

Laboratory 1 and 2

Antoni Malinowski

04.03.2023

TASK 1

```
AUGCAGGACGCUCCCCUGAGCUGCCUGUCACCGACUAAGUGGAGCAGUGUUUCUCCGCAGACUCAACUG
AGAAGUCAGCCUCUGGGGCAGGCACCAGGAAUCUGCCUUUUCAGUUCUGUCUCCGGCAGGCUUGAGGAU
GAAGGCUGCGGGCAUUCUGACCCUCAUUGGCUGCCUGGUCACAGGCGCCGAGUCCAAAAUCUACACUCGU
UGCAAACUGGCAAAAUAUUCUCGAGGGCUGGCCUGGACAAUUCUGGGGCUUCAGCCUUGGAAACUGGA
UCUGCAUGGCAUAUUAUGAGAGCGGCUACAACACCACAGCCCAGACGGUCCUGGAUGACGGCAGCAUCGA
CUAUGGCAUCUCCAGAUCAACAGCUUCGCGUGGUGCAGACGCGGAAAGCUGAAGGAGAACAACCACUGC
CAUGUCGCCUGCUCAGCCUUGAUCACUGAUGACCUCACAGAUGCAAUUAUCUGUGCCAGGAAAAUUGUUA
AAGAGACACAAGGAAUGAACUAUUGGCAAGGCUGGAAGAAACAUUGUGAGGGCAGAGACCUGUCCGAGUG
GAAAAAAGGCUGUGAGGUUCCUAA
```

TASK 2

mRNA is a ribonucleic acid and a single RNA molecule. It is the carrier of genetic information read by a ribosome in the process of synthesizing a protein. mRNA is created during the process of transcription. Based on mRNA, amino acids are created according to the given order. The final product of the process on translation is the genetic information - protein. The mRNA nucleotides contain the genetic code of the amino acid sequence of polypeptides. One codon consists of three nucleotides.

TASK 3

“U” in mRNA sequence stands for Uracil. In the process of transcription from DNA to mRNA, nucleotide Thymine is replaced by Uracil.

TASK 4

```
MQDAPLSCLSPTKWSSVSSADSTEKSASGAGTRNLPFQFCLRQALRMKAAGILTLIGCLVTGAESKIYTR
CKLAKIFSRAGLDNYWGFSLGNWICMAYYESGYNTTAQTVLDDGSIDYGIFQINSFAWCRRGKLENNHC
HVACALITDDLTDALICARKIVKETQGMNYWQGWKKHCEGRDLSEWKKGCEVS
```

TASK 5

Proteins are made of large numbers of amino acids joined end to end in long chains called polipeptides.

TASK 6

The name of the protein encoded by this gene is Lysozyme. Lysozyme is an antimicrobial enzyme produced by animals that forms part of the innate immune system.

TASK 7

Lysozyme comes from *Homo sapiens* species.

TASK 8

DNA molecule consists of two strands so when given only one strand we can complete the DNA molecule by finding complementary base pair to each of the four nucleotides - Adenine, Thymine, Guanine, Cytosine

TASK 9

```
CCAAGCACATGTGGCCTGGAGACATAAAGGGCAATTTGGACAACTGCATATCTAAACAGTAACTGGTT
GGTTCGTGTACACCGGACCTCTGTATTTCCCGTTAAACCTGTTTGACGTATAGATTTGTCATTGACCAA
CCCTGCAGGAAGTAAACCTTTTCATTTACCAGGAG
GGGACGTCCTTCATTTGGAAAGTAAATGGTCCTC
```

TASK 10

The cell cycle consists of two distinct phases:

1. interphase
2. mitotic phase

Interphase is when cell growth and DNA synthesis occur. Throughout this phase, there are cellular checkpoints:

- G1/S checkpoint that ensures the cell has made sufficient organelles and growth factors for replication and division
- S phase checkpoints check for DNA structure and their downstream targets checkpoint kinase 1 (CHK1) and/or CHK2
- G2/M checkpoint which evaluates the cell size, nutrient availability, and integrity of the DNA

In the mitotic phase the process of cell division occurs and at this phase the cell confronts the final checkpoint:

- M/G1 checkpoint, which is the last checkpoint to assess the arrangement of the copied chromosomes to facilitate division into two daughter cells

TASK 11

In the G2/M phase checkpoint pass is granted when the cell:

1. has completely replicated genome
2. is of large volume

It fails if the DNA is damaged.

