



Christine Massey <cmssyc@gmail.com>

---

## Access to Info request to PHAC re alleged "new COVID-19 variant"

---

Christine Massey <cmssyc@gmail.com>  
To: phac.atip-aiprp.aspc@canada.ca

Mon, Dec 21, 2020 at 9:57 PM

December 21, 2020

Cynthia Richardson  
Access to Information and Privacy Coordinator  
Access to Information and Privacy Division  
Holland Cross, Tower B  
7th Floor, Suite 700, Room 741  
1600 Scott Street, Address locator: 3107A  
Ottawa, Ontario K1A 0K9  
[phac.atip-aiprp.aspc@canada.ca](mailto:phac.atip-aiprp.aspc@canada.ca)

Dear Access to Information and Privacy Coordinator,

This is a formal request for records made under the *Access to Information Act (R.S.C., 1985, c. A-1)*.

Last week, the U.K. Secretary of State for Health and Social Care Matt Hancock stated that:

*"Over the last few days, thanks to our world class genomic capability in the UK, we have identified a new variant of coronavirus which may be associated with the faster spread in the southeast of England. Initial analysis suggests that this variant is growing faster than the existing variants. We've currently identified over a thousand cases of this variant, predominantly in the south of England, although cases have been identified in nearly 60 different local authority areas and numbers are increasing rapidly. Similar variants have been identified in other countries over the last few months. We've notified the World Health Organization about this new variant, and Public Health England is working hard to continue its expert analysis ... I must stress at this point that there is currently nothing at this point to suggest that this variant is more likely to cause serious disease and the latest clinical advice is that it's highly unlikely that this mutation would fail to respond to a vaccine but it shows we've got to be vigilant and follow the rules and everyone needs to take personal responsibility not to spread this virus."*  
<https://twitter.com/talkRADIO/status/1338510584275460099>

On December 20, 2020 Minister of Health Patty Hajdu [tweeted](#):

*"This afternoon, @JustinTrudeau and I are meeting with our colleagues and officials from the Incident Response Group to discuss the genetic variant of the virus that causes COVID-19 identified in the United Kingdom."*

### Description of Requested Records:

All records in the possession, custody or control of the Public Health Agency of Canada (PHAC) that:

- describe the isolation of the [alleged] *genetic variant of the [alleged] virus that [allegedly] causes [the alleged disease referred to as] COVID-19 [allegedly] identified in the United Kingdom*, directly from a sample taken from a diseased patient, where the patient sample was not first combined with any other source of genetic material (i.e. monkey kidney cells aka vero cells; fetal bovine serum).

Please note that I am using "isolation" in the every-day sense of the word: *the act of separating a thing(s) from everything else*. I am not requesting records where "isolation" refers instead to:

- the culturing of something, or
  - the performance of an amplification test (i.e. a PCR test), or
  - the sequencing of something.
- 
- describe the **discovery (not manufacture / fabrication / creation / assembly / alignment / trimming / mapping)** of the alleged genome for this alleged particular *new variant of coronavirus*;
  - describe how this alleged *new variant of coronavirus* relates to the alleged "SARS-COV-2";
  - include **any** additional analysis/investigation into this alleged "*new variant*".

Please note that my request is **not** limited to records that were authored by agents of PHAC, or to records that pertain to work done by agents of PHAC; it includes **any** sort of record, authored by anyone, anywhere, ever.

If any records match the above descriptions of requested records and are currently available to the public elsewhere, please provide enough information about each record so that I may identify and access each record with certainty (i.e. author; title; date; publisher); please provide URLs where possible.

**Format:**

URLs and/or pdf documents sent to me via email; I do not wish for anything to be shipped to me.

**Contact Information:**

Last name: Massey

First name: Christine

Address: 21 Keystone Avenue, Toronto ON M4C 1G9

Phone: 905-965-6254

Email: [cmssyc@gmail.com](mailto:cmssyc@gmail.com)

**Application Fee:**

I will submit a \$5 cheque by mail, payable to the Receiver General for Canada.

**Proof of Right:**

Please find a copy in the attached "BC" jpg file.

Thank you in advance and best wishes,  
Christine Massey, M.Sc.

---



Our file: PHAC-A-2020-000393 / TTL

2021-06-23

Christine Massey  
21 Keystone Avenue  
Toronto, Ontario  
M4C 1G9

Dear Christine Massey:

This is in response to your request made under the *Access to Information Act* (the Act) for the following information:

**Description of Requested Records:**

**“All records in the possession, custody or control of the Public Health Agency of Canada (PHAC) that: · describe the isolation of the [alleged] genetic variant of the [alleged] virus that [allegedly] causes [the alleged disease referred to as] COVID-19 [allegedly] identified in the United Kingdom, directly from a sample taken from a diseased patient, where the patient sample was not first combined with any other source of genetic material (i.e. monkey kidney cells aka vero cells; fetal bovine serum). Please note that {I} am using "isolation" in the every-day sense of the word: the act of separating a thing(s) from everything else. {I} am not requesting records where "isolation" refers instead to:**

- the culturing of something, or
- the performance of an amplification test (i.e. a PCR test), or
- the sequencing of something.
- describe the discovery (not manufacture / fabrication / creation / assembly / alignment / trimming / mapping) of the alleged genome for this alleged particular new variant of coronavirus;
- describe how this alleged new variant of coronavirus relates to the alleged "SARS-COV-2";
- include any additional analysis/investigation into this alleged "new variant".

**Please note that my request is not limited to records that were authored by agents of PHAC, or to records that pertain to work done by agents of PHAC; it includes any sort of record, authored by anyone, anywhere, ever.**

**If any records match the above descriptions of requested records and are currently available to the public elsewhere, please provide enough information**

**about each record so that I may identify and access each record with certainty (i.e. author; title; date; publisher); please provide URLs where possible”.**

Having completed a thorough search, we regret to inform you that we were unable to locate any records responsive to your request.

Your request has resulted in a “No Records Exist”, because of the way that you have formulated your request. The isolation of the virus variant is not completed without the use of another medium, therefore we have no records that would show this process taking place. It is important to understand the following: The gold standard assay used to determine the presence of intact virus in patient samples is viral isolation in cell culture. With this assay, if virus is present in the patient sample, it will multiply and produce visible cytopathic effects, which means that infected cells demonstrate visible changes. Additionally, the detection of an increase in the genetic viral material by PCR further confirms that intact virus is present in the patient sample, since increasing viral genetic material necessitates replication of the viral within the cell culture. This technique was successfully used to confirm that intact SARS-COV-2 was present in Canadian patient samples. In the case of SARS-COV-2 isolation, Vero cells combined with minimal essential medium (MEM) were used because they are essential to support viral replication and cell growth. This combination supports the growth of other coronavirus types and was successful in the case of SARS-CoV-2 as well.

Should you have any questions or concerns about the processing of your request, please do not hesitate to contact Tammy Turpin-Loyer, the analyst responsible for this file by email at [tammy.turpin-loyer@canada.ca](mailto:tammy.turpin-loyer@canada.ca), with reference to our file number cited above.

Please be advised that you are entitled to complain to the Office of the Information Commissioner of Canada concerning the processing of your request within 60 days of the receipt of this notice. In the event you decide to avail yourself of this right, your notice of complaint can be made online at: <https://www.oic-ci.gc.ca/en/submitting-complaint> or by mail to:

Office of the Information Commissioner of Canada  
30 Victoria Street  
Gatineau, Quebec K1A 1H3

Yours sincerely,



Digitally signed by Burrows,  
Andrea  
DN: C=CA, O=GC, OU=HC-SC,  
CN="Burrows, Andrea"  
Date: 2021.06.23 08:11:16-04'00'

Andrea Burrows  
Access to Information and Privacy Division



Christine Massey &lt;cmssyc@gmail.com&gt;

---

**PHAC-A-2020-000393/TTL**

---

Christine Massey &lt;cmssyc@gmail.com&gt;

Thu, Jun 24, 2021 at 1:53 PM

To: "Turpin-Loyer, Tammy (HC/SC)" &lt;tammy.turpin-loyer@canada.ca&gt;

Hello Tammy,

Thank you, but are you sure this response is accurate? The request was not only for records of isolation/purification, but any analysis whatsoever of "the variant".

All records in the possession, custody or control of the Public Health Agency of Canada (PHAC) that:

6/24/2021

Access to Info request to PHAC re alleged "new COVID-19 variant" <https://mail.google.com/mail/u/0?ik=80b5ba0454&view=pt8>

- describe the isolation of the [alleged] *genetic variant of the [alleged] virus that [allegedly] causes [the alleged disease referred to as] COVID-19 [allegedly] identified in the United Kingdom*, directly from a sample taken from a diseased patient, where the patient sample was not first combined with any other source of genetic material (i.e. monkey kidney cells aka vero cells; fetal bovine serum).

Please note that I am using "isolation" in the every-day sense of the word: *the act of separating a thing(s) from everything else*. I am not requesting records where "isolation" refers instead to:

- the culturing of something, or
- the performance of an amplification test (i.e. a PCR test), or
- the sequencing of something.

- describe the **discovery (not manufacture / fabrication / creation / assembly / alignment / trimming / mapping)** of the alleged genome for this alleged particular *new variant of coronavirus*;
- describe how this alleged *new variant of coronavirus* relates to the alleged "SARS-COV-2";
- include **any** additional analysis/investigation into this alleged "*new variant*".

Christine

[Quoted text hidden]



Christine Massey <cmssyc@gmail.com>

---

## PHAC A-2020-000393/TTL Response

---

**Turpin-Loyer, Tammy (HC/SC)** <tammy.turpin-loyer@hc-sc.gc.ca>  
To: Christine Massey <cmssyc@gmail.com>

Mon, Aug 30, 2021 at 2:11 PM

Hello


Please find attached the response letter and related records regarding your request.


Please do not hesitate to contact me should you require additional information.

Tammy

---

### 2 attachments

 **ReleasePackage-A-2020-000393-2021-08-11.pdf**  
2201K

 **FinalResponse-A-2020-000393-2021-08-18.pdf**  
195K



August 30, 2021

Our file: PHAC-A-2020-000393 / TTL

Christine Massey  
21 Keystone Avenue  
Toronto, Ontario  
M4C 1G9

Dear Christine Massey:

This is in follow-up to our initial response to your request made under the *Access to Information Act* (the Act) for the following information:

**“All records in the possession, custody or control of the Public Health Agency of Canada (PHAC) that: · describe the isolation of the [alleged] genetic variant of the [alleged] virus that [allegedly] causes [the alleged disease referred to as] COVID-19 [allegedly] identified in the United Kingdom, directly from a sample taken from a diseased patient, where the patient sample was not first combined with any other source of genetic material (i.e. monkey kidney cells aka vero cells; fetal bovine serum). Please note that {I} am using "isolation" in the every-day sense of the word: the act of separating a thing(s) from everything else. {I} am not requesting records where "isolation" refers instead to:**

- the culturing of something, or
- the performance of an amplification test (i.e. a PCR test), or
- the sequencing of something.
- describe the discovery (not manufacture / fabrication / creation / assembly / alignment / trimming / mapping) of the alleged genome for this alleged particular new variant of coronavirus;
- describe how this alleged new variant of coronavirus relates to the alleged "SARS-COV-2";
- include any additional analysis/investigation into this alleged "new variant".

**Please note that {my} request is not limited to records that were authored by agents of PHAC, or to records that pertain to work done by agents of PHAC; it includes any sort of record, authored by anyone, anywhere, ever. If any records match the above descriptions of requested records and are currently available to the public elsewhere, please provide enough information about each record so that {I} may identify and access each record with certainty (i.e. author; title; date; publisher); please provide URLs where possible”.**

As further clarified, June 24, 2021, “The request was not only for records of isolation/purification, but any analysis whatsoever of "the variant". Three bullets from the original request were highlighted and an additional search was requested for: ·

- describe the discovery (not manufacture / fabrication / creation / assembly / alignment / trimming / mapping) of the alleged genome for this alleged particular new variant of coronavirus;
- describe how this alleged new variant of coronavirus relates to the alleged "SARS-COV-2";
- include any additional analysis/investigation into this alleged "new variant".

In response to your request, please find attached the records released in full. In addition as requested, please find below URLs for records **matching the above descriptions of requested records and that are currently available to the public for ease of access:**

1. Describe the **discovery (not manufacture/fabrication/creation/assembly/alignment/trimming/mapping)** of the alleged genome for this alleged particular new variants of coronavirus.  
*Within the scope of 'discovery' of the [B.1.1.7 \(Alpha\)](#) variant in Canada, following release of the first identified genome for B.1.1.7 on the global genomics lineage platform [PANGO from a sample on 7 February 2020](#), NML identified a small number of isolated cases. The sample came from patient nasopharyngeal swab that tested positive for COVID-19 by [PCR test](#) and was then went for whole-genomic sequencing. Standard techniques for genome sequencing were used. There are 21 identifiable genomic differences between the B.1.1.7 (Alpha) variant and the original Wuhan-1 reference genome. The whole B.1.1.7 (Alpha) "family" of variants now has, on average, approximately 38 mutations from that original Wuhan-1 reference genome.*
2. Describe how this alleged new variant of coronavirus relates to the alleged "SARS-COV-2"  
*Copies of the Wuhan-1 and the first Canadian B.1.1.7 (Alpha) sequences can be provided. Sequence data tracing the evolution of the SARS-CoV-2 virus, including Canadian samples as well as globally, are published on [GISAID](#).*
3. Include **any** additional analysis/investigation into this alleged "new variant"  
*There were no specific additional analyses related to the 'discovery' of B.1.1.7 (Alpha) in Canada at that time. Since the [declaration of B.1.1.7 \(Alpha\) as a Variant of Concern by the WHO on 18 December 2020](#), PHAC has gathered clinical case and laboratory data as part of its routine public health responsibility for evaluation of epidemiological factors associated with this and other variants, including severity, transmissibility, immune response, and vaccine effectiveness. Analyses such as these have been incorporated into the modelling reports provided to the public throughout the pandemic, including those on [COVID-19 daily epidemiology update](#) and linked to from this site.*

Should you have any questions or concerns about the processing of your request, please do not hesitate to contact Tammy Turpin-Loyer, the analyst responsible for this file, either by phone at 613-698-6021, by email at [tammy.turpin-loyer@hc-sc.gc.ca](mailto:tammy.turpin-loyer@hc-sc.gc.ca), with reference to our file number cited above.

Please be advised that you are entitled to complain to the Office of the Information Commissioner of Canada concerning the processing of your request within 60 days of the receipt of this notice. In the event you decide to avail yourself of this right, your notice of complaint can be made online at: <https://www.oic-ci.gc.ca/en/submitting-complaint> or by mail to:

Office of the Information Commissioner of Canada  
30 Victoria Street  
Gatineau, Quebec K1A 1H3

Yours sincerely,



Digitally signed by Burrows,  
Andrea  
DN: C=CA, O=GC, OU=HC-SC,  
CN="Burrows, Andrea"

