Phe Ala Val Asp  Ala Ala Lys
    4265                4270                4275

Ala Tyr  Lys Asp Tyr Leu Ala  Ser Gly Gly Gln Pro  Ile Thr Asn
    4280                4285                4290

Cys Val  Lys Met Leu Cys Thr  His Thr Gly Thr Gly  Gln Ala Ile
    4295                4300                4305

Thr Val  Thr Pro Glu Ala Asn  Met Asp Gln Glu Ser  Phe Gly Gly
    4310                4315                4320

Ala Ser  Cys Cys Leu Tyr Cys  Arg Cys His Ile Asp  His Pro Asn
    4325                4330                4335

Pro Lys  Gly Phe Cys Asp Leu  Lys Gly Lys Tyr Val  Gln Ile Pro
    4340                4345                4350

Thr Thr  Cys Ala Asn Asp Pro  Val Gly Phe Thr Leu  Lys Asn Thr
    4355                4360                4365

Val Cys  Thr Val Cys Gly Met  Trp Lys Gly Tyr Gly  Cys Ser Cys
    4370                4375                4380

Asp Gln  Leu Arg Glu Pro Met  Leu Gln Ser Ala Asp  Ala Gln Ser
    4385                4390                4395

Phe Leu  Asn Gly Phe Ala Val
    4400                4405
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<210> 17
<211> 1273
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<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (709)..(709)
<223> Xaa can be any naturally occurring amino acid

<400> 17

Met Phe Val Phe Leu Val Leu Leu Pro Leu Val Ser Ser Gln Cys Val
1   5   10   15

Asn Leu Thr Thr Arg Thr Gln Leu Pro Pro Ala Tyr Thr Asn Ser Phe
            20   25   30

Thr Arg Gly Val Tyr Tyr Pro Asp Lys Val Phe Arg Ser Ser Val Leu
        35   40   45

His Ser Thr Gln Asp Leu Phe Leu Pro Phe Phe Ser Asn Val Thr Trp
    50   55   60

Phe His Ala Ile His Val Ser Gly Thr Asn Gly Thr Lys Arg Phe Asp
65   70   75   80

Asn Pro Val Leu Pro Phe Asn Asp Gly Val Tyr Phe Ala Ser Thr Glu
                85   90   95

Lys Ser Asn Ile Ile Arg Gly Trp Ile Phe Gly Thr Thr Leu Asp Ser
            100   105   110

Lys Thr Gln Ser Leu Leu Ile Val Asn Asn Ala Thr Asn Val Val Ile
        115   120   125

Lys Val Cys Glu Phe Gln Phe Cys Asn Asp Pro Phe Leu Gly Val Tyr
    130   135   140

Tyr His Lys Asn Asn Lys Ser Trp Met Glu Ser Glu Phe Arg Val Tyr
145   150   155   160

Ser Ser Ala Asn Asn Cys Thr Phe Glu Tyr Val Ser Gln Pro Phe Leu

```
                165                 170                 175

Met Asp Leu Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Arg Glu Phe
            180                 185                 190

Val Phe Lys Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His Thr
        195                 200                 205

Pro Ile Asn Leu Val Arg Asp Leu Pro Gln Gly Phe Ser Ala Leu Glu
    210                 215                 220

Pro Leu Val Asp Leu Pro Ile Gly Ile Asn Ile Thr Arg Phe Gln Thr
225                 230                 235                 240

Leu Leu Ala Leu His Arg Ser Tyr Leu Thr Pro Gly Asp Ser Ser Ser
                245                 250                 255

Gly Trp Thr Ala Gly Ala Ala Ala Tyr Tyr Val Gly Tyr Leu Gln Pro
            260                 265                 270

Arg Thr Phe Leu Leu Lys Tyr Asn Glu Asn Gly Thr Ile Thr Asp Ala
        275                 280                 285

Val Asp Cys Ala Leu Asp Pro Leu Ser Glu Thr Lys Cys Thr Leu Lys
    290                 295                 300

Ser Phe Thr Val Glu Lys Gly Ile Tyr Gln Thr Ser Asn Phe Arg Xaa
305                 310                 315                 320

Gln Pro Thr Glu Ser Ile Val Arg Phe Pro Asn Ile Thr Asn Leu Cys
                325                 330                 335

Pro Phe Gly Glu Val Phe Asn Ala Thr Arg Phe Ala Ser Val Tyr Ala
            340                 345                 350

Trp Asn Arg Lys Arg Ile Ser Asn Cys Val Ala Asp Tyr Ser Val Leu
        355                 360                 365

Tyr Asn Ser Ala Ser Phe Ser Thr Phe Lys Cys Tyr Gly Val Ser Pro
    370                 375                 380
```

```
Thr Lys Leu Asn Asp Leu Cys Phe Thr Asn Val Tyr Ala Asp Ser Phe
385                 390                 395                 400

Val Ile Arg Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr Gly
                405                 410                 415

Lys Ile Ala Asp Tyr Asn Tyr Lys Leu Pro Asp Asp Phe Thr Gly Cys
            420                 425                 430

Val Ile Ala Trp Asn Ser Asn Asn Leu Asp Ser Lys Val Gly Gly Asn
        435                 440                 445

Tyr Asn Tyr Leu Tyr Arg Leu Phe Arg Lys Ser Asn Leu Lys Pro Phe
    450                 455                 460

Glu Arg Asp Ile Ser Thr Glu Ile Tyr Gln Ala Gly Ser Thr Pro Cys
465                 470                 475                 480

Asn Gly Val Glu Gly Phe Asn Cys Tyr Phe Pro Leu Gln Ser Tyr Gly
                485                 490                 495

Phe Gln Pro Thr Asn Gly Val Gly Tyr Gln Pro Tyr Arg Val Val Val
            500                 505                 510

Leu Ser Phe Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro Lys
        515                 520                 525

Lys Ser Thr Asn Leu Val Lys Asn Lys Cys Val Asn Phe Asn Phe Asn
    530                 535                 540

Gly Leu Thr Gly Thr Gly Val Leu Thr Glu Ser Asn Lys Lys Phe Leu
545                 550                 555                 560

Pro Phe Gln Gln Phe Gly Arg Asp Ile Ala Asp Thr Thr Asp Ala Val
                565                 570                 575

Arg Asp Pro Gln Thr Leu Glu Ile Leu Asp Ile Thr Pro Cys Ser Phe
            580                 585                 590

Gly Gly Val Ser Val Ile Thr Pro Gly Thr Asn Thr Ser Asn Gln Val
```

```
        595                 600                 605

Ala Val Leu Tyr Gln Gly Val Asn Cys Thr Glu Val Pro Val Ala Ile
    610                 615                 620

His Ala Asp Gln Leu Thr Pro Thr Trp Arg Val Tyr Ser Thr Gly Ser
625                 630                 635                 640

Asn Val Phe Gln Thr Arg Ala Gly Cys Leu Ile Gly Ala Glu His Val
                645                 650                 655

Asn Asn Ser Tyr Glu Cys Asp Ile Pro Ile Gly Ala Gly Ile Cys Ala
            660                 665                 670

Ser Tyr Gln Thr Gln Thr Asn Ser Pro Arg Arg Ala Arg Ser Val Ala
        675                 680                 685

Ser Gln Ser Ile Ile Ala Tyr Thr Met Ser Leu Gly Ala Glu Asn Ser
    690                 695                 700

Val Ala Tyr Ser Xaa Asn Ser Ile Ala Ile Pro Thr Asn Phe Thr Ile
705                 710                 715                 720

Ser Val Thr Thr Glu Ile Leu Pro Val Ser Met Thr Lys Thr Ser Val
                725                 730                 735

Asp Cys Thr Met Tyr Ile Cys Gly Asp Ser Thr Glu Cys Ser Asn Leu
            740                 745                 750

Leu Leu Gln Tyr Gly Ser Phe Cys Thr Gln Leu Asn Arg Ala Leu Thr
        755                 760                 765

Gly Ile Ala Val Glu Gln Asp Lys Asn Thr Gln Glu Val Phe Ala Gln
    770                 775                 780

Val Lys Gln Ile Tyr Lys Thr Pro Pro Ile Lys Asp Phe Gly Gly Phe
785                 790                 795                 800

Asn Phe Ser Gln Ile Leu Pro Asp Pro Ser Lys Pro Ser Lys Arg Ser
                805                 810                 815
```

```
Phe Ile Glu Asp Leu Leu Phe Asn Lys Val Thr Leu Ala Asp Ala Gly
            820                 825                 830

Phe Ile Lys Gln Tyr Gly Asp Cys Leu Gly Asp Ile Ala Ala Arg Asp
        835                 840                 845

Leu Ile Cys Ala Gln Lys Phe Asn Gly Leu Thr Val Leu Pro Pro Leu
    850                 855                 860

Leu Thr Asp Glu Met Ile Ala Gln Tyr Thr Ser Ala Leu Leu Ala Gly
865                 870                 875                 880

Thr Ile Thr Ser Gly Trp Thr Phe Gly Ala Gly Ala Ala Leu Gln Ile
                885                 890                 895

Pro Phe Ala Met Gln Met Ala Tyr Arg Phe Asn Gly Ile Gly Val Thr
            900                 905                 910

Gln Asn Val Leu Tyr Glu Asn Gln Lys Leu Ile Ala Asn Gln Phe Asn
        915                 920                 925

Ser Ala Ile Gly Lys Ile Gln Asp Ser Leu Ser Ser Thr Ala Ser Ala
    930                 935                 940

Leu Gly Lys Leu Gln Asp Val Val Asn Gln Asn Ala Gln Ala Leu Asn
945                 950                 955                 960

Thr Leu Val Lys Gln Leu Ser Ser Asn Phe Gly Ala Ile Ser Ser Val
                965                 970                 975

Leu Asn Asp Ile Leu Ser Arg Leu Asp Lys Val Glu Ala Glu Val Gln
            980                 985                 990

Ile Asp Arg Leu Ile Thr Gly Arg  Leu Gln Ser Leu Gln  Thr Tyr Val
        995                 1000                1005

Thr Gln  Gln Leu Ile Arg Ala  Ala Glu Ile Arg Val  Ser Ala Asn
    1010                1015                1020

Leu Ala  Ala Thr Lys Met Ser  Glu Cys Val Leu Gly  Gln Ser Lys
```

```
    1025                1030                1035

Arg Val  Asp Phe Cys Gly Lys  Gly Tyr His Leu Met  Ser Phe Pro
    1040                1045                1050

Gln Ser  Ala Pro His Gly Val  Val Phe Leu His Val  Thr Tyr Val
    1055                1060                1065

Pro Ala  Gln Glu Lys Asn Phe  Thr Thr Ala Pro Ala  Ile Cys His
    1070                1075                1080

Asp Gly  Lys Ala His Phe Pro  Arg Glu Gly Val Phe  Val Ser Asn
    1085                1090                1095

Gly Thr  His Trp Phe Val Thr  Gln Arg Asn Phe Tyr  Glu Pro Gln
    1100                1105                1110

Ile Ile  Thr Thr Asp Asn Thr  Phe Val Ser Gly Asn  Cys Asp Val
    1115                1120                1125

Val Ile  Gly Ile Val Asn Asn  Thr Val Tyr Asp Pro  Leu Gln Pro
    1130                1135                1140

Glu Leu  Asp Ser Phe Lys Glu  Glu Leu Asp Lys Tyr  Phe Lys Asn
    1145                1150                1155

His Thr  Ser Pro Asp Val Asp  Leu Gly Asp Ile Ser  Gly Ile Asn
    1160                1165                1170

Ala Ser  Val Val Asn Ile Gln  Lys Glu Ile Asp Arg  Leu Asn Glu
    1175                1180                1185

Val Ala  Lys Asn Leu Asn Glu  Ser Leu Ile Asp Leu  Gln Glu Leu
    1190                1195                1200

Gly Lys  Tyr Glu Gln Tyr Ile  Lys Trp Pro Trp Tyr  Ile Trp Leu
    1205                1210                1215

Gly Phe  Ile Ala Gly Leu Ile  Ala Ile Val Met Val  Thr Ile Met
    1220                1225                1230
```

