Tecnológico de Monterrey

Actividad Base De Datos de Virus de NCBI

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Instrucciones: Realiza los siguientes ejercicios en **R Studio** y comparte tu **script** con la solución de todos:

Dentro de la base de datos del **NCBI** (https://www.ncbi.nlm.nih.gov) busca las secuencias de las siguientes entidades:

· Zika virus, complete genome

·SARS coronavirus, complete genome

· Wuhan seafood market pneumonia virus isolate Wuhan-Hu-1, complete genome

· Middle East respiratory syndrome coronavirus, complete genome

·Dengue virus 1, complete genome

Para cada uno obtenga sus secuencias en formato **.fasta** y utiliza código en **R** para responder las siguientes preguntas.

Muestra el resultado obtenido con tus propias funciones creadas en el curso y el resultado obtenido con las funciones del paquete "**seqinr**".

1.¿Cuál es el tamaño de cada genoma?

SARS COVID	29751
Zika Virus	10794
Wuhan-Hu-1	29903
Middle East respiratory syndrome coronavirus (MERS)	30119

Dengue virus 1	10735

2.¿Cúal es la composición de nucleótidos de cada genoma?

```
> base.content(vector_SarsCovid)
[1] "Contenido de Adenina: "
[1] 8481
[1] "Contenido de Timina: "
[1] 9143
[1] "Contenido de Citosina: "
[1] 5940
[1] "Contenido de Guanina: "
[1] 6187
> base.content(vector_wuhanhu1)
[1] "Contenido de Adenina: "
[1] 8954
[1] "Contenido de Timina: "
[1] 9594
[1] "Contenido de Citosina: "
[1] 5492
[1] "Contenido de Guanina: "
[1] 5863
> base.content(vector_zikavirus)
[1] "Contenido de Adenina: "
[1] 2991
[1] "Contenido de Timina: "
[1] 2305
[1] "Contenido de Citosina: "
[1] 2359
[1] "Contenido de Guanina: "
[1] 3139
> base.content(vector_Mers)
[1] "Contenido de Adenina: "
[1] 7900
[1] "Contenido de Timina: "
[1] 9799
[1] "Contenido de Citosina: "
[1] 6116
[1] "Contenido de Guanina: "
[1] 6304
> base.content(vector_denguevirus)
[1] "Contenido de Adenina: "
[1] 3426
[1] "Contenido de Timina: "
[1] 2299
[1] "Contenido de Citosina: "
```

```
[1] 2240
[1] "Contenido de Guanina: "
[1] 2770
>

length(vector_sarsCovid)
[1] 29751
> base.percentage(vector_sarsCovid)
[1] "Porcentaje de Adenina: "
[1] 28.5066
[1] "Porcentaje de Timina: "
[1] 30.73174
[1] "Porcentaje de Citosina: "
[1] 19.96572
[1] "Porcentaje de Guanina: "
[1] 20.79594
> length(vector_Denguevirus)
[1] 10735
> base.percentage(vector_Denguevirus)
[1] "Porcentaje de Adenina: "
[1] 31.9143
[1] "Porcentaje de Timina: "
[1] 21.41593
[1] "Porcentaje de Citosina: "
[1] 20.86633
[1] "Porcentaje de Guanina: "
[1] 25.80345
> length(vector_Mersvirus)
[1] 30119
> base.percentage(vector_Mersvirus)
[1] "Porcentaje de Adenina: "
[1] 26.22929
[1] "Porcentaje de Timina: "
[1] 32.53428
[1] "Porcentaje de Citosina: "
[1] 20.30612
[1] "Porcentaje de Guanina: "
[1] 20.93031
> length(vector_WuhanHu1)
[1] 29903
> base.percentage(vector_WuhanHu1)
[1] "Porcentaje de Adenina: "
[1] 29.94348
[1] "Porcentaje de Timina: "
[1] 32.08374
[1] "Porcentaje de Citosina: "
[1] 18.36605
[1] "Porcentaje de Guanina: "
```

```
[1] 19.60673
> length(vector_Zikavirus)
[1] 10794
> base.percentage(vector_Zikavirus)
[1] "Porcentaje de Adenina: "
[1] 27.70984
[1] "Porcentaje de Timina: "
[1] 21.35446
[1] "Porcentaje de Citosina: "
[1] 21.85473
[1] "Porcentaje de Guanina: "
[1] 29.08097
```

