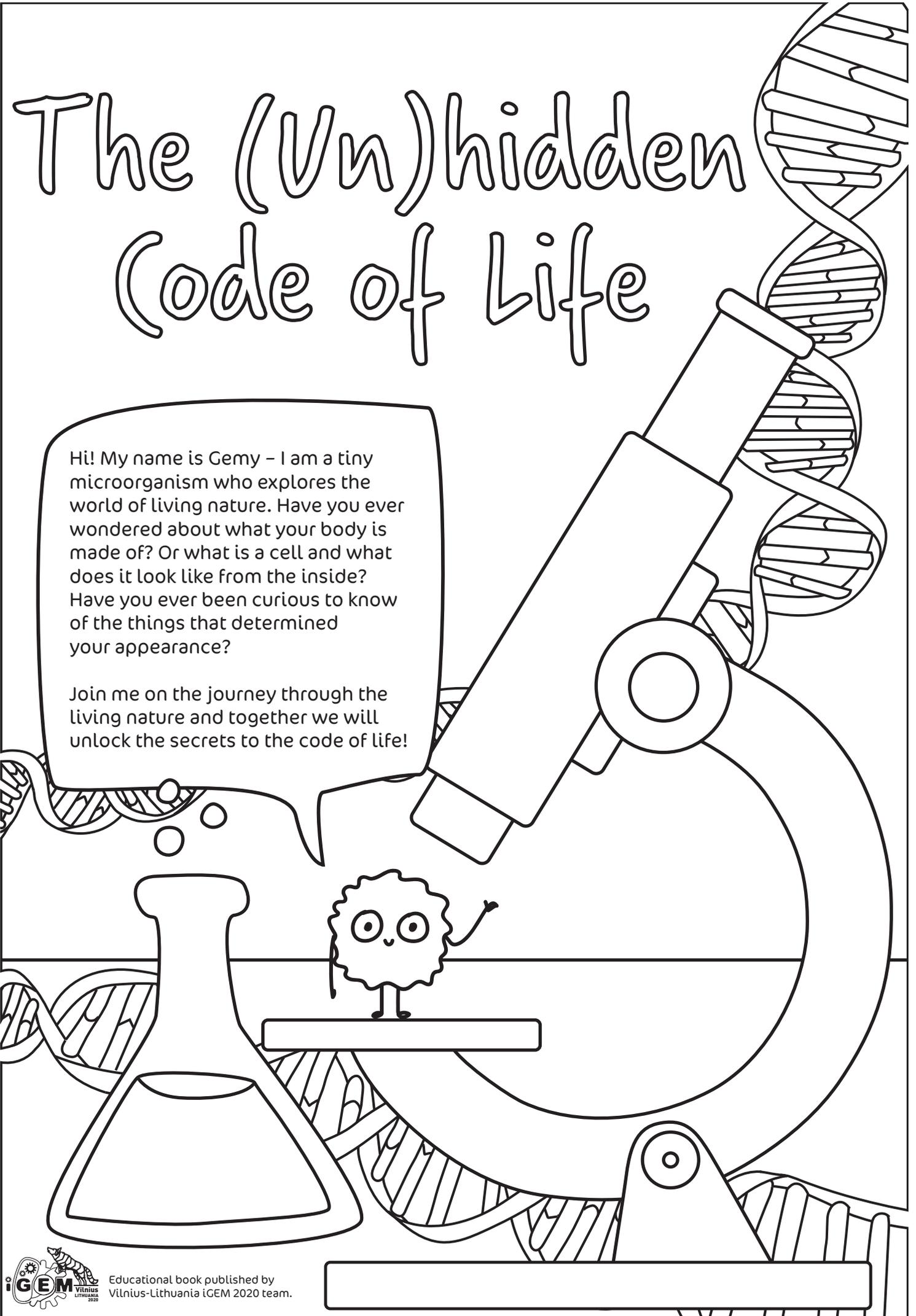


The (Vn)hidden Code of Life

Hi! My name is Gemy - I am a tiny microorganism who explores the world of living nature. Have you ever wondered about what your body is made of? Or what is a cell and what does it look like from the inside? Have you ever been curious to know of the things that determined your appearance?

Join me on the journey through the living nature and together we will unlock the secrets to the code of life!

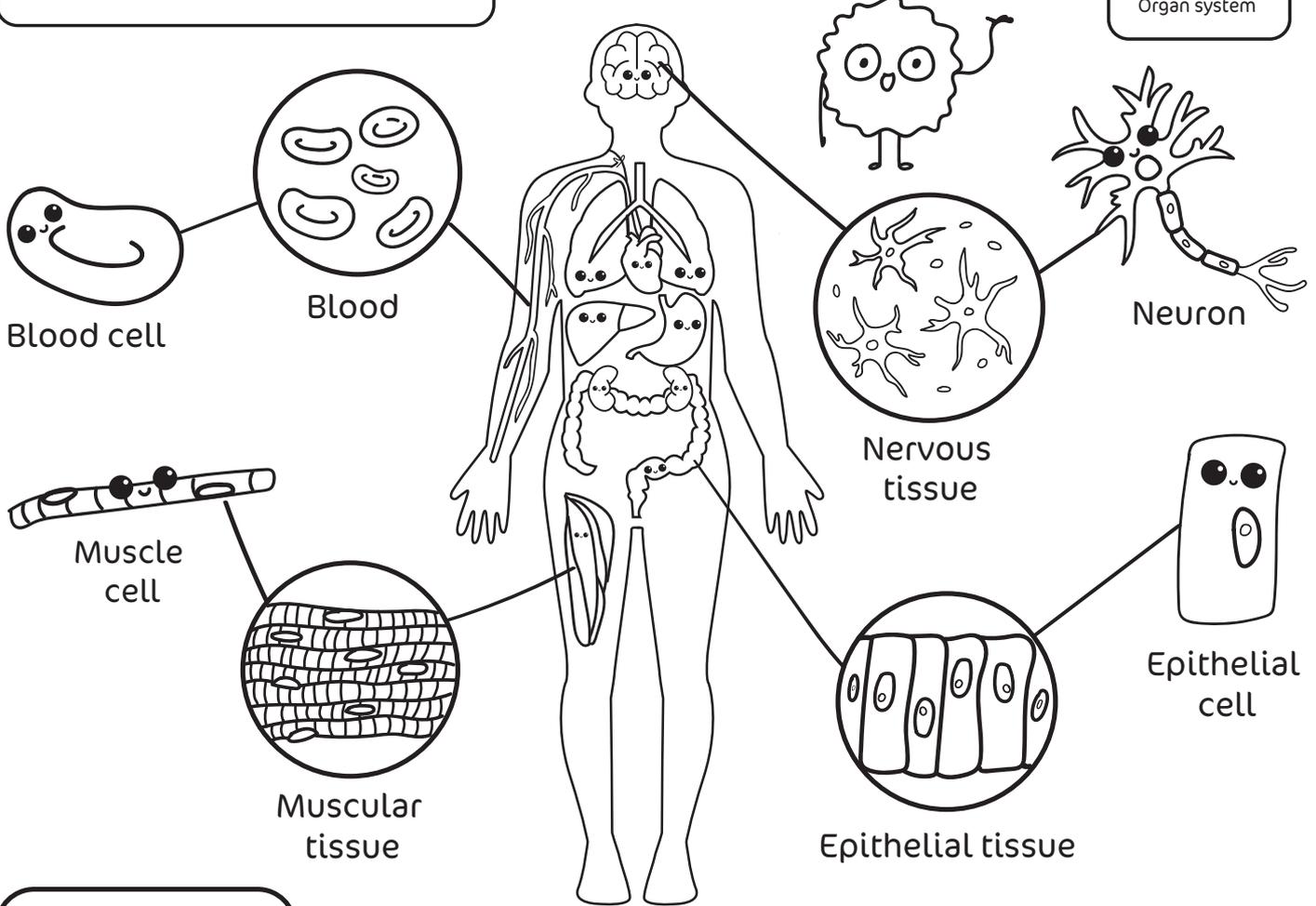
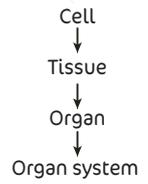


What Is Your Body Made of?

Body structure from the smallest to largest parts:

The smallest "building brick" of your body is the cell. By joining, cells of the same kind create tissues. We have four major types of tissue: **muscular, epithelial, nervous, and connective.**

Cells join together to form **tissues**, different tissues join to form **organs**, and finally, organs group up to create **organ systems**.



Task 1

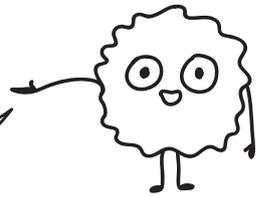
Assist Gemy in connecting the cells with their appropriate tissues and organs. Name the organs pictured.

Cell	Tissue	Organ

Animal cell

Cells are like tiny organisms, which are a part of larger communities, in which they help each other to survive, develop and multiply.

Organelles are the organs of the cells, which perform various tasks.



Nucleus

It is a sort of a "brain" of the cell where the genetic material is stored, which in itself is like a blueprint that describes the cell how it has to look and behave.

Endoplasmic reticulum

It helps the cell produce nutrients - fats and protein. Many ribosomes can be found on its surface.

Ribosomes

They make proteins according to special instructions.

Golgi apparatus

It is a cell's very own sorting machine, which packs its nutrients into tiny vesicles and readies them for transport.