Leu Cys Cys Met Thr Ser Cys Cys Ser Cys Leu Lys Gly Cys Cys
    1235   1240   1245

Ser Cys Gly Ser Cys Cys Lys Phe Asp Glu Asp Asp Ser Glu Pro
    1250   1255   1260

Val Leu Lys Gly Val Lys Leu His Tyr Thr
    1265   1270

<210> 18
<211> 29897
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<223> n is a, c, g, or t

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cacgcagtat aattaataac taattactgt cgttgacagg acacgagtaa ctcttctatc   180

ttctgcaggc tgcttacggt ttcgtccgtg ttgcagccga tcatcagcac atctaggttt   240

tgtccgggtg tgaccgaaag gtaagatgga gagccttgtc cctggtttca acgagaaaac   300

acacgtccaa ctcagtttgc ctgttttaca ggttcgcgac gtgctcgtac gtggctttgg   360

agactccgtg gaggaggtct tatcagaggc acgtcaacat cttaaagatg gcacttgtgg   420

cttagtagaa gttgaaaaag gcgttttgcc tcaacttgaa cagccctatg tgttcatcaa   480

acgttcggat gctcgaactg cacctcatgg tcatgttatg gttgagctgg tagcagaact   540

cgaaggcatt cagtacggtc gtagtggtga gacacttggt gtccttgtcc ctcatgtggg   600

cgaaatacca gtggcttacc gcaaggttct tcttcgtaag aacggtaata aaggagctgg 660

tggccatagt tacggcgccg atctaaagtc atttgactta ggcgacgagc ttggcactga 720

tccttatgaa gattttcaag aaaactggaa cactaaacat agcagtggtg ttacccgtga 780

actcatgcgt gagcttaacg gaggggcata cactcgctat gtcgataaca acttctgtgg 840

ccctgatggc taccctcttg agtgcattaa agaccttcta gcacgtgctg gtaaagcttc 900

atgcactttg tccgaacaac tggactttat tgacactaag aggggtgtat actgctgccg 960

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gcttgatggc tttatgggta gaattcgatc tgtctatcca gttgcgtcac caaatgaatg 1200

caaccaaatg tgcctttcaa ctctcatgaa gtgtgatcat tgtggtgaaa cttcatggca 1260

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aaaaggaaaa gctaaaaaag gtgcctggaa tattggtgaa cagaaatcaa tactgagtcc 1860

tctttatgca tttgcatcag aggctgctcg tgttgtacga tcaattttct cccgcactct 1920

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gctaactaac atctttggca ctgtttatga aaaactcaaa cccgtccttg attggcttga 2160

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ctcaacctgt gcttgtgaaa ttgtcggtgg acaaattgtc acctgtgcaa aggaaattaa 2280

ggagagtgtt cagacattct ttaagcttgt aaataaattt ttggctttgt gtgctgactc 2340

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Thr Arg Gly Val Tyr Tyr Pro Asp Lys Val Phe Arg Ser Ser Val Leu
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His Ser Thr Gln Asp Leu Phe Leu Pro Phe Phe Ser Asn Val Thr Trp
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Phe His Ala Ile His Val Ser Gly Thr Asn Gly Thr Lys Arg Phe Ala
65 70 75 80

Asn Pro Val Leu Pro Phe Asn Asp Gly Val Tyr Phe Ala Ser Thr Glu
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Lys Ser Asn Ile Ile Arg Gly Trp Ile Phe Gly Thr Thr Leu Asp Ser
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Lys Thr Gln Ser Leu Leu Ile Val Asn Asn Ala Thr Asn Val Val Ile
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Lys Val Cys Glu Phe Gln Phe Cys Asn Asp Pro Phe Leu Gly Val Tyr

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Tyr His Lys Asn Asn Lys Ser Trp Met Glu Ser Glu Phe Arg Val Tyr
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Ser Ser Ala Asn Asn Cys Thr Phe Glu Tyr Val Ser Gln Pro Phe Leu
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Met Asp Leu Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Arg Glu Phe
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Val Phe Lys Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His Thr
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Pro Ile Asn Leu Val Arg Gly Leu Pro Gln Gly Phe Ser Ala Leu Glu
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Pro Leu Val Asp Leu Pro Ile Gly Ile Asn Ile Thr Arg Phe Gln Xaa
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Xaa Xaa Leu His Arg Ser Tyr Leu Thr Pro Gly Asp Ser Ser Ser Gly
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Trp Thr Ala Gly Ala Ala Ala Tyr Tyr Val Gly Tyr Leu Gln Pro Arg
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Thr Phe Leu Leu Lys Tyr Asn Glu Asn Gly Thr Ile Thr Asp Ala Val
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Asp Cys Ala Leu Asp Pro Leu Ser Glu Thr Lys Cys Thr Leu Lys Ser
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Phe Thr Val Glu Lys Gly Ile Tyr Gln Thr Ser Asn Phe Arg Val Gln
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Pro Thr Glu Ser Ile Val Arg Phe Pro Asn Ile Thr Asn Leu Cys Pro
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Phe Gly Glu Val Phe Asn Ala Thr Arg Phe Ala Ser Val Tyr Ala Trp
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Asn Arg Lys Arg Ile Ser Asn Cys Val Ala Asp Tyr Ser Val Leu Tyr
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Lys Leu Asn Asp Leu Cys Phe Thr Asn Val Tyr Ala Asp Ser Phe Val
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Ile Arg Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr Gly Asn
                405                 410                 415