Andrea Burrows  
Team Leader



B117

AGATCTGTTCTCTAAACGAACTTTAAAATCTGTGTGGCTGTCACTCGGCTGCATGCTTAGTGCCTCACGCAGTATAATTAAT  
AACTAATTACTGTCGTTGACAGGACACGAGTAACTCGTCTATCTTCTGCAGGCTGCTTACGGTTTTCGTCCGTGTTGCAGCCGA  
TCATCAGCACATCTAGGTTTTGTCCGGGTGTGACCGAAAAGGTAAGATGGAGAGCCTTGTCCCTGGTTTTCAACGAGAAAAACA  
CGTCCAACCTCAGTTTTGCCTGTTTTACAGGTTTCGCGACGTGCTCGTACGTGGCTTTGGAGACTCCGTGGAGGAGGTCTTATCAG  
AGGCACGTCAACATCTTAAAGATGGCACTTGTGGCTTAGTAGAAGTTGAAAAAGGCGTTTTGCCTCAACTTGAACAGCCCTAT  
GTGTTTCATCAAACGTTCCGGATGCTCGAACTGCACCTCATGGTCATGTTATGGTTGAGCTGGTAGCAGAACTCGAAGGCATTCA  
GTACGGTCGTAGTGGTGGAGACACTTGGTGTCTTGTCCCTCATGTGGGCGAAAATACCAGTGGCTTACCGCAAGGTTCTTCTTC  
GTAAGAACGGTAATAAAGGAGCTGGTGGCCATAGTTACGGCGCCGATCTAAAGTCATTTGACTTAGGCGACGAGCTTGGCACT  
GATCCTTATGAAGATTTTCAAGAAAACTGGAACACTAAACATAGCAGTGGTGTACCCGTGAACTCATGCGTGAGCTTAACGG  
AGGGGCATACACTCGCTATGTCGATAACAACCTTCTGTGGCCCTGATGGCTACCCTCTTGAGTGCATTAAAGACCTTCTAGCAC  
GTGCTGGTAAAGCTTTCATGCACTTTGTCTGAACAACCTGGACTTTATTGACACTAAGAGGGGTGTATACTGCTGCCGTGAACAT  
GAGCATGAAATTGCTTGGTACACGGAACTTCTGAAAAGAGCTATGAATTGCAGACACCTTTTGAATTAATTTGGCAAAGAA  
ATTTGACACCTTCAATGGGGAATGTCCAAATTTTGTATTTCCCTTAAATTCATAATCAAGACTATTC AACCAAGGGTTGAAA  
AGAAAAAGCTTGATGGCTTTATGGGTAGAATTCGATCTGTCTATCCAGTTGCGTCACCAAAATGAATGCAACCAAAATGTGCCTT  
TCAACTCTCATGAAGTGTGATCATTGTGGTGAACTTCATGGCAGACGGGCGATTTTTGTTAAAGCCACTTGCGAATTTTTGTGG  
CACTGAGAAATTTGACTAAAAGAAGGTGCCACTACTTGTGGTTACTTACCCAAAATGCTGTTGTTAAAAATTTATTGTCCAGCAT  
GTCACAATTCAGAAGTAGGACCTGAGCATAGTCTTGGCGAATACCATAATGAATCTGGCTTGA AAAACCATTTCTTCGTAAGGGT  
GGTCGCACTATTGCCCTTGGAGGCTGTGTGTTCTCTTATGTTGGTTGCCATAACAAGTGTGCCATTGGGTTCCACGTGCTAG  
CGTAAACATAGTTGTAACCATACAGGTGTTGTTGGAGAAGGTTCCGAAAGTCTTAATGACAACCTTCTTGAAATACTCCAAA  
AAGAGAAAAGTCAACATCAATATTGTTGGTGACTTTAACTTAATGAAGAGATCGCCATTATTTTGGCATCTTTTTCTGCTTCC  
ACAAGTGCTTTTTGTGGAACTGTGAAAGTTTTGGATTATAAAGCATTCAAACAAAATGTTGAATCCTGTGGTAATTTTAAAGT  
TACAAAAGGAAAAGCTAAAAAAGGTGCCTGGAATATTGGTGAACAGAAAATCAATACTGAGTCTCTTTATGCATTTGCATCAG  
AGGCTGCTCGTGTGTTGACGATCAATTTTCTCCGCACTCTTGAACCTGCTCAAAAATCTGTGCGTGTGTTTACAGAAGGCCGCT  
ATAACAATACTAGATGGAATTTACAGTATTCACTGAGACTCATTGATGCTATGATGTTACATCTGATTTGGCTACTAACAA  
TCTAGTTGTAATGGCCTACATTACAGGTGGTGTGTTGACTTTCGCACTGGCTAACTAACATCTTTGGCACTGTTTATG  
AAAACTCAAACCCGTCCTTGATTGGCTTGAAGAGAAGTTTAAAGGAAGGTGTAGAGTTTCTTAGAGACGGTTGGGAAATGTT  
AAATTTATCTCAACCTGTGCTTGTGAAATTTGCGGTGGACAAAATTTGTACCTGTGCAAAAGGAAATTAAGGAGAGTGTTCAGAC  
ATTCTTTAAGCTTGTAATAAATTTTTGGCTTTGTGTGCTGACTCTATCATTATTGGTGGAGCTAACTTAAAGCCTTGAATT  
TAGGTGAAACATTTGTACGCACTCAAAGGGATTGTACAGAAAAGTGTGTTAAATCCAGAGAAGAACTGGCCTACTCATGCCT  
CTAAAAGCCCCAAAAGAAATTTCTTCTAGAGGGAGAAAACACTTCCACAGAAAGTGTAAACAGAGGAAGTTGTCTTGA AAAAC  
TGGTGATTTACAACCATTAGAACAACCTACTAGTGAAGCTGTTGAAGCTCCATTGGTTGGTACACCAGTTTGTATTAACGGGC  
TTATGTTGCTCGAAATCAAAGACACAGAAAAGTACTGTGCCCTTGCACTAATATGATGGTAAACAAAACATACCTTACACTC  
AAAGGCGGTGCACCAACAAAGGTTACTTTTGGTGATGACACTGTGATAGAAGTGAAGGTTACAAGAGTGTGAATATCACTTT  
TGAACCTGATGAAAGGATTGATAAAGTACTTAATGAGAAGTGTCTGCTATACAGTTGAACTCGGTACAGAAGTAAATGAGT  
TCGCCTGTGTTGTGGCAGATGCTGTCATAAAAACTTTGCAACCAGTATCTGAATTACTTACACCACTGGGCATTGATTTAGAT  
GAGTGGAGTATGGCTACATACTACTTATTTGATGAGTCTGGTGAGTTTAAATGGCTTACATATGTATTGTTCTTTTTACCC  
TCCAGATGAGGATGAAGAAGAAGGTGATTGTGAAGAAGAAGAGTTTGAAGCCATCAACTCAATATGAGTATGGTACTGAAGATG  
ATTACCAAGGTAAACCTTTGGAATTTGGTGGCACTTCTGCTGCTTCAACCTGAAGAAGAGCAAGAAGAAGATTGGTTAGAT  
GATGATAGTCAACAACTGTTGGTCAACAAGACGGCAGTGAGGACAATCAGACAACCTATTATTCAAACAATTTGTTGAGGTTCA  
ACCTCAATTAGAGATGGAACCTTACACCAGTTGTTTACAGACTATTGAAGTGAATAGTTTTAGTGGTTATTTAAAACCTTACTGACA  
ATGTATACATTA AAAATGCAGACATTGTGGAAGAAGCTAAAAAGGTA AAAACCAACAGTGGTTGTTAATGCAGCCAATGTTTAC  
CTTAAACATGGAGGAGGTGTTGCAGGAGCCTTAAATAAGGCTACTAACAATGCCATGCAAGTTGAATCTGATGATTACATAGC  
TACTAATGGACCACTTAAAGTGGGTGGTAGTTGTGTTTTAAGCGGACACAATCTTGCTAAACACTGTCTTCATGTTGTGCGCC  
CAAATGTTAAACAAAGGTGAAGACATTCAACTTCTTAAAGAGTGTCTATGAAAATTTTAAATCAGCACGAAGTTCTACTTGCACCA  
TTATTATCAGCTGGTATTTTTGGTGCTGACCCTATACATTCTTTAAGAGTTTGTGTAGATACTGTTTCGCACAAAATGTCTACTT  
AGCTGTCTTTGATAAAAACTCTCTATGACAAACTTGTTTCAAGCTTTTTGGAAAATGAAGAGTGA AAAAGCAAGTTGAACAAAAGA  
TCGCTGAGATTCTTAAAGAGGAAGTTAAGCCATTTATAACTGAAAAGTAAACCTTCAAGTTGAACAGAGAAAACAAGATGATAAG  
AAAATCAAAGCTTGTGTTGAAGAAGTTACAACAACCTGGAAGAAAATAAGTTCCCTCACAGAAAACCTGTTACTTTTATATTGA  
CATTAATGGCAATCTTCATCCAGATTCTGCCACTCTGTTAGTGACATTGACATCACTTTCTTAAAGAAAAGATGCTCCATATA  
TAGTGGGTGATGTTGTTCAAGAGGGTGTTTTAACTGCTGTGGTTATACCTACTAAAAAGGCTGGTGGCACTACTGAAATGCTA

GCGAAAGCTTTGAGAAAAGTGCCAACAGACAATTATATAACCACTTACCCGGGTGAGGGTTTAAATGGTTATACTGTAGAGGA  
GGCAAAGACAGTGCTTAAAAAGTGTAAGAGTGCCTTTTACATTCTACCATCTATTATCTCTAATGAGAAGCAAGAAATCTTG  
GAACTGTTTCTTGGAAATTTGCGAGAAAAGTCTTGCACATGCAGAAGAAACACGCAAATTAATGCCTGTCTGTGTGGAACTAAA  
GCCATAGTTTCAACTATACAGCGTAAATATAAGGGTATTAAAAACAAGAGGGTGTGGTTGATTATGGTGCTAGATTTTACTT  
TTACACCAGTAAAACAACTGTAGCGTCACTTATCAACACACTTAACGATCTAAATGAAACTCTTGTTACAATGCCACTTGGCT  
ATGTAACACATGGCTTAAATTTGGAAGAAGCTGCTCGGTATATGAGATCTCTCAAAGTGCCAGCTACAGTTTCTGTTTCTTCA  
CCTGATGCTGTTACAGCGTATAATGGTTATCTTACTTCTTCTTCTAAAAACCTGAAGAACATTTTATTGAAACCATCTCACT  
TGCTGGTTCCTATAAAGATTGGTCTATTCTGGACAATCTACACAACCTAGGTATAGAATTTCTTAAGAGAGGTGATAAAAAGTG  
TATATTACACTAGTAATCCTACCACATTCCACCTAGATGGTGAAGTTATCACCTTTGACAATCTTAAGACACTTCTTTCTTTG  
AGAGAAGTGAGGACTATTAAGGTGTTTACAACAGTAGACAACATTAACCTCCACACGCAAGTTGTGGACATGTCAATGACATA  
TGGACAACAGTTTGGTCCAACCTATTTGGATGGAGCTGATGTTACTAAAAATAAAACCTCATAATTCACATGAAGGTAAAAACAT  
TTTATGTTTTACCTAATGATGACACTCTACGTGTTGAGGCTTTTGTAGTACTACCACACAACCTGATCCTAGTTTTCTGGGTAGG  
TACATGTCAGCATTAAATCACACTAAAAAGTGGAATAACCCACAAGTTAATGGTTTAACTTCTATTAATGGGCAGATAACAA  
CTGTTATCTTGCCACTGCATTGTTAACACTCCAACAAATAGAGTTGAAGTTAATCCACCTGCTCTACAAGATGCTTATTACA  
GAGCAAGGGCTGGTGAAGCTGATAACTTTTGTGCACTTATCTTAGCCTACTGTAATAAGACAGTAGGTGAGTTAGGTGATGTT  
AGAGAAAACATGAGTTACTTGTTCACATGCCAATTTAGATTCTTGCAAAAAGAGTCTTGAACGTGGTGTGTA AAACTTGTGG  
ACAACAGCAGACAACCCCTTAAGGGTGTAGAAGCTGTTATGTACATGGGCACACTTTCTTATGAACAATTTAAGAAAAGGTGTTT  
AGATACCTTGTACGTGTGGTAAACAAGCTACAAAAATCTAGTACAACAGGAGTCACCTTTTGTATGATGTCAGCACCACCT  
GCTCAGTATGAACTTAAGCATGGTACATTTACTTGTGCTAGTGAGTACACTGGTAATTACCAGTGTGGTCACTATAAACATAT  
AACTTCTAAAGAACTTTGTATTGCATAGACGGTCTTTACTTACAAAGTCTCAGAATACAAAGGTCTATTACGGATGTTT  
TCTACAAAGAAAACAGTTACACAACAACCATAAAAACAGTTACTTATAAATTTGGATGGTGTGTTTGTACAGAAAATTGACCCT  
AAGTTGGACAATTTATAAAGAAAAGACAATTTCTTATTTTACAGAGCAACCAATTTGATCTTGTACCAAACCAACCATATCCAAA  
CGCAAGCTTCGATAATTTTAAAGTTTGTATGTGATAATATCAAAATTTGCTGATGATTTAAACCAGTTAACTGGTTATAAGAAAC  
CTGCTTCAAGAGAGCTTAAAGTTACATTTTCCCTGACTTAAATGGTGTGATGGTGGCTATTGATTATAAACACTACACACCC  
TCTTTTAAAGAAAAGGAGCTAAATTTGTACATAAACCTATTGTTTGGCATGTTAAACAATGCAACTAATAAAGCCACGTATAAAC  
AAATACCTGGTGTATACGTTGCTTTGGAGCACAAAACCAAGTTGAAACATCAAATTCGTTTGTATGACTGAAGTCAGAGGACG  
CGCAGGGAAATGGATAATCTTGCCTGCGAAGATCTAAAACCAAGTCTCTGAAGAAGTAGTGGAAAATCCTACCATACAGAAAGAC  
GTTCTTGAGTGTAATGTGAAAACCTACCGAAGTTGTAGGAGACATTATACTTAAACCAGCAAATAATAGTTTAAAAATTACAGA  
AGAGGTTGGCCACACAGATCTAATGGCTGCTTATGTAGACAATTTAGTCTTACTATTAAGAAAACCTAATGAATTATCTAGAG  
TATTAGGTTTGA AAAACCTTGTACTCATGGTTTAGCTGCTGTTAATAGTGTCCCTTGGGATACTATAGCTAATTATGCTAAG  
CCTTTTCTTAAACAAGTTGTTAGTACAACACTAACAATAGTTACACGGTGTTTAAACCGTGTTTGTACTAATTATATGCCTTA  
TTTCTTTACTTTATTGCTACAATTTGTACTTTTACTAGAAGTACAAATTTCTAGAATTAAGCATCTATGCCGACTACTATAG  
CAAAGAATACTGTTAAGAGTGTGCGTAAATTTTGTCTAGAGGCTTCAATTAATTTTGAAGTCACCTAATTTTTCTAAACTG  
ATAAATATTACAATTTGGTTTTTACTATTAAGTGTGTTGCCTAGGTTCTTAACTACTCAACCGCTGCTTTAGGTGTTTTAAT  
GTCTAATTTAGGCATGCCTTCTTACTGTACTGGTTACAGAGAAGGCTATTTGAACTCTACTAATGTCAGTGTGCAACCTACT  
GTACTGGTCTATACCTGTAGTGTGTTGCTTAGTGGTTAGATTCTTTAGACACCTATCCTTCTTTAGAAAATATACAAAT  
ACCATTTTCATCTTTTAAATGGGATTTAACTGCTTTTGGCTTAGTTGCAGAGTGGTTTTTGGCATATATTCTTTTCACTAGGTT  
TTTCTATGACTTGGATTGGCTGCAATCATGCAATGTTTTTTCAGCTATTTTGCAGTACATTTTATTAGTAATTTCTTGGCTTA  
TGTGGTTAATAATTAATCTTGTACAAAATGGCCCCGATTTTCAGCTATGGTTAGAATGTACATCTTCTTTGCATCATTTTATTAT  
GTATGGAAAAGTTATGTGCATGTTGTAGACGGTTGTAATTCATCAACTTGTATGATGTTTACAAACGTAATAGAGCAACAAG  
AGTCGAATGTACAACCTATTGTTAATGGTGTAGAAAGTCTTTTATGTCTATGCTAATGGAGGTAAGGCTTTTGC AAACTAC  
ACAATTTGGAATTTGTGTTAATTTGTGATACATTTCTGTGCTGGTAGTACATTTATTAGTGATGAAGTTGCGAGAGACTTGTCACTA  
CAGTTTAAAAAGACCAATAAATCCTACTGACCAGTCTTCTTACATCGTTGATAGTGTACAGTGAAGAATGGTTCCATCCATCT  
TTACTTTGATAAAGCTGGTCAAAAAGACTTATGAAAAGACATTTCTCTCTCATTTTTGTTAACTTAGACAACCTGAGAGCTAATA  
ACACTAAAGGTTTCATTGCCTATTAATGTTATAGTTTTTGTGGTAAATCAAAAATGTGAAGAATCATCTGCAAAAATCAGCGTCT  
GTTTACTACAGTCAGCTTATGTGTCAACCTATACTGTTACTAGATCAGGCATTAGTGTCTGATGTTGGTGATAGTGCAGGAAAGT  
TGCAGTTAAAAATGTTGATGCTTACGTTAATACGTTTTTTCATCAACTTTTAAACGTACCAATGGAAAAACTCAAAAACCTAGTTG  
CAACTGCAGAAGCTGAACTTGCAAGAATGTGTCCCTAGACAATGTCTTATCTACTTTTTATTTTCAAGCAGCTCGGCAAGGTTTT  
GTTGATTCAGATGTAGAAAACCTAAAGATGTTGTTGAATGTCTTAAATTTGTCACATCAATCTGACATAGAAGTTACTGGCGATAG  
TTGTAATAACTATATGCTCACCTATAACAAAAGTTGAAAACATGACACCCCGTACCTTGGTGCTTGTATTGACTGTAGTGCGC