3.¿Cuál es el contenido de GC de cada virus?

```
#Calcular GC
> GC(vector_sarsCovid)
[1] 0.4076166
> GC(vector_Denguevirus)
[1] 0.4666977
> GC(vector_Mersvirus)
[1] 0.4123643
> GC(vector_WuhanHu1)
[1] 0.3797278
> GC(vector_Zikavirus)
[1] 0.5093571
```

4. Crear una función para obtener la secuencia complementaria e imprimirla por cada secuencia, ejemplo: Virus original: agttgttagt ctacgtggac cgacaagaac Complementaria: tcaacaatca gatgcacctg gctgttcttg

```
#Obtener la secuencia complementaria del genoma viral
> complement(vector_sarsCovid)
   [1] "t" "a" "t" "a" "a" "t" "c" "c" "a" "a" "a" "a" "a" "t"
  [15] "g" "g" "a" "t" "g" "g" "g" "t" "c" "c" "t" "t" "t" "t"
  [29] "c" "g" "g" "t" "t" "g" "g" "t" "t" "g" "g" "a" "g" "c"
  [43] "t" "a" "g" "a" "g" "a" "a" "c" "a" "t" "c" "t" "a" "g"
  [57] "a" "c" "a" "a" "g" "a" "g" "a" "t" "t" "t" "g" "c" "t"
  [71] "t" "g" "a" "a" "a" "t" "t" "t" "t" "a" "g" "a" "c" "a"
  [85] "c" "a" "t" "c" "g" "a" "c" "a" "g" "c" "g" "a" "g" "c"
  [99] "c" "g" "a" "c" "g" "t" "a" "c" "g" "g" "a" "t" "c" "a"
 [113] "c" "g" "t" "g" "g" "a" "t" "g" "c" "g" "t" "c" "a" "t"
 [127] "a" "t" "t" "t" "g" "t" "t" "a" "t" "t" "a" "t" "t" "t"
 [141] "a" "a" "a" "a" "t" "g" "a" "c" "a" "g" "c" "a" "a" "c"
 [155] "t" "g" "t" "t" "c" "t" "t" "t" "g" "c" "t" "c" "a" "t"
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[169] "t" "g" "a" "g" "c" "a" "g" "g" "g" "a" "g" "a" "a" "g"
[183] "a" "c" "g" "t" "c" "t" "g" "a" "c" "g" "a" "a" "t" "g"
[197] "c" "c" "a" "a" "a" "g" "c" "a" "g" "g" "c" "a" "c" "a"
[211] "a" "c" "g" "t" "c" "a" "g" "c" "t" "a" "g" "t" "a" "g"
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[239] "a" "g" "c" "a" "g" "g" "c" "c" "c" "a" "c" "a" "c" "t"
[253] "g" "g" "c" "t" "t" "t" "c" "c" "a" "t" "t" "c" "t" "a"
[267] "c" "c" "t" "c" "t" "c" "g" "g" "a" "a" "c" "a" "a" "g"
[281] "a" "a" "c" "c" "a" "c" "a" "g" "t" "t" "g" "c" "t" "c"
[295] "t" "t" "t" "t" "g" "t" "g" "t" "g" "c" "a" "g" "g" "t"
[309] "t" "g" "a" "g" "t" "c" "a" "a" "a" "c" "g" "g" "a" "c"
[323] "a" "g" "g" "a" "a" "g" "t" "c" "c" "a" "a" "t" "c" "t"
[337] "c" "t" "g" "c" "a" "c" "g" "a" "t" "c" "a" "c" "g" "c"
[351] "a" "c" "c" "g" "a" "a" "g" "c" "c" "c" "c" "t" "g" "a"
[365] "g" "a" "c" "a" "c" "c" "t" "t" "c" "t" "c" "c" "g" "g"
[379] "g" "a" "t" "a" "g" "c" "c" "t" "c" "c" "g" "t" "g" "c"
[393] "a" "c" "t" "t" "g" "t" "g" "g" "a" "g" "t" "t" "t" "t"
[407] "t" "a" "c" "c" "g" "t" "g" "a" "a" "c" "a" "c" "c" "a"