Ile Ala Asp Tyr Asn Tyr Lys Leu Pro Asp Asp Phe Thr Gly Cys Val
            420                 425                 430

Ile Ala Trp Asn Ser Asn Asn Leu Asp Ser Lys Val Gly Gly Asn Tyr
        435                 440                 445

Asn Tyr Leu Tyr Arg Leu Phe Arg Lys Ser Asn Leu Lys Pro Phe Glu
    450                 455                 460

Arg Asp Ile Ser Thr Glu Ile Tyr Gln Ala Gly Ser Thr Pro Cys Asn
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Gly Val Lys Gly Phe Asn Cys Tyr Phe Pro Leu Gln Ser Tyr Gly Phe
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Gln Pro Thr Tyr Gly Val Gly Tyr Gln Pro Tyr Arg Val Val Val Leu
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Ser Phe Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro Lys Lys
        515                 520                 525

Ser Thr Asn Leu Val Lys Asn Lys Cys Val Asn Phe Asn Phe Asn Gly
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Leu Thr Gly Thr Gly Val Leu Thr Glu Ser Asn Lys Lys Phe Leu Pro
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Phe Gln Gln Phe Gly Arg Asp Ile Ala Asp Thr Thr Asp Ala Val Arg
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Asp Pro Gln Thr Leu Glu Ile Leu Asp Ile Thr Pro Cys Ser Phe Gly
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Gly Val Ser Val Ile Thr Pro Gly Thr Asn Thr Ser Asn Gln Val Ala
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Val Leu Tyr Gln Gly Val Asn Cys Thr Glu Val Pro Val Ala Ile His
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Ala Asp Gln Leu Thr Pro Thr Trp Arg Val Tyr Ser Thr Gly Ser Asn
625                 630                 635                 640

Val Phe Gln Thr Arg Ala Gly Cys Leu Ile Gly Ala Glu His Val Asn
                645                 650                 655

Asn Ser Tyr Glu Cys Asp Ile Pro Ile Gly Ala Gly Ile Cys Ala Ser
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Tyr Gln Thr Gln Thr Asn Ser Pro Arg Arg Ala Arg Ser Val Ala Ser
        675                 680                 685

Gln Ser Ile Ile Ala Tyr Thr Met Ser Leu Gly Val Glu Asn Ser Val
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Ala Tyr Ser Asn Asn Ser Ile Ala Ile Pro Thr Asn Phe Thr Ile Ser
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Val Thr Thr Glu Ile Leu Pro Val Ser Met Thr Lys Thr Ser Val Asp
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Cys Thr Met Tyr Ile Cys Gly Asp Ser Thr Glu Cys Ser Asn Leu Leu
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Leu Gln Tyr Gly Ser Phe Cys Thr Gln Leu Asn Arg Ala Leu Thr Gly
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Ile Ala Val Glu Gln Asp Lys Asn Thr Gln Glu Val Phe Ala Gln Val
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Ile Glu Asp Leu Leu Phe Asn Lys Val Thr Leu Ala Asp Ala Gly Phe
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Ile Lys Gln Tyr Gly Asp Cys Leu Gly Asp Ile Ala Ala Arg Asp Leu
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Ile Cys Ala Gln Lys Phe Asn Gly Leu Thr Val Leu Pro Pro Leu Leu
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Thr Asp Glu Met Ile Ala Gln Tyr Thr Ser Ala Leu Leu Ala Gly Thr
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Ile Thr Ser Gly Trp Thr Phe Gly Ala Gly Ala Ala Leu Gln Ile Pro
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Phe Ala Met Gln Met Ala Tyr Arg Phe Asn Gly Ile Gly Val Thr Gln
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Asn Val Leu Tyr Glu Asn Gln Lys Leu Ile Ala Asn Gln Phe Asn Ser
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Ala Ile Gly Lys Ile Gln Asp Ser Leu Ser Ser Thr Ala Ser Ala Leu
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Gly Lys Leu Gln Asp Val Val Asn Gln Asn Ala Gln Ala Leu Asn Thr
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Leu Val Lys Gln Leu Ser Ser Asn Phe Gly Ala Ile Ser Ser Val Leu
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Asp Arg Leu Ile Thr Gly Arg Leu  Gln Ser Leu Gln Thr  Tyr Val Thr
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Val Asp  Phe Cys Gly Lys Gly  Tyr His Leu Met Ser  Phe Pro Gln
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Ser Ala  Pro His Gly Val Val  Phe Leu His Val Thr  Tyr Val Pro
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Ala Gln  Glu Lys Asn Phe Thr  Thr Ala Pro Ala Ile  Cys His Asp
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Gly Lys  Ala His Phe Pro Arg  Glu Gly Val Phe Val  Ser Asn Gly
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Thr His  Trp Phe Val Thr Gln  Arg Asn Phe Tyr Glu  Pro Gln Ile
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Ile Thr  Thr Asp Asn Thr Phe  Val Ser Gly Asn Cys  Asp Val Val
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Ile Gly  Ile Val Asn Asn Thr  Val Tyr Asp Pro Leu  Gln Pro Glu
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Leu Asp  Ser Phe Lys Glu Glu  Leu Asp Lys Tyr Phe  Lys Asn His
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Thr Ser  Pro Asp Val Asp Leu  Gly Asp Ile Ser Gly  Ile Asn Ala
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Ser Val  Val Asn Ile Gln Lys  Glu Ile Asp Arg Leu  Asn Glu Val
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Ala Lys  Asn Leu Asn Glu Ser  Leu Ile Asp Leu Gln  Glu Leu Gly
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Cys Cys  Met Thr Ser Cys Cys  Ser Cys Leu Lys Gly  Cys Cys Ser
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Thr Arg Gly Val Tyr Tyr Pro Asp Lys Val Phe Arg Ser Ser Val Leu
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His Ser Thr Gln Asp Leu Phe Leu Pro Phe Phe Ser Asn Val Thr Trp
    50                  55                  60

Phe His Ala Ile His Val Ser Gly Thr Asn Gly Thr Lys Arg Phe Asp
65                  70                  75                  80

Asn Pro Val Leu Pro Phe Asn Asp Gly Val Tyr Phe Ala Ser Thr Glu
                85                  90                  95

Lys Ser Asn Ile Ile Arg Gly Trp Ile Phe Gly Thr Thr Leu Asp Ser
            100                 105                 110

Lys Thr Gln Ser Leu Leu Ile Val Asn Asn Ala Thr Asn Val Val Ile
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Lys Val Cys Glu Phe Gln Phe Cys Asn Tyr Pro Phe Leu Gly Val Tyr
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Tyr His Lys Asn Asn Lys Ser Trp Met Glu Ser Glu Phe Arg Val Tyr
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Ser Ser Ala Asn Asn Cys Thr Phe Glu Tyr Val Ser Gln Pro Phe Leu
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Met Asp Leu Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Ser Glu Phe
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Val Phe Lys Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His Thr
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Leu Leu Ala Leu His Arg Ser Tyr Leu Thr Pro Gly Asp Ser Ser Ser
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Gly Trp Thr Ala Gly Ala Ala Ala Tyr Tyr Val Gly Tyr Leu Gln Pro
            260                 265                 270

Arg Thr Phe Leu Leu Lys Tyr Asn Glu Asn Gly Thr Ile Thr Asp Ala
        275                 280                 285

Val Asp Cys Ala Leu Asp Pro Leu Ser Glu Thr Lys Cys Thr Leu Lys
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Ser Phe Thr Val Glu Lys Gly Ile Tyr Gln Thr Ser Asn Phe Arg Val
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Gln Pro Thr Glu Ser Ile Val Arg Phe Pro Asn Ile Thr Asn Leu Cys
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Pro Phe Gly Glu Val Phe Asn Ala Thr Arg Phe Ala Ser Val Tyr Ala
            340                 345                 350