GTCATATTAATGCGCAGGTAGCAAAAAGTCACAACATTGCTTTGATATGGAACGTTAAAGATTTTCATGTCATTGTCTGAACAA  
CTACGAAAAACAAATACGTAGTGCTGCTAAAAAGAATAACTTACCTTTTAAAGTTGACATGTGCAACTACTAGACAAGTTGTTAA  
TGTTGTAACAACAAGATAGCACTTAAGGGTGGTAAAAATTGTTAATAATTGGTTGAAAGCAGTTAATTAAAGTTACACTTGTGT  
TCCTTTTTTGTGCTGCTATTTTCTATTTAATAACACCTGTTTCATGTCATGTCTAAACATACTGACTTTTTCAAGTGAAATCATA  
GGATAACAAGGCTATTGATGGTGGTGTCACTCGTGACATAGCATCTACAGATACTTGTTTTTGCTAACAAACATGCTGATTTTTGA  
CACATGGTTTTAGCCAGCGTGGTGGTAGTTATACTAATGACAAAAGCTTGCCCATTTGATTGCTGCAGTCATAACAAGAGAAGTGG  
GTTTTGTCGTGCCTGGTTTTGCCTGGCACGATATTACGCACAACCTAATGGTGACTTTTTGCATTTCTTACCTAGAGTTTTTGT  
GCAGTTGGTAACATCTGTTACACACCATCAAAACTTATAGAGTACACTGACTTTGCAACATCAGCTTGTGTTTTGGCTGCTGA  
ATGTACAATTTTTAAAGATGCTTCTGGTAAGCCAGTACCATATTGTTATGATACCAATGTACTAGAAGGTTCTGTTGCTTATG  
AAAGTTTACGCCCTGACACACGTTATGTTCTCATGGATGGCTCTATTATTCAATTTCCCTAACACCTACCTTGAAGGTTCTGTT  
AGAGTGGTAACAACCTTTTGATTCTGAGTACTGTAGGCACGGCACTTTGTGAAAGATCAGAAGCTGGTGTTTGTGTATCTACTAG  
TGGTAGATGGGTAACCAATGATTATTACAGATCTTTACCAGGAGTTTTCTGTGGTGTAGATGCTGTAAATTTACTTACTA  
ATATGTTTACACCACTAATTCACCTATTGGTGCTTTGGACATATCAGCATCTATAGTAGCTGGTGGTATTGTAGCTATCGTA  
GTAACATGCCTTGCCTACTATTTTATGAGGTTTAGAAGAGCTTTTGGTGAATACAGTCATGTAGTTGCCTTAAACTTTACT  
ATTCCTTATGTCATTCACTGTACTCTGTTTAAACACCAGTTTACTCATTCTTACCTGGTGTTTATTCTGTTATTTACTTGTACT  
TGACATTTTATCTTACTAATGATGTTTTCTTTTTTAGCACATATTCAGTGGATGGTTATGTTACACCTTTAGTACCTTTCTGG  
ATAACAATTGCTTATATCATTGTATTTCCACAAAAGCATTCTATTGGTTCTTTAGTAATTACCTAAAGAGACGTGTAGTCTT  
TAATGGTGTTCCTTTAGTACTTTTTGAAGAAGCTGCGCTGTGCACCTTTTTGTAAATAAAAGAAATGTATCTAAAGTTGCGTA  
GTGATGTGCTATTACCTCTTACGCAATATAATAGATACTTAGCTCTTTATAATAAGTACAAGTATTTTAGTGGAGCAATGGAT  
ACAACCTAGCTACAGAGAAGCTGCTTGTGTCATCTCGCAAAGGCTCTCAATGACTTCAGTAACTCAGGTTCTGATGTTCTTTA  
CCAACCACCACAAACCTCTATCACCTCAGCTGTTTTGCAGAGTGGTTTTAGAAAAATGGCATTCCCCTGTTAAAGTTGAGG  
GTTGTATGGTACAAGTAACTTGTGGTACAACCTAACCGTCTTTGGCTTGTGACGTAGTTTACTGTCCAAGACATGTG  
ATCTGCACCTCTGAAGACATGCTTAAACCTAATTATGAAGATTTACTCATTGTAAGTCAATCATAATTTCTTGGTACAGGC  
TGGTAATGTTCAACTCAGGGTTATTGGACATTCTATGCAAAAATTGTGACTTAAAGCTTAAAGTTGATACAGCCAATCCTAAGA  
CACCTAAGTATAAGTTTTGTTTCGATTCAACCAGGACAGACTTTTTAGTGTAGCTTGTTACAATGGTTCCACCATCTGGTGT  
TACCAATGTGCTATGAGGCCCAATTTCACTATTAAGGGTTTCAATCCTTAAATGGTTTCAATGTTGGTAGTGTGGTTTTAACATAGA  
TTATGACTGTGCTCTTTTTGTTACATGCACCATATGGAATTACCAACTGGAGTTCATGCTGGCACAGACTTAGAAGGTAAC  
TTTATGGACCTTTTGTGACAGGCAAAACAGCACAAAGCAGCTGGTACGGACACAACCTATTACAGTTAATGTTTTAGCTTGGTTG  
TACGCTGCTGTTATAAATGGAGACAGGTGGTTTCTCAATCGATTTACCACAACCTTAAATGACTTTAACCTTGTGGCTATGAA  
GTACAATTATGAACCTTAACACAAGACCATGTTGACATACTAGGACCTCTTTCTGCTCAAACCTGGAATTGCCGTTTTAGATA  
TGTGTGCTTCAATAAAAGAATTACTGCAAAAATGGTATGAATGGACGTACCATATTGGGTAGTGTCTTTATTAGAAGATGAATTT  
ACACCTTTTGTGTTGTTAGACAATGCTCAGGTGTTACTTTCCAAAGTGCAAGTAAAAGAACAATCAAGGGTACACACCACTG  
GTTGTTACTCACAATTTTACTTCACTTTTACTTTTACTCCAGAGTACTCAATGGTCTTTGTTCTTTTTTTTGTATGAAAATG  
CCTTTTTACCTTTTGTATGGGTATTATTGCTATGTCTGCTTTTGCATGATGTTTGTCAAACATAAGCATGCATTTCTCTGT  
TTGTTTTGTTTACCTTCTTGGCACTGTAGCTTATTTAATATGGTCTATATGCCTGCTAGTTGGGTGATGCGTATTATGAC  
ATGGTTGGATATGGTTGATACTAGTTTGAAGCTAAAAGACTGTGTTATGATGATGCATCAGCTGTAGTGTACTAATCCTTATGA  
CAGCAAGAACTGTGTATGATGATGGTGCTAGGAGAGTGTGGACACTTATGAATGTCTTGACACTCGTTTATAAAGTTTATTAT  
GGTAATGCTTTAGATCAAGCCATTTCCATGTGGGCTCTTATAATCTCTGTTACTTCTAACTACTCAGGTGTAGTTACAACCTGT  
CATGTTTTTGGCCAGAGGTATTGTTTTTATGTGTGTTGAGTATTGCCCTATTTTCTTCAAACTGGTAATACACTTCACTGT  
TAATGCTAGTTTATTGTTTCTTAGGCTATTTTTGTACTTGTACTTTGGCCTTTTTGTTTACTCAACCGCTACTTTAGACTG  
ACTCTTGGTGTATGATTACTTAGTTTCTACACAGGAGTTTAGATAATATGAATTCACAGGGACTACTCCCACCCAAGAATAG  
CATAGATGCCTTCAAACCTAACATTAATTTGTTGGGTGTTGGTGGCAAACTTGTATCAAAGTAGCCACTGTACAGTCTAAAA  
TGTCAGATGTAAGTGCACATCAGTAGTCTTACTCTCAGTTTTGCAACAACCTCAGAGTAGAATCATCATCTAAATTTGTTGGCT  
CAATGTGTCCAGTTACACAATGACATTTCTTACTTAAAGATACTACTGAAGCCTTTGAAAAAATGGTTTCACTACTTTCTGT  
TTTTGCTTTCCATGCAGGGTGTGTAGACATAAAACAAGCTTTGTGAAGAAATGCTGGACAACAGGGCAACCTTACAAGCTATAG  
CCTCAGAGTTTAGTTCCCTTCCATCATATGCAGCTTTTGTACTGCTCAAGAAGCTTATGAGCAGGCTGTTGCTAATGGTGAT  
TCTGAAGTTGTTCTTAAAAAGTTGAAGAAGTCTTTGAATGTGGCTAAATCTGAATTTGACCGTGATGCAGCCATGCAACGTAA  
GTTGGAAAAGATGGCTGATCAAGCTATGACCCAAATGTATAAACAGGCTAGATCTGAGGACAAGAGGGCAAAAGTTACTAGTG  
CTATGCAGACAATGCTTTTCACTATGCTTAGAAAAGTTGGATAATGATGCACCTCAACAACATTATCAACAATGCAAGAGATGGT  
TGTGTTCCCTTGAACATAATACCTCTTACAACAGCAGCCAAACTAATGGTTGTCATACCAGACTATAACACATATAAAAAATAC

GTGTGATGGTACAACATTTACTTATGCATCAGCATTGTGGGAAATCCAACAGGTTGTAGATGCAGATAGTAAAATTGTTCAAC  
TTAGTAAAATTAGTATGGACAATTCACCTAATTTAGCATGGCCTCTTATTGTAACAGCTTTAAGGGCCAATTCGCTGTCAAA  
TTACAGAATAATGAGCTTAGTCTGTTGCACTACGACAGATGTCTTGTGCTGCCGGTACTACACAACTGCTTGCCTGATGA  
CAATGCGTTAGCTTACTACAACACAACAAAGGGAGGTAGGTTTGTACTTGCCTGTTATCCGATTTACAGGATTTGAAATGGG  
CTAGATTTCCCTAAGAGTGATGGAACCTGGTACTATCTATACAGAACTGGAACCACCTTGTAGGTTTGTACAGACACACCTAAA  
GGTCTAAAAGTGAAGTATTTATACTTTATTTAAAGGATTTAAACAACCTAAATAGAGGTATGGTACTTGGTAGTTTAGCTGCCAC  
AGTACGTCTACAAGCTGGTAATGCAACAGAAAGTGCCTGCCAATTCAACTGTATTATCTTTCTGTGCTTTTGTGTAGATGCTG  
CTAAAAGCTTACAAAAGATTATCTAGCTAGTGGGGGACAACCAATCACTAATTGTGTTAAGATGTTGTGTACACACACTGGTACT  
GGTCAGGCAATAACAGTTACACCGGAAGCCAATATGGATCAAGAATCCTTTGGTGGTGCATCGTGTGTGTACTGCCGTTG  
CCACATAGATCATCCAAATCCTAAAAGGATTTTGTGACTTAAAAGGTAAGTATGTACAAAACCTACAACCTTGTGCTAATGACC  
CTGTGGGTTTTACTTAAAACACAGTCTGTACCGTCTGCCGATGTGGAAAAGTTATGGCTGTAGTTGTGATCAACTCCGC  
GAACCCATGCTTCAGTACAGCTGATGCACAATCGTTTTTAAACGGGTTTGCGGTGTAAAGTGCAGCCGCTTACACCGTGCGGC  
ACAGGCACTAGTACTGATGTCGTATACAGGGCTTTTGACATCTACAATGATAAAGTAGCTGGTTTTGCTAAATTCCTAAAAAC  
TAATTGTTGTCGCTTCCAAGAAAAGGACGAAGATGACAATTTAATTGATTCTTACTTTGTAGTTAAGAGACACACTTTCTCTA  
ACTACCAACATGAAGAAAACAATTTATAATTTACTTAAAGGATTGTCCAGCTGTTGCTAAACATGACTTCTTTAAGTTTAGAATA  
GACGGTGACATGGTACCACATATATCACGTCAACGTCTTACTAAAACACAATGGCAGACCTCGTCTATGCTTTAAGGCATTT  
TGATGAAGGTAATTTGTGACACATTTAAAAGAAATACTTGTACACATAAATGTTGTGATGATGATTATTTCAATAAAAAAGGACT  
GGTATGATTTTGTAGAAAACCCAGATATATTACGCGTATACGCCAACCTTAGGTGAACGTGTACGCCAAGCTTTGTTAAAAACA  
GTACAATTTCTGTGATGCCATGCGAAATGCTGGTATTGTTGGTGTACTGACATTAGATAAATCAAGATCTCAATGGTAACTGGTA  
TGATTTGCGTGATTTTCATACAAAACACGCCAGGTAGTGGAGTTCCTGTTGTAGATTCTTATTATTCAATTGTTAATGCCTATAT  
TAACCTTGACCAGGGCTTTAACTGCAGAGTACATGTTGACACTGACTTAAACAAAGCCTTACATTAAGTGGGATTTGTTAAAA  
TATGACTTCACGGAAGAGAGGTTAAAACCTTTTGACCGTTATTTTTAAATATTGGGATCAGACATACCACCCAAATTTGTGTTAA  
CTGTTTGGATGACAGATGCATTCTGCATTGTGCAAACTTTAATGTTTTATTCTCTACAGTGTTCACACTTACAAGTTTTGGAC  
CACTAGTGAGAAAAATATTTGTTGATGGTGTTCATTTGTAGTTTCAACTGGATACCCTTACAGAGCTAGGTGTTGTACAT  
AATCAGGATGTAACTTACATAGCTCTAGACTTAGTTTTTAAGGAATTACTTGTGTATGCTGCTGACCCTGCTATGCACGCTGC  
TTCTGGTAATCTATTACTAGATAAACCGCACTACGTGCTTTTCAGTAGCTGCACTTACTAACAAATGTTGCTTTTCAAACCTGTCA  
AACCTGGTAATTTTAAACAAAGACTTCTATGACTTTGCTGTGCTAAGGGTTTTCTTTAAGGAAGGAAGTTCTGTTGAATTTAAAA  
CACTTCTTCTTTGCTCAGGATGGTAATGCTGCTATCAGCGATTATGACTACTATCGTTATAATCTACCAACAATGTGTGATAT  
CAGACAACCTACTATTTGTAGTTGAAGTTGTTGATAAGTACTTTGATTGTTACGATGGTGGCTGTATTAATGCTAACCAAGTCA  
TCGTCAACAACCTAGACAAATCAGCTGGTTTTCCATTTAATAAATGGGGTAAGGCTAGACTTTATTATGATTCAATGAGTTAT  
GAGGATCAAGATGCACTTTTTCGCATATACAAAACGTAATGTCATCCCTACTATAACTCAAATGAATCTTAAAGTATGCCATTAG  
TGCAAAGAATAGAGCTCGCACCGTAGCTGGTGTCTCTATCTGTAGTACTATGACCAATAGACAGTTTTCATCAAAAAATTATTGA  
AATCAATAGCCGCCACTAGAGGAGCTACTGTAGTAATTTGGAACAAGCAAATTTCTATGGTGGTTGGCACAACATGTTAAAAACT  
GTTTATAGTGATGTAGAAAACCCCTCATCTTATGGGTTGGGATTATCCTAAATGTGATAGAGCCATGCCTAACATGCTTAGAAT  
TATGGCCTCACTTGTCTTCTGCTCGCAAACATACAACGTGTTGTAGCTTGTACACCGTTTTCTATAGATTAGCTAATGAGTGTG  
CTCAAGTATTGAGTGAATGGTCATGTGTGGCGTTCACTATATGTTAAACCAGGTGGAACCTCATCAGGAGATGCCACAACCT  
GCTTATGCTAATAGTGTTTTTAACATTTGTCAAGCTGTCACGGCCAATGTTAATGCACTTTTATCTACTGATGGTAACAAAAAT  
TGCCGATAAGTATGTCCGCAATTTACAACACAGACTTTATGAGTGTCTCTATAGAAAATAGAGATGTTGACACAGACTTTGTGA  
ATGAGTTTTACGCATATTTGCGTAAACATTTCTCAATGATGATACTCTCTGACGATGCTGTTGTGTGTTTCAATAGCACTTAT  
GCATCTCAAGGCTAGTGGCTAGCATAAAGAACTTTAAGTCAAGTCTTTTATTATCAAAAACAAATGTTTTTATGTCTGAAGCAA  
ATGTTGGACTGAGACTGACCTTACTAAAGGACCTCATGAATTTTGTCTCTCAACATACAATGCTAGTTAAACAGGGTGATGATT  
ATGTGTACCTTCTTACCCAGATCCATCAAGAATCCTAGGGGCCGGCTGTTTTGTAGATGATATCGTAAAAACAGATGGTACA  
CTTATGATTGAACGGTTCGTGTCTTTAGCTATAGATGCTTACCCACTTACTAAACATCCTAATCAGGAGTATGCTGATGTCTT  
TCATTTGTACTTACAATACATAAAGAAAAGCTACATGATGAGTTAACAGGACACATGTTAGACATGTATTCTGTTATGCTTACTA  
ATGATAACACCTCAAGGTATTGGGAACCTGAGTTTTATGAGGCTATGTACACACCGCATAACAGTCTTACAGGCTGTTGGGGCT  
TGTGTTCTTTGCAATTCACAGACTTCAATTAAGATGTGGTGTCTGATACGTAAGCATTCTTATGTTGTAAATGCTGTTACGA  
CCATGTCATATCAACATCACATAAATTAGTCTTGTCTGTTAATCCGTATGTTTGAATGCTCCAGGTTGTGATGTCACAGATG  
TGACTCAACTTTACTTAGGAGGTATGAGCTATTATTGTAATCACATAAACCACCCATTAGTTTTCCATTGTGTGCTAATGGA  
CAAGTTTTTGGTTTTATATAAAAAATACATGTGTTGGTAGCGATAATGTTACTGACTTTAATGCAATTGCAACATGTGACTGGAC  
AAATGCTGGTGATTACATTTTAGCTAACACCTGTAAGGACTCAAGCTTTTTGCAGCAGAAAACGCTCAAAGCTACTGAGG

AGACATTTAAACTGTCTTATGGTATTGCTACTGTACGTGAAGTGCTGTCTGACAGAGAATTACATCTTTCATGGGAAGTTGGT  
AAACCTAGACCACCCTTAACCGAAATTATGTCTTTACTGGTTATCGTGTAACAAAAACAGTAAAGTACAAAATAGGAGAGTA  
CACCTTTGAAAAAGGTGACTATGGTGATGCTGTTGTTTACCAGAGGTACAACAACCTTACAAAATAAATGTTGGTGATTATTTTG  
TGCTGACATCACATACAGTAATGCCATTAAGTGCACCTACACTAGTGCCACAAGAGCACTATGTTAGAATTACTGGCTTATAC  
CCAACACTCAATATCTCAGATGAGTTTTCTAGCAATGTTGCAAATTATCAAAAAGTTGGTATGCAAAAAGTATTCTACACTCCA  
GGGACCACCTGGTACTGGTAAGAGTCATTTTGCTATTGGCCTAGCTCTCTACTACCCTTCTGCTCGCATAGTGTATACAGCTT  
GCTCTCATGCCGCTGTTGATGCACTATGTGAGAAGGCATTAATAATTTGCCTATAGATAAATGTAGTAGAATTATACCTGCA  
CGTGCTCGTGATAGAGTGTGGTATAAAATCAAAGTGAATTAACATTAGAACAGTATGTCTTTTGTACTGTAAATGCATTGCC  
TGAGACGACAGCAGATATAGTTGCTTTGATGAAAATTTCAATGGCCACAATAATGATTTGAGTGTGTCAATGCCAGATTAC  
GTGCTAAGCACTATGTGTACATTGGCGACCCTGCTCAATTACCTGCACCACGCACATTGCTAACTAAGGGCACACTAGAACCA  
GAATATTTCAATTCAGTGTGTAGACTTATGAAAATATAGGTCCAGACATGTTCTCGGAACTTGTGCGGCTTGTCTCTGCTGA  
AATTGTTGACACTGTGAGTGCCTTGGTATTATGATAATAGGCTTAAAGCACATAAAGACAAAATCAGCTCAATGCCTTAAAAATGT  
TTTATAAGGGTGTATCACGCATGATGTTTCATCTGCAATTAACAGGCCACAAAATAGGCGTGGTAAGAGAATTCCTTACACGT  
AACCTGCTTGGAGAAAAGCTGTCTTTATTTACCTTATAAATCACAGAATGCTGTAGCCTCAAAGATTTTGGGACTACCAAC  
TCAAACCTGTTGATTCATCACAGGGCTCAGAAATGACTATGTCATATTCACTCAAACCACTGAAACAGCTCACTCTTGTAAATG  
TAAACAGATTTAATGTTGCTATTACCAGAGCAAAAAGTAGGCATACTTTGCATAATGTCTGATAGAGACCTTTATGACAAGTTG  
CAATTTACAAGCTTGGAAATCCACGTAGGAATGTGGCAACTTTACAAGCTGAAAATGTAACAGGACTCTTTAAAGATTGTAG  
TAAGGTAATCACTGGGTTACATCCTACACAGGCACCTACACACCTCAGTGTGACACTAAAATCAAACCTGAAGGTTTATGTG  
TTGACATACCTGGCATACTAAGGACATGACCTATAGAAGACTCATCTCTATGATGGGTTTTAAAAATGAATTATCAAGTTAAT  
GGTTACCCTAACATGTTTATCACCCGCGAAGAAGCTATAAGACATGTACGTGCATGGATTGGCTTCGATGTGAGGGGTGTCA  
TGCTACTAGAGAAGCTGTTGGTACCAATTTACCTTTACAGCTAGGTTTTCTACAGGTGTTAACCTAGTTGCTGTACCTACAG  
GTTATGTTGATACACCTAATAATACAGATTTTTCCAGAGTTAGTGCTAAACCACCGCCTGGAGATCAATTTAAACACCTCATA  
CCACTTATGTACAAAAGGACTTCTTGGAAATGAGTGCATATAAAGATTGTACAAAATGTTAAGTGACACACTTAAAAATCTCTC  
TGACAGAGTCGATTTTGTCTTATGGGCACATGGCTTTGAGTTGACATCTATGAAGTATTTTGTGAAAATAGGACCTGAGCGCA  
CCTGTTGCTATGTGATAGACGTGCCACATGCTTTTCCACTGCTTCAGACACTTATGCCTGTTGGCATCATTCTATTGGATTT  
GATTACGTCTATAATCCGTTTTATGATTGATGTTCAACAATGGGGTTTTACAGGTAACCTACAAAAGCAACCATGATCTGTATTG  
TCAAGTCCATGGTAATGCACATGTAGCTAGTTGTGATGCAATCATGACTAGGTGTCTAGCTGTCCACGAGTGCCTTTGTTAAGC  
GTGTTGACTGGACTATTGAATATCCTATAAATGGTGATGAACTGAAGATTAATGCGGCTTGTAGAAAAGTTCAACACATGGTT  
GTTAAAGCTGCATTATTAGCAGACAAAATCCCAGTCTTTCACGACATTGGTAACCCTAAAGCTATTAAGTGTGTACCTCAAGC  
TGATGTAGGATGGAAGTTCTATGATGCACAGCCTTGTAGTGACAAAAGCTTATAAAAATAGAAGAATTATTCTATTCTTATGCCA  
CACATTCTGACAAAATCACAGATGGTGTATGCCTATTTTGGAAATGCAATGTCGATAGATATCCTGCTAATTCATTGTTTGT  
AGATTTGACACTAGAGTGTCTATCTAACCTTAACTTGCCTGGTTGTGATGGTGGCAGTTTGTATGTAATAAACATGCATTCCA  
CACACCAGCTTTTGATAAAAAGTGCTTTTGTAAATTTAAAAACAATTACCATTTTTCTATTACTCTGACAGTCCATGTGAGTCTC  
ATGAAAAACAAGTAGTGTGAGATATAGATTATGTACCACTAAAGTCTGCTACGTGTATAACACGTTGCAATTTAGGTGGTGCT  
GTCTGTAGACATCATGCTAATGAGTACAGATTGTATCTCGATGCTTATAACATGATGATCTCAGCTGGCTTTAGCTTGTGGGT  
TTACAAAACAATTTGATACTTATAACCTCTGGAACACTTTTACAAGACTTCAGAGTTTAGAAAATGTGGCTTTTAAATGTTGTAA  
ATAAGGGACACTTTGATGGACAACAGGGTGAAGTACCAGTTTCTATCATTAAATAACACTGTTTACACAAAAGTTGATGGTGTT  
GATGTAGAATTGTTTAAAAATAAACCAATTACCTGTTAATGTAGCATTGAGCTTTGGGCTAAGCGCAACATTAACCAAGT  
ACCAGAGGTGAAAATACTCAATAATTTGGGTGTGGATATTGCTGCTAATACTGTGATCTGGGACTACAAAAGAGATGCTCCAG  
CACATATATCTACTATTGGTGTGTTGTTCTATGACTGACATAGCCAAGAAACCAACTGAAACGATTTGTGCCACCACTCACTGTC  
TTTTTTGATGGTAGAGTTGATGGTCAAGTAGACTTATTTAGAAATGCCCGTAAATGGTGTCTTATTACAGAAGGTAGTGTTAA  
AGGTTTACAACCATCTGTAGGTCCCAAACAAGCTAGTCTTAATGGAGTCACATTAATGGAGAAGCCGTAACCAACAGTTCA  
ATTATTATAAGAAAAGTTGATGGTGTGTTGCCAACAAATTACCTGAAACTTACTTTACTCAGAGTAGAAAATTTACAAGAAATTTAAA  
CCCAGGAGTCAAAATGAAAATTTGATTTCTTAGAATTAGCTATGGATGAATTCATTGAACGGTATAAAATAGAAGGCTATGCCTT  
CGAACATATCGTTTATGGAGATTTTAGTCATAGTCAGTTAGGTGGTTTACATCTACTGATTGGACTAGCTAAACGTTTTAAAG  
AATCACCTTTTTGAATTAGAAGATTTTATTCCATGACAGTACAGTTAAAAACTATTTTACATAACAGATGCGCAACAGGTTCA  
TCTAAGTGTGTGTTCTGTTATTGATTTATTACTTGATGATTTTGTGAAATAATAAAAATCCCAAGATTTATCTGTAGTTTC  
TAAGTGTGCAAGTGAATTTGACTATACAGAAATTTCAATTTATGCTTTGGTGTAAAGATGGCCATGTAGAAACATTTTACC  
CAAAAATACAATCTAGTCAAGCGTGGCAACCGGGTGTGCTATGCCTAATCTTTACAAAATGCAAAGAAATGCTATTAGAAAAG  
TGTGACCTTCAAAAATATGGTGATAGTGAACATTACCTAAAGGCATAATGATGAATGTCGCAAAAATATACTCAACTGTGTCA

