



BIOREMEDIATION SYSTEMS EXPLOITING SYNERGIES FOR IMPROVED REMOVAL OF MIXED POLLUTANTS

# MISSION: CLEAN EARTH!

Fun & Games About Bioremediation for Soil, Water & Groundwater





# WHAT IS BIOREMEDIATION?

## Tiny Helpers Saving the Planet!

Bioremediation is a natural process where living organisms help clean pollution from the environment.

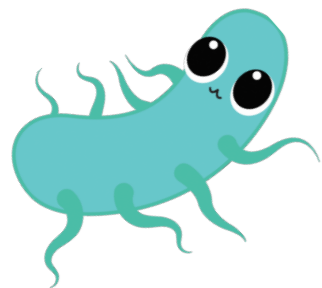
These living helpers include:

- Microbes (tiny bacteria and fungi) like Max the Microbe
- Plants like our little Planty
- Natural biofilms like our Droppy

## They can help clean:

✓ Polluted soil ✓ Dirty rivers & groundwater ✓ Sediments near beaches & wetlands ✓ Industrial pollution

# CHARACTERS INTRODUCED:



MAX THE MICROBE (cleans pollution)



LITTLE PLANTY (drinks dirty water)

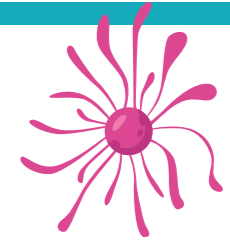


DROPPY (wants to stay clean)

Lets match the helper-hero with the job they are doing

- |                 |   |                       |
|-----------------|---|-----------------------|
| Max the Microbe | • | • travels underground |
| Little Planty   | • | • eats pollution      |
| Droppy          | • | • cleans soil         |

# BIOSYSMO APPLICATIONS



The BIOSYSMO project develops smart solutions for:



Plant-assisted water cleaning

Poplar tree phytoremediation



Estuarine sediment restoration

Groundwater treatment systems



Soil bioaugmentation



Fun Fact! Some microbes can "eat" pollutants and transform them into less harmful substances!



Let's circle all the living things that can help bioremediation:

Plastic bottle

Tree

Microbe

Fungus

Rock

Flower



# SPOT THE DIFFERENCE!

Can You Find the 10 Differences?



Healthy rivers and wetlands protect biodiversity and provide clean water for humans and animals.











# BIOSYSMO SUDOKU

## Eco Sudoku Challenge

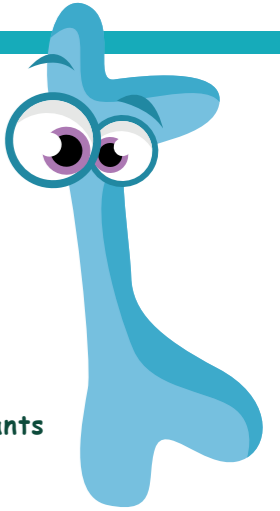
Fill the grid using the symbols below so that each row and column contains each symbol only once.

Symbols:



# MULTIPLE CHOICE QUIZ



Question 1:

What do microbes do in bioremediation?

- A. Build cars
- B. Help break down pollutants
- C. Paint trees

Question 4:

Why are wetlands important?

- A. They clean water naturally
- B. They support animals and plants
- C. Both A and B

Question 2:

Which of these can help clean polluted soil?

- A. Plants
- B. Microbes
- C. Both A and B



Question 5:

What color is often linked with sustainability?

- A. Green
- B. Purple
- C. Black



Question 3:

What is groundwater?

- A. Water underground
- B. Water in clouds
- C. Water in bottles



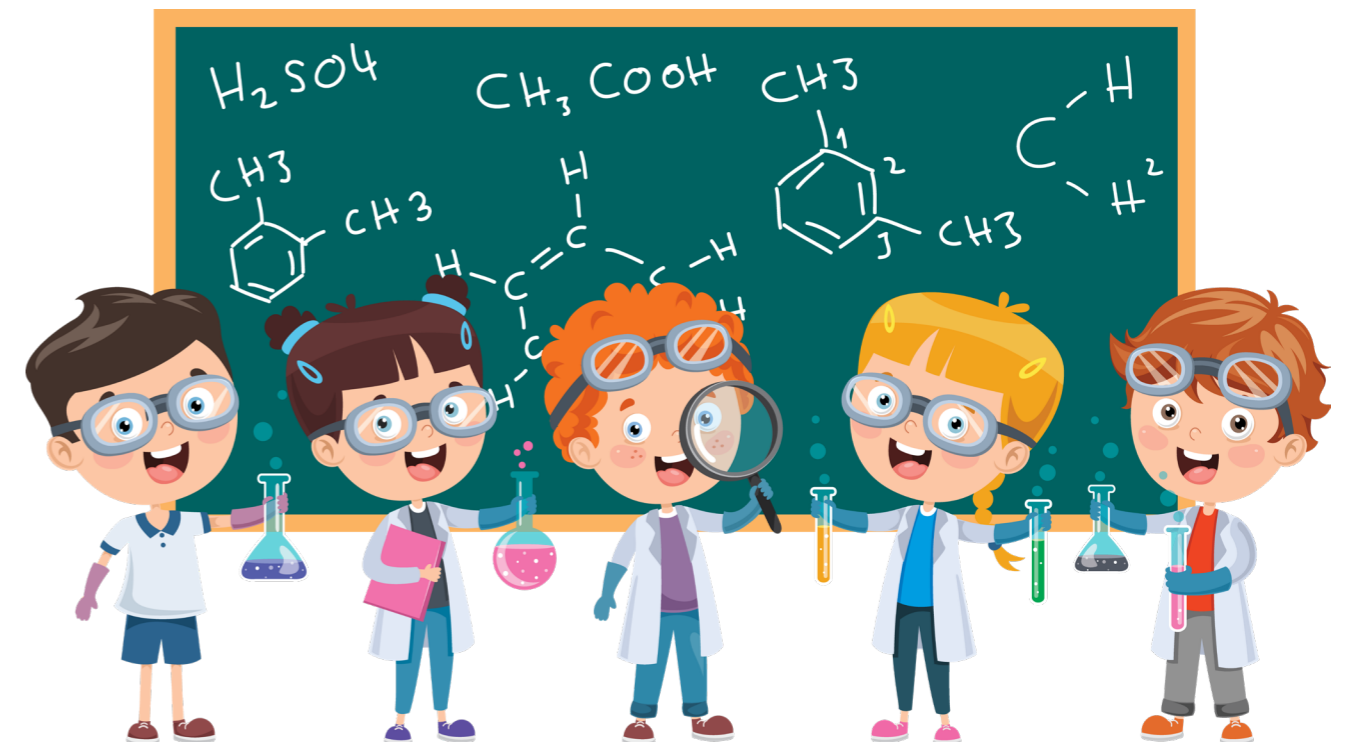
Bonus Challenge

Name one thing YOU can do to help the environment!

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# TREASURE HUNT IN THE MOUNTAIN

## The Eco Explorer Mountain Mission!

You are hiking through the mountain forest searching for hidden nature treasures!



- Find and check:  A pinecone  A bird feather  A smooth rock  A tiny insect
- A plant growing between rocks  Flowing clean water  Animal footprints  A fallen leaf
- Moss on a tree  Something green

Mission Challenge: Can you spot signs of pollution during your walk? Examples:

- Plastic waste  Smoke  Dirty water  Damaged plants



**ECO TIP!**  
 Never leave trash in forests or mountains. Nature protects us when we protect it too!

**MINI FACT!**  
 Healthy mountain ecosystems help keep groundwater clean.



# TREASURE HUNT AT THE BEACH



## Beach Guardians Mission!

Explore the beach and discover nature treasures while protecting marine ecosystems.

### Find and check:

- |  |   |
|--|---|
| <input type="checkbox"/> A seashell                | <input type="checkbox"/> A piece of driftwood         |
| <input type="checkbox"/> Seaweed                   | <input type="checkbox"/> Tiny pebbles                 |
| <input type="checkbox"/> A feather                 | <input type="checkbox"/> A bird near the water        |
| <input type="checkbox"/> A crab or tiny sea animal | <input type="checkbox"/> Something blue               |
| <input type="checkbox"/> Smooth sand patterns      | <input type="checkbox"/> A wave bigger than your foot |

**Beach Protection Challenge:** Count how many pieces of litter you can safely collect during a beach cleanup \_\_\_\_\_

*\*Important: Always ask an adult before touching unknown objects.*

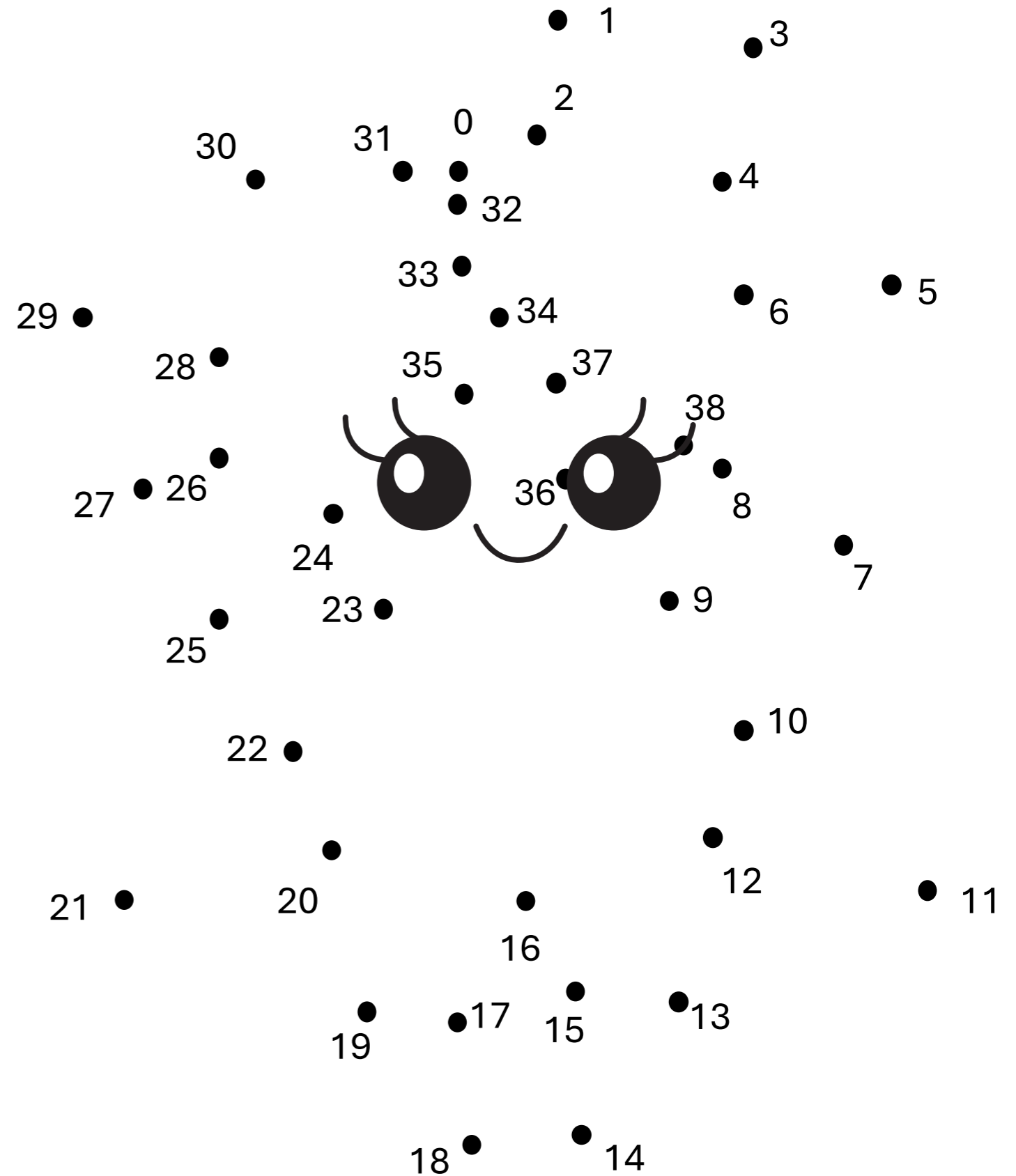


**FUN FACT!**

Wetlands and coastal ecosystems can naturally filter pollution and protect biodiversity.

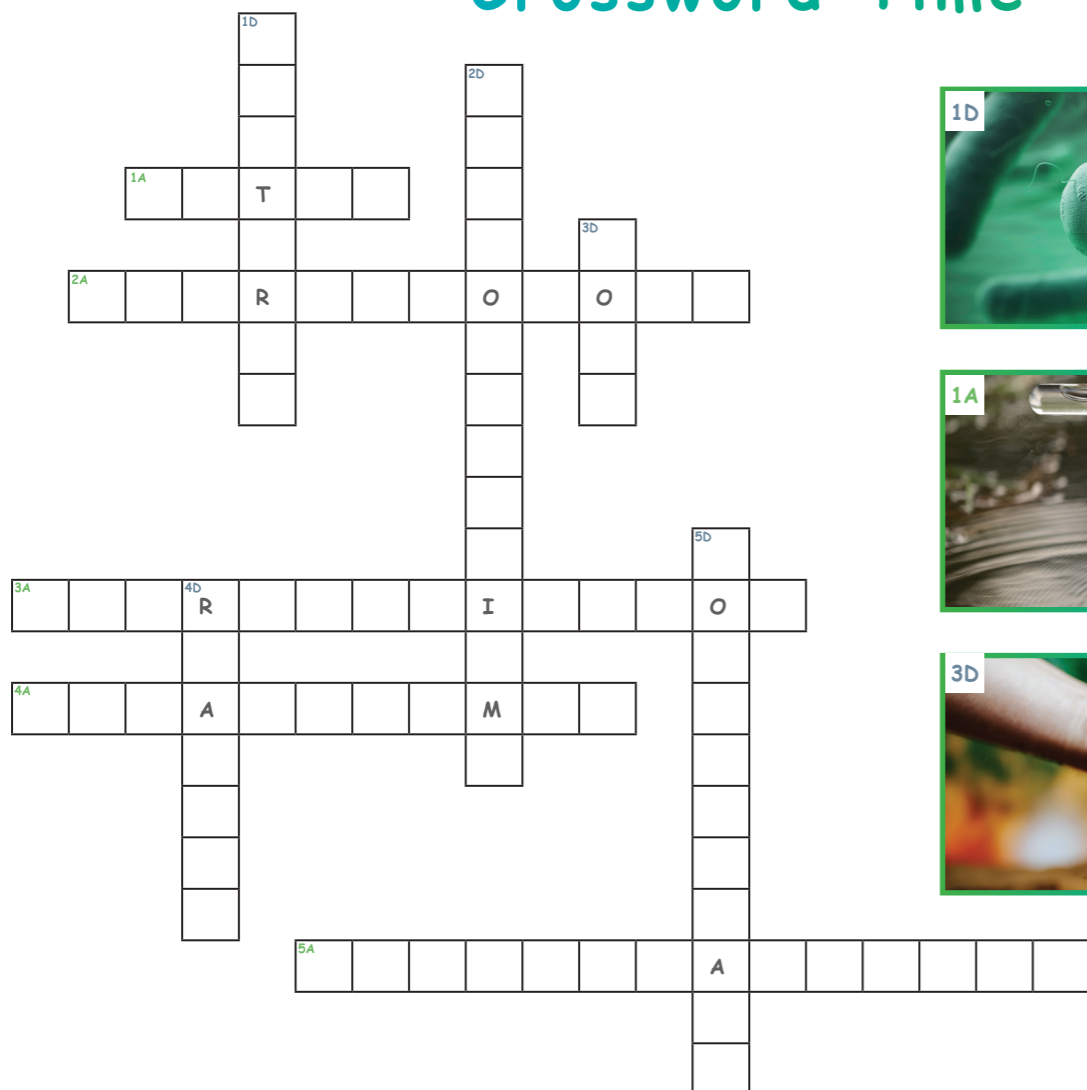
# CONNECT THE DOTS

Find out who is hiding in this page.





## Crossword Time



### Across

- 1A** Often acting as a solvent but also as a transport medium for contaminants.
- 2A** The science studying the microorganisms and their role in ecosystems.
- 3A** BIOSYSMO focuses on this type of environmental cleanup using microorganisms.
- 4A** Microorganisms are studied at this molecular level in BIOSYSMO.
- 5A** The biological breakdown of pollutants through microbial activity.

### Down

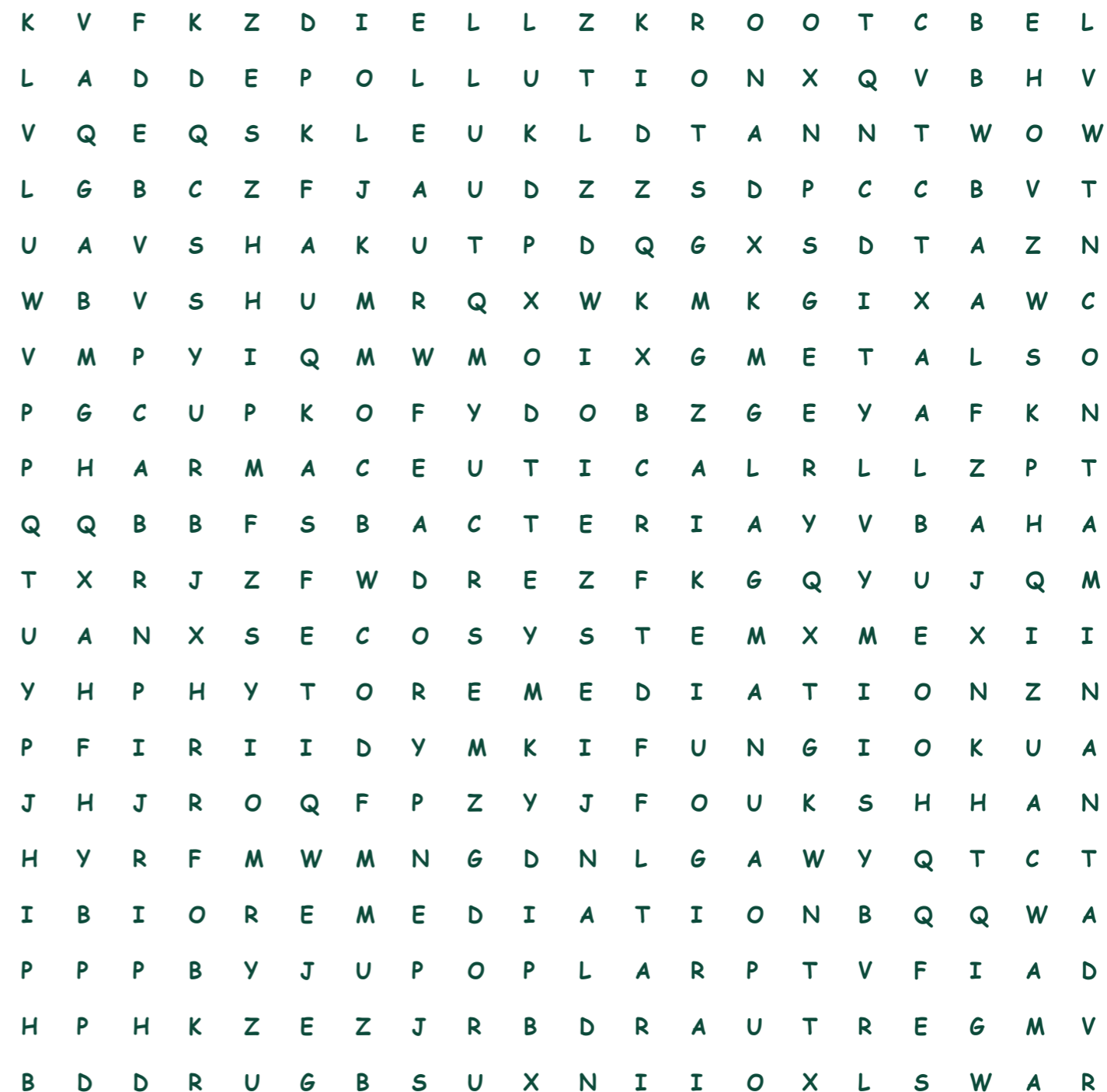
- 1D** Small single-celled organisms used in BIOSYSMO for environmental remediation.
- 2D** The living organisms used to achieve the environmental cleanup under BIOSYSMO project, that may exist in colonies of cells.
- 3D** BIOSYSMO project focuses on the cleanup of this type of environment as well.
- 4D** BES- \_\_\_\_ is used for simultaneous treatment of complex pollutant mixtures.
- 5D** A harmful substance introduced into the environment



## Word Search: Nature Clean Up Words

Word search grid with words like:

BIOREMEDIATION, DE POLLUTION, PHYTOREMEDIATION, POPLAR, ECOSYSTEM, BACTERIA, FUNGI, METALS, PHARMACEUTICAL, CONTAMINANT



FUN FACT BOX: "HEALTHY SOIL HELPS PLANTS GROW AND KEEPS WATER CLEAN!"