Trp Asn Arg Lys Arg Ile Ser Asn Cys Val Ala Asp Tyr Ser Val Leu
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Tyr Asn Ser Ala Ser Phe Ser Thr Phe Lys Cys Tyr Gly Val Ser Pro
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Thr Lys Leu Asn Asp Leu Cys Phe Thr Asn Val Tyr Ala Asp Ser Phe
385                 390                 395                 400

Val Ile Arg Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr Gly
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Thr Ile Ala Asp Tyr Asn Tyr Lys Leu Pro Asp Asp Phe Thr Gly Cys
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Val Ile Ala Trp Asn Ser Asn Asn Leu Asp Ser Lys Val Gly Gly Asn
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Tyr Asn Tyr Leu Tyr Arg Leu Phe Arg Lys Ser Asn Leu Lys Pro Phe
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Glu Arg Asp Ile Ser Thr Glu Ile Tyr Gln Ala Gly Ser Thr Pro Cys
465                 470                 475                 480

Asn Gly Val Lys Gly Phe Asn Cys Tyr Phe Pro Leu Gln Ser Tyr Gly
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Phe Gln Pro Thr Tyr Gly Val Gly Tyr Gln Pro Tyr Arg Val Val Val
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Leu Ser Phe Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro Lys
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Lys Ser Thr Asn Leu Val Lys Asn Lys Cys Val Asn Phe Asn Phe Asn
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Gly Leu Thr Gly Thr Gly Val Leu Thr Glu Ser Asn Lys Lys Phe Leu
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Pro Phe Gln Gln Phe Gly Arg Asp Ile Ala Asp Thr Thr Asp Ala Val
                565                 570                 575

Arg Asp Pro Gln Thr Leu Glu Ile Leu Asp Ile Thr Pro Cys Ser Phe
            580                 585                 590

Gly Gly Val Ser Val Ile Thr Pro Gly Thr Asn Thr Ser Asn Gln Val
        595                 600                 605

Ala Val Leu Tyr Gln Gly Val Asn Cys Thr Glu Val Pro Val Ala Ile
    610                 615                 620

His Ala Asp Gln Leu Thr Pro Thr Trp Arg Val Tyr Ser Thr Gly Ser
625                 630                 635                 640
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Asn Val Phe Gln Thr Arg Ala Gly Cys Leu Ile Gly Ala Glu Tyr Val
                645                 650                 655

Asn Asn Ser Tyr Glu Cys Asp Ile Pro Ile Gly Ala Gly Ile Cys Ala
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Ser Tyr Gln Thr Gln Thr Asn Ser Pro Arg Arg Ala Arg Ser Val Ala
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Ser Gln Ser Ile Ile Ala Tyr Thr Met Ser Leu Gly Ala Glu Asn Ser
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Val Ala Tyr Ser Asn Asn Ser Ile Ala Ile Pro Thr Asn Phe Thr Ile
705                 710                 715                 720

Ser Val Thr Thr Glu Ile Leu Pro Val Ser Met Thr Lys Thr Ser Val
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Asp Cys Thr Met Tyr Ile Cys Gly Asp Ser Thr Glu Cys Ser Asn Leu
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Leu Leu Gln Tyr Gly Ser Phe Cys Thr Gln Leu Asn Arg Ala Leu Thr
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Gly Ile Ala Val Glu Gln Asp Lys Asn Thr Gln Glu Val Phe Ala Gln
    770                 775                 780

Val Lys Gln Ile Tyr Lys Thr Pro Pro Ile Lys Asp Phe Gly Gly Phe
785                 790                 795                 800

Asn Phe Ser Gln Ile Leu Pro Asp Pro Ser Lys Pro Ser Lys Arg Ser
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Phe Ile Glu Asp Leu Leu Phe Asn Lys Val Thr Leu Ala Asp Ala Gly
            820                 825                 830

Phe Ile Lys Gln Tyr Gly Asp Cys Leu Gly Asp Ile Ala Ala Arg Asp
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Leu Ile Cys Ala Gln Lys Phe Asn Gly Leu Thr Val Leu Pro Pro Leu
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Leu Thr Asp Glu Met Ile Ala Gln Tyr Thr Ser Ala Leu Leu Ala Gly
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Thr Ile Thr Ser Gly Trp Thr Phe Gly Ala Gly Ala Ala Leu Gln Ile
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Pro Phe Ala Met Gln Met Ala Tyr Arg Phe Asn Gly Ile Gly Val Thr
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Gln Asn Val Leu Tyr Glu Asn Gln Lys Leu Ile Ala Asn Gln Phe Asn
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Ser Ala Ile Gly Lys Ile Gln Asp Ser Leu Ser Ser Thr Ala Ser Ala
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Leu Gly Lys Leu Gln Asp Val Val Asn Gln Asn Ala Gln Ala Leu Asn
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Thr Leu Val Lys Gln Leu Ser Ser Asn Phe Gly Ala Ile Ser Ser Val
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Leu Asn Asp Ile Leu Ser Arg Leu Asp Lys Val Glu Ala Glu Val Gln
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Ile Asp Arg Leu Ile Thr Gly Arg  Leu Gln Ser Leu Gln  Thr Tyr Val
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Thr Gln  Gln Leu Ile Arg Ala  Ala Glu Ile Arg Ala  Ser Ala Asn
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Leu Ala  Ala Ile Lys Met Ser  Glu Cys Val Leu Gly  Gln Ser Lys
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Arg Val  Asp Phe Cys Gly Lys  Gly Tyr His Leu Met  Ser Phe Pro
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Gln Ser  Ala Pro His Gly Val  Val Phe Leu His Val  Thr Tyr Val
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Gly Thr  His Trp Phe Val Thr  Gln Arg Asn Phe Tyr  Glu Pro Gln
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Ile Ile  Thr Thr Asp Asn Thr  Phe Val Ser Gly Asn  Cys Asp Val
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Val Ile  Gly Ile Val Asn Asn  Thr Val Tyr Asp Pro  Leu Gln Pro
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Glu Leu  Asp Ser Phe Lys Glu  Glu Leu Asp Lys Tyr  Phe Lys Asn
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His Thr  Ser Pro Asp Val Asp  Leu Gly Asp Ile Ser  Gly Ile Asn
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Ala Ser  Phe Val Asn Ile Gln  Lys Glu Ile Asp Arg  Leu Asn Glu
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Val Ala  Lys Asn Leu Asn Glu  Ser Leu Ile Asp Leu  Gln Glu Leu
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Gly Lys  Tyr Glu Gln Tyr Ile  Lys Trp Pro Trp Tyr  Ile Trp Leu
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Gly Phe  Ile Ala Gly Leu Ile  Ala Ile Val Met Val  Thr Ile Met
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Thr Arg Gly Val Tyr Tyr Pro Asp Lys Val Phe Arg Ser Ser Val Leu
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His Ser Thr Gln Asp Leu Phe Leu Pro Phe Phe Ser Asn Val Thr Trp
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Phe His Ala Ile Ser Gly Thr Asn Gly Thr Lys Arg Phe Asp Asn Pro
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Val Leu Pro Phe Asn Asp Gly Val Tyr Phe Ala Ser Thr Glu Lys Ser
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Asn Ile Ile Arg Gly Trp Ile Phe Gly Thr Thr Leu Asp Ser Lys Thr
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Gln Ser Leu Leu Ile Val Asn Asn Ala Thr Asn Val Val Ile Lys Val
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Cys Glu Phe Gln Phe Cys Asn Asp Pro Phe Leu Gly Val Tyr His Lys
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Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Arg Glu Phe Val Phe Lys
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Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His Thr Pro Ile Asn
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Leu Val Arg Asp Leu Pro Gln Gly Phe Ser Ala Leu Glu Pro Leu Val
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Asp Leu Pro Ile Gly Ile Asn Ile Thr Arg Phe Gln Thr Leu Leu Ala
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Leu His Arg Ser Tyr Leu Thr Pro Gly Asp Ser Ser Ser Gly Trp Thr
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Ala Gly Ala Ala Ala Tyr Tyr Val Gly Tyr Leu Gln Pro Arg Thr Phe
            260                 265                 270

Leu Leu Lys Tyr Asn Glu Asn Gly Thr Ile Thr Asp Ala Val Asp Cys
        275                 280                 285

Ala Leu Asp Pro Leu Ser Glu Thr Lys Cys Thr Leu Lys Ser Phe Thr
    290                 295                 300