[421] "g" "a" "t" "c" "a" "t" "c" "t" "c" "g" "a" "c" "c" "t"
[435] "t" "t" "t" "t" "c" "c" "g" "c" "a" "t" "g" "a" "c" "g"
[449] "g" "g" "g" "t" "c" "g" "a" "a" "c" "t" "t" "g" "t" "c"
[463] "g" "g" "g" "a" "t" "a" "c" "a" "c" "a" "a" "g" "t" "a"
[477] "a" "t" "t" "t" "g" "c" "a" "a" "g" "a" "c" "t" "a" "c"
[491] "g" "g" "a" "a" "t" "t" "c" "g" "t" "g" "g" "t" "t" "a"
[505] "g" "t" "g" "c" "c" "g" "g" "t" "g" "t" "t" "c" "c" "a"
[519] "g" "c" "a" "a" "c" "t" "c" "g" "a" "c" "c" "a" "a" "c"
[533] "g" "t" "c" "t" "t" "t" "a" "c" "c" "t" "g" "c" "c" "g"
[547] "t" "a" "a" "g" "t" "c" "a" "t" "g" "c" "c" "a" "g" "c"
[561] "a" "t" "c" "g" "c" "c" "a" "t" "a" "t" "t" "g" "t" "g"
[575] "a" "c" "c" "c" "t" "c" "a" "t" "g" "a" "g" "c" "a" "c"
[589] "g" "g" "t" "g" "t" "a" "c" "a" "c" "c" "c" "g" "c" "t"
[603] "t" "t" "g" "g" "g" "g" "t" "t" "a" "a" "c" "g" "t" "a"
[617] "t" "g" "g" "c" "g" "t" "t" "a" "c" "a" "a" "g" "a" "a"
[631] "g" "a" "a" "g" "c" "a" "t" "t" "c" "t" "t" "g" "c" "c"
[645] "a" "t" "t" "a" "t" "t" "c" "c" "c" "t" "c" "g" "g" "c"
[659] "c" "a" "c" "c" "a" "g" "t" "a" "t" "c" "g" "a" "t" "a"
[673] "c" "c" "g" "t" "a" "g" "c" "t" "a" "g" "a" "t" "t" "t"
[687] "c" "a" "g" "a" "a" "t" "a" "c" "t" "g" "a" "a" "t" "c"
[701] "c" "a" "c" "t" "g" "c" "t" "c" "g" "a" "a" "c" "c" "g"
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[729] "t" "c" "t" "a" "a" "t" "a" "c" "t" "t" "g" "t" "t" "t"
[743] "t" "g" "a" "c" "c" "t" "t" "g" "t" "g" "a" "t" "t" "c"
[757] "g" "t" "a" "c" "c" "g" "t" "c" "a" "c" "c" "a" "c" "g"
[771] "t" "g" "a" "g" "g" "c" "a" "c" "t" "t" "g" "a" "g" "t"
[785] "g" "a" "g" "c" "a" "c" "t" "c" "g" "a" "g" "t" "t" "a"
[799] "c" "c" "t" "c" "c" "a" "c" "g" "t" "c" "a" "g" "t" "g"
[813] "a" "g" "c" "g" "a" "t" "a" "c" "a" "g" "c" "t" "g" "t"
[827] "t" "g" "t" "t" "a" "a" "a" "g" "a" "c" "a" "c" "c" "g"

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 [841] "g" "g" "t" "c" "t" "a" "c" "c" "c" "a" "t" "g" "g" "g"
 [855] "a" "g" "a" "a" "c" "t" "a" "a" "c" "g" "t" "a" "g" "t"
 [869] "t" "t" "c" "t" "a" "a" "a" "a" "g" "a" "g" "c" "g" "t"
 [883] "g" "c" "g" "c" "g" "c" "c" "c" "g" "t" "t" "c" "a" "g"
 [897] "t" "t" "a" "c" "a" "c" "g" "t" "g" "a" "g" "a" "a" "a"
 [911] "g" "g" "c" "t" "t" "g" "t" "t" "g" "a" "a" "c" "t" "a"
 [925] "a" "t" "g" "t" "a" "g" "c" "t" "c" "a" "g" "c" "t" "t"
 [939] "c" "t" "c" "t" "c" "c" "a" "c" "a" "g" "a" "t" "g" "a"
 [953] "c" "g" "a" "c" "g" "g" "c" "a" "c" "t" "g" "g" "t" "a"