Mitochondrion

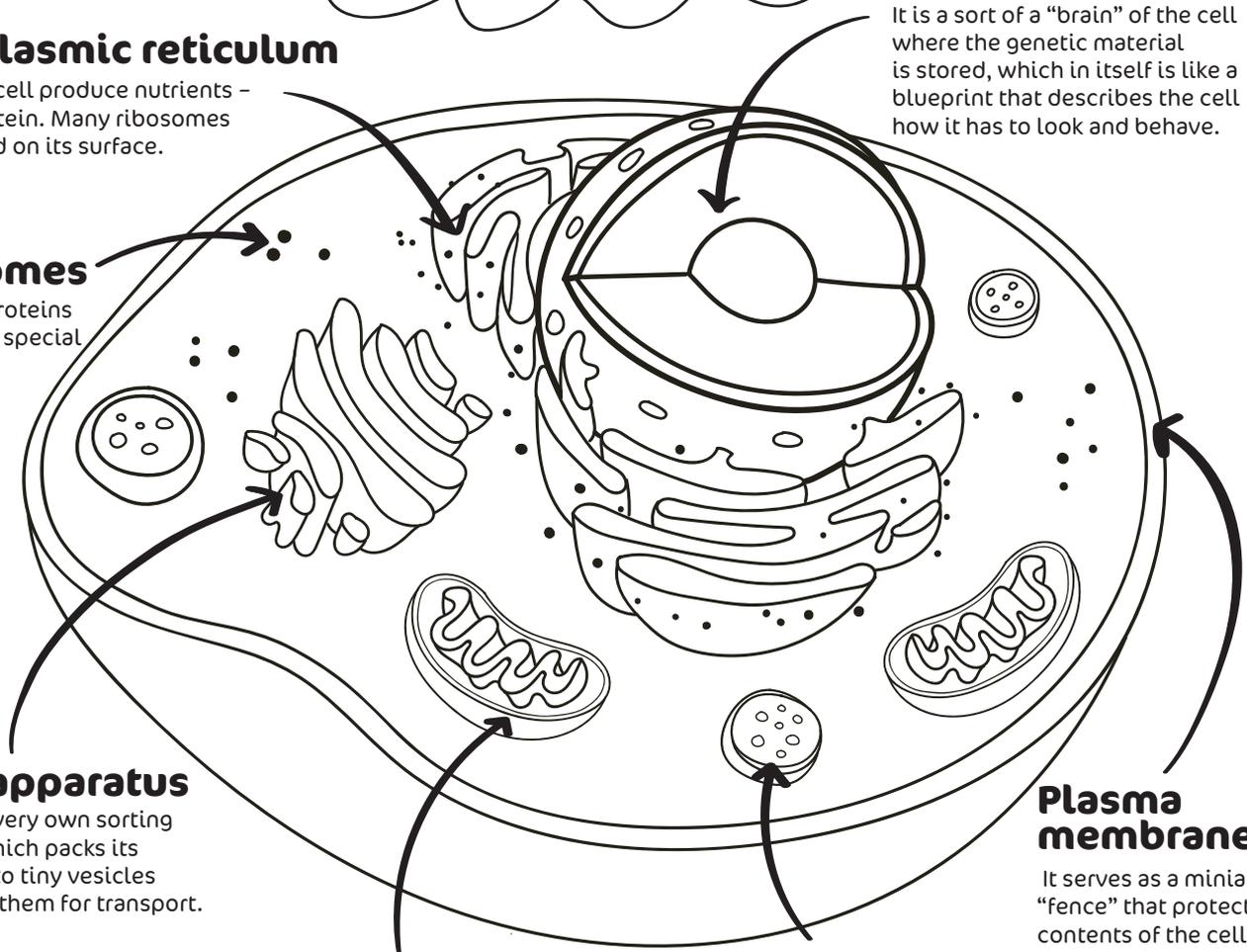
This is where the cell's energy is produced.

Lysosome

It is the cell's "trash can" where all the no longer needed materials are destroyed.

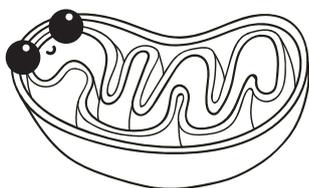
Plasma membrane

It serves as a miniature "fence" that protects the contents of the cell from the outside world.



Task 2

Help Gemy match the organelles to their proper function.



Mitochondrion

1. I collect all the cell's waste.

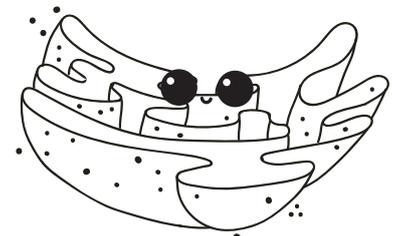
2. I am the "brain" of the cell. Everyone listens to me.

3. I am embellished with ribosomes.

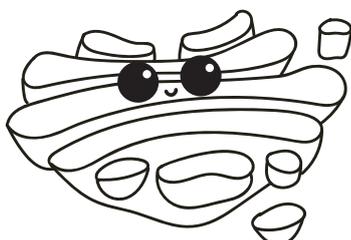
4. I am the cell's "packaging machine".

5. I provide energy to the cell.

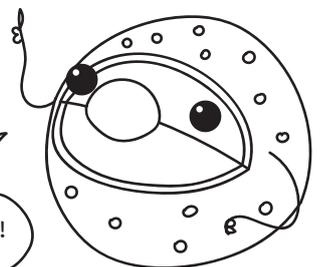
6. I am the protective wall of the cell.



Endoplasmic reticulum



Golgi apparatus

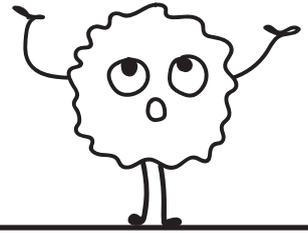


Nucleus

Kingdoms of Life

Humans belong to the kingdom **Animalia**, trees and flowers – kingdom **Plantae**.

Organisms are living creatures which can feed themselves, breathe, move, grow, excrete, sense and reproduce.

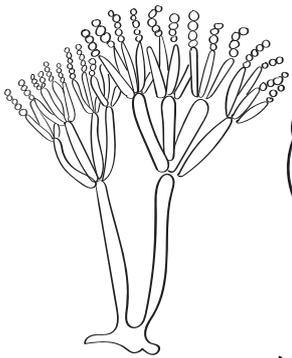


In the world, there exists a spectacular variety of organisms, which are composed of different forms of cells. The living creatures are divided into **5 kingdoms**.

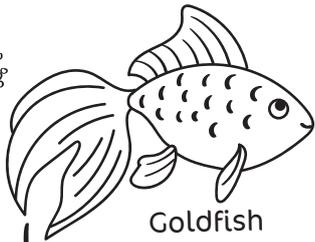
Mushrooms, that grow in the forest, belong to kingdom **Fungi**, while the tiny organisms that live in puddles and swamps and can be barely seen with the naked eye – are from the kingdom **Protista**. The tiniest life forms – bacteria and archaea represent the kingdom **Monera**.

Task 3

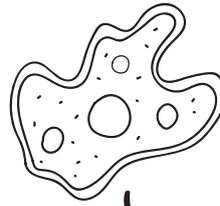
Kingdoms' creatures have lost their way! Help them return to their castles. To make your assignment easier, Gemy has already led some of the creatures back to their kingdoms.