Val Glu Lys Gly Ile Tyr Gln Thr Ser Asn Phe Arg Val Gln Pro Thr
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Glu Ser Ile Val Arg Phe Pro Asn Ile Thr Asn Leu Cys Pro Phe Gly
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Glu Val Phe Asn Ala Thr Arg Phe Ala Ser Val Tyr Ala Trp Asn Arg
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Lys Arg Ile Ser Asn Cys Val Ala Asp Tyr Ser Val Leu Tyr Asn Ser
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Ala Ser Phe Ser Thr Phe Lys Cys Tyr Gly Val Ser Pro Thr Lys Leu
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Asn Asp Leu Cys Phe Thr Asn Val Tyr Ala Asp Ser Phe Val Ile Arg
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Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr Gly Lys Ile Ala
                405                 410                 415

Asp Tyr Asn Tyr Lys Leu Pro Asp Asp Phe Thr Gly Cys Val Ile Ala
            420                 425                 430

Trp Asn Ser Asn Asn Leu Asp Ser Lys Val Gly Gly Asn Tyr Asn Tyr
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Leu Tyr Arg Leu Phe Arg Lys Ser Asn Leu Lys Pro Phe Glu Arg Asp
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Ile Ser Thr Glu Ile Tyr Gln Ala Gly Ser Thr Pro Cys Asn Gly Val
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Thr Tyr Gly Val Gly Tyr Gln Pro Tyr Arg Val Val Val Leu Ser Phe
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Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro Lys Lys Ser Thr
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Asn Leu Val Lys Asn Lys Cys Val Asn Phe Asn Phe Asn Gly Leu Thr
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Gly Thr Gly Val Leu Thr Glu Ser Asn Lys Lys Phe Leu Pro Phe Gln
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Gln Phe Gly Arg Asp Ile Asp Asp Thr Thr Asp Ala Val Arg Asp Pro
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Gln Thr Leu Glu Ile Leu Asp Ile Thr Pro Cys Ser Phe Gly Gly Val
            580                 585                 590

Ser Val Ile Thr Pro Gly Thr Asn Thr Ser Asn Gln Val Ala Val Leu
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Tyr Gln Gly Val Asn Cys Thr Glu Val Pro Val Ala Ile His Ala Asp
    610                 615                 620

Gln Leu Thr Pro Thr Trp Arg Val Tyr Ser Thr Gly Ser Asn Val Phe
625                 630                 635                 640

Gln Thr Arg Ala Gly Cys Leu Ile Gly Ala Glu His Val Asn Asn Ser
                645                 650                 655

Tyr Glu Cys Asp Ile Pro Ile Gly Ala Gly Ile Cys Ala Ser Tyr Gln
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Thr Gln Thr Asn Ser His Arg Arg Ala Arg Ser Val Ala Ser Gln Ser
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Ile Ile Ala Tyr Thr Met Ser Leu Gly Ala Glu Asn Ser Val Ala Tyr
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Ser Asn Asn Ser Ile Ala Ile Pro Ile Asn Phe Thr Ile Ser Val Thr
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Thr Glu Ile Leu Pro Val Ser Met Thr Lys Thr Ser Val Asp Cys Thr
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Met Tyr Ile Cys Gly Asp Ser Thr Glu Cys Ser Asn Leu Leu Leu Gln
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Tyr Gly Ser Phe Cys Thr Gln Leu Asn Arg Ala Leu Thr Gly Ile Ala
        755                 760                 765

Val Glu Gln Asp Lys Asn Thr Gln Glu Val Phe Ala Gln Val Lys Gln
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Ile Tyr Lys Thr Pro Pro Ile Lys Asp Phe Gly Gly Phe Asn Phe Ser
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Gln Ile Leu Pro Asp Pro Ser Lys Pro Ser Lys Arg Ser Phe Ile Glu
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Asp Leu Leu Phe Asn Lys Val Thr Leu Ala Asp Ala Gly Phe Ile Lys
            820                 825                 830

Gln Tyr Gly Asp Cys Leu Gly Asp Ile Ala Ala Arg Asp Leu Ile Cys
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Ala Gln Lys Phe Asn Gly Leu Thr Val Leu Pro Pro Leu Leu Thr Asp
    850                 855                 860

Glu Met Ile Ala Gln Tyr Thr Ser Ala Leu Leu Ala Gly Thr Ile Thr
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Ser Gly Trp Thr Phe Gly Ala Gly Ala Ala Leu Gln Ile Pro Phe Ala
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Leu Gln Asp Val Val Asn Gln Asn Ala Gln Ala Leu Asn Thr Leu Val
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Lys Gln Leu Ser Ser Asn Phe Gly Ala Ile Ser Ser Val Leu Asn Asp
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Ile Leu Ala Arg Leu Asp Lys Val Glu Ala Glu Val Gln Ile Asp Arg
            980                 985                 990

Leu Ile Thr Gly Arg Leu Gln Ser  Leu Gln Thr Tyr Val  Thr Gln Gln
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Leu Ile  Arg Ala Ala Glu Ile  Arg Ala Ser Ala Asn  Leu Ala Ala
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Thr Lys  Met Ser Glu Cys Val  Leu Gly Gln Ser Lys  Arg Val Asp
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Phe Cys  Gly Lys Gly Tyr His  Leu Met Ser Phe Pro  Gln Ser Ala
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Pro His  Gly Val Val Phe Leu  His Val Thr Tyr Val  Pro Ala Gln
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Glu Lys  Asn Phe Thr Thr Ala  Pro Ala Ile Cys His  Asp Gly Lys
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Ser Phe  Lys Glu Glu Leu Asp  Lys Tyr Phe Lys Asn  His Thr Ser
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Pro Asp  Val Asp Leu Gly Asp  Ile Ser Gly Ile Asn  Ala Ser Val
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Val Asn  Ile Gln Lys Glu Ile  Asp Arg Leu Asn Glu  Val Ala Lys
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Asn Leu  Asn Glu Ser Leu Ile  Asp Leu Gln Glu Leu  Gly Lys Tyr
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Glu Gln  Tyr Ile Lys Trp Pro  Trp Tyr Ile Trp Leu  Gly Phe Ile
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Ala Gly  Leu Ile Ala Ile Val  Met Val Thr Ile Met  Leu Cys Cys
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Met Thr  Ser Cys Cys Ser Cys  Leu Lys Gly Cys Cys  Ser Cys Gly
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Thr Arg Gly Val Tyr Tyr Pro Asp Lys Val Phe Arg Ser Ser Val Leu
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His Ser Thr Gln Asp Leu Phe Leu Pro Phe Phe Ser Asn Val Thr Trp
50 55 60

Phe His Ala Ile His Val Ser Gly Thr Asn Gly Thr Lys Arg Phe Asp
65 70 75 80

Asn Pro Val Leu Pro Phe Asn Asp Gly Val Tyr Phe Ala Ser Thr Glu

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Lys Ser Asn Ile Ile Arg Gly Trp Ile Phe Gly Thr Thr Leu Asp Ser
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Lys Thr Gln Ser Leu Leu Ile Val Asn Asn Ala Thr Asn Val Val Ile
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Lys Val Cys Glu Phe Gln Phe Cys Asn Asp Pro Phe Leu Gly Val Tyr
    130                 135                 140

Tyr His Lys Asn Asn Lys Ser Cys Met Glu Ser Glu Phe Arg Val Tyr
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Ser Ser Ala Asn Asn Cys Thr Phe Glu Tyr Val Ser Gln Pro Phe Leu
                165                 170                 175

Met Asp Leu Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Arg Glu Phe
            180                 185                 190

Val Phe Lys Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His Thr
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Pro Ile Asn Leu Val Arg Asp Leu Pro Gln Gly Phe Ser Ala Leu Glu
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Pro Leu Val Asp Leu Pro Ile Gly Ile Asn Ile Thr Arg Phe Gln Thr
225                 230                 235                 240

Leu Leu Ala Leu His Arg Ser Tyr Leu Thr Pro Gly Asp Ser Ser Ser
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Gly Trp Thr Ala Gly Ala Ala Ala Tyr Tyr Val Gly Tyr Leu Gln Pro
            260                 265                 270

Arg Thr Phe Leu Leu Lys Tyr Asn Glu Asn Gly Thr Ile Thr Asp Ala
        275                 280                 285

Val Asp Cys Ala Leu Asp Pro Leu Ser Glu Thr Lys Cys Thr Leu Lys
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Ser Phe Thr Val Glu Lys Gly Ile Tyr Gln Thr Ser Asn Phe Arg Val
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Gln Pro Thr Glu Ser Ile Val Arg Phe Pro Asn Ile Thr Asn Leu Cys
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Pro Phe Gly Glu Val Phe Asn Ala Thr Arg Phe Ala Ser Val Tyr Ala
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Trp Asn Arg Lys Arg Ile Ser Asn Cys Val Ala Asp Tyr Ser Val Leu
        355                 360                 365