 [967] "c" "t" "c" "g" "t" "a" "c" "t" "t" "t" "a" "a" "c" "g"
 [981] "g" "a" "c" "c" "a" "a" "g" "t" "g" "a" "c" "t" "c" "g"
 [995] "c" "g" "a" "g" "a" "c"
 [ reached getOption("max.print") -- omitted 28751 entries ]
> complement(vector_Denguevirus)
   [1] "t" "c" "a" "a" "c" "a" "a" "t" "c" "a" "g" "a" "t" "g"
  [15] "c" "a" "c" "c" "t" "g" "g" "c" "t" "g" "t" "t" "c" "t"
  [29] "t" "g" "t" "c" "a" "a" "a" "g" "c" "t" "t" "a" "g" "c"
  [43] "c" "t" "t" "c" "g" "a" "a" "c" "g" "a" "a" "t" "t" "g"
  [57] "c" "a" "t" "c" "a" "a" "g" "a" "t" "t" "g" "t" "c" "a"
  [71] "a" "a" "a" "a" "a" "t" "a" "a" "t" "c" "t" "c" "t" "c"
  [85] "g" "t" "c" "t" "a" "g" "a" "g" "a" "c" "t" "a" "c" "t"
  [99] "t" "g" "t" "t" "g" "g" "t" "t" "g" "c" "c" "t" "t" "t"
 [113] "t" "t" "c" "t" "g" "c" "c" "c" "a" "g" "c" "t" "g" "g"
 [127] "c" "a" "g" "a" "a" "a" "g" "t" "t" "a" "t" "a" "c" "g"
 [141] "a" "c" "t" "t" "t" "g" "c" "g" "c" "g" "c" "t" "c" "t"
 [155] "t" "t" "g" "g" "c" "g" "c" "a" "c" "a" "g" "t" "t" "g"
 [169] "a" "c" "a" "a" "a" "g" "t" "g" "t" "c" "a" "a" "c" "c"
 [183] "g" "c" "t" "t" "c" "t" "c" "t" "a" "a" "g" "a" "g" "t"
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 [253] "g" "g" "a" "t" "t" "c" "t" "a" "a" "a" "g" "a" "t" "c"
 [267] "g" "g" "t" "a" "t" "g" "g" "a" "g" "g" "t" "t" "g" "t"
 [281] "c" "g" "t" "c" "c" "t" "t" "a" "a" "a" "a" "c" "c" "g"
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 [463] "c" "g" "g" "c" "g" "t" "g" "t" "a" "c" "t" "a" "t" "c"
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 [477] "a" "a" "t" "c" "g" "t" "t" "c" "g" "t" "c" "c" "t" "t"
 [491] "t" "c" "t" "c" "c" "t" "t" "t" "t" "a" "g" "t" "g" "a"
 [505] "a" "a" "a" "c" "a" "a" "a" "t" "t" "c" "t" "g" "g" "a"
 [519] "g" "a" "c" "g" "t" "c" "c" "a" "c" "a" "g" "t" "t" "g"
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 [547] "a" "c" "g" "t" "t" "a" "c" "c" "t" "a" "a" "a" "c" "c"
 [561] "c" "t" "c" "t" "c" "a" "a" "t" "a" "c" "a" "c" "t" "c"
 [575] "c" "t" "g" "t" "g" "t" "t" "a" "c" "t" "g" "g" "a" "t"
 [589] "g" "t" "t" "t" "a" "c" "g" "g" "g" "g" "g" "c" "c" "t"
 [603] "a" "g" "t" "g" "a" "c" "t" "c" "t" "g" "c" "c" "t" "t"
 [617] "g" "g" "t" "c" "t" "a" "c" "t" "g" "c" "a" "a" "c" "t"
 [631] "g" "a" "c" "a" "a" "c" "c" "a" "c" "g" "t" "t" "a" "c"
 [645] "g" "g" "t" "g" "c" "c" "t" "c" "t" "g" "t" "a" "c" "c"
 [659] "c" "a" "c" "t" "g" "g" "a" "t" "a" "c" "c" "t" "t" "g"
 [673] "t" "a" "c" "a" "a" "g" "a" "g" "t" "t" "t" "g" "a" "c"