Mold



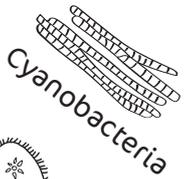
Goldfish



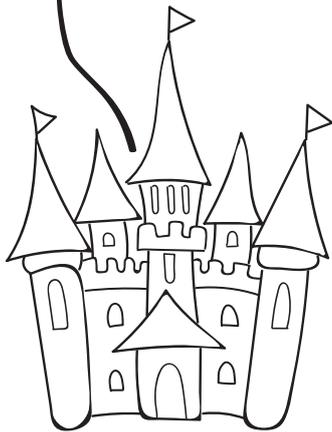
Amoeba



Oak



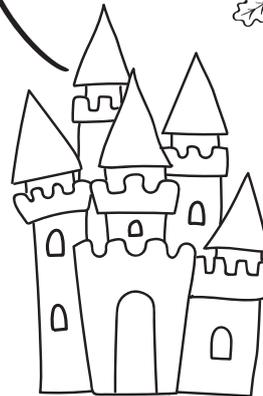
Cyanobacteria



Animals



Penny bun



Protozoa



Chamomile



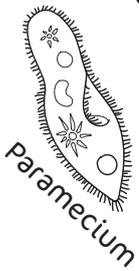
Euglena



E. coli



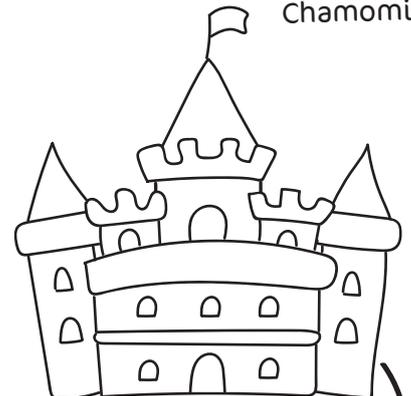
Salmonella



Paramecium



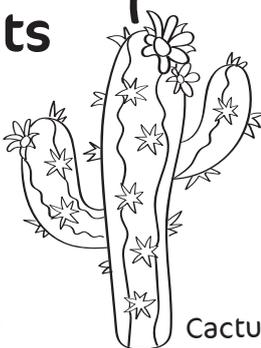
Plants



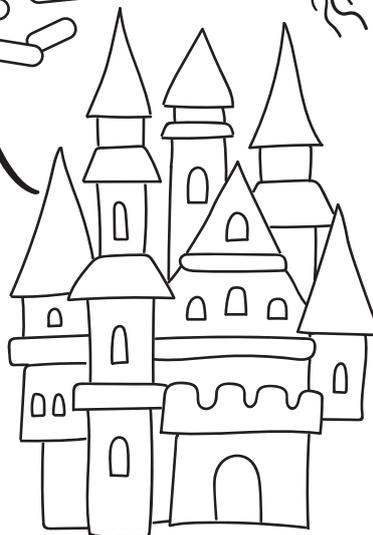
Fungi



Dog



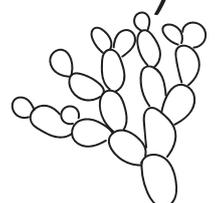
Cactus



Monera



Sparrow

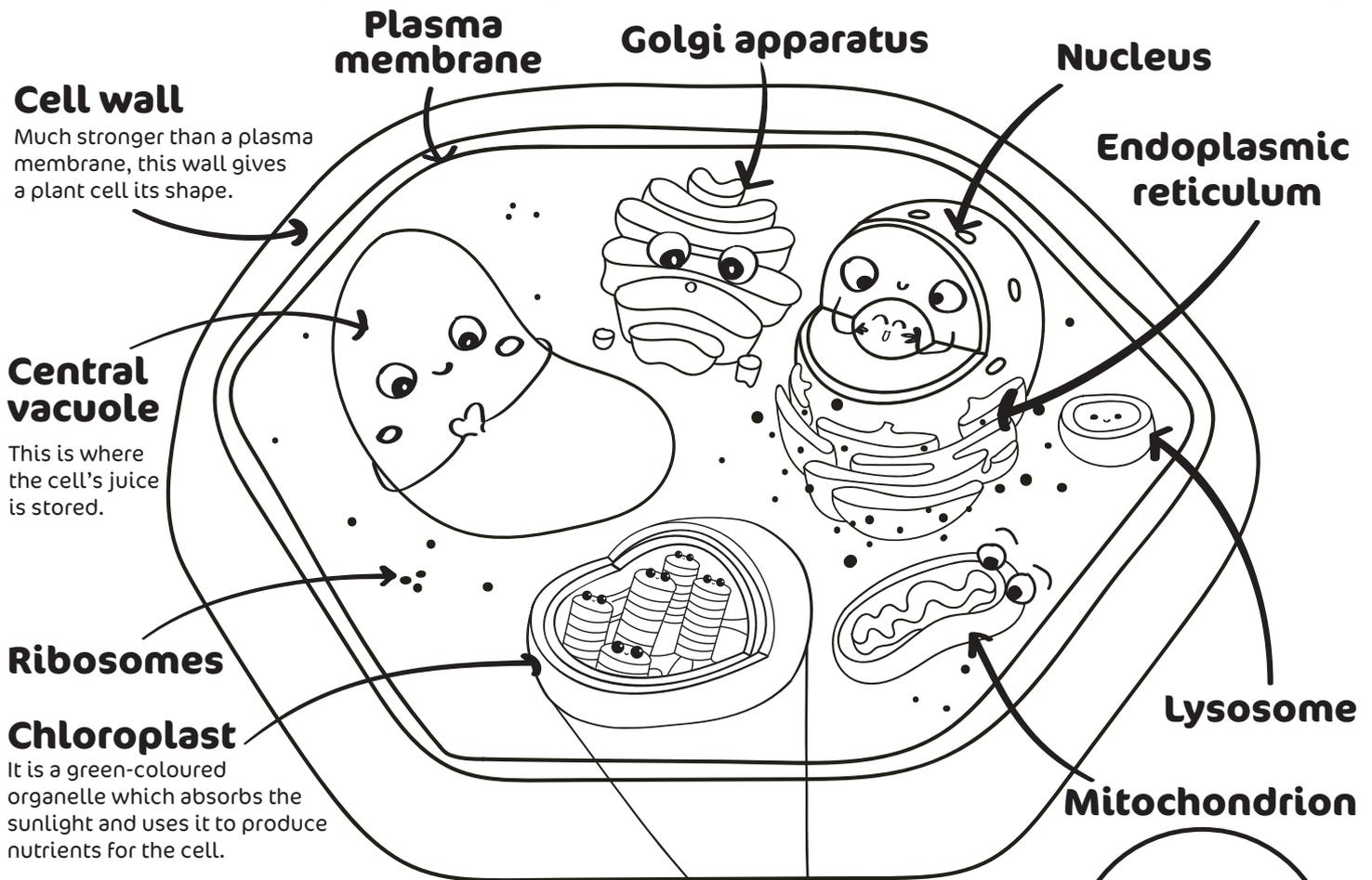


Yeast

Plants

Task 4

Pictured below you will see organelles of a plant cell. Find and circle the organelles that are not found in animal cells. See page 3 for a hint.