Tyr Asn Ser Ala Ser Phe Ser Thr Phe Lys Cys Tyr Gly Val Ser Pro
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Thr Lys Leu Asn Asp Leu Cys Phe Thr Asn Val Tyr Ala Asp Ser Phe
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Val Ile Arg Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr Gly
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Lys Ile Ala Asp Tyr Asn Tyr Lys Leu Pro Asp Asp Phe Thr Gly Cys
            420                 425                 430

Val Ile Ala Trp Asn Ser Asn Asn Leu Asp Ser Lys Val Gly Gly Asn
        435                 440                 445

Tyr Asn Tyr Arg Tyr Arg Leu Phe Arg Lys Ser Asn Leu Lys Pro Phe
    450                 455                 460

Glu Arg Asp Ile Ser Thr Glu Ile Tyr Gln Ala Gly Ser Thr Pro Cys
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Asn Gly Val Glu Gly Phe Asn Cys Tyr Phe Pro Leu Gln Ser Tyr Gly
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Phe Gln Pro Thr Asn Gly Val Gly Tyr Gln Pro Tyr Arg Val Val Val
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Leu Ser Phe Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro Lys
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Lys Ser Thr Asn Leu Val Lys Asn Lys Cys Val Asn Phe Asn Phe Asn
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Gly Leu Thr Gly Thr Gly Val Leu Thr Glu Ser Asn Lys Lys Phe Leu
545                 550                 555                 560

Pro Phe Gln Gln Phe Gly Arg Asp Ile Ala Asp Thr Thr Asp Ala Val
                565                 570                 575

Arg Asp Pro Gln Thr Leu Glu Ile Leu Asp Ile Thr Pro Cys Ser Phe
            580                 585                 590

Gly Gly Val Ser Val Ile Thr Pro Gly Thr Asn Thr Ser Asn Gln Val
        595                 600                 605

Ala Val Leu Tyr Gln Gly Val Asn Cys Thr Glu Val Pro Val Ala Ile
    610                 615                 620

His Ala Asp Gln Leu Thr Pro Thr Trp Arg Val Tyr Ser Thr Gly Ser
625                 630                 635                 640

Asn Val Phe Gln Thr Arg Ala Gly Cys Leu Ile Gly Ala Glu His Val
                645                 650                 655

Asn Asn Ser Tyr Glu Cys Asp Ile Pro Ile Gly Ala Gly Ile Cys Ala
            660                 665                 670

Ser Tyr Gln Thr Gln Thr Asn Ser Pro Arg Arg Ala Arg Ser Val Ala
        675                 680                 685

Ser Gln Ser Ile Ile Ala Tyr Thr Met Ser Leu Gly Ala Glu Asn Ser
    690                 695                 700

Val Ala Tyr Ser Asn Asn Ser Ile Ala Ile Pro Thr Asn Phe Thr Ile
705                 710                 715                 720

Ser Val Thr Thr Glu Ile Leu Pro Val Ser Met Thr Lys Thr Ser Val
                725                 730                 735
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Asp Cys Thr Met Tyr Ile Cys Gly Asp Ser Thr Glu Cys Ser Asn Leu
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Gly Ile Ala Val Glu Gln Asp Lys Asn Thr Gln Glu Val Phe Ala Gln
    770                 775                 780

Val Lys Gln Ile Tyr Lys Thr Pro Pro Ile Lys Asp Phe Gly Gly Phe
785                 790                 795                 800

Asn Phe Ser Gln Ile Leu Pro Asp Pro Ser Lys Pro Ser Lys Arg Ser
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Phe Ile Glu Asp Leu Leu Phe Asn Lys Val Thr Leu Ala Asp Ala Gly
            820                 825                 830

Phe Ile Lys Gln Tyr Gly Asp Cys Leu Gly Asp Ile Ala Ala Arg Asp
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Leu Ile Cys Ala Gln Lys Phe Asn Gly Leu Thr Val Leu Pro Pro Leu
    850                 855                 860

Leu Thr Asp Glu Met Ile Ala Gln Tyr Thr Ser Ala Leu Leu Ala Gly
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Thr Ile Thr Ser Gly Trp Thr Phe Gly Ala Gly Ala Ala Leu Gln Ile
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Pro Phe Ala Met Gln Met Ala Tyr Arg Phe Asn Gly Ile Gly Val Thr
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Gln Asn Val Leu Tyr Glu Asn Gln Lys Leu Ile Ala Asn Gln Phe Asn
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Ser Ala Ile Gly Lys Ile Gln Asp Ser Leu Ser Ser Thr Ala Ser Ala
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Leu Gly Lys Leu Gln Asp Val Val Asn Gln Asn Ala Gln Ala Leu Asn
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Ile Asp Arg Leu Ile Thr Gly Arg  Leu Gln Ser Leu Gln  Thr Tyr Val
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Thr Gln  Gln Leu Ile Arg Ala  Ala Glu Ile Arg Ala  Ser Ala Asn
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Leu Ala  Ala Thr Lys Met Ser  Glu Cys Val Leu Gly  Gln Ser Lys
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Arg Val  Asp Phe Cys Gly Lys  Gly Tyr His Leu Met  Ser Phe Pro
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Gln Ser  Ala Pro His Gly Val  Val Phe Leu His Val  Thr Tyr Val
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Pro Ala  Gln Glu Lys Asn Phe  Thr Thr Ala Pro Ala  Ile Cys His
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Asp Gly  Lys Ala His Phe Pro  Arg Glu Gly Val Phe  Val Ser Asn
    1085                1090                1095

Gly Thr  His Trp Phe Val Thr  Gln Arg Asn Phe Tyr  Glu Pro Gln
    1100                1105                1110

Ile Ile  Thr Thr Asp Asn Thr  Phe Val Ser Gly Asn  Cys Asp Val
    1115                1120                1125

Val Ile  Gly Ile Val Asn Asn  Thr Val Tyr Asp Pro  Leu Gln Pro
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Glu Leu  Asp Ser Phe Lys Glu  Glu Leu Asp Lys Tyr  Phe Lys Asn
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His Thr  Ser Pro Asp Val Asp  Leu Gly Asp Ile Ser  Gly Ile Asn
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Val Ala  Lys Asn Leu Asn Glu  Ser Leu Ile Asp Leu  Gln Glu Leu
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Gly Lys  Tyr Glu Gln Tyr Ile  Lys Trp Pro Trp Tyr  Ile Trp Leu
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Gly Phe  Ile Ala Gly Leu Ile  Ala Ile Val Met Val  Thr Ile Met
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Leu Cys  Cys Met Thr Ser Cys  Cys Ser Cys Leu Lys  Gly Cys Cys
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atgtaacaca agctttcggc agacgtggtc cagaacaaac ccaaggaaat tttggggacc 29100