 [687] "c" "a" "c" "t" "t" "g" "t" "g" "g" "c" "t" "g" "c" "t"
 [701] "c" "t" "g" "t" "t" "t" "g" "c" "a" "a" "g" "g" "c" "a"
 [715] "g" "c" "g" "t" "g" "a" "c" "c" "g" "t" "g" "g" "t" "g"
 [729] "t" "g" "c" "a" "t" "c" "c" "c" "g" "a" "a" "c" "c" "a"
 [743] "g" "a" "t" "c" "t" "t" "t" "g" "t" "t" "c" "t" "t" "g"
 [757] "g" "c" "t" "t" "t" "g" "c" "a" "c" "c" "t" "a" "c" "a"
 [771] "g" "g" "a" "g" "a" "c" "t" "t" "c" "c" "g" "c" "g" "a"
 [785] "a" "c" "c" "t" "t" "t" "g" "t" "t" "t" "a" "t" "g" "t"
 [799] "t" "t" "t" "t" "c" "a" "c" "c" "t" "c" "t" "g" "g" "a"
 [813] "c" "c" "c" "g" "a" "g" "a" "c" "t" "c" "t" "g" "t" "g"
 [827] "g" "g" "t" "c" "c" "t" "a" "a" "g" "t" "g" "c" "c" "a"
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 [855] "a" "t" "c" "g" "t" "g" "t" "a" "c" "g" "g" "t" "a" "t"
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  [43] "c" "t" "t" "c" "g" "c" "t" "c" "t" "c" "g" "a" "t" "t"
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[197] "t" "t" "c" "t" "c" "c" "a" "a" "c" "g" "g" "t" "c" "g"
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[225] "c" "a" "g" "t" "a" "c" "c" "t" "g" "g" "g" "t" "a" "g"
[239] "t" "c" "t" "t" "a" "c" "c" "a" "a" "a" "a" "c" "c" "g"
[253] "c" "t" "a" "t" "g" "a" "t" "c" "g" "g" "a" "a" "a" "a"
[267] "a" "c" "t" "c" "t" "a" "a" "a" "t" "g" "t" "c" "g" "t"
[281] "t" "a" "g" "t" "t" "c" "g" "g" "t" "a" "g" "t" "g" "a"
[295] "c" "c" "c" "g" "g" "a" "a" "t" "a" "g" "t" "t" "g" "t"
[309] "c" "t" "a" "c" "c" "c" "c" "a" "a" "g" "g" "c" "a" "c"
[323] "c" "c" "c" "t" "t" "t" "t" "t" "t" "c" "t" "c" "c" "g"
[337] "a" "t" "a" "c" "c" "t" "t" "t" "a" "t" "t" "a" "t" "t"
[351] "t" "c" "t" "t" "c" "a" "a" "g" "t" "t" "c" "t" "t" "t"
[365] "c" "t" "a" "g" "a" "a" "c" "g" "a" "c" "g" "g" "t" "a"
[379] "c" "a" "a" "c" "t" "c" "t" "t" "a" "t" "t" "a" "g" "t"
[393] "t" "a" "c" "g" "a" "t" "c" "c" "t" "t" "t" "c" "t" "c"
[407] "t" "c" "c" "t" "t" "c" "t" "c" "t" "g" "c" "a" "c" "c"
[421] "g" "c" "g" "t" "c" "t" "g" "t" "g" "g" "t" "c" "g" "t"
[435] "a" "g" "c" "c" "t" "t" "a" "g" "t" "a" "a" "c" "c" "g"
[449] "g" "a" "g" "g" "a" "c" "g" "a" "c" "t" "g" "a" "t" "g"
[463] "t" "c" "g" "g" "t" "a" "c" "c" "g" "t" "c" "g" "t" "c"
[477] "t" "c" "t" "a" "g" "t" "g" "a" "t" "c" "t" "g" "c" "g"
[491] "c" "c" "c" "t" "c" "a" "c" "g" "t" "a" "t" "g" "a" "t"
[505] "g" "t" "a" "c" "a" "t" "g" "a" "a" "c" "c" "t" "a" "t"
[519] "c" "c" "t" "c" "g" "c" "t" "a" "c" "g" "g" "c" "c" "c"