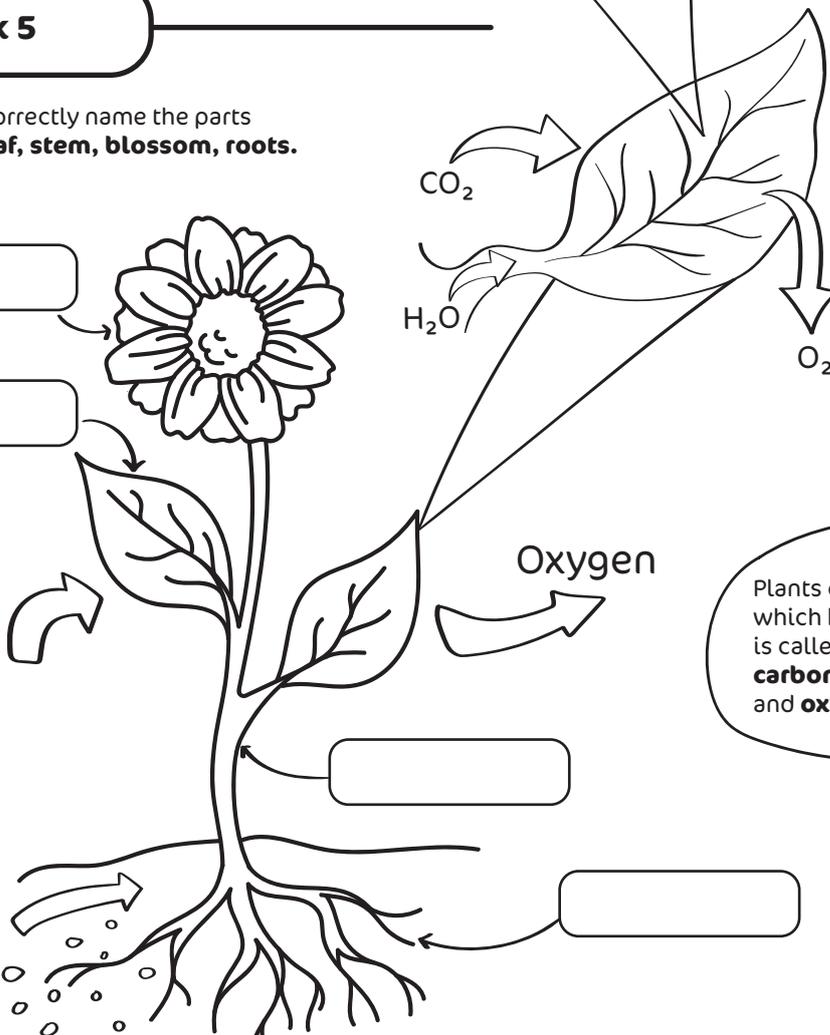


Task 5

Help Gemy correctly name the parts of a plant: **leaf, stem, blossom, roots.**

Carbon dioxide

Water



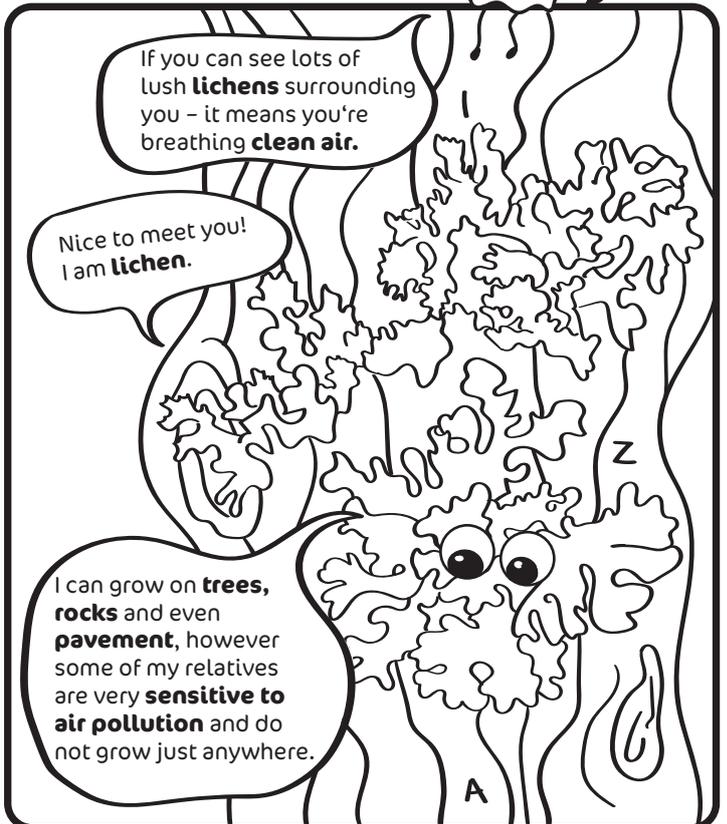
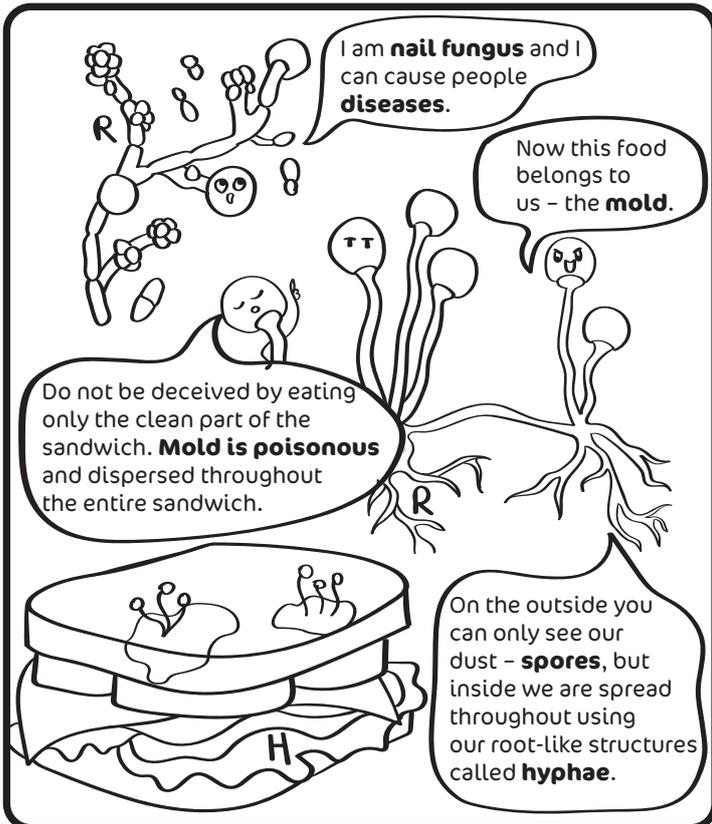
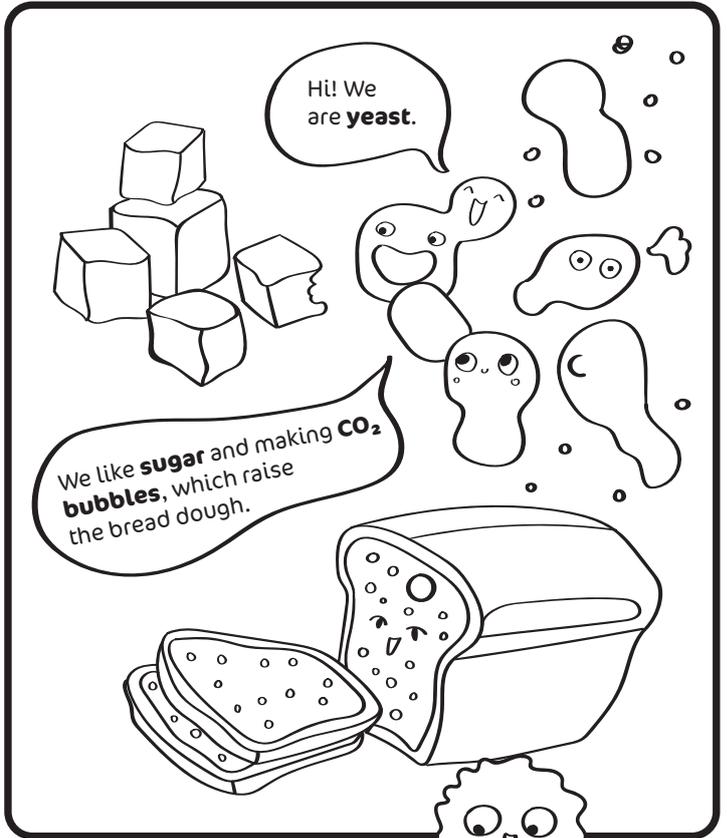
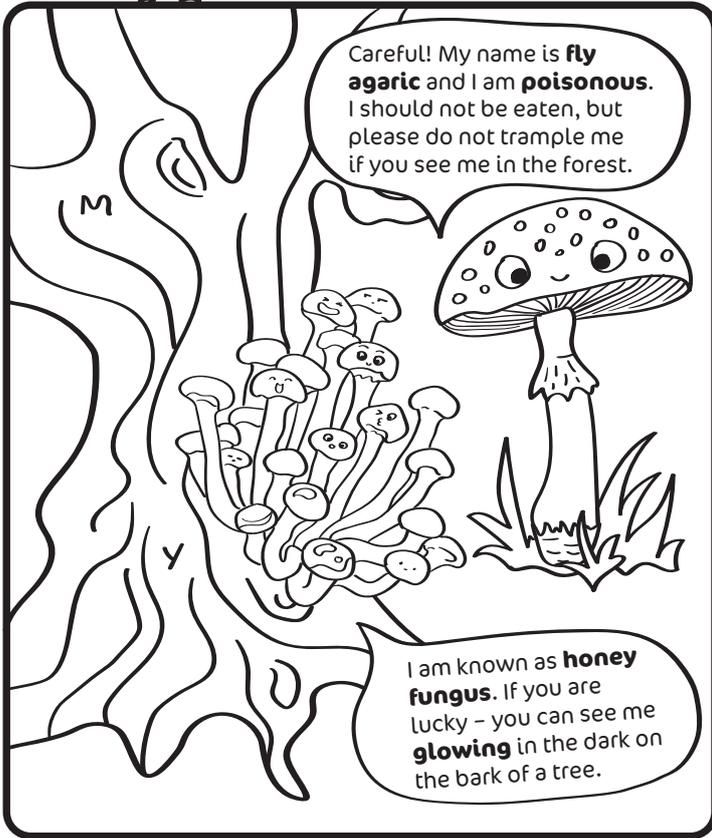
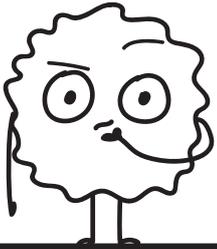
Oxygen

Sunlight

Fungi

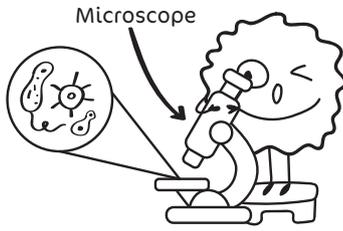
Task 6

Find the letters, which are scattered across this page. Once put together in the correct order, they will spell out a term for a mutually beneficial relationship that trees and fungi form. During this kind of "friendship" they exchange nutrients and minerals.



Protists

You will need a **microscope**, should you wish to see these minute organisms – the **protists**, because you cannot see them with a naked eye. Great majority of the protists are made up of just a **single cell**.



If a protist's cell resembles that one of...

an animal

a plant

then it's...

a protozoan

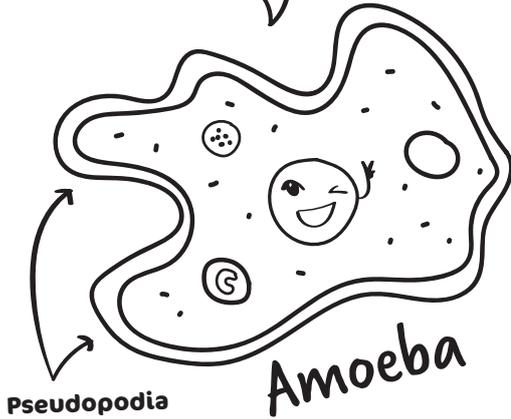
an alga

Paramecium

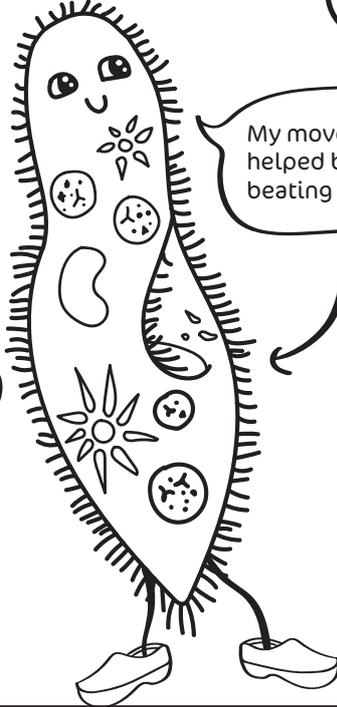
I move using my **pseudopodia** – “false” legs, which can change shape.

My movement is helped by the beating **cilia**.

I can eat like an **animal**, but I can also generate food like a **plant** – using the energy of sunlight!



Amoeba



Euglena

Task 7

Can you and Gemy find all the words associated with protists?

PSEUDOPODIUM, AMOEBIA, ALGAE, PARAMECIUM, FLAGELLUM, CILIA, EUGLENA.

S	P	A	G	I	M	E	C	I	L	M	P	G	A
I	B	L	K	H	E	U	G	L	E	N	A	O	T
E	U	G	A	L	P	O	K	O	L	A	R	S	G
M	E	A	J	M	S	A	I	C	F	L	A	U	O
P	S	E	U	D	O	P	O	D	I	U	M	P	S
S	N	Y	A	R	T	E	D	F	U	L	E	A	Y
Z	H	O	O	V	I	S	B	L	E	K	C	D	N
A	C	I	L	I	A	G	M	A	S	N	I	S	B
G	T	A	P	M	T	K	D	I	U	W	U	A	I
D	P	M	F	L	A	G	E	L	L	U	M	P	O

Monera

You and Gemy have finally reached the kingdom of smallest organisms. However, it also happens to be the richest one. In kingdom Monera live **bacteria** and **archaea**.