TASK 12

Five differences between a plant cell and an animal cell are:

1. plant cell has bigger vacuole
2. plant cell does not have centriole
3. plant cell has a single lysosome
4. animal cell does not have cell walls
5. animal cell does not have chloroplasts

TASK 13

Ebola virus is bigger than Staphylococcus and smaller than Rhinovirus.

TASK 14

!{Screen for TASK 14}(https://drive.google.com/file/d/1DURxU_KjD4ckh0kiJ7l59qInZAoUOpTD/view?usp=sharing)

TASK 15

The study of genetic profiles of Y chromosome is directed only towards male representatives and is performed by studying genetic markers found on these chromosomes. Since Y chromosomes are passed from father to son unchanged, males can trace their male-line in that way. In contrary, mt-DNA genetic variability test can be performed on both men and women. Mitochondria is passed from mothers to their children therefore people can trace their mother-line ancestry through such test.

TASK 16

Haplogroup is a human genealogical group sharing common ancestor.

TASK 17

The country with the most representatives of haplogroup R1a is Poland.

TASK 18

Examples of famous people who possessed or have R1a haplogroup are:

- actor Tom Hanks
- scientist and inventor Nikola Tesla
- Nazi politician Rudolf Hess

TASK 19

Studies have demonstrated that people with the rs53576 genetic marker are more empathetic, feel less lonely, employ more sensitive parenting techniques and have lower rates of autism.

TASK 20

People carrying a single copy of genetic marker rs333 are somewhat resistant to HIV infection. Individuals with two copies of this marker were reported to be almost completely immune to HIV infection.

TASK 21

The three reports that captured my attention the most are:

1. Wellness and Longevity
2. Personality DNA
3. DNA Art

TASK 22

TASK 23

Dominant trait can be described as stronger and dominant over the generation therefore possibly covering the recessive (“weaker”) trait.

TASK 24

Some of my dominant traits are:

- non-red hair
- the ability to curl the tongue into a trumpet
- the presence of dimples in the cheeks

meanwhile some of my recessive traits:

- short eyelashes
- no freckles
- light hair

TASK 25

An allele is a copy of a gene, one from our mother and one from our father. Alleles could be the same or a different form of the gene. Alleles are an important because the way they interact with each other may result in a variety of effects within our body, including different observable traits.

TASK 26

In Poland, approximately 1 out of 7 500 people have phenylketonuria. Since Poland has 38 427 000 citizens it means that around 5 123 polish people have this disease. How_many_people_live_in_Poland Phenylketonuria_causes_symptoms_diagnostics_treatment

TASK 27

If both parents are carriers for phenylketonuria, there is a 25% chance any child they have will be born with the disorder, a 50% chance the child will be a carrier and a 25% chance the child will neither develop nor be a carrier for the disease.

TASK 28

We cannot produce vitamin C. Although, the recipe for producing vitamin C is present in human genes, we cannot synthesise it due to lack of an enzyme called gulonolactone oxidase. Vitamin_C_in_human_health_and_disease_is_still_a_mystery

TASK 29

The reason for our inability to produce vitamin C has been put down to evolutionary reasons. Over a very long period of time, we have had access to an abundance of fresh fruit and vegetables. So in the modern day, there is no need for us to produce vitamin C ourselves. The gene that coded for vitamin C synthesis has been 'deactivated'. Why_cant_humans_produce_vitamin_C