[533] "t" "t" "c" "c" "g" "g" "t" "a" "a" "a" "g" "c" "a" "a"
[547] "a" "c" "g" "a" "t" "g" "g" "t" "g" "t" "a" "a" "c" "c"
[561] "c" "t" "c" "a" "c" "t" "t" "g" "t" "t" "c" "a" "c" "g"
[575] "g" "t" "g" "c" "a" "t" "g" "t" "c" "t" "a" "g" "t" "a"
[589] "c" "c" "t" "g" "g" "a" "g" "c" "c" "c" "g" "t" "g" "t"
[603] "a" "c" "a" "c" "a" "c" "t" "g" "c" "g" "g" "t" "g" "g"
[617] "t" "a" "c" "t" "c" "a" "a" "t" "a" "c" "t" "c" "a" "c"
[631] "g" "g" "g" "a" "t" "a" "c" "g" "a" "c" "c" "t" "a" "c"
[645] "t" "c" "c" "c" "t" "c" "a" "c" "c" "t" "t" "g" "g" "t"
[659] "c" "t" "a" "c" "t" "a" "c" "a" "g" "c" "t" "a" "a" "c"
[673] "g" "a" "c" "c" "a" "c" "g" "t" "t" "g" "t" "g" "c" "t"
[687] "g" "t" "a" "g" "t" "t" "g" "a" "a" "c" "c" "c" "a" "a"
[701] "c" "a" "c" "a" "t" "g" "c" "c" "t" "t" "g" "g" "a" "c"
[715] "a" "g" "t" "a" "g" "t" "g" "t" "t" "t" "t" "t" "t" "c"

[729] "c" "a" "c" "t" "c" "c" "g" "t" "g" "c" "c" "g" "c" "t"
[743] "a" "g" "a" "t" "c" "t" "t" "c" "t" "c" "g" "g" "c" "a"
[757] "c" "t" "g" "c" "g" "a" "g" "g" "g" "a" "a" "g" "a" "g"
[771] "t" "g" "a" "g" "a" "t" "g" "t" "t" "c" "c" "t" "t" "c"
[785] "a" "a" "c" "g" "t" "t" "t" "g" "c" "g" "c" "c" "a" "g"
[799] "c" "g" "t" "c" "t" "g" "g" "a" "c" "c" "a" "a" "t" "c"
[813] "t" "t" "a" "g" "t" "t" "c" "t" "c" "t" "t" "a" "t" "g"
[827] "t" "g" "c" "t" "t" "c" "g" "t" "g" "a" "a" "c" "t" "a"
[841] "g" "t" "t" "c" "c" "a" "a" "c" "t" "t" "t" "t" "g" "a"
[855] "c" "c" "t" "a" "t" "a" "a" "g" "t" "c" "c" "t" "t" "g"
[869] "g" "g" "g" "c" "c" "c" "a" "a" "a" "c" "g" "c" "g" "a"
[883] "t" "c" "a" "c" "c" "g" "g" "c" "a" "a" "c" "g" "g" "t"
[897] "a" "a" "c" "g" "g" "a" "c" "c" "g" "a" "a" "a" "a" "c"
[911] "c" "c" "t" "t" "c" "g" "a" "g" "c" "t" "g" "c" "t" "c"
[925] "g" "g" "t" "t" "t" "t" "t" "c" "a" "g" "t" "a" "t" "a"
[939] "t" "g" "a" "a" "c" "c" "a" "g" "t" "a" "c" "t" "a" "t"
[953] "g" "a" "c" "g" "a" "c" "t" "a" "a" "c" "g" "g" "g" "g"
[967] "c" "c" "g" "t" "a" "t" "g" "t" "c" "a" "t" "a" "g" "t"
[981] "c" "c" "a" "c" "g" "t" "a" "a" "c" "c" "t" "c" "a" "g"
[995] "t" "c" "g" "t" "t" "a"
[reached getOption("max.print") -- omitted 9794 entries]

5. Crear una tabla comparativa a manera de resumen (marco de datos) en la que se muestre la composición de nucleótidos de los 5 genomas virales.

	adenina	citocina	guanina	timina
SarsCovid	8481	5940	6187	9143
Zika	2991	2359	3139	2305
WuhanHu1	8954	5492	5863	9594
Mers	7900	6116	6304	9799
Dengue	3426	2240	2770	2299