aggaactaat cagacaagga actgattaca aacattggcc gcaaattgca caatttgccc 29160

ccagcgcttc agcgttcttc ggaatgtcgc gcattggcat ggaagtcaca ccttcgggaa 29220

cgtggttgac ctacacaggt gccatcaaat tggatgacaa agatccaaat ttcaaagatc 29280

aagtcatttt gctgaataag catattgacg catacaaaac atttccacca acagagccta 29340

aaaaggacaa aaagaagaag gctgatgaaa ctcaagcctt accgcagaga cagaagaaac 29400

agcaaactgt gactcttctt cctgctgcag atttggatga tttctccaaa caattgcaac 29460

aatccatgag cagtgctgac tcaactcagg cctaaactca tgcagaccac acaaggcaga 29520

tgggctatat aaacgttttc gcttttccgt ttacgatata tagtctactc ttgtgcagaa 29580

tgaattctcg taactacata gcacaagtag atgtagttaa ctttaatctc acatagcaat 29640

ctttaatcag tgtgtaacat tagggaggac ttgaaagagc caccacattt tcaccgaggc 29700

cacgcggagt acgatcgagt gtacagtgaa caatgctagg gagagctgcc tatatggaag 29760

agccctaatg tgtaaaatta attttagtag tgctatcccc atgtgatttt aatagc 29816

<210> 27
<211> 1273
<212> PRT
<213> SARS-CoV2

<400> 27

Met Phe Val Phe Leu Val Leu Leu Pro Leu Val Ser Ile Gln Cys Val
1 5 10 15

Asn Leu Thr Thr Arg Thr Gln Leu Pro Pro Ala Tyr Thr Asn Ser Phe
20 25 30

Thr Arg Gly Val Tyr Tyr Pro Asp Lys Val Phe Arg Ser Ser Val Leu
35 40 45

His Ser Thr Gln Asp Leu Phe Leu Pro Phe Phe Ser Asn Val Thr Trp
50 55 60

Phe His Ala Ile His Val Ser Gly Thr Asn Gly Thr Lys Arg Phe Asp
65 70 75 80

Asn Pro Val Leu Pro Phe Asn Asp Gly Val Tyr Phe Ala Ser Thr Glu
85 90 95

Lys Ser Asn Ile Ile Arg Gly Trp Ile Phe Gly Thr Thr Leu Asp Ser
100 105 110

Lys Thr Gln Ser Leu Leu Ile Val Asn Asn Ala Thr Asn Val Val Ile
115 120 125

Lys Val Cys Glu Phe Gln Phe Cys Asn Asp Pro Phe Leu Gly Val Tyr
130 135 140

Tyr His Lys Asn Asn Lys Ser Cys Met Glu Ser Glu Phe Arg Val Tyr
145 150 155 160

```
Ser Ser Ala Asn Asn Cys Thr Phe Glu Tyr Val Ser Gln Pro Phe Leu
                165                 170                 175

Met Asp Leu Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Arg Glu Phe
            180                 185                 190

Val Phe Lys Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His Thr
        195                 200                 205

Pro Ile Asn Leu Val Arg Asp Leu Pro Gln Gly Phe Ser Ala Leu Glu
    210                 215                 220

Pro Leu Val Asp Leu Pro Ile Gly Ile Asn Ile Thr Arg Phe Gln Thr
225                 230                 235                 240

Leu Leu Ala Leu His Arg Ser Tyr Leu Thr Pro Gly Asp Ser Ser Ser
                245                 250                 255

Gly Trp Thr Ala Gly Ala Ala Ala Tyr Tyr Val Gly Tyr Leu Gln Pro
            260                 265                 270

Arg Thr Phe Leu Leu Lys Tyr Asn Glu Asn Gly Thr Ile Thr Asp Ala
        275                 280                 285

Val Asp Cys Ala Leu Asp Pro Leu Ser Glu Thr Lys Cys Thr Leu Lys
    290                 295                 300

Ser Phe Thr Val Glu Lys Gly Ile Tyr Gln Thr Ser Asn Phe Arg Val
305                 310                 315                 320

Gln Pro Thr Glu Ser Ile Val Arg Phe Pro Asn Ile Thr Asn Leu Cys
                325                 330                 335

Pro Phe Gly Glu Val Phe Asn Ala Thr Arg Phe Ala Ser Val Tyr Ala
            340                 345                 350

Trp Asn Arg Lys Arg Ile Ser Asn Cys Val Ala Asp Tyr Ser Val Leu
        355                 360                 365

Tyr Asn Ser Ala Ser Phe Ser Thr Phe Lys Cys Tyr Gly Val Ser Pro
```

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    370                 375                 380

Thr Lys Leu Asn Asp Leu Cys Phe Thr Asn Val Tyr Ala Asp Ser Phe
385                 390                 395                 400

Val Ile Arg Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr Gly
                405                 410                 415

Lys Ile Ala Asp Tyr Asn Tyr Lys Leu Pro Asp Asp Phe Thr Gly Cys
            420                 425                 430

Val Ile Ala Trp Asn Ser Asn Asn Leu Asp Ser Lys Val Gly Gly Asn
        435                 440                 445

Tyr Asn Tyr Arg Tyr Arg Leu Phe Arg Lys Ser Asn Leu Lys Pro Phe
    450                 455                 460

Glu Arg Asp Ile Ser Thr Glu Ile Tyr Gln Ala Gly Ser Thr Pro Cys
465                 470                 475                 480

Asn Gly Val Glu Gly Phe Asn Cys Tyr Phe Pro Leu Gln Ser Tyr Gly
                485                 490                 495

Phe Gln Pro Thr Asn Gly Val Gly Tyr Gln Pro Tyr Arg Val Val Val
            500                 505                 510

Leu Ser Phe Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro Lys
        515                 520                 525

Lys Ser Thr Asn Leu Val Lys Asn Lys Cys Val Asn Phe Asn Phe Asn
    530                 535                 540

Gly Leu Thr Gly Thr Gly Val Leu Thr Glu Ser Asn Lys Lys Phe Leu
545                 550                 555                 560

Pro Phe Gln Gln Phe Gly Arg Asp Ile Ala Asp Thr Thr Asp Ala Val
                565                 570                 575

Arg Asp Pro Gln Thr Leu Glu Ile Leu Asp Ile Thr Pro Cys Ser Phe
            580                 585                 590
```

```
Gly Gly Val Ser Val Ile Thr Pro Gly Thr Asn Thr Ser Asn Gln Val
        595                 600                 605

Ala Val Leu Tyr Gln Gly Val Asn Cys Thr Glu Val Pro Val Ala Ile
    610                 615                 620

His Ala Asp Gln Leu Thr Pro Thr Trp Arg Val Tyr Ser Thr Gly Ser
625                 630                 635                 640

Asn Val Phe Gln Thr Arg Ala Gly Cys Leu Ile Gly Ala Glu His Val
                645                 650                 655

Asn Asn Ser Tyr Glu Cys Asp Ile Pro Ile Gly Ala Gly Ile Cys Ala
            660                 665                 670

Ser Tyr Gln Thr Gln Thr Asn Ser Pro Arg Arg Ala Arg Ser Val Ala
        675                 680                 685

Ser Gln Ser Ile Ile Ala Tyr Thr Met Ser Leu Gly Ala Glu Asn Ser
    690                 695                 700

Val Ala Tyr Ser Asn Asn Ser Ile Ala Ile Pro Thr Asn Phe Thr Ile
705                 710                 715                 720

Ser Val Thr Thr Glu Ile Leu Pro Val Ser Met Thr Lys Thr Ser Val
                725                 730                 735

Asp Cys Thr Met Tyr Ile Cys Gly Asp Ser Thr Glu Cys Ser Asn Leu
            740                 745                 750

Leu Leu Gln Tyr Gly Ser Phe Cys Thr Gln Leu Asn Arg Ala Leu Thr
        755                 760                 765

Gly Ile Ala Val Glu Gln Asp Lys Asn Thr Gln Glu Val Phe Ala Gln
    770                 775                 780

Val Lys Gln Ile Tyr Lys Thr Pro Pro Ile Lys Asp Phe Gly Gly Phe
785                 790                 795                 800

Asn Phe Ser Gln Ile Leu Pro Asp Pro Ser Lys Pro Ser Lys Arg Ser
```

```
               805                 810                 815

Phe Ile Glu Asp Leu Leu Phe Asn Lys Val Thr Leu Ala Asp Ala Gly
            820                 825                 830

Phe Ile Lys Gln Tyr Gly Asp Cys Leu Gly Asp Ile Ala Ala Arg Asp
        835                 840                 845

Leu Ile Cys Ala Gln Lys Phe Asn Gly Leu Thr Val Leu Pro Pro Leu
    850                 855                 860

Leu Thr Asp Glu Met Ile Ala Gln Tyr Thr Ser Ala Leu Leu Ala Gly
865                 870                 875                 880

Thr Ile Thr Ser Gly Trp Thr Phe Gly Ala Gly Ala Ala Leu Gln Ile
               885                 890                 895

Pro Phe Ala Met Gln Met Ala Tyr Arg Phe Asn Gly Ile Gly Val Thr
            900                 905                 910

Gln Asn Val Leu Tyr Glu Asn Gln Lys Leu Ile Ala Asn Gln Phe Asn
        915                 920                 925

Ser Ala Ile Gly Lys Ile Gln Asp Ser Leu Ser Ser Thr Ala Ser Ala
    930                 935                 940

Leu Gly Lys Leu Gln Asp Val Val Asn Gln Asn Ala Gln Ala Leu Asn
945                 950                 955                 960

Thr Leu Val Lys Gln Leu Ser Ser Asn Phe Gly Ala Ile Ser Ser Val
               965                 970                 975

Leu Asn Asp Ile Leu Ser Arg Leu Asp Lys Val Glu Ala Glu Val Gln
            980                 985                 990

Ile Asp Arg Leu Ile Thr Gly Arg  Leu Gln Ser Leu Gln  Thr Tyr Val
        995                 1000                1005