Below you can see a **bacterial cell**.



Did you know...

Archaea can survive in extreme conditions. Some of the species can withstand living in **100°C (boiling water)** temperatures!

In **8 hours** one bacterium can divide up to **17 million** bacteria!

Bacteria, which **cause diseases**, are called **pathogens**. However, not all bacteria are bad.

Our gut has many **beneficial bacteria**, which act as "guards" and help strengthen your immune system.

Plasmid

Like the nucleoid, genetic information is stored in it, which defines the cell's properties.

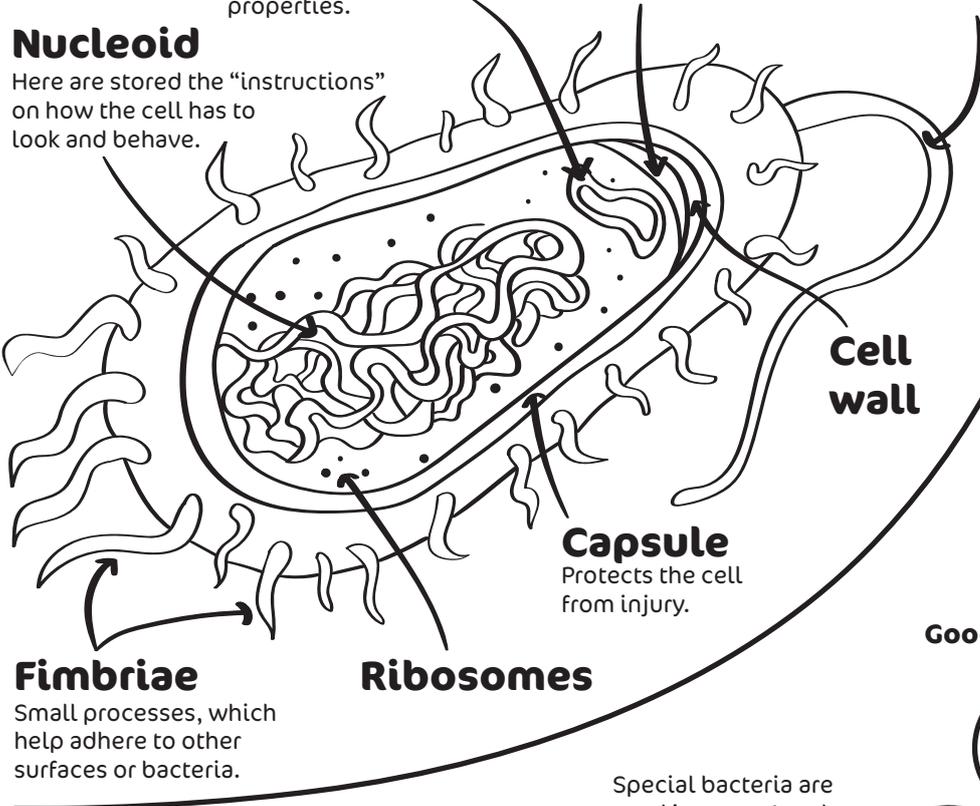
Plasma membrane

Flagellum

A whip-like growth, which the bacteria whips to swim.

Nucleoid

Here are stored the "instructions" on how the cell has to look and behave.



Cell wall

Capsule

Protects the cell from injury.

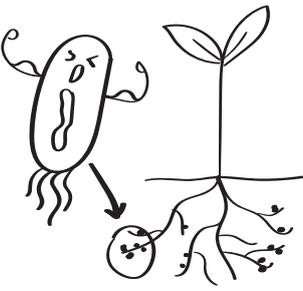
Fimbriae

Small processes, which help adhere to other surfaces or bacteria.

Ribosomes

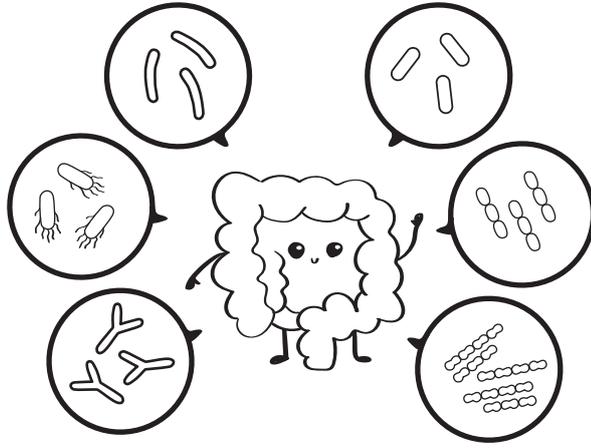
Special bacteria are used in **yogurt** and **cheese** production.

Diazotrophs are monera which enrich the soil with nitrogen, thus helping the plants grow.



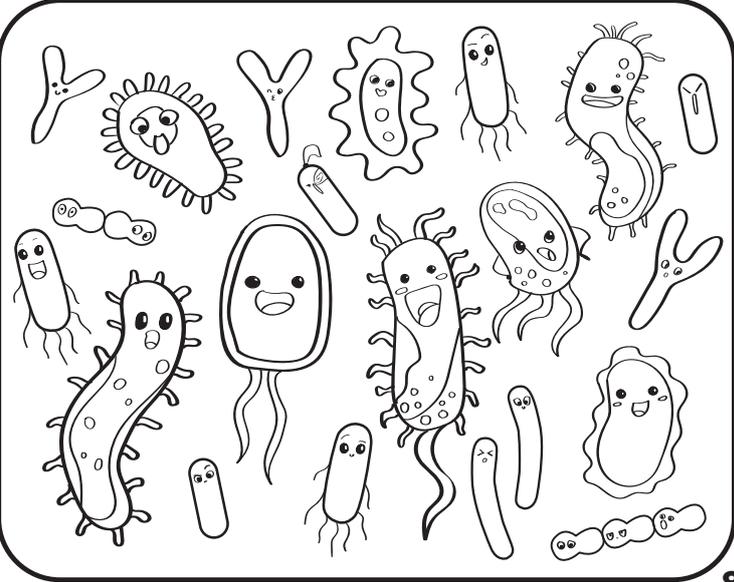
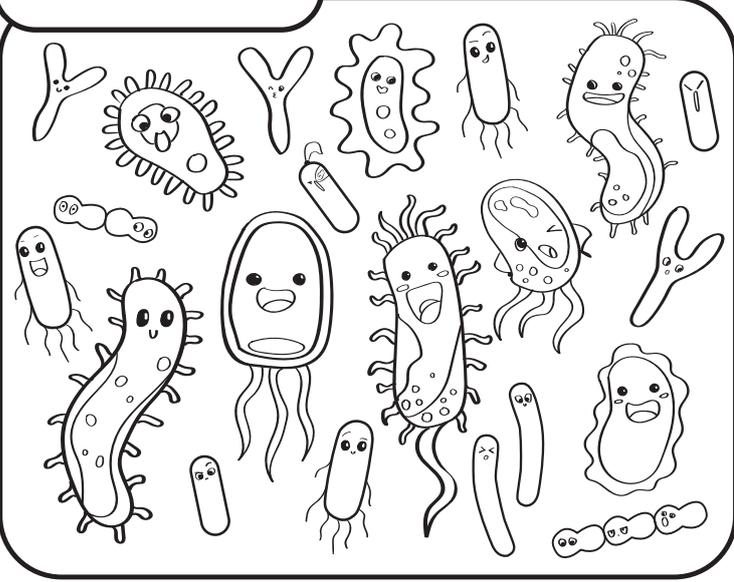
Good bacteria

Bad bacteria



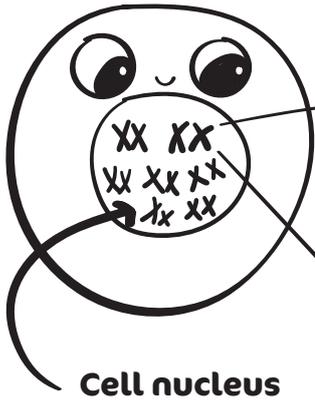
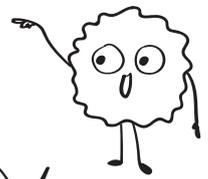
Task 8

Find 7 differences and circle them. Colour the good bacteria yellow and bad bacteria - blue.



Code of Life

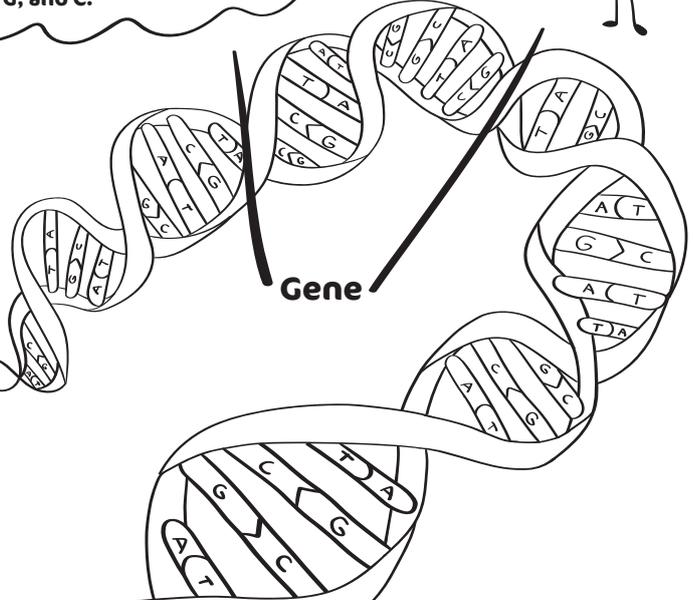
The **DNA molecule** resembles a twisted ladder, the stairs of which are made of four different smaller molecules – **nucleotides**. They are represented by the letters **A, T, G, and C**.



Cell nucleus



Chromosome



Gene

All the information about you and the living creatures surrounding you is stored in **genes**.

Genes are like instructions, which **define how your body looks and operates**. For example, genes have determined the colour of your eyes.

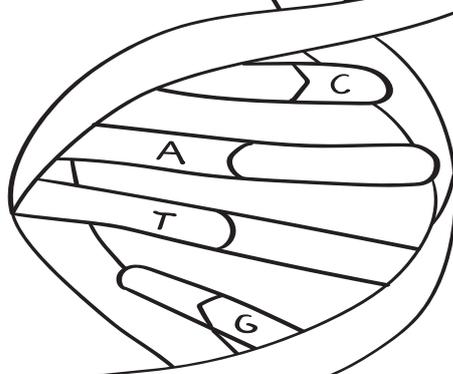
These instructions are encrypted in a special material – a **DNA molecule**.

Genes of all organisms are written in the same **DNA language**, called the **genetic code**.

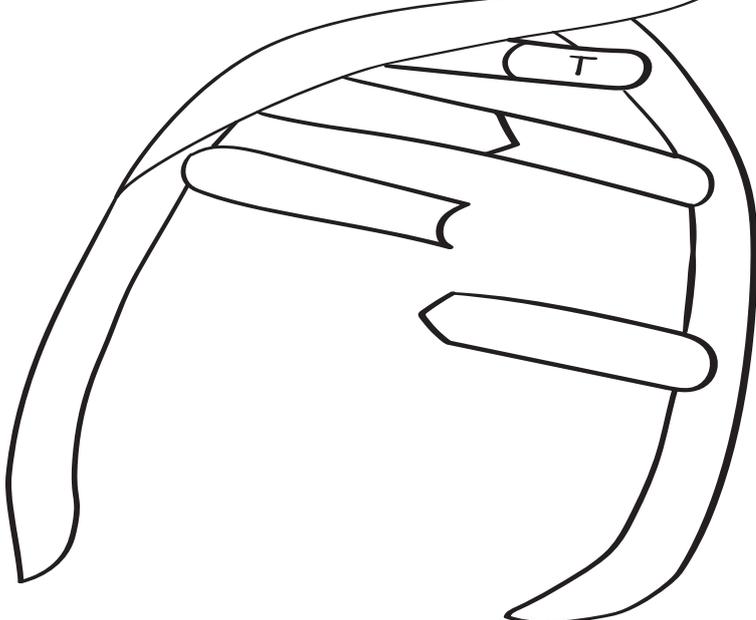
Genetic code consists of a four-letter sequence: **A, T, G, and C**. Each one of us is unique due to the distinct arrangement of these letters in our genetic code.

Task 9

Gemy has lost some of the nucleotide pairs. Notice what pairs nucleotides form and complete the rest of them accordingly.



Adenine	ACGTAATCCGT
Thymine	CGTACTGAACG
Guanine	TCCATTACTACA
Cytosine	CGTAGCTCGTTA
	TATGCATTGCAT
	ACGTAGAGCTA



99% of your genes are the same as **chimpanzee's**.

50% match those of a **banana**.

Future of Life Sciences

Synthetic biology - breakthrough in the world of science!

Scientists have learned to harness the organisms in order to **benefit humanity**.

Scientists with the help of **genetic engineering** can, for example, change animal's or plant's genes. That way, they are able to **create new functions** in living organisms.

Engineering

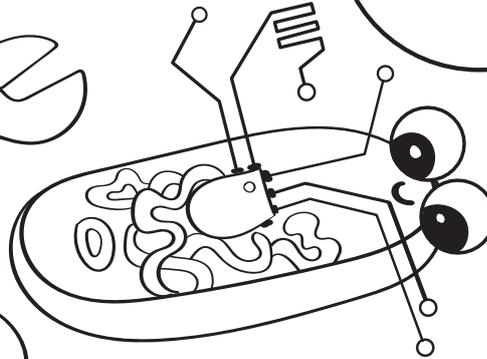
Construction and design of various structures and machines.

Biology

The study of living organisms.

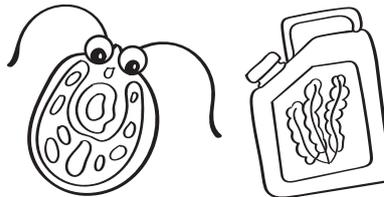
Synthetic biology

Construction and design of living organisms and biological materials.

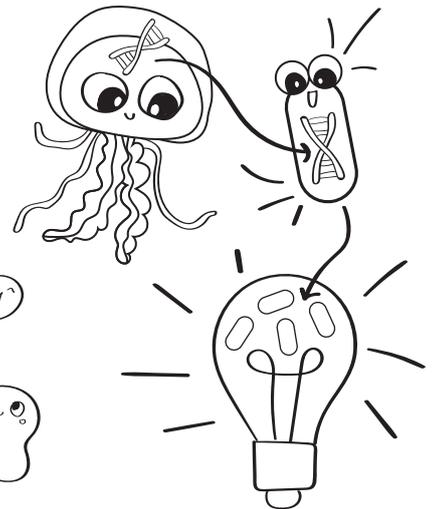


Take a closer look at what the synthetic biology scientists have created!

Biofuel from algae



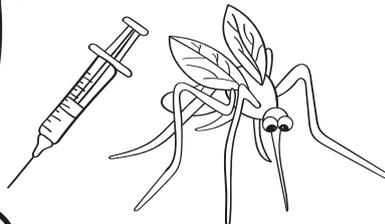
Glowing bacteria lamps



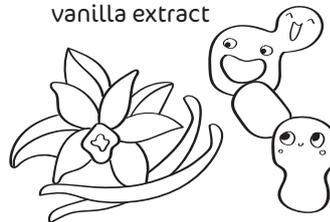
Sustainable textile paint, produced by bacteria



Antimalarial drug from modified yeast



Yeast-produced vanilla extract



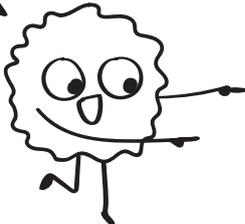
Task 10

Some of Gemy's fishes in the aquarium got infected with bacteria, and he doesn't want the rest of them to get infected too. Help Gemy create a microorganism, which would help save the fishes. Think about how your organism could release medicine, protecting them from disease. Or maybe, it will make the fish immune to bacteria? How will it distinguish healthy fish from the infected aquatic animals?

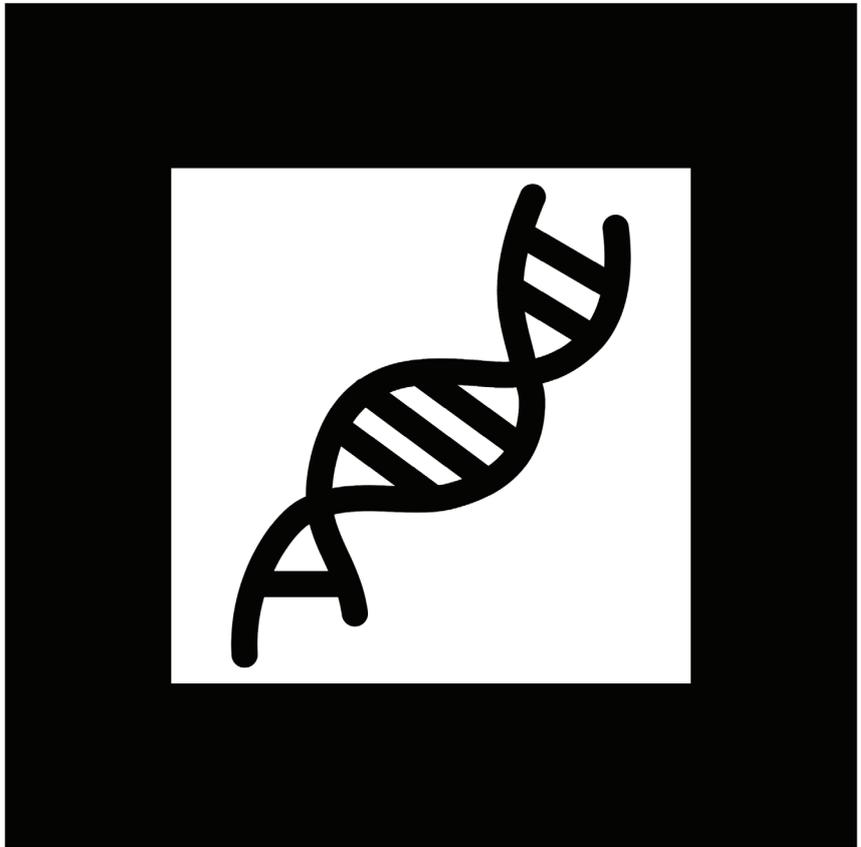
Life Sciences From Another Perspective

Explore more

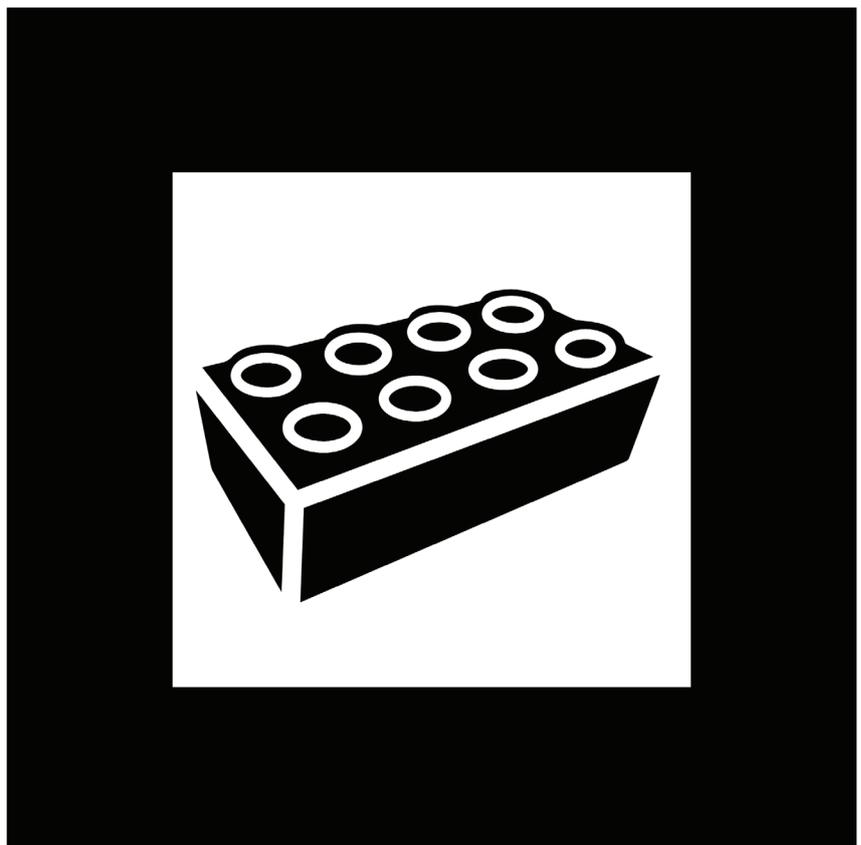
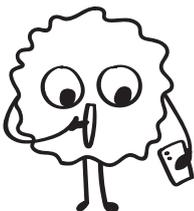
We share about **99,9 %** identical genetic information!



Scan & see DNA 3D model!

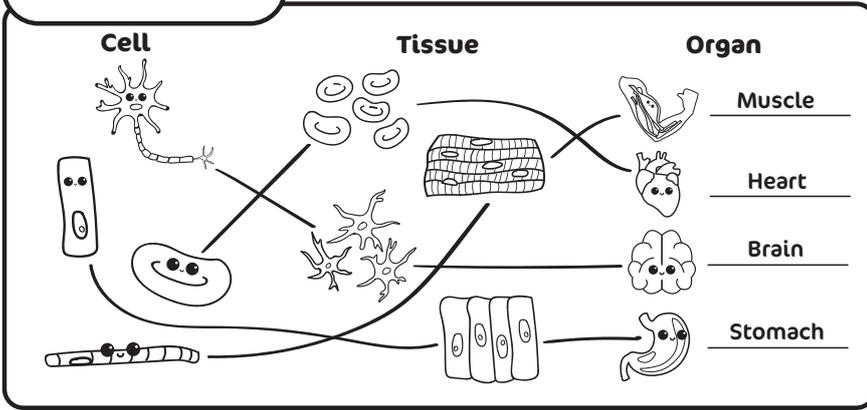


Did you know that in synthetic biology **DNA fragments** are similar to the **LEGO bricks** in how they work?



Answers

Task 1



Task 2



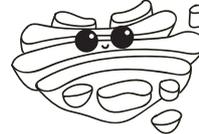
Mitochondrion

5. I provide energy to the cell.



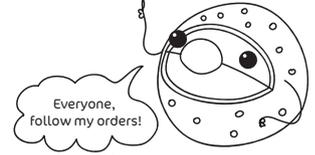
Endoplasmic reticulum

3. I am embellished with ribosomes.



Golgi apparatus

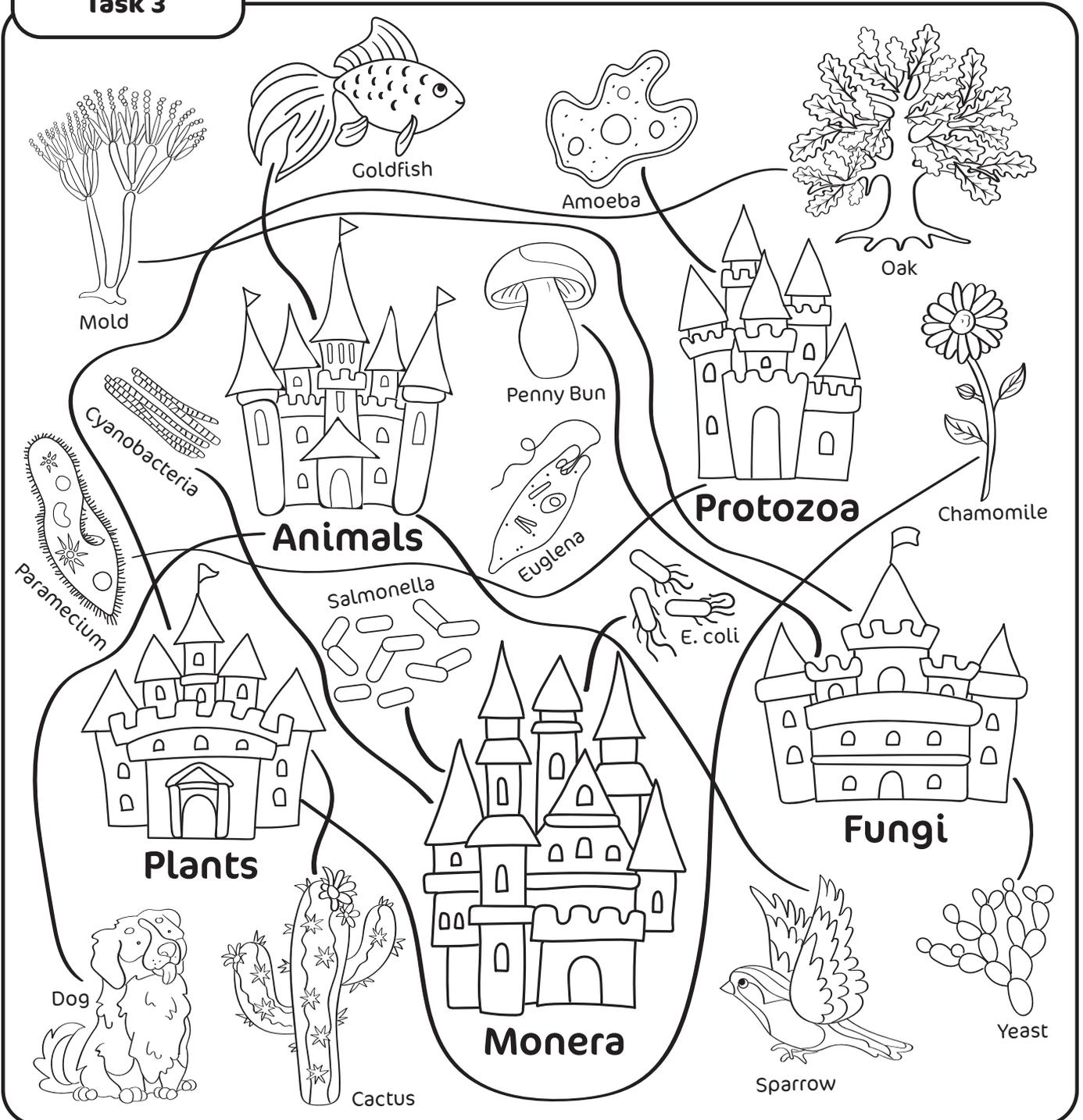
4. I am the cell's "packaging machine".



Nucleus

2. I am the "brain" of the cell. Everyone listens to me.

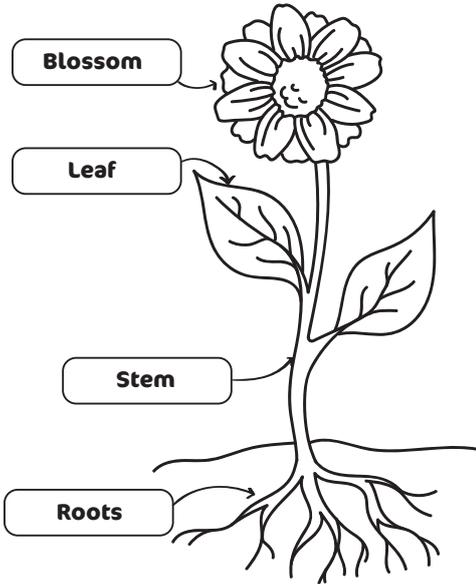
Task 3



Task 4

Cell wall, central vacuole, chloroplast

Task 5



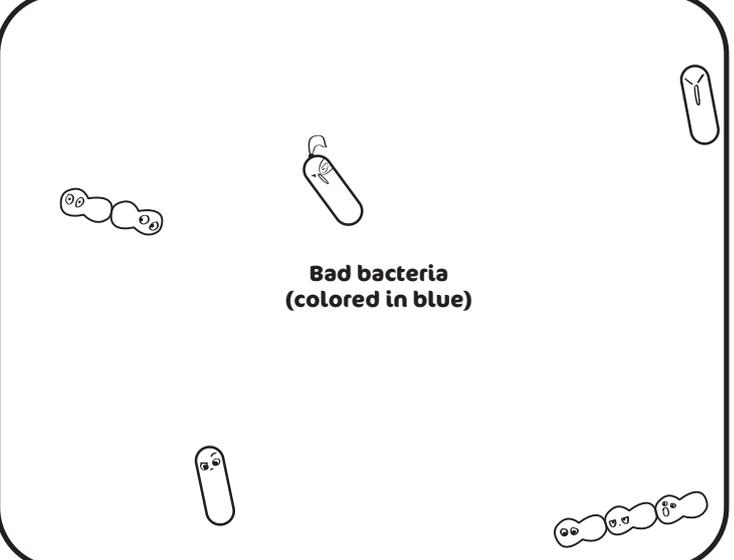
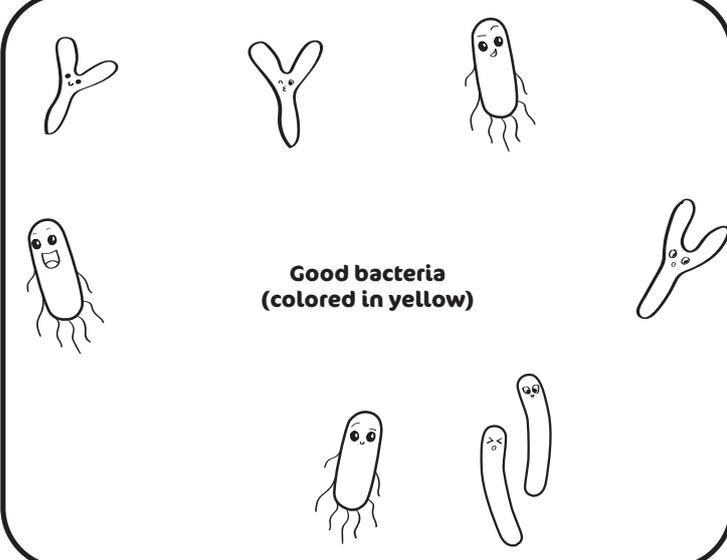
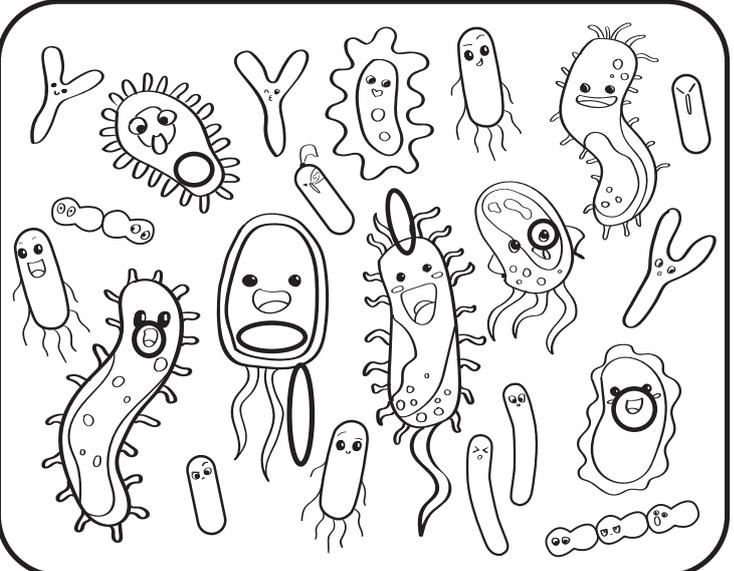
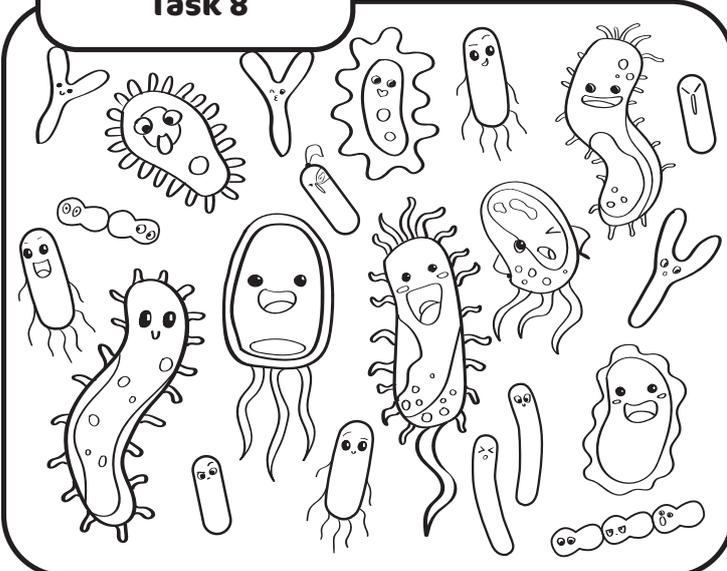
Task 6

M Y C O R R H I Z A

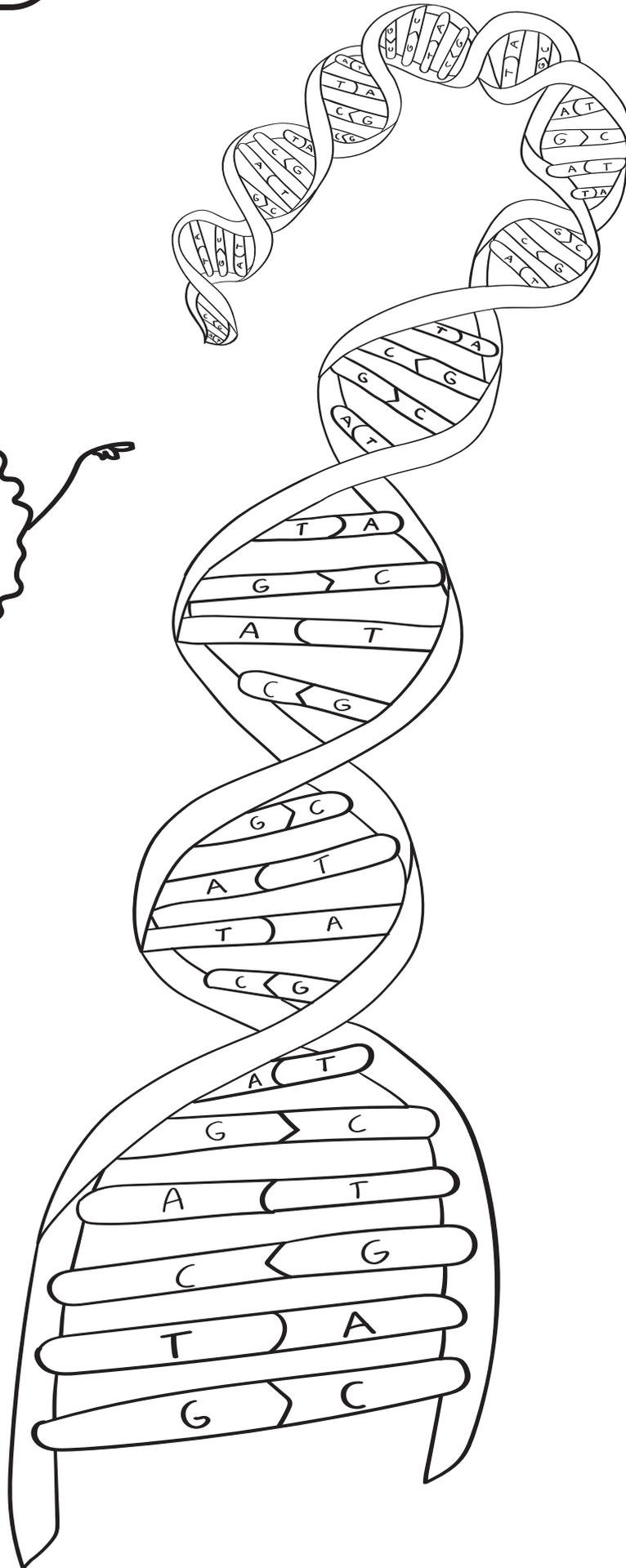
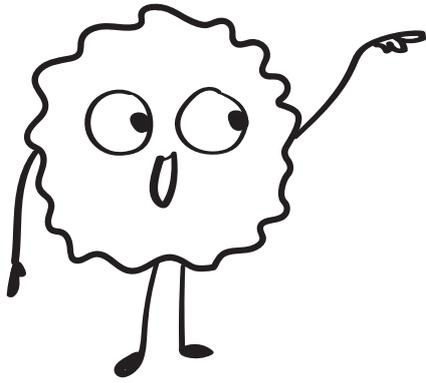
Task 7

S	P	A	G	I	M	E	C	I	L	M	P	G	A
I	B	L	K	H	E	U	G	L	E	N	A	O	T
E	U	G	A	L	P	O	K	O	L	A	R	S	G
M	E	A	J	M	S	A	I	C	F	L	A	U	O
P	S	E	U	D	O	P	O	D	I	U	M	P	S
S	N	Y	A	R	T	E	D	F	U	L	E	A	Y
Z	H	O	O	V	I	S	B	L	E	K	C	D	N
A	C	I	L	I	A	G	M	A	S	N	I	S	B
G	T	A	P	M	T	K	D	I	U	W	U	A	I
D	P	M	F	L	A	G	E	L	L	U	M	P	O

Task 8



Task 9





It was fun a
fun adventure
with you!