ATATTTAAACACATTAACATTAGCTGTACCCTATAATATGAGAGTTATACATTTTTGGTGCTGGTTCTGATAAAGGAGTTGCAC  
CAGGTACAGCTGTTTTAAGACAGTGGTTGCCACGGGTACGCTGCTTGTGCGATTAGATCTTAATGACTTTGTCTCTGATGCA  
GATTCAACTTTGATTGGTGATTGTGCAACTGTACATACAGCTAATAAATGGGATCTCATTATTAGTGATATGTACGACCCTAA  
GACTAAAAATGTTACAAAAGAAAATGACTCTAAAGAGGGTTTTTCACTTACATTTGTGGGTTTATACAACAAAAGCTAGCTC  
TTGGAGGTTCCGTGGCTATAAAGATAACAGAACATTCTTGGAATGCTGATCTTTATAAGCTCATGGGACACTTCGCATGGTGG  
ACAGCCTTTGTTACTAATGTGAATGCGTCATCATCTGAAGCATTTTTAATTGGATGTAATTATCTTGGCAAACCACGCGAACA  
AATAGATGGTTATGTCATGCATGCAAATTACATATTTTGGAGGAATACAAATCCAATTCAGTTGTCTTCTTATTCTTTATTTG  
ACATGAGTAAATTTCCCTTAAATTAAGGGGTACTGCTGTTATGTCTTTAAAAGAAGGTCAAATCAATGATATGATTTTATCT  
CTTCTTAGTAAAGGTAGACTTATAATTAGAGAAAAACAACAGAGTTGTTATTTCTAGTGATGTTCTTGTAAACAACTAAACGAA  
CAATGTTTGTTTTTCTGTTTTATTGCCACTAGTCTCTAGTCAGTGTGTTAATCTTACAACCAGAACTCAATTACCCCTGCA  
TACACTAATTTCTTTCACACGTGGTGTATTATACCCTGACAAAGTTTTTCAGATCCTCAGTTTTACATTCAACTCAGGACTTGT  
CTTACCTTTCTTTCCAATGTTACTTGGTTCCATGCTATCTCTGGGACCAATGGTACTAAGAGGTTTGATAACCCCTGCTCTAC  
CATTTAATGATGGTGTATTATTTGCTTCCACTGAGAAGTCTAACATAATAAGAGGCTGGATTTTTGGTACTACTTTAGATTG  
AAGACCCAGTCCCTACTTATTGTTAATAACGCTACTAATGTTGTTATTTAAAGTCTGTGAATTTCAATTTTGTAAATGATCCATT  
TTTGGGTGTNNNTTACCACAAAAACAACAAAAGTTGGATGGAAAGTGAGTTCAGAGTTTATTCTAGTGCGAATAAATGCACTT  
TTGAATATGTCTCTCAGCCTTTTCTTATGGACCTTGAAGGAAAAACAGGGTAATTTCAAAAACTTAGGGAATTTGTGTTAAG  
AATATTGATGGTTATTTTAAAAATATATTCTAAGCACACGCCTATTAATTTAGTGCGTGATCTCCCTCAGGGTTTTTCGGCTTT  
AGAACCATTGGTAGATTTGCCAATAGGTATTAACATCACTAGGTTTCAAACCTTACTTGGCTTTACATAGAAGTTATTTGACTC  
CTGGTGATTCTTCTCAGGTTGGACAGCTGGTGCTGCAGCTTATTATGTGGGTTATCTTCAACCTAGGACTTTTCTATTAAAA  
TATAATGAAAAATGGAACCATTACAGATGCTGTAGACTGTGCACTTGACCCTCTCTCAGAAACAAAGTGACGTTGAAATCCTT  
CACTGTAGAAAAAGGAATCTATCAAACCTTCTAACTTTAGAGTCCAACCAACAGAATCTATTGTTAGATTTCTAATATTACAA  
ACTTGTGCCCTTTTGGTGAAGTTTTAACGCCACCAGATTTGCATCTGTTTATGCTTGGAACAGGAAGAGAATCAGCAACTGT  
GTTGCTGATTATTCTGTCTATATAAATCCGCATCATTTTCCACTTTTAAAGTGTATGGAGTGTCTCCTACTAAAATTAATGA  
TCTCTGCTTTACTAATGTCTATGCAGATTCATTTGTAATTAGAGGTGATGAAGTCAGACAAATCGCTCCAGGGCAAACCTGGAA  
AGATTGCTGATTATAATTATAAATTACCAGATGATTTTACAGGCTGCGTTATAGCTTGGAAATCTAACAATCTTGATTCTAAG  
GTTGGTGGTAATTATAAATTACCTGTATAGATTGTTTAGGAAAGTCTAATCTCAAACCTTTTGGAGAGAGATAATTTCAACTGAAAT  
CTATCAGGCCGGTAGCACACCTTGTAAATGGTGTGAAAGTTTTAATTGTTACTTTCTTTACAATCATATGGTTTTCCAACCCA  
CTTATGGTGTGGTTACCAACCATAACAGAGTAGTAGTACTTTCTTTTGAACCTTCTACATGCACCAGCAACTGTTTGTGGACCT  
AAAAAGTCTACTAATTTGGTTAAAAACAATGTGTCAATTTCAACTTCAATGGTTTAAACAGGCACAGGTGTTCTTACTGAGTC  
TAACAAAAAGTTTCTGCCTTTCCAACAATTTGGCAGAGACATTGATGACACTACTGATGCTGTCCGTGATCCACAGACACTTG  
AGATTCTTGACATTACACCATGTTCTTTTGGTGGTGTGAGTGTATAACACCAGGAACAAATACTTCTAACCAGGTTGCTGTT  
CTTTATCAGGGTGTAACTGCACAGAAGTCCCTGTTGCTATTATCATGCAGATCAACTTACTCCTACTTGGCGTGTATTATTCTAC  
AGGTTCTAATGTTTTTCAAACACGTGCAGGCTGTTAATAGGGGCTGAACATGTCAACAACCTCATATGAGTGTGACATACCCA  
TTGGTGCAGGTATATGCGCTAGTTATCAGACTCAGACTAATTTCTCATCGGCGGGCACGTAGTGTAGCTAGTCAATCCATCATT  
GCCTACACTATGTCACTTGGTGCAGAAAAATTCAGTTGCTTACTCTAATAACTCTATTGCCATACCCATAAAATTTACTATTAG  
TGTTACCACAGAAATTTACCAGTGTCTATGACCAAGACATCAGTAGATTGTACAATGTACATTTGTGGTGATTCAACTGAAT  
GCAGCAATCTTTTGTGCAATATGGCAGTTTTTGTACACAATTAACCGTGCTTTAACTGGAATAGCTGTTGAACAAGACAAA  
AACACCCAAGAAGTTTTTGCACAAGTCAAACAAATTTACAAAACACCACCAATTAAGATTTTTGGTGGTTTTAATTTTTTACA  
AATATTACCAGATCCATCAAACCAAGCAAGAGGTCAATTTATTGAAGATCTACTTTTCAACAAAGTGACACTTGCAGATGCTG  
GCTTCATCAAACAATATGGTGATTGCCCTTGGTGATATTGCTGCTAGAGACCTCATTTGTGCACAAAAGTTTAAACGGCCTTACT  
GTTTTGCCACCTTTGCTCACAGATGAAATGATTGCTCAATACACTTCTGCACTGTTAGCGGGTACAATCACTTCTGGTTGGAC  
CTTTGGTGCAGGTGCTGCATTACAAATACCATTGCTATGCAAATGGCTTATAGTTTTAATGGTATTGGAGTTACACAGAATG  
TTCTCTATGAGAACCAAAAAATGATTGCCAACCAATTAATAGTGCTATTGGCAAAAATCAAGACTCACTTTCTTCCACAGCA  
AGTGCACCTTGGAAAATTTCAAGATGTGGTCAACCAAAAATGCACAAGCTTTAAACACGCTTGTAAACAACCTTAGCTCCAATTT  
TGGTGCAATTTCAAGTGTTTTTAAATGATATCCTTGCACGTCTTGCACAAAGTTGAGGCTGAAGTGCAAAATGATAGGTTGATCA  
CAGGCAGACTTCAAAGTTTGCAGACATATGTGACTCAACAATTAATTAGAGCTGCAGAAATCAGAGCTTCTGCTAATCTTGGCT  
GCTACTAAAATGTGAGAGTGTGACTTGGACAATCAAAAAGAGTTGATTTTTGTGGAAAAGGGCTATCATCTTATGCTCTTCCC  
TCAGTCAGCACCTCATGGTGTAGTCTTCTTGCATGTGACTTATGTCCCTGCACAAGAAAAGAACTTCACAACTGCTCCTGCCA  
TTTTGTATGAAACCACAAATCATTACTACACACAACACATTTGTGTCTGGTAACTGTGATGTTGTAATAGGAATTTGTAACAACAC

AGTTTATGATCCTTTGCAACCTGAATTAGACTCATTCAAGGAGGAGTTAGATAAATATTTTAAGAATCATAACATCACCAGATG  
TTGATTTAGGTGACATCTCTGGCATTAAATGCTTCAGTTGTAACATTCAAAAAGAAATTGACCGCCTCAATGAGGTTGCCAAG  
AATTTAAATGAATCTCTCATCGATCTCCAAGAACTTGAAAAGTATGAGCAGTATATAAAATGGCCATGGTACATTTGGCTAGG  
TTTTATAGCTGGCTTGATTGCCATAGTAATGGTGACAATTATGCTTTGCTGTATGACCAGTTGCTGTAGTTGTCTCAAGGGCT  
GTTGTTCTTGTGGATCCTGCTGCAAAATTTGATGAAGACGACTCTGAGCCAGTGCTCAAAGGAGTCAAATTACATTACACATAA  
ACGAACTTATGGATTTGTTTATGAGAATCTTCACAATTGGAACGTGAACTTTGAAGCAAGGTGAAATCAAGGATGCTACTCCT  
TCAGATTTTGTTCGCGCTACTGCAACGATACCGATACAAGCCTCACTCCCTTTGCGATGGCTTATTGTTGGCGTTGCACTTCT  
TGCTGTTTTTCAGAGCGCTTCCAAAATCATAACCTCAAAAAGAGATGGCAACTAGCACTCTCCAAGGGTGTTCACCTTTGTTT  
GCAACTTGCTGTTGTTGTTGTAACAGTTTACTCACACCTTTTGTCTGTTGCTGCTGGCCTTGAAGCCCCTTTTCTCTATCTT  
TATGCTTTAGTCTACTTCTTGCAAGTATAAACTTTGTAAGAATAATAATGAGGCTTTGGCTTTGCTGGAAATGCCGTTCCAA  
AAACCCATTACTTTATGATGCCAACTATTTTCTTTGCTGGCATACTAATTGTTACGACTATTGTATACCTTACAATAGTGTA  
CTTCTTCAATTGTCATTACTTCAGGTGATGGCACAACAAAGTCCATTTCTGAACATGACTACCAGATTGGTGGTTATACTGAA  
AAATGGGAATCTGGAGTAAAAGACTGTGTTGTATTACACAGTTACTTCACTTCAGACTATTACCAGCTGTACTCAACTCAATT  
GAGTACAGACACTGGTGTGAACATGTTACCTTCTTCATCTACAATAAAATGTTGATGAGCCTGAAGAACATGTCCAAATTC  
ACACAATCGACGGTTCATCCGGAGTTGTTAATCCAGTAAATGGAACCAATTTATGATGAACCGACGACGACTACTAGCGTGCCT  
TTGTAAGCACAAGCTGATGAGTACGAACCTTATGTACTCATTGTTTCGGAAGAGACAGGTACGTTAATAGTTAATAGCGTACT  
TCTTTTTCTTGTCTTTCGTTGTTTCTTGTACTAGTTACTAGCCATCCTTACTGCGCTTCGATTGTGTGCGTACTGCTGCAATA  
TTGTTAACGTGAGTCTTGTAAAACCTTCTTTTTACGTTTACTCTCGTGTAAAAATCTGAATTCTTCTAGAGTTCTTGTATCTT  
CTGGTCTAAACGAACTAAATATTATATTAGTTTTTCTGTTTGGAACTTAAATTTAGCCATGGCAGATTCCAACGGTACTATT  
ACCGTTGAAGAGCTTAAAAAGCTCCTTGAACAAATGGAACCTAGTAATAGGTTTCTTATTCTTACATGGATTTGTCTTCTACA  
ATTTGCCTATGCCAACAGGAATAGGTTTTGTATATAATTAAGTTAATTTTCTCTGGCTGTTATGGCCAGTAACTTTAGCTT  
GTTTTGTGCTTGTGCTGTTTACAGAATAAAATGGATCACCGGTGGAATTGCTATCGCAATGGCTTGTCTTGTAGGCTTGATG  
TGGCTCAGTACTTCATTGCTTCTTTCAGACTGTTTGCAGTACGCGTTCATGTGGTCATTCAATCCAGAAAATAACATTCT  
TCTCAACGTGCCACTCCATGGCACTATTCTGACCAGACCGCTTCTAGAAAAGTGAACCTCGTAATCGGAGCTGTGATCCTTCGTG  
GACATCTTCGTATTGCTGGACACCATCTAGGACGCTGTGACATCAAGGACCTGCCTAAAAGAAATCACTGTTGCTACATCACGA  
ACGCTTTCTTATTACAAATTTGGGAGCTTCGCAGCGTGTAGCAGGTGACTCAGGTTTTGCTGCATACAGTCGCTACAGGATTGG  
CAACTATAAATTAACACAGACCATTCCAGTAGCAGTGACAATAATTGCTTTGCTTGTACAGTAAGTGACAACAGATGTTTCAT  
CTCGTTGACTTTCAGGTTACTATAGCAGAGATATTACTAATTATTATGAGGACTTTTAAAGTTTCCATTTGGAATCTTGATTA  
CATCATAAACCTCATAAATTAATAATTTATCTAAGTCACTAACTGAGAATAAATATTCTCAATTAGATGAAGAGCAACCAATGG  
AGATTGATTAACGAACATGAAAATTTATCTTTTTCTTGGCACTGATAACACTCGTACTTGTGAGCTTTATCACTACCAAGAG  
TGTGTTAGAGGTACAACAGTACTTTTTAAAAGAACCTTGCTCTTCTGGAACATACGAGGGCAATTCACCATTTCATCCTCTAGC  
TGATAACAAATTTGCACTGACTTGCTTTAGCACTCAATTTGCTTTTGTCTTGTGCTGACGGCGTAAAACACGTCATCAGTTAC  
GTGCCAGATCAGTTTCACTAACTGTTTCATCAGACAAGAGGAAGTTCAAGAACTTTACTCTCCAATTTTTCTTATTGTTGCG  
GCAATAGTGTATAACACTTTGCTTCACTCAAAAAGAAAGACAGAATGATTGAACTTTCATTAATTGACTTCTATTTGTGC  
TTTTTAGCCTTCTGCTATTCCTGTTTTAATTATGCTTATTATCTTTTGGTTCTCACTTGAACGTCAAGATCATAATGAAAC  
TTGTCACGCCTAAACGAACATGAAAATTTCTGTTTTCTTAGGAATCATCACAACCTGTAGCTGCATTTCCACCAAGAATGTAGTT  
TACAGTCATGTACTTAACATCAACCATATGTAGTTGATGACCCGTGCTTATTCACTTCTATTCTAAATGGTATATTAGAGTA  
GGAGCTATAAAATCAGCACCTTAAATTGAATTGTGCGTGGATGAGGCTGGTTCTAAATCACCCATTCACTGCATCGATATCGG  
TAATTATACAGTTTCTGTTTACCTTTTACAATTAATTGCCAGGAACCTAAATTTGGGTAGTCTTGTAGTGCGTTGTTCTGTTCT  
ATGAAGACTTTTTAGAGTATCATGACGTTGCTGTTGTTTTAGATTTTCATCTAAACGAACAACTAAATGTCTCTAAATGGACC  
CCAAAATCAGCGAAATGCACCCCGCATTACGTTTGGTGGACCCCTCAGATTCAACTGGCAGTAACCCAGAAATGGAGAACGCAGTG  
GGGCGGATCAAAAACACGTGCGCCCAAGTTTACCAATAAATACTGCGTCTTGGTTACCGCTCTCACTCAACATGGCAAG  
GAAGACCTTAAATCCCTCGAGGACAAGGCGTTCCAATTAACACCAATAGCAGTCCAGATGACCAAATTTGGCTACTACCGAAG  
AGCTACCAGACGAATTCGTGGTGGTGACGGTAAAAATGAAAGATCTCAGTCCAAGATGGTATTTCTACTACCTAGGAACTGGGC  
CAGAAGCTGGACTTCCCTATGGTGCTAACAAAGACGGCATCATATGGGTTGCAACTGAGGGAGCCTTGAATACACCAAAAAGAT  
CACATTGGCACCCGCAATCCTGCTAACAAATGCTGCAATCGTGCTACAACCTTCTCAAGGAACAACATTGCCAAAAGGCTTCTA  
CGCAGAAGGGAGCAGAGGCGGACGTCAGCCCTTCTCGTTCCTCATCACGTAGTCGCAACAGTTCAAGAAATTCAACTCCAG  
GCAGCAGTAAACGAACTTCTCCTGCTAGAATGGCTGGCAATGGCGGTGATGCTGCTCTTGTCTTGTGCTGCTTGGACAGATTG  
AACCAGCTTGAGAGCAAAATGTTTGGTAAAGGCCAACAAACAAGGCCAACTGTCACTAAGAAATCTGCTGCTGAGGCTTC  
TAAGAAGCTTCGGCAAAAACGTAAGTCCACTAAAGCATACAATGTAACACAAGCTTTCGGCAGACGTGGTCCAGAACAACCC

AAGGAAAATTTGGGGACCAGGAACTAATCAGACAAGGAACTGATTACAAACATTGGCCGCAAATTGCACAATTTGCCCCCAGC  
GCTTCAGCGTTCTTCGGAATGTCGCGCATTGGCATGGAAGTCACACCTTCGGGAACGTGGTTGACCTACACAGGTGCCATCAA  
ATTGGATGACAAAGATCCAAATTTCAAAGATCAAGTCATTTTGCTGAATAAGCATATTGACGCATACAAAACATTCCCACCAA  
CAGAGCCTAAAAAGGACAAAAAGAAGGCTGATGAACTCAAGCCTTACCGCAGAGACAGAAGAAACAGCAAACACTGTGACT  
CTTCTTCCTGCTGCAGATTTGGATGATTTCTCCAAACAATTGCAACAATCCATGAGCAGTGCTGACTCAACTCAGGCCTAAAC  
TCATGCAGACCACACAAGGCAGATGGGCTATATAAACGTTTTTCGCTTTTCCGTTTACGATATATAGTCTACTCTTGTGCAGAA  
TGAATTCTCGTAACTACATAGCACAAAGTAGATGTAGTTAACTTTAATCTCACATAGCAATCTTTAATCAGTGTGTAACATTAG  
GGAGGACTTGAAAGAGCCACCACATTTTCACCGAGGCCACGCGGAGTACGATCGAGTGTACAGTGAACAATGCTAGGGAGAGC  
TGCCTATATGGAAGAGCCCTAATGTGTAATAATTTTAGTAGTGCTATCC



Wuhan-1

ATTAAGGTTTATACCTTCCAGGTAACAAACCAACCACTTTTCGATCTCTTGTAGATCTGTTCTCTAAACGAACTTTAAAAAT  
CTGTGTGGCTGTCACTCGGCTGCATGCTTAGTGCACCTCACGCAGTATAATTAATAACTAATTACTGTGCTTGACAGGACACGA  
GTAACCTGTCTATCTTCTGCAGGCTGCTTACGGTTTCGTCCTGTTGCGACGGATCATCAGCACATCTAGGTTTCGTCGCGGT  
GTGACCGAAAGGTAAAGATGGAGACCTTGTCCCTGGTTTTCAACGAGAAAAACACACGTCCAACCTCAGTTTGCCTGTTTTACAGG  
TTCGCGACGTGCTCGTACGTGGCTTTGGAGACTCCGTTGGAGGAGGTCCTATCAGAGGCACGTCAACATCTTAAAGATGGCACT  
TGTGGCTTAGTGAAGTTGAAAAAGGCGTTTTGCCTCAACTTGAACAGCCCTATGTGTTTCATCAAACGTTCCGGATGCTCGAAC  
TGCACCTCATGGTCATGTTATGGTTGAGCTGGTAGCAGAACTCGAAGGCATTACAGTACGGTCGTAGTGGTGGACACTTTGGTG  
TCCTTGTCCCTCATGTGGCGAAAATACCAAGTGGCTTACCGCAAAGGTTCTTCTTCGTAAGAACGGTAAATAAGGAGCTGGTGGC  
CATAGTTACGGCGCCGATCTAAAAGTCAATTTGACTTAGGGCAGCAGCTTGGCACTGATCCTTATGAAGATTTTCAAGAAAAGCTG  
GAACACTAAACATAGCAGTGGTGTACCCGTAACCTCATGCGTGGAGCTTAAACGGAGGGGCATACACTCGCTATGTCGATAACA  
ACTTCTGTGGCCCTGATGGCTACCCCTTGAGTGCATTAAGACCTTCTAGCACGTGCTGGTAAAGCTTTCATGCACTTTTGTCC  
GAACACTGGACTTTATTGACACTAAGAGGGGTGTAATGCTGCTGCGTGAACATGAGCATGAAATTGCTTGGTACACGGAAACG  
TTCTGAAAAGAGCTATGAATTGCAGACACCTTTTGAATTAATTTGGCAAAGAAATTTGACACCTTCAATGGGGAATGTCCAA  
ATTTTGTATTTCCCTAAAATCCATAATCAAGACTATTCAACCAAGGGTTGAAAAGAAAAAGCTTGATGGCTTATGGGTAGA  
ATTCGATCTGTCTATCCAGTTGCGTCAACCAATGAATGCAACCAATGTGCCTTTCAACTTCCATGAAGTGTGATCATTGTGG  
TGAAACTTCATGGCAGACGGGCGATTTTGTAAAGCCACTTGCGAATTTGTGGCACTGAGAAATTTGACTAAAAGAAGGTGCCA  
CTACTTGTGGTTACTTACCCCAAAATGCTGTTGTTAAATTTATTGTCCAGCATGTCACAATTCAGAAGTAGGACCTGAGCAT  
AGTCTTGCCGAATACCAATAATGAATCTGGCTTGAACCAATTCTTCGTAAGGGTGGTCGCACTATTGCCTTTGGAGGCTGTGT  
GTTCTTATGTTGGTTCGACATAACCAAGTGTGCCTATTGGGTTCCACGTGCTAGCGCTAACATAGGTTGTAACCATAACAGGTG  
TTGTTGGAGAAGGTTCGAAAGGTCTTAATGACAACCTTCTTGAATACTCCAAAAAGAGAAAGTCAACATCAATATTGTTGGT  
GACTTTAACTTAATGAAGAGATCGCCATTATTTTGGCATCTTTTTCTGCTTCCACAAGTGTCTTTTGTGGAAACTGTGAAAGG  
TTTGGATTATAAAGCATTCAAACAAATGTTGAAATCCTGTGGTAATTTTAAAGTTACAAAAGGAAAAGCTAAAAAAGGTGCCT  
GGAATATTGGTGAACAGAAAATCAATACTGAGTCCCTTTATGCATTTGCATCAGAGGCTGCTCGTGTGTACGATCAATTTTC  
TCCCGCACTCTTGAACCTGCTCAAAATCTGTGCGTGTTTTACAGAAGGCCGCTATAACAATACTAGATGGAATTTCCACAGTA  
TTCACTGAGACTCATTGATGCTATGATGTTTACATCTGATTTGGCTACTAACAATCTAGTTGTAATGGCCTACATTACAGGTG  
GTGTTGTTAGTGTGACTTCGCAGTGGCTAACTAACATCTTTGGCACTGTTTATGAAAAACTCAAACCCGTCCTTGATTGGCTT  
GAAGAGAAGTTTAAAGGAAGGTGTAGAGTTTCTTAGAGACGGTTGGGAAAATGTTAAATTTATCTCAACCTGTGCTTGTGAAAT  
TGTCGGTGGACAAATTTGCACCTGTGCAAAGGAAATTAAGGAGAGTTCAGACACTTCTTAAGCTTGTAAATAAATTTTGG  
CTTTGTGTGCTGACTCTATCATTATTGGTGGAGCTAACTTAAAGCCTTGAATTTAGGTGAAACATTTGTACGCCTCAAAG  
GGATTGTACAGAAAAGTGTGTTAAATCCAGAGAAGAAACTGGCCTACTCATGCCTTAAAAGCCCCAAAAGAAAATATCTTCTT  
AGAGGGGAGAAACACTTCCACAGAAGTGTAAACAGAGGAAGTGTCTTGAACACTGGTGATTTACAACCATTAGAACAACCTA  
CTAGTGAAGCTGTTGAAAGCTCATTGGTTGGTACACCAGTTTGTATTAACGGGCTTATGTTGCTCGAAAATCAAAGACACAGAA  
AAGTACTGTGCCCTTGCACCTAATATGATGGTAAACAAACAATACCTTACACTCAAAGGCCGGTGCACCAACAAAGGTTACTTT  
TGGTGATGACACTGTGATAGAAGTGAAGGTTACAAGAGTGTGAATATCACTTTTGAACCTGATGAAAGGATTGATAAAGTAC  
TTAATGAGAAGTGCTCTGCCTATACAGTTGAACTCGGTACAGAAGTAAATGAGTTCGCCTGTGTTGTGGCAGATGCTGTCATA  
AAAATTTGCAACCAGTATCTGAATTACTTACACCACTGGGCATTGATTTAGATGAGTGGAGTATGGCTACATACTACTTATT  
TGATGAGTCTGGTGAGTTTAAATTTGGCTTACATATGATTTGTTCTTTCTACCCTCCAGATGAGGATGAAGAAGAAGGTGATT  
GTGAAGAAGAAGAGTTTGAAGCCTCAACTCAATATGAGTATGGTACTGAAGATGATTACCAAGGTAAACCTTTGGAAATTTGGT  
GCCACTTCTGCTGCTTCAACCTGAAGAAGAGCAAGAAGAAGATTTGGTTAGATGATGATAGTCAACAAACTGTTGGTCAACA  
AGACGGCAGTGAGGACAATCAGACAACCTACTATCAAACAATTTGTTGAGGTTCAAACCTCAATTAGAGATGGAACCTTACACCAG  
TTGTTCCAGACTATTGAAGTGAATAGTTTTAGTGGTTATTTAACTTACTGACAAATGATACATTTAAAATGCAGACATTGTA  
GAGAAGCTAAAAAGGTAACCAACAGTGGTTGTTAATGCAGCCAAATGTTTACCTTAAACATGGAGGAGGTGTTGCAGGAGC  
CTTAAATAAGGCTACTAACAATGCCATGCAAGTGAATCTGATGATTACATAGCTACTAATGGACCCTTAAAGTGGGTGGTA  
GTTGTGTTTTAAAGCGGACACAATCTTGCTAAACACTGTCTTCATGTTGTGCGCCCAAAATGTTAACAAGGTTGAAGACATTCAA  
CTTCTTAAAGAGTGCTTATGAAAAATTTAATCAGCACGAAGTTCTACTTGACCACTTATTATCAGCTGGTATTTTTGGTGTGTA  
CCCTATACATTTTAAAGAGTTTGTGTAGATACTGTTTCGACAAAATGTCCTACTTAGCTGCTTTGATAAAAAATCTCTATGACA  
AACTTGTTCAGGCTTTTTGGAAATGAAGAGTGAAGAGCAAGTGAACAAAAGATCGCTGAGATTCCTAAAAGAGGAAGTTAAG  
CCATTTATAACTGAAAGTAAACCTTCAAGTGAACAGAGAAAACAAAGATGATAAGAAAATCAAAGCTTGTGTTGAAGAAGTTAC  
AACAACTCTGGAAGAAAACCTAGTTTCCACAGAAAACCTTACTTTTATATTGACATTAATGGCAATCTTCATCCAGATTCTG  
CCACTCTTGTAGTACATTGACATCACTTTCTTAAAGAAAAGATGCTCCATATATAGTGGGTGATGTTGTTCAAGAGGGTGT

TTAACTGCTGTGGTTATACCTACTAAAAAGGCTGGTGGCACTACTGAAATGCTAGCGAAAAGCTTTGAGAAAAGTGCCAACAGA  
CAATTATATAACCACTTACCCGGGTCAGGGTTTTAAATGGTTACTACTGTAGAGGAGGCAAAGACAGTGCTTAAAAAGTGTA  
GTGCCTTTTACTTCTACCATCTATTATCTCTAATGAGAAGCAAGAAATTTCTTGGAACTGTTTCTTGGAAATTTGCGAGAAATG  
CTTGACATGCAGAAAGAACACGCAAATTAATGCCTGTCTGTGTGGAACTAAAGCCATAGTTTCAACTATACAGCGTAAATA  
TAAGGGTATTAATAACAAGAGGGTGTGGTTGATTATGGTGCTAGATTTTACTTTTACACCAGTAAAACAACTGTAGCGTCAC  
TTATCAACACACTTAAACGATCTAAATGAAACTCTTGTACAATGCCACTTGGCTATGTAACACATGGCTTAAATTTGGAAGAA  
GCTGCTCGGTATATGAGATCTCTCAAAGTGCCAGCTACAGTTTCTGTTTCTTACCTGATGCTGTTACAGCGTATAATGGTTA  
TCTTACTTCTTCTTAAAAACACCTGAAGAACATTTTTATTGAAACCATCTCACTTGTCTGGTTTCTATAAAAGATTGGTCTTATT  
CTGGACAATCTACACAACCTAGGTATAGAATTTCTTAAAGAGAGGTGATAAAAAGTGATATTACACTAGTAATCCTACCACATTC  
CACCTAGATGGTGAAGTTATCACCTTTGACAATCTTAAAGACACTTCTTTCTTTGAGAGAAAGTGAGGACTATTAAGGTGTTTAC  
AACAGTAGACAACATTAACCTCCACACGCAAGTTGTGGACATGTCAATGACATATGGACAACAGTTTGGTCCAACCTATTTGG  
ATGGAGCTGATGTTACTAAAAATAAACCTCATAATTCACATGAAGGTAAAAATTTTATGTTTTACCTAATGATGACACTCTA  
CGTGTGAGGCTTTTGTAGTACTACCACACAACCTGATCCTAGTTTTCTGGGTAGGTACATGTCAGCATTAAATCACACTAAAAA  
GTGAAAATACCCACAAGTTAATGGTTTAACTTCTATTAATGGGCAGATAACAACCTGTTATCTTGCCACTGCATTGTTAACAC  
TCCAACAAATAGAGTTGAAGTTTAAATCCACCTGCTCTACAAGATGCTTATTACAGAGCAAGGGCTGGTGAAGCTGCTAACTTT  
TGTGCACTTATCTTAGCCTACTGTAATAAGACAGTAGGTGAGTTAGGTGATGTTAGAGAAAACAATGAGTTACTTGTTTCAACA  
TGCCAATTTAGATTTCTGCAAAAAGAGTCTTGAACGTGGTGTGTA AAAACTTGTGGACAACAGCAGACAACCCTTAAGGGTGTAG  
AAGCTGTTATGTACATGGGCACACTTTCTTATGAACAATTTAAGAAAAGGTGTTTACAGATACCTTGTACGTGTGGTAAACAAGCT  
ACAAAATATCTAGTACAACAGGAGTCACCTTTTGTATGATGTCAGCACCACCTGCTCAGTATGAACTTAAGCATGGTACATT  
TACTTGTGCTAGTGAGTACACTGGTAAATTACCAGTGTGGTCACTATAAACATATAACTTCTAAAGAACTTTGTATTGCATAG  
ACGGTGCTTTACTTACAAAAGTCTCAGAATACAAAAGTCTTATTACGGATGTTTTCTACAAAAGAAAACAGTTACACAACAACC  
ATAAAAACCAAGTTACTTATAAATTTGGATGGTGTGTTTGTACAGAAAATGACCCTAAGTTGGACAATTTATAAGAAAAGACAA  
TTCTTATTTTACAGAGCAACCAATTTGATCTTGTACAAAACCAACCATATCCAAACGCAAGCTTCGATAATTTTAAAGTTTGTAT  
GTGATAATATCAAATTTGCTGATGATTTAAACCAGTTAACTGGTTATAAGAAAACCTGCTTCAAGAGAGCTTAAAGTTACATTT  
TTCCCTGACTTAAATGGTGATGTGGTGGCTATTGATTATAAACTACACACCCTCTTTTAAAGAAAAGGAGCTAAATTTGTTACA  
TAAACCTATTGTTTGGCATGTTAAACAATGCAACTAATAAAGCCACGTATAAACCAAAATACCTGGTGTATACGTTGTCTTTGGA  
GCACAAAACCAAGTTGAAACATCAAATTCGTTTGTATGACTGAAGTCAGAGGACGCGCAGGGAATGGATAATCTTGCCTGCGAA  
GATCTAAAACCAAGTCTCTGAAGAAGTAGTGGAAAATCCTACCATACAGAAAAGACGTTCTTGAGTGTAATGTGAAAACCTACCGA  
AGTTGTAGGAGACATTATACTTAAACCAGCAAATAATAGTTTAAAAATACAGAAGAGGTTGGCCACACAGATCTAATGGCTG  
CTTATGTAGACAATTTAGTCTTACTATTAAGAAAACCTAATGAATTATCTAGAGTATTAGGTTTGA AAAACCTTGTACTCAT  
GGTTTAGCTGCTGTTAATAGTGTCCCTTGGGATACTATAGCTAATTTATGCTAAGCCTTTTCTTAAACAAGTTGTTAGTACAAC  
TACTAACATAGTTACACGGTGTTTAAACCCTGTTTGTACTAATTTATATGCCTTATTTCTTTACTTTATTGCTACAATTTGTGTA  
CTTTTACTAGAAGTACAAAATCTAGAATTAAGCATCTATGCCGACTACTATAGCAAAGAATACTGTTAAGAGTGTGCGTAAA  
TTTTGTCTAGAGGCTTCATTTAATTTTGAAGTCACCTAATTTTTCTAAACTGATAAAATATTATAAATTTGGTTTTTACTATT  
AAGTGTTCCTAGGTTCTTTAATCTACTCAACCGCTGCTTTAGGTGTTTTAATGTCTAATTTAGGCATGCCTTCTTACTGTA  
CTGGTTACAGAGAAGGCTATTTGAACTCTACTAATGTCACTATTGCAACCTACTGTACTGGTTCTATACCTTGTAGTGTGTTGT  
CTTAGTGGTTTAGATTCTTTAGACACCTATCCTTCTTTAGAAAATACAAAATACCATTTTCACTTTTAAATGGGATTTAAC  
TGCTTTTGGCTTAGTTGAGAGTGGTTTTTGGCATATATTCTTTTCACTAGGTTTTTCTATGTACTTGGATTGGCTGCAATCA  
TGCAATTTGTTTTTTCAGCTATTTTGCAGTACATTTTATTAGTAATTTCTTGGCTTATGTGGTTAATAATTAATCTTGTACAAAATG  
GCCCGATTTTTCAGCTATGGTTAGAATGTACATCTTCTTTGCATCATTTTATTATGTATGGAAAAGTTATGTGCATGTTGTAGA  
CGTTTGTAAATTCATCAACTTGTATGATGTGTTACAAAACGTAATAGAGCAACAAGAGTCGAATGTACAACCTATTGTTAATGGTG  
TTAGAAGGTCCTTTTATGTCTATGCTAATGGAGGTAAGGCTTTTGC AAACTACACAATGGAAATTTGTGTTAATTTGTGATACA  
TTCTGTGCTGGTAGTACATTTATTAGTGATGAAGTTGCGAGAGACTTGTCACTACAGTTTAAAAGACCAATAAATCCTACTGA  
CCAGTCTTCTTACATCGTTGATAGTGTACAGTGAAGAATGGTTCCATCCATCTTTACTTTTGATAAAGCTGGTCAAAAAGACTT  
ATGAAAAGACATTTCTCTCTCATTTTGTAACTTAGACAACCTGAGAGCTAATAACAACCTAAAGGTTTCAATGCTTATTAATGTT  
ATAGTTTTTGTATGGTAAATCAAATGTGAAGAATCATCTGCAAAAATCAGCGTCTGTTTACTACAGTCAGCTTATGTGTCAACC  
TATACTGTTACTAGATCAGGCATTAGTGTCTGATGTTGGTGATAGTGCAGGAAAGTTGCAAGTTAAAATGTTTGTGCTTACGTTA  
ATACGTTTTTCACTCAACTTTTAAACGTACCAATGGAAAACTCAAACAACCTAGTTGCAACTGCAGAAAGCTGAACTTGCAAGAAT  
GTGTCCTTAGACAATGTCTTATCTACTTTTTATTTCAGCAGCTCGGCAAGGGTTTGTGATTGAGATGTAGAAAACCTAAAGATGT  
TGTTGAATGTCTTAAATTTGTCACATCAATCTGACATAGAAGTTACTGGCGATAGTTGTAATAACTATATGCTCACCTATAACA

AAGTTGAAAACATGACACCCCGTGACCTTGGTGCTTGTATTGACTGTAGTGC GCGTCATATTAATGCGCAGGTAGCAAAAAGT  
CACAAACATTGCTTTGATATGGAACGTTAAAGATTTTCATGTCATTGTCTGAACAACTACGAAAACAAATACGTAGTGCTGCTAA  
AAAGAATAACTTACCTTTTAAAGTTGACATGTGCAACTACTAGACAAGTTGTTAATGTTGTAACAACAAGATAGCACTTAAGG  
GTGGTAAAAATTGTTAATAATTGGTTGAAGCAGTTAATTTAAAGTTACACTTGTGTTCCCTTTTTGTTGCTGCTATTTTCTATTTA  
ATAACACCTGTTTCATGTCATGCTCTAAACATACTGACTTTTTCAAGTGAATCATAGGATACAAGGCTATTGATGGTGGTGTCC  
TCGTGACATAGCATCTACAGATACTTGTGTTTGTCTAACAAACATGCTGATTTTGACACATGGTTTAGCCAGCGTGGTGGTAGTT  
ATACTAATGACAAAAGCTTGCCCATGATTGCTGCAGTCATAACAAGAGAAGTGGGTTTTGTCGTGCCTGGTTTGCCTGGCACG  
ATATTACGCACAACATAATGGTGACTTTTTGCATTTCTTACCTAGAGTTTTAGTGCAGTTGGTAACATCTGTTACACACCATC  
AAAACCTATAGAGTACACTGACTTTGCAACATCAGCTTGTGTTTTGGCTGCTGAATGTACAATTTTTAAAGATGCTTCTGGTA  
AGCCAGTACCATATTGTTATGATACCAATGTACTAGAAGTTCTGTTGCTTATGAAAAGTTTACGCCCTGACACACGTTATGTG  
CTCATGGATGGCTCTATTATTCAATTTCTAACACCTACCTTGAAGGTTCTGTTAGAGTGGTAACAACCTTTTGATTCTGAGTA  
CTGTAGGCACGGCACTTGTGAAAAGATCAGAAGCTGGTGTGTTGTGTATCTACTAGTGGTAGATGGGTAACCAATGATTATT  
ACAGATCTTTACCAGGAGTTTTCTGTGGTGTAGATGCTGTAATTTACTTACTAATATGTTTACACCACTAATTCAACCTATT  
GGTGTCTTTGGACATATCAGCATCTATAGTAGCTGGTGGTATTGTAGCTATCGTAGTAACATGCCTTGCCTACTATTTTATGAG  
GTTTAGAAGAGCTTTTGGTGAATACAGTCATGTAGTTGCCTTAAACTTTACTATTCCCTTATGTCATTCACTGTACTCTGTT  
TAACACCAGTTTACTCATTCTTACCTGGTGTGTTATTCTGTTATTTACTTGTACTTGACATTTTATCTTACTAATGATGTTTCT  
TTTTTAGCACATATTCAGTGGATGGTTATGTTTACACCTTTAGTACCTTTCTGGATAACAATTGCTTATATCATTGTATTTCT  
CACAAAGCATTCTATTGGTCTTTAGTAATTACCTAAAGAGACGTGTAGTCTTAAATGGTGTGTTCCCTTTAGTACTTTTTGAAG  
AAGCTGCGCTGTGCACCTTTTTGTTAAATAAAGAAATGTATCTAAAGTTGCGTAGTGATGTGCTATTACCTCTTACGCAATAT  
AATAGATACTTAGCTCTTTATAAATAAGTACAAGTATTTTAGTGGAGCAATGGATACAACACTAGCTACAGAGAAGCTGCTTGTG  
TCATCTCGCAAAGGCTCTCAATGACTTCAGTAACTCAGGTTCTGATGTTCTTTACCAACCACCACAAACCTCTATCACCTCAG  
CTGTTTTGCAGAGTGGTTTTAGAAAAATGGCATTCCCATCTGGTAAAGTTGAGGGTTGTATGGTACAAGTAACTTGTGGTACA  
ACTACACTTAACGGTCTTTGGCTTGATGACGTAGTTTACTGTCCAAGACATGTGATCTGCACCTCTGAAGACATGCTTAACCC  
TAATTATGAAGATTTACTCATTTCGTAAGTCTAATCATAATTTCTTGGTACAGGCTGGTAATGTTCAACTCAGGGTTATTGGAC  
ATTCTATGCAAAAATTGTGTACTTAAGCTTAAGGTTGATACAGCCAATCCTAAGACACCTAAGTATAAGTTTTGTTTCGCATTCAA  
CCAGGACAGACTTTTTAGTGTAGCTTGTACAAATGGTTTACCATCTGGTGTTTACCAATGTGCTATGAGGCCCAATTTTAC  
TATTAAGGGTTCATTCCCTAATGGTTCATGTGGTAGTGTGGTTTTAACATAGATTATGACTGTGTCTCTTTTTGTTTACATGC  
ACCATATGGAATTACCAACTGGAGTTCATGCTGGCACAGACTTAGAAGTAACTTTTATGGACCTTTTGTGACAGGCAAAACA  
GCACAAGCAGCTGGTACGGACACAACCTATTACAGTTAATGTTTTAGCTTGGTTGTACGCTGCTGTTATAAAATGGAGACAGGTG  
GTTTCTCAATCGATTTACCACAACCTCTAATGACTTTAACCTTGTGGCTATGAAGTACAATTATGAACCTCTAACACAAGACC  
ATGTTGACATACTAGGACCTCTTTCTGCTCAAACCTGGAATTGCCGTTTTAGATATGTGTGCTTCATTAAAAAGAACTACTGCAA  
AATGGTATGAATGGACGTACCATATTGGGTAGTGTCTTATTAGAAAGTGAATTTACACCTTTTGATGTTGTTAGACAATGCTC  
AGGTGTTACTTTCCAAAGTGCAGTGAAAAGAACAATCAAGGGTACACACCCTGGTGTGTTACTCACAATTTTGACTTCACTTT  
TAGTTTTAGTCCAGAGTACTCAATGGTCTTTGTTCTTTTTTTTTGTATGAAAATGCCTTTTTTACCTTTTGCTATGGGTATTATT  
GCTATGTCTGCTTTTTGCAATGATGTTTGTCAAACATAAGCATGCATTTCTCTGTTTTGTTTTGTTTACCTTCTCTTGCCACTGT  
AGCTTATTTAATATGGTCTATATGCCTGCTAGTTGGGTGATGCGTATTATGACATGGTTGGATATGGTTGATACTAGTTTGT  
CTGGTTTTAAGCTAAAAGACTGTGTTATGTATGCATCAGCTGTAGTGTACTAATCCTTATGACAGCAAGAAGTGTGTATGAT  
GATGGTGCTAGGAGAGTGTGGACACTTATGAATGTCTTGACACTCGTTTATAAAGTTTATTATGGTAATGCTTTAGATCAAGC  
CATTTCCATGTGGGCTCTTATAATCTCTGTTACTTCTAACTACTCAGGTGTAGTTACAACCTGTCATGTTTTTGCCAGAGGTA  
TTGTTTTTATGTGTGTTGAGTATTGCCCTATTTTCTTCAAACTGGTAATACACTTCAAGTGTATAATGCTAGTTTATTGTTTCT  
TTAGGCTATTTTTGACTTGTACTTTTGGCCTTTTTGTTTACTCAACCGCTACTTTAGACTGACTCTTGGTGTGTTATGATTA  
CTTAGTTTCTACACAGGAGTTTAGATATATGAATTCACAGGGACTACTCCCACCAAGAATAGCATAGATGCCTTCAAACCTCA  
ACATTAATTTGTTGGGTGTTGGTGGCAAACCTTGTATCAAAGTAGCCACTGTACAGTCTAAAATGTCAGATGTAAAGTGCACA  
TCAGTAGTCTTACTCTCAGTTTTGCAACAACCTCAGAGTAGAATCATCATCTAAATTTGTTGGGCTCAATGTGTCCAGTTACACAA  
TGACATTCTCTTAGCTAAAAGATACTACTGAAGCCTTTGAAAAAATGGTTTCACTACTTTCTGTTTTGCTTTCCATGCAGGGTG  
CTGTAGACATAAAACAAGCTTTGTGAAGAAATGCTGGACAACAGGGCAACCTTACAAGCTATAGCCTCAGAGTTTAGTTCCCTT  
CCATCATATGCAGCTTTTGCTACTGCTCAAGAAGCTTATGAGCAGGCTGTTGCTAATGGTGATTCTGAAGTTGTTCTTAAAAA  
GTTGAAGAAGTCTTTGAATGTGGCTAAATCTGAATTTGACCGTGATGCAGCCATGCAACGTAAGTTGGAAAAGATGGCTGATC  
AAGCTATGACCCAAATGTATAAACAGGCTAGATCTGAGGACAAGAGGGCAAAAAGTTACTAGTGCTATGCAGACAATGCTTTTCT  
ACTATGCTTAGAAAAGTTGGATAATGATGCACTCAACAACATTATCAACAATGCAAGAGATGGTTGTGTTCCCTTGAACATAAT

ACCTCTTACAACAGCAGCCAAACTAATGGTTGTCATACCAGACTATAACACATATAAAAAATACGTGTGATGGTACAACATTTA  
CTTATGCATCAGCATTGTGGGAAATCCAACAGGTTGTAGATGCAGATAGTAAAAATGTTCAACTTAGTGAAATTAGTATGGAC  
AATTCACCTAATTTAGCATGGCCTCTTATTGTAACAGCTTTAAGGGCCAATTTCTGCTGTCAAATTACAGAATAATGAGCTTAG  
TCCTGTTGCACTACGACAGATGTCTTGTGCTGCCGGTACTACACAACTGCTTGCCTGATGACAATGCGTTAGCTTACTACA  
ACACAACAAAGGGAGGTAGGTTTGTACTTGCCTGTTATCCGATTTACAGGATTTGAAATGGGGCTAGATTTCCCTAAGAGTGAT  
GGAACGGTACTATCTATACAGAACTGGAACCCACTTGTAGGTTTGTACAGACACACCTAAAGTCTTAAAGTGAAGTATTT  
ATACTTTATTAAGGATTAACAACCTAAATAGAGGTATGGTACTTGGTAGTTTAGCTGCCACAGTACGTCTACAAGCTGGTA  
ATGCAACAGAAGTGCCTGCCAATTTCAACTGTATTATCTTTCTGTGCTTTTGTGCTAGATGCTGCTAAAGCTTACAAAAGATTAT  
CTAGCTAGTGGGGGACAACCAATCACTAATTGTGTTAAGATGTTGTGTACACACACTGGTACTGGTCAGGCAATAACAGTTAC  
ACCGGAAGCCAATATGGATCAAGAATCCTTTGGTGGTGCATCGTGTGTCTGTACTGCCGTTGCCACATAGATCATCCAAATC  
CTAAAGGATTTTGTGACTTAAAGGTAAGTATGTACAAAACCTACAACCTTGTGCTAATGACCCTGTGGGTTTTACACTTAAA  
AACACAGTCTGTACCGTCTGCCGATGTGGAAAAGTTATGGCTGTAGTTGTGATCAACTCCGCGAACCCATGCTTCAGTCAGC  
TGATGCACAATCGTTTTTAAACGGGTTTGCCTGTAAAGTGCAGCCGCTTACACCGTGCAGGACAGGCACTAGTACTGATGT  
CGTATACAGGGCTTTTGTACATCTACAATGATAAAGTAGCTGGTTTTGCTAAATTCCTAAAACTAATTGTTGTGCTTCCAAG  
AAAAGGACGAAGATGACAATTTAATTGATTCTTACTTTGTAGTTAAGAGACACACTTTCTCTAACTACCAACATGAAGAAA  
ATTTATAATTTACTTAAAGGATTGTCCAGCTGTTGCTAAACATGACTTCTTTAAGTTTAGAATAGACGGTGCATGGTACCACA  
TATATCACGTCAACGCTTACTAAAACACAATGGCAGACCTCGTCTATGCTTTAAGGCATTTTGTGAAAGGTAATTGTGACA  
CATTAAAAGAAATACTTGTACATACAATTTGTGTGATGATGATTATTTCAATAAAAAAGGACTGGTATGATTTTGTAGAAAAC  
CCAGATATATTACGCGTATACGCCAECTTAGGTGAACGTGTACGCCAAGCTTTGTTAAAAACAGTACAATTTCTGTGATGCCAT  
GCGAAATGCTGGTATTGTTGGTGTACTGACATTAGATAATCAAGATCTCAATGGTAACTGGTATGATTTCCGGTATTTCATAC  
AAACCACGCCAGGTAGTGGAGTTCCTGTTGTAGATTCTTATTATTCATTGTTAATGCCTATATTAACCTTGACCAGGGCTTTA  
ACTGCAGAGTCACATGTTGACACTGACTTAAACAAAGCCTTACATTAAGTGGGATTTGTTAAAAATGACTTCACGGAAGAGAG  
GTTAAAACTCTTTGACCCTTATTTTAAATATTGGGATCAGACATACCACCCAAATTTGTGTTAACTGTTTGGATGACAGATGCA  
TTCTGCATTGTGCAAACTTTAATGTTTTATTCTCTACAGTGTTCACACCTACAAGTTTTGGACCACTAGTGAGAAAAATATTT  
GTTGATGGTGTTCATTTGTAGTTTCAACTGGATACCACTTCAGAGAGCTAGGTGTTGTACATAATCAGGATGTAACCTTACA  
TAGCTCTAGACTTAGTTTTAAGGAATTACTTGTGTATGCTGCTGACCCTGCTATGCACGCTGCTTCTGGTAATCTATTACTAG  
ATAAACGCACTACGTGCTTTTCAAGTAGCTGCACCTACTAACAAATGTTGCTTTTCAAAGTGTCAAACCCGGTAAATTTAACAAA  
GACTTCTATGACTTTGCTGTGCTAAGGGTTTCTTTAAGGAAGGAAGTCTGTTGAATTAACAACTTCTTCTTTGCTCAGGA  
TGGTAATGCTGCTATCAGCGATTATGACTACTATCGTTATAATCTACCAACAATGTGTGATATCAGACAACCTACTATTTGTAG  
TTGAAGTTGTTGATAAGTACTTTGATTGTTACGATGGTGGCTGTATTAATGCTAACCAAGTCATCGTCAACAACCTAGACAAA  
TCAGCTGGTTTTCCATTTAATAAATGGGGTAAGGCTAGACTTTATTATGATTCAATGAGTTATGAGGATCAAGATGCACTTTT  
CGCATATACAAAACGTAATGTCATCCCTACTATAACTCAAATGAATCTTAAAGTATGCCATTAGTGCAAAGAATAGAGCTCGCA  
CCGTAGCTGGTGTCTCTATCTGTAGTACTATGACCAATAGACAGTTTTCATCAAAAAATTTATTGAAATCAATAGCCGCCACTAGA  
GGAGCTACTGTAGTAATTGGAACAAGCAAATTTCTATGGTGGTTGGCACAAACATGTTAAAAACTGTTTATAGTGATGTAGAAAA  
CCCTCACCTTATGGGTTGGGATTATCCTAAAATGTGATAGAGCCATGCCTAACATGCTTAGAATTTATGGCCTCACTTGTCTTG  
CTCGCAAACATACAACGTGTTGTAGCTTGTACACCGTTTCTATAGATTAGCTAATGAGTGTGCTCAAGTATTGAGTGAAATG  
GTCATGTGTGGCGGTTCACTATATGTTAAACCAGGTGGAACCTCATCAGGAGATGCCACAACCTGCTTATGCTAATAGTGT  
TAACATTTGTCAAGCTGTCACGGCCAATGTTAATGCACTTTTATCTACTGATGGTAAACAAAATTTGCCGATAAGTATGTCGCA  
ATTTACAACACAGACTTTATGAGTGTCTCTATAGAAAATAGAGATGTTGACACAGACTTTGTGAATGAGTTTTACGCATATTTG  
CGTAAACATTTCTCAATGATGATACTCTCTGACGATGCTGTTGTGTGTTTCAATAGCACTTATGCATCTCAAGGTCTAGTGGC  
TAGCATAAAGAACTTTAAGTCAAGTTCTTTATTATCAAAAACAAATGTTTTTATGTCTGAAGCAAAATGTTGGACTGAGACTGACC  
TTACTAAAGGACCTCATGAATTTTGTCTCAACATACAATGCTAGTTAAACAGGGTGATGATTATGTGTACCTTCTTACCCA  
GATCCATCAAGAATCCTAGGGGCCGGCTGTTTTGTAGATGATATCGTAAAAACAGATGGTACACTTATGATTGAACGGTTCGT  
GTCTTTAGCTATAGATGCTTACCCACTTACTAAACATCCTAATCAGGAGTATGCTGATGTCTTTTCAATTTGTACTTACAATA  
TAAGAAAAGCTACATGATGAGTTAACAGGACACATGTTAGACATGATTCTGTTATGCTTACTAATGATAACACTTCAAGGTAT  
TGGGAACCTGAGTTTTATGAGGCTATGTACACACCCGCATACAGTCTTACAGGCTGTTGGGGCTTGTGTTCTTTGCAATTCACA  
GACTTCAATTAAGATGTGGTGTGCTTGCATACGTAGACCATTCTTATGTTGTAAATGCTGTTACGACCATGTCATATCAACATCAC  
ATAAATTAGTCTTGTCTGTTAATCCGTATGTTTGCATGCTCCAGGTTGTGATGTCACAGATGTGACTCAACTTTACTTAGGA  
GGTATGAGCTATTATTGTAATCACATAAACCACCCATTAGTTTTCCATTGTGTGCTAATGGACAAGTTTTTGGTTTTATATAA  
AAATACATGTGTTGGTAGCGATAATGTTACTGACTTTAATGCAATTGCAACATGTGACTGGACAAATGCTGGTGATTACATTT

TAGCTAACACCTGTACTGAAAGACTCAAGCTTTTTGCAGCAGAAAACGCTCAAAGCTACTGAGGAGACATTTAAACTGTCTTAT  
GGTATTGCTACTGTACGTGAAGTGCTGTCTGACAGAGAATTACATCTTTCATGGGAAGTTGGTAAACCTAGACCACCACTTAA  
CCGAAATTATGTCTTTACTGGTTATCGTGTAACAAAAACAGTAAAGTACAAAATAGGAGAGTACACCTTTGAAAAAGGTGACT  
ATGGTGATGCTGTTGTTTACCGAGGTACAACAACCTTACAAAATAAATGTTGGTGATTATTTTGTGCTGACATCACATACAGTA  
ATGCCATTAAGTGCACCTACACTAGTGCCACAAGAGCACTATGTTAGAATTACTGGCTTATACCCAACACTCAATATCTCAGA  
TGAGTTTTCTAGCAATGTTGCAAATATCAAAAAGTTGGTATGCAAAAAGTATTCTACACTCCAGGGACCACCTGGTACTGGTA  
AGAGTCATTTTGTATTGGCCTAGCTCTCTACTACCCTTCTGCTCGCATAGTGTATACAGCTTGCTCTCATGCCGCTGTTGAT  
GCACTATGTGAGAAGGCATTAATAATTTGCCTATAGATAAATGTAGTAGAATTATACCTGCACGTGCTCGTGTAGAGTGT  
TGATAAATTCAAAAGTGAATTCACATTAGAACAGTATGTCTTTTGTACTGTAAATGCATTGCCTGAGACGCAGCAGATATAG  
TTGCTCTTTGATGAAATTTCAATGGCCACAATTTATGATTTGAGTGTGTCAATGCCAGATTACGTGCTAAGCACTATGTGTAC  
ATTGGCGACCTGCTCAATTACCTGCACCACGCACATTGCTAACTAAGGGCACACTAGAACCAGAATATTTCAATTCAGTGTG  
TAGACTTATGAAAATATAGGTCAGACATGTTCCCTCGGAACTTGTGCGGCTTGTCTGCTGAAAATGTTGACACTGTGAGTG  
CTTTGGTTTTATGATAATAAGCTTAAAGCACATAAAGACAAAATCAGCTCAATGCTTTAAAAATGTTTTATAAGGGTGTATCACG  
CATGATGTTTCATCTGCAATTAACAGGCCACAAATAGGCGTGGTAAGAGAATTCCTTACACGTAACCCTGCTTGGAGAAAAGC  
TGTCTTTATTTACCTTATAAATTCACAGAATGCTGTAGCCTCAAAGATTTTGGGACTACCAACTCAAAGTGTGATTTCATCAC  
AGGGCTCAGAAATGACTATGTCATATCACTCAAACACTGAAACAGCTCACTCTTGTAAATGTAACAGATTTAATGTTGCT  
ATTACCAGAGCAAAAAGTAGGCATACTTTGCATAATGTCTGATAGAGACCTTTATGACAAGTTGCAATTTACAAGTCTTGAAAT  
TCCACGTAGGAATGTGGCAACTTTACAAGCTGAAAATGTAACAGGACTCTTTAAAGATTGTAGTAAGGTAATCACTGGGTTAC  
ATCCTACACAGGCACCTACACACCTCAGTGTGACACTAAAATTCAAAAGTAAAGTTTATGTGTTGACATACCTGGCATACT  
AAGGACATGACCTATAGAAGACTCATCTCTATGATGGGTTTTAAAAATGAATTTATCAAGTTAATGGTTACCTAACATGTTTAT  
CACCCGCAAGAAAGCTATAAGACATGTACGTGCATGGATTGGCTTCGATGTGAGGGGTGCATGCTACTAGAGAAGCTGTTG  
GTACCAATTTACCTTTACAGCTAGGTTTTTCTACAGGTGTTAACCTAGTTGCTGTACCTACAGGTTATGTTGATACACCTAAT  
AATACAGATTTTTCCAGAGTTAGTGCTAAACCACCGCCTGGAGATCAATTTAAACACCTCATACCACTTATGTACAAAAGGACT  
TCCTTGGAAATGATGTGCTATAAAGATTGTACAAAATGTTAAGTGACACACTTAAAAATCTCTGACAGAGTCGATTTTGTCT  
TATGGGCACATGGCTTTGAGTTGACATCTATGAAGTATTTTGTGAAAATAGGACCTGAGCGCACCTGTTGTCTATGTGATAGA  
CGTGCCACATGCTTTTCACTGCTTCAGACACTTATGCCGTTTGGCATCATTCTATTGGATTTGATTACGTCTATAATCCGTT  
TATGATTGATGTTCAACAAATGGGTTTTACAGGTAACCTACAAAGCAACCATGATCTGTATTGTCAAGTCCATGGTAATGCAC  
ATGTAGCTAGTTGTGATGCAATCATGACTAGGTGTCTAGCTGTCCACGAGTGCTTTGTTAAGCGTGTGACTGGACTATTGAA  
TATCCTATAAATGGTGATGAACTGAAGATTAATGCGGCTTGTAGAAAAGTTCAACACATGGTTGTTAAAGTGCATTATTAGC  
AGACAAAATCCAGTTCTTCACGACATTGGTAACCCTAAAGCTATTAAGTGTGTACCTCAAGCTGATGTAGAATGGAAGTTCT  
ATGATGCACAGCCTTGATGACAAAAGCTTATAAAAATAGAAGAATTATTCTATTCTTATGCCACACATTCTGACAAAATTCACA  
GATGGTGTATGCCATTTTTGGAATGCAATGTCGATAGATATCCTGCTAATTCATTGTTTGTAGATTTGACACTAGAGTGCT  
ATCTAACCTTAACTTGCCTGGTTGTGATGGTGGCAGTTTGTATGTAATAAACATGCATTCCACACACCAGCTTTTGATAAAA  
GTGCTTTTTGTTAATTTAAAAACAATTACCATTTTTCTATTACTCTGACAGTCCATGTGAGTCTCATGGAAAAACAAGTGTGCA  
GATATAGATTATGTACCACTAAAAGTCTGCTACGTGTATAACACGTTGCAATTTAGGTGGTGTCTGTCTGTAGACATCATGCTAA  
TGAGTACAGATTGTATCTCGATGCTTATAACATGATGATCTCAGCTGGCTTTAGCTTGTGGGTTTACAAAACAATTTGATACTT  
ATAACCTCTGGAACACTTTTACAAGACTTCAGAGTTTAGAAAAATGTGGCTTTTAAATGTTGTAATAAAGGGACACTTTGATGGA  
CAACAGGGTGAAGTACCAGTTTCTATCATTAAATAACACTGTTTACACAAAAGTTGATGGTGTGATGTAGAATGTTTAAAA  
TAAAAACAACATTACCTGTTAATGTAGCATTGAGCTTTGGGCTAAGCGCAACATTAAACCAGTACCAGAGGTGAAAAACTCA  
ATAATTTGGGTGTGGACATTGCTGCTAATACTGTGATCTGGGACTACAAAAGAGATGCTCCAGCACATATATCTACTATTGGT  
GTTTGTCTATGACTGACATAGCCAAGAAACCAACTGAAACGATTTGTGCAACCACTCACTGTCTTTTTTGTGATGGTAGAGTTGA  
TGGTCAAGTAGACTTATTTAGAAAATGCCCGTAATGGTGTCTTATTACAGAAGGTAGTGTTAAAGGTTTACAACCATCTGTAG  
GTCCCAAACAAGCTAGTCTTAATGGAGTCACATTAATGGAGAAGCCGTAAAAACACAGTTCAATTTATATAAGAAAAGTTGAT  
GGTGTGTCCAACAATTACCTGAAACTTACTTTACTCAGAGTAGAAAATTTACAAGAAATTTAAACCAGGAGTCAAATGGAAAT  
TGATTTCTTAGAATTAGCTATGGATGAATTCATTGAACGGTATAAATTAGAAGGCTATGCCCTCGAACATATCGTTTATGGAG  
ATTTTAGTCATAGTCAGTTAGGTGGTTTACATCTACTGATTGGACTAGCTAAACGTTTTTAAAGGAATCACCTTTTGAATTAGAA  
GATTTTATTCTATGGACAGTACAGTTAAAAACTATTTTATAACAGATGCGCAACAGGTTTCACTAAGTGTGTGTGTTCTGT  
TATTGATTTATTACTTGATGATTTTTGTTGAAATAATAAAAATCCCAAGATTTATCTGTAGTTTCTAAGGTTGTCAAAGTGACTA  
TTGACTATACAGAAAATTCATTTATGCTTTGGTGTAAAGATGGCCATGTAGAAACATTTTACCCAAAATTACAATCTAGTCAA  
CGTGGCAACCGGGTGTGCTATGCCTAATCTTTACAAAATGCAAAGAATGCTATTAGAAAAGTGTGACCTTCAAAAATATGG

TGATAGTGCAACATTACCTAAAGGCATAATGATGAATGTCGCAAAATATACTCAACTGTGTCAATATTTAAACACATTAACAT  
TAGCTGTACCTATAATATGAGAGTTATACATTTTTGGTGCTGGTTCTGATAAAGGAGTTGCACCAGGTACAGCTGTTTTAAGA  
CAGTGGTTGCCACGGGTACGCTGCTTGTGCGATTAGATCTTAATGACTTTGTCTCTGATGCAGATTCAACTTTGATTGGTGA  
TTGTGCAACTGTACATACAGTAATAAATGGGATCTCATTATTAGTGATATGTACGACCCTAAGACTAAAAATGTTACAAAAG  
AAAATGACTCTAAAGAGGGTTTTTTCACTTACATTTGTGGGTTTTATACAACAAAAGCTAGCTCTTGGAGGTTCCGTGGCTATA  
AAGATAACAGAACATTCTTGGAAATGCTGATCTTTATAAGCTCATGGGACACTTCGCATGGTGGACAGCCTTTGTTACTAATGT  
GAATGCGTCATCATCTGAAGCATTTTTAATTGGATGTAATTATCTTGGCAAACCACGCGAACAAAATAGATGGTTATGTCATGC  
ATGCAAAATTACATATTTTGGAGGAATACAAAATCCAATTCAGTTGTCTTCTTATTCTTTATTTGACATGAGTAAATTTCCCTT  
AAATTAAGGGGTACTGCTGTTATGTCTTTAAAAAGGTTCAAAATCAATGATATGATTTTATCTCTTCTTAGTAAAGGTAGACT  
TATAATTAGAGAAAAACAACAGAGTTGTTATTTCTAGTGATGTTCTTGTAAACAACTAAACGAACAATGTTTGTTTTTCTTGT  
TTATTGCCACTAGTCTCTAGTCAGTGTGTTAATCTTACAACCAGAACTCAATTACCCCTGCATACACTAATCTTTTACACG  
TGGTGTATTATTACCTGACAAAGTTTTAGATCCTCAGTTTTACATTCAACTCAGGACTTGTCTTACCTTTCTTTTCCAATG  
TTACTTGGTCCATGCTATACATGTCTCTGGGACCAATGGTACTAAGAGGTTTGATAACCTGTCTTACCATTAAATGATGGT  
GTTTTATTTGCTTCCACTGAGAAAGTCTAACATAATAAGAGGCTGGATTTTTGGTACTACTTTAGATTGAAAGACCAGTCCCT  
ACTTATTGTTAATAACGCTACTAATGTTGTTATTTAAAGTCTGTGAATTTCAATTTTGTAAATGATCCATTTTTGGGTGTTTATT  
ACCACAAAAACAACAAAAGTTGGATGGAAAGTGAGTTCAGAGTTTATTCTAGTGCGAATAAATGCACTTTTTGAATATGTCTCT  
CAGCTTTTTCTTATGGACCTTGAAGGAAAAACAGGGTAATTTCAAAAATCTTAGGGAAATTTGTGTTAAGAATATTGATGGTTA  
TTTTAAAAATATATTCTAAGCACACGCCATTAAATTTAGTGCGTGATCTCCCTCAGGGTTTTTTCGGCTTTAGAACCATTGGTAG  
ATTTGCCAATAGGTATTAACATCACTAGGTTTTCAAACTTTACTTGGCTTTACATAGAAGTTATTTGACTCCTGGTGATTCTTCT  
TCAGGTTGGACAGCTGGTGTGCGAGCTTATTATGTGGGTTATCTTCAACCTAGGACTTTTTCTATTAAAAATAAATGAAAATGG  
AACCATTACAGATGCTGTAGACTGTGCACTTGACCCTCTCTCAGAAAACAAAGTGACGTTGAAATCCTTCACTGTAGAAAAAG  
GAATCTATCAAACTTCTAACTTTAGAGTCCAACCAACAGAATCTATTGTTAGATTTTCTAATATTACAACTTGTGCCCTTTT  
GGTGAAGTTTTTAACGCCACCAGATTTGCATCTGTTTATGCTTGGAACAGGAAGAGAATCAGCAACTGTGTTGCTGATTATTC  
TGTCTATATAAATCCGCATCATTTTTCACTTTTTAAGTGTATGGAGTGTCTCCTACTAAATTAATGATCTCTGCTTTACTA  
ATGTCATGCGAGATTCATTTGTAATTAGAGGTGATGAAGTCAGACAAATCGCTCCAGGGCAAACCTGGAAAGATTGCTGATTAT  
AATTATAAATACCAGATGATTTTACAGGCTGCGTTATAGCTTGGAAATCTAACAACTTTGATTCTAAGGTTGGTGGTAATTA  
TAATTACCTGTATAGATTGTTTAGGAAGTCTAATCTCAAACCTTTTGGAGAGAGATATTTCAACTGAAATCTATCAGGCCGGTA  
GCACACCTTGAATGGTGTGAAAGTTTTAATTGTTACTTTCTTTACAATCATATGGTTTCCAACCCACTAATGGTGTGGT  
TACCAACCATACAGAGTAGTAGTACTTTCTTTTGAACCTTCTACATGCACCAGCAACTGTTTGTGGACCTAAAAAGTCTACTAA  
TTTGGTTAAAAACAAATGTGTCAATTTCAACTTCAATGGTTTAAACAGGCACAGGTGTTCTTACTGAGTCTAACAAAAAGTTTC  
TGCCTTTCCAACAATTTGGCAGAGACATTGCTGACACTACTGATGCTGTCCGTGATCCACAGACACTTGAGATTCTTGACATT  
ACACCATGTTCTTTTGGTGGTGTGAGTGTATAACACCAGGAACAAAATACTTCTAACCAGGTTGCTGTTCTTTATCAGGATGT  
TAACTGCACAGAAGTCCCTGTTGCTATTTCATGCAGATCAACTTACTCCTACTTGGCGTGTATTATTCTACAGGTTCTAATGTTT  
TTCAAACACGTGCAGGCTGTTAATAGGGGCTGAACATGTCAACAACTCATATGAGTGTGACATACCCATTGGTGCAGGTATA  
TGCCTAGTTATCAGACTCAGACTAATTTCTCTCGGCGGGCACGTAGTGTAGCTAGTCAATCCATCATTGCCTACACTATGTC  
ACTTGGTGCAGAAAAATCAGTTGCTTACTCTAATAACTCTATTGCCATACCCACAAAATTTACTATTAGTGTACCACAGAAA  
TTCTACCAGTGTCTATGACCAAGACATCAGTAGATTGTACAATGTACATTTGTGGTGATTCAACTGAATGCAGCAATCTTTTG  
TTGCAATATGGCAGTTTTTTGTACACAATTAACCGTGCTTTAACTGGAATAGCTGTTGAACAAGACAAAAACACCCAAGAAGT  
TTTTGCACAAGTCAAAACAAATTTACAAAACACCACCAATTAAGATTTTTGGTGGTTTTAATTTTTTACAAAATATTACCAGATC  
CATCAAAACCAAGCAAGAGGTCATTTATTGAAGATCTACTTTTTCAACAAAAGTGACACTTGCAGATGCTGGCTTCATCAAAACAA  
TATGGTGATTGCCCTGGTGATATTGCTGCTAGAGACCTCATTTGTGCACAAAAGTTTAAACGGCCCTTACTGTTTTGCCACCTTT  
GCTCACAGATGAAATGATTGCTCAATACACTTCTGCACTGTTAGCGGGTACAATCACTTCTGGTTGGACCTTTGGTGCAGGTG  
CTGCATTACAAATACCATTGCTATGCAAATGGCTTATAGGTTTAAATGGTATTGGAGTTACACAGAATGTTCTCTATGAGAAC  
CAAAAATGATTGCCAACCAATTTAATAGTGCTATTGGCAAAAATCAAGACTCACTTTCTTCCACAGCAAGTGCCTTGGAAA  
ACTTCAAGATGTGGTCAACCAAAATGCACAAGCTTTAAACACGCTTGTAAACAACCTTAGCTCCAATTTTTGGTGCATTTCAA  
GTGTTTTAAATGATATCTTTTACGCTCTTGACAAAAGTTGAGGCTGAAGTGCAAAATGATAGGTTGATCACAGGCAGACTTCAA  
AGTTTGCAGACATATGTGACTCAACAATTAATTAGAGCTGCAGAAATCAGAGCTTCTGCTAATCTTGTGCTACTAAAATGTC  
AGAGTGTGACTTGGACAAATCAAAAAGAGTTGATTTTTGTGAAAAGGGCTATCATCTTATGCTCTTCCCTCAGTCAGCACCTC  
ATGGTGTAGTCTTCTTGCATGTGACTTATGTCCCTGCACAAGAAAAGAACTTCACAACTGCTCCTGCCATTTGTCATGATGGA  
AAAGCACACTTTCCTCGTGAAGGTGTCTTTGTTTCAAATGGCACACACTGGTTTGAACACAAAAGGAATTTTTATGAACCACA

AATCATTACTACAGACAACACATTTGTGTCTGGTAACTGTGATGTTGTAATAGGAATTGTCAACAACACAGTTTATGATCCTT  
TGCAACCTGAATTAGACTCATTCAAGGAGGAGTTAGATAAAATATTTTAAAGAATCATAACATCACCAGATGTTGATTTAGGTGAC  
ATCTCTGGCATTAAATGCTTCAGTTGTAACATTCAAAAAAGAAATTGACCGCCTCAATGAGGTTGCCAAGAAATTTAAATGAATC  
TCTCATCGATCTCCAAGAACTTGAAAAGTATGAGCAGTATATAAAATGGCCATGGTACATTTGGCTAGGTTTTATAGCTGGCT  
TGATTGCCATAGTAATGGTGACAATTATGCTTTGCTGTATGACCAGTTGCTGTAGTTGTCTCAAGGGCTGTTGTTCTTGTGGA  
TCCTGCTGCAAATTTGATGAAGACGACTCTGAGCCAGTGCTCAAAGGAGTCAAATACATTACACATAAACGAACTTATGGAT  
TTGTTTATGAGAATCTTCACAATTGAACTGTAACCTTGAAGCAAGGTGAAATCAAGGATGCTACTCCTTCAGATTTTGTTCG  
CGCTACTGCAACGATACCGATAACAAGCCTCACTCCCTTTCGGATGGCTTATTGTTGGCGTTGCACTTCTTGCTGTTTTTCAGA  
GCGCTTCAAAAATCATAACCTCAAAAAGAGATGGCAACTAGCACTCTCAAGGGTGTTCACCTTGTGTTGCAACTTGCTGTTG  
TTGTTTGAACAGTTTACTCACACCTTTTGTCTGTTGCTGCTGGCCTTGAAGCCCCTTTTCTATCTTTATGCTTTAGTCTA  
CTTCTTGCAAGTATAAACTTTGTAAGAAATAAATGAGGCTTTGGCTTTGCTGGAAATGCCGTTCCAAAAACCCATTACTTT  
ATGATGCCAACTATTTTCTTTGCTGGCATACTAATTGTTACGACTATTGTATACCTTACAATAGTGTAACTTCTTCAATTGTC  
ATTACTTCAGGTGATGGCACAACAAGTCTTATTTCTGAACATGACTACCAGATTGGTGGTTATACTGAAAAATGGGAATCTGG  
AGTAAAAGACTGTGTTGTATTACACAGTTACTTCACTTCAGACTATTACCAGCTGACTCAACTCAATTGAGTACAGACACTG  
GTGTTGAACATGTTACCTTCTTCATCTACAATAAAATTTGTTGATGAGCCTGAAGAACATGTCCAAATTCACACAATCGACGGT  
TCATCCGGAGTTGTTAATCCAGTAATGGAACCAATTTATGATGAACCGACGACGACTACTAGCGTGCCTTTGTAAGCACAAGC  
TGATGAGTACGAACTTATGTACTCATTGCTTTTCGGAAGAGACAGGTACGTTAATAGTTAATAGCGTACTTCTTTTTCTTGCTT  
TCGTGGTATTCTTGCTAGTTTACACTAGCCATCCTTACTGCGCTTCGATTGTGTGCGTACTGCTGCAATATTGTTAACGTGAGT  
CTTGTAACCTTCTTTTTACGTTTACTCTCGTGTAAAAATCTGAATTCTTCTAGAGTTCTGTATCTTCTGGTCTAAACGAA  
CTAAATATTATATTAGTTTTTCTGTTTGGAACTTTAATTTTAGCCATGGCAGATTCCAACGGTACTATTACCGTTGAAGAGCT  
TAAAAAGCTCCTTGAACAATGGAACCTAGTAATAGGTTTCTTATTCTTACATGGATTTGTCTTCTACAATTTGCCTATGCCA  
ACAGGAATAGGTTTTTGTATATAATTAAGTTAATTTTCTCTGGCTGTTATGGCCAGTAACTTTAGCTTGTTTTTGTGCTTGCT  
GCTGTTTACAGAATAAATTTGGATCACCGGTGGAATTTGCTATCGCAATGGCTTGTCTTGTAGGCTTGATGTGGCTCAGCTACTT  
CATTGCTTCTTTCAGACTGTTTTCGCGTACGCGTTCCATGTGGTCATTCAATCCAGAACTAACATTCTTCTCAACGTGCCAC  
TCCATGGCACTATTCTGACCAGACCGCTTCTAGAAAAGTGAACCTCGTAATCGGAGCTGTGATCCTTCGTGGACATCTTCGTATT  
GCTGGACACCATCTAGGACGCTGTGACATCAAGGACCTGCCAAAAGAAATCACTGTTGCTACATCACGAACGCTTTCTTATTA  
CAAATTTGGGAGCTTCGCAGCGTGTAGCAGGTGACTCAGGTTTTGCTGCATACAGTCGCTACAGGATTGGCAACTATAAAATTA  
ACACAGACCATTCCAGTAGCAGTGACAATATTGCTTTGCTTGTACAGTAAGTGACAACAGATGTTTCATCTCGTTGACTTTCA  
GGTACTATAGCAGAGATATTACTAATTAATTAATGAGGACTTTTTAAAGTTTCCATTTGGAATCTTGATTACATCATAAACCTCA  
TAATTAATAAATTTATCTAAGTCACTAACTGAGAATAAATATTCTCAATTAGATGAAGAGCAACCAATGGAGATTGATTAACG  
AACATGAAAATTAATCTTTTTCTTGGCACTGATAACACTCGCTACTTGTGAGCTTTATCACTACCAAGAGTGTGTTAGAGGTAC  
AACAGTACTTTTTAAAAGAACCTTGCTCTTCTGGAACATACGAGGGCAATTCACCATTTCATCCTCTAGCTGATAACAAATTTG  
CACTGACTTGCTTTAGCACTCAATTTGCTTTTGTCTTGTCTGACGGCGTAAAAACGCTCTATCAGTTACGTGCCAGATCAGTT  
TCACCTAACTGTTTCATCAGACAAGAGGAAGTTCAAGAACTTTACTCTCCAATTTTTCTTATTGTTGCGGCAATAGTGTATT  
AACACTTTGCTTCACACTCAAAAGAAAAGACAGAATGATTGAACTTTCATTAATTGACTTCTATTTGTGCTTTTTAGCCTTTCT  
GCTATTCCTGTTTTAATTATGCTTATTATCTTTTGGTTCTCACTGAACTGCAAGATCATAATGAACTTGTACGCCTAAA  
CGAACATGAAAATTTCTGTTTTCTTAGGAATCATCACAACCTGTAGCTGCATTTACCAAGAATGTAGTTTACAGTCATGACT  
CAACATCAACCATATGTAGTTGATGACCCGTGCTTATTCACTTCTATTCTAAATGGTATATTAGAGTAGGAGCTAGAAAAATC  
AGCACCTTAATTTGAATTTGTGCGTGGATGAGGCTGGTTCTAAATCACCCATTCACTACATCGATATCGGTAATTTATACAGTTT  
CCTGTTTACCTTTTACAATTAATTTGCCAGGAACCTAAATTTGGGTAGTCTTGTAGTGCGTTGTTCTATGAAGACTTTTTA  
GAGTATCATGACGTTTCGTGTTGTTTTAGATTTTCATCTAAACGAACAACTAAAATGTCTGATAATGGACCCCAAAATCAGCGA  
AATGCACCCCGCATTACGTTTGGTGGACCCTCAGATTCAACTGGCAGTAACCAGAATGGAGAACGCACTGGGGCGCGATCAAA  
ACAACGTGCGCCCAAGGTTTACCCAATAAATACTGCGTCTTGGTTCAACGCTCTCACTCAACATGGCAAGGAAGACCTTAAAT  
TCCCTCGAGGACAAGGCGTTCCAATTAACACCAATAGCAGTCCAGATGACCAAATTTGGCTACTACCGAAGAGCTACCAGACGA  
ATTCGTGGTGGTGACGGTAAAATGAAAAGATCTCAGTCCAAGATGGTATTTCTACTACCTAGGAACTGGGCCAGAAGCTGGACT  
TCCCTATGGTGCTAACAAAAGACGGCATCATATGGGTTGCAACTGAGGGGAGCCTTGAATACACCAAAAAGATCACATTGGCACCC  
GCAATCCTGCTAACAAATGCTGCAATCGTGCTACAACCTTCTCAAGGAACAACATTGCCAAAAGGCTTCTACGCAGAAGGGGAGC  
AGAGGCGGCAGTCAAGCCTCTTCTCGTTCCTCATCACGTAGTCGCAACAGTTCAAGAAATTTCAACTCCAGGCAGCAGTAGGGG  
AACTTCTCCTGCTAGAATGGCTGGCAATGGCGGTGATGCTGCTCTTGCTTTGCTGCTGCTTGACAGATTGAACCAGCTTGAGA  
GCAAAATGTCTGGTAAAGGCCAACAAACAAGGCCAACTGTCACTAAGAAATCTGCTGCTGAGGCTTCTAAGAAGCCTCGG

CAAAAACGTACTGCCACTAAAGCATACAATGTAACACAAGCTTTCGGCAGACGTGGTCCAGAACAAACCCAAGGAAATTTTGG  
GGACCAGGAACTAATCAGACAAGGAACTGATTACAAACATTGGCCGCAAATTGCACAATTTGCCCCAGCGCTTCAGCGTTCT  
TCGGAATGTCGCGCATTGGCATGGAAGTCACACCTTCGGGAACGTGGTTGACCTACACAGGTGCCATCAAATTGGATGACAAA  
GATCCAAATTTCAAAGATCAAGTCATTTTGCTGAATAAGCATATTGACGCATACAAAACATTCCCACCAACAGAGCCTAAAAA  
GGACAAAAAGAAGAAGGCTGATGAAACTCAAGCCTTACCGCAGAGACAGAAGAAACAGCAAACCTGTGACTCTTCTTCCTGCTG  
CAGATTTGGATGATTTCTCCAAACAATTGCAACAATCCATGAGCAGTGCTGACTCAACTCAGGCCTAAACTCATGCAGACCAC  
ACAAGGCAGATGGGCTATATAAACGTTTTTCGCTTTTCCGTTTACGATATATAGTCTACTCTTGTGCAGAATGAATTCTCGTAA  
CTACATAGCACAAGTAGATGTAGTTAACTTTAATCTCACATAGCAATCTTTAATCAGTGTGTAACATTAGGGAGGACTTGAAA  
GAGCCACCACATTTTCACCGAGGCCACGCGGAGTACGATCGAGTGTACAGTGAACAATGCTAGGGAGAGCTGCCTATATGGAA  
GAGCCCTAATGTGTAATAATTTTAGTAGTGCTATCCCCATGTGATTTTAATAGCTTCTTAGGAGAATGACAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAA



[Underlined text below are public links that are provided in a separate document](#)

A-2020-000393

In response to the request, these links were also provided for the information that is available to the public:

“Please see the attached rec form and documents pertaining to this request. The text below describes the text attachments.

*Attached are the original Wuhan-1 genome used as reference and the first B.1.1.7 (Alpha) genome sequenced in Canada from 7 February 2021. They are provided as simple text files for ease of accessibility.*

The revised request text provides public links that may be of interest to the requestor.

The ATI request is specific to ‘discovery’ and as such we can provide information on the first example of B.1.1.7 (Alpha) identified in Canada. This isolated case was not particularly noteworthy at the time. Extracting the information about this sample and the data generated from it is relatively straightforward. Case specific information on the sample is Protected-B, e.g. identifiable information on the patient. We are interpreting additional analyses that relate to the characteristics of an identified variant rather than to its discover to be out of scope.

On the three questions, we would propose the following responses:

1. Describe the **discovery (not manufacture/fabrication/creation/assembly/alignment/trimming/mapping)** of the alleged genome for this alleged particular new variants of coronavirus.

*Within the scope of ‘discovery’ of the B.1.1.7 (Alpha) variant in Canada, following release of the first identified genome for B.1.1.7 on the global genomics lineage platform PANGO from a sample on 7 February 2020, NML identified a small number of isolated cases. The sample came from patient nasopharyngeal swab that tested positive for COVID-19 by PCR test and was then went for whole-genomic sequencing. Standard techniques for genome sequencing were used. There are 21 identifiable genomic differences between the B.1.1.7 (Alpha) variant and the original Wuhan-1 reference genome. The whole B.1.1.7 (Alpha) “family” of variants now has, on average, approximately 38 mutations from that original Wuhan-1 reference genome.*

2. Describe how this alleged new variant of coronavirus relates to the alleged “SARS-COV-2”  
*Copies of the Wuhan-1 and the first Canadian B.1.1.7 (Alpha) sequences can be provided. Sequence data tracing the evolution of the SARS-CoV-2 virus, including Canadian samples as well as globally, are published on GISAID.*

3. Include **any** additional analysis/investigation into this alleged “new variant”

*There were no specific additional analyses related to the ‘discovery’ of B.1.1.7 (Alpha) in Canada at that time. Since the declaration of B.1.1.7 (Alpha) as a Variant of Concern by the WHO on 18 December 2020, PHAC has gathered clinical case and laboratory data as part of its routine public health responsibility for evaluation of epidemiological factors associated with this and other variants, including severity, transmissibility, immune response, and vaccine effectiveness. Analyses such as these have been a incorporated into the modelling reports provided to the public throughout the pandemic, including those on COVID-19 daily epidemiology update and linked to from this site.*



Christine Massey &lt;cmssyc@gmail.com&gt;

---

**PHAC A-2020-000393/TTL Response**

---

Christine Massey &lt;cmssyc@gmail.com&gt;

Sun, Sep 12, 2021 at 8:31 PM

To: "Turpin-Loyer, Tammy (HC/SC)" &lt;tammy.turpin-loyer@hc-sc.gc.ca&gt;

Thank you Tammy.

I notice that the only **records** provided are copies of electronic "genomes" for the alleged original "Wuhan-1 virus" and the alleged "first" Canadian "Alpha variant".

The final page of the response package contains some very vague notes that were clearly written in response to my request, but no pre-existing records.

At the top of the final page of the response package, a text box was inserted that reads "*underlined text below are public links that are provided in a separate document.*" Both the response letter and the release package have sections that are coloured and/or underlined, and they look like hyperlinks but there are no **live** hyperlinks in the documents (with the exception of a live link to the website of the Office of the Information Commissioner), and there are no other documents. Was this by design or accident? If by accident, may I have corrected versions of these documents with live links, and any other documents that I was meant to receive?

Also, the notes state that "*NML identified a **small number** of isolated cases*". Does PHAC have no records stating what that "small number" is?

The note continues: "*The sample [SINGULAR] came from patient nasopharyngeal swab that tested positive for COVID-19 by PCR test and was then went for whole-genomic sequencing.*" Am I to understand that **only 1 patient sample** has been classified as positive for the alleged "Alpha variant" via "whole-genomic" sequencing?

The note continues: "*Standard techniques for genomic sequencing were used*". Does this mean that PHAC has no records that actually **describe the specific methodology** that was used?

I would expect PHAC to have record(s):

- explaining how the patient sample was selected for "genomic sequencing";
- stating whether the patient sample was stored in virus transport medium (which often contains fetal bovine serum and toxic drugs) prior to the "sequencing", and
- describing the source of the genetic material that used to create the "genome" (i.e. was the total RNA extracted from the patient sample "soup" of genetic material, or was the patient sample cultured with monkey cells and fetal bovine first and then the total RNA extracted from that soup?), and
- containing the specific "genomic sequencing" protocol that was implemented.

I have not requested/expected/wanted any identifiable patient information, only records describing methodology and/or including analysis of the alleged variant and/or comparisons with the alleged original "virus".

The note stating that analyses relating to the characteristics of "an identified variant" were considered out of scope makes no sense to me.

Thanks and best wishes,  
Christine

[Quoted text hidden]