Thr Gln  Gln Leu Ile Arg Ala  Ala Glu Ile Arg Ala  Ser Ala Asn
    1010                1015                1020
```

```
Leu Ala  Ala Thr Lys Met Ser  Glu Cys Val Leu Gly  Gln Ser Lys
    1025                1030                1035

Arg Val  Asp Phe Cys Gly Lys  Gly Tyr His Leu Met  Ser Phe Pro
    1040                1045                1050

Gln Ser  Ala Pro His Gly Val  Val Phe Leu His Val  Thr Tyr Val
    1055                1060                1065

Pro Ala  Gln Glu Lys Asn Phe  Thr Thr Ala Pro Ala  Ile Cys His
    1070                1075                1080

Asp Gly  Lys Ala His Phe Pro  Arg Glu Gly Val Phe  Val Ser Asn
    1085                1090                1095

Gly Thr  His Trp Phe Val Thr  Gln Arg Asn Phe Tyr  Glu Pro Gln
    1100                1105                1110

Ile Ile  Thr Thr Asp Asn Thr  Phe Val Ser Gly Asn  Cys Asp Val
    1115                1120                1125

Val Ile  Gly Ile Val Asn Asn  Thr Val Tyr Asp Pro  Leu Gln Pro
    1130                1135                1140

Glu Leu  Asp Ser Phe Lys Glu  Glu Leu Asp Lys Tyr  Phe Lys Asn
    1145                1150                1155

His Thr  Ser Pro Asp Val Asp  Leu Gly Asp Ile Ser  Gly Ile Asn
    1160                1165                1170

Ala Ser  Val Val Asn Ile Gln  Lys Glu Ile Asp Arg  Leu Asn Glu
    1175                1180                1185

Val Ala  Lys Asn Leu Asn Glu  Ser Leu Ile Asp Leu  Gln Glu Leu
    1190                1195                1200

Gly Lys  Tyr Glu Gln Tyr Ile  Lys Trp Pro Trp Tyr  Ile Trp Leu
    1205                1210                1215

Gly Phe  Ile Ala Gly Leu Ile  Ala Ile Val Met Val  Thr Ile Met
```

```
    1220                1225                1230


Leu Cys  Cys Met Thr Ser Cys  Cys Ser Cys Leu Lys  Gly Cys Cys
    1235                1240                1245


Ser Cys  Gly Ser Cys Cys Lys  Phe Asp Glu Asp Asp  Ser Glu Pro
    1250                1255                1260


Val Leu  Lys Gly Val Lys Leu  His Tyr Thr
    1265                1270


<210>  28
<211>  419
<212>  PRT
<213>  SARS-CoV2

<400>  28

Met Ser Asp Asn Gly Pro Gln Asn Gln Arg Asn Ala Pro Arg Ile Thr
1               5                   10                  15


Phe Gly Gly Pro Ser Asp Ser Thr Gly Ser Asn Gln Asn Gly Glu Arg
            20                  25                  30


Ser Gly Ala Arg Ser Lys Gln Arg Arg Pro Gln Gly Leu Pro Asn Asn
        35                  40                  45


Thr Ala Ser Trp Phe Thr Ala Leu Thr Gln His Gly Lys Glu Asp Leu
    50                  55                  60


Lys Phe Pro Arg Gly Gln Gly Val Pro Ile Asn Thr Asn Ser Ser Pro
65                  70                  75                  80


Asp Asp Gln Ile Gly Tyr Tyr Arg Arg Ala Thr Arg Arg Ile Arg Gly
                85                  90                  95


Gly Asp Gly Lys Met Lys Asp Leu Ser Pro Arg Trp Tyr Phe Tyr Tyr
            100                 105                 110


Leu Gly Thr Gly Pro Glu Ala Gly Leu Pro Tyr Gly Ala Asn Lys Asp
        115                 120                 125
```

```
Gly Ile Ile Trp Val Ala Thr Glu Gly Ala Leu Asn Thr Pro Lys Asp
    130                 135                 140

His Ile Gly Thr Arg Asn Pro Ala Asn Asn Ala Ala Ile Val Leu Gln
145                 150                 155                 160

Leu Pro Gln Gly Thr Thr Leu Pro Lys Gly Phe Tyr Ala Glu Gly Ser
                165                 170                 175

Arg Gly Gly Ser Gln Ala Ser Ser Arg Ser Ser Ser Arg Ser Arg Asn
            180                 185                 190

Ser Ser Arg Asn Ser Thr Pro Gly Ser Ser Arg Gly Thr Ser Pro Ala
        195                 200                 205

Arg Met Ala Gly Asn Gly Gly Asp Ala Ala Leu Ala Leu Leu Leu Leu
    210                 215                 220

Asp Arg Leu Asn Gln Leu Glu Ser Lys Met Ser Gly Lys Gly Gln Gln
225                 230                 235                 240

Gln Gln Gly Gln Thr Val Thr Lys Lys Ser Ala Ala Glu Ala Ser Lys
                245                 250                 255

Lys Pro Arg Gln Lys Arg Thr Ala Thr Lys Ala Tyr Asn Val Thr Gln
            260                 265                 270

Ala Phe Gly Arg Arg Gly Pro Glu Gln Thr Gln Gly Asn Phe Gly Asp
        275                 280                 285

Gln Glu Leu Ile Arg Gln Gly Thr Asp Tyr Lys His Trp Pro Gln Ile
    290                 295                 300

Ala Gln Phe Ala Pro Ser Ala Ser Ala Phe Phe Gly Met Ser Arg Ile
305                 310                 315                 320

Gly Met Glu Val Thr Pro Ser Gly Thr Trp Leu Thr Tyr Thr Gly Ala
                325                 330                 335

Ile Lys Leu Asp Asp Lys Asp Pro Asn Phe Lys Asp Gln Val Ile Leu
            340                 345                 350
```

```
Leu Asn Lys His Ile Asp Ala Tyr Lys Thr Phe Pro Pro Thr Glu Pro
        355                 360                 365

Lys Lys Asp Lys Lys Lys Lys Ala Asp Glu Thr Gln Ala Leu Pro Gln
    370                 375                 380

Arg Gln Lys Lys Gln Gln Thr Val Thr Leu Leu Pro Ala Ala Asp Leu
385                 390                 395                 400

Asp Asp Phe Ser Lys Gln Leu Gln Gln Ser Met Ser Ser Ala Asp Ser
                405                 410                 415

Thr Gln Ala
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<210> 29
<211> 222
<212> PRT
<213> SARS-CoV2

<400> 29

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Met Ala Asp Ser Asn Gly Thr Ile Thr Val Glu Glu Leu Lys Lys Leu
1               5                   10                  15

Leu Glu Gln Trp Asn Leu Val Ile Gly Phe Leu Phe Leu Thr Trp Ile
            20                  25                  30

Cys Leu Leu Gln Phe Ala Tyr Ala Asn Arg Asn Arg Phe Leu Tyr Ile
        35                  40                  45

Ile Lys Leu Ile Phe Leu Trp Leu Leu Trp Pro Val Thr Leu Ala Cys
    50                  55                  60

Phe Val Leu Ala Ala Val Tyr Arg Ile Asn Trp Ile Thr Gly Gly Ile
65                  70                  75                  80

Ala Ile Ala Met Ala Cys Leu Val Gly Leu Met Trp Leu Ser Tyr Phe
                85                  90                  95

Ile Ala Ser Phe Arg Leu Phe Ala Arg Thr Arg Ser Met Trp Ser Phe
```

```
            100                 105                 110

Asn Pro Glu Thr Asn Ile Leu Leu Asn Val Pro Leu His Gly Thr Ile
        115                 120                 125

Leu Thr Arg Pro Leu Leu Glu Ser Glu Leu Val Ile Gly Ala Val Ile
    130                 135                 140

Leu Arg Gly His Leu Arg Ile Ala Gly His His Leu Gly Arg Cys Asp
145                 150                 155                 160

Ile Lys Asp Leu Pro Lys Glu Ile Thr Val Ala Thr Ser Arg Thr Leu
                165                 170                 175

Ser Tyr Tyr Lys Leu Gly Ala Ser Gln Arg Val Ala Gly Asp Ser Gly
            180                 185                 190

Phe Ala Ala Tyr Ser Arg Tyr Arg Ile Gly Asn Tyr Lys Leu Asn Thr
        195                 200                 205

Asp His Ser Ser Ser Ser Asp Asn Ile Ala Leu Leu Val Gln
    210                 215                 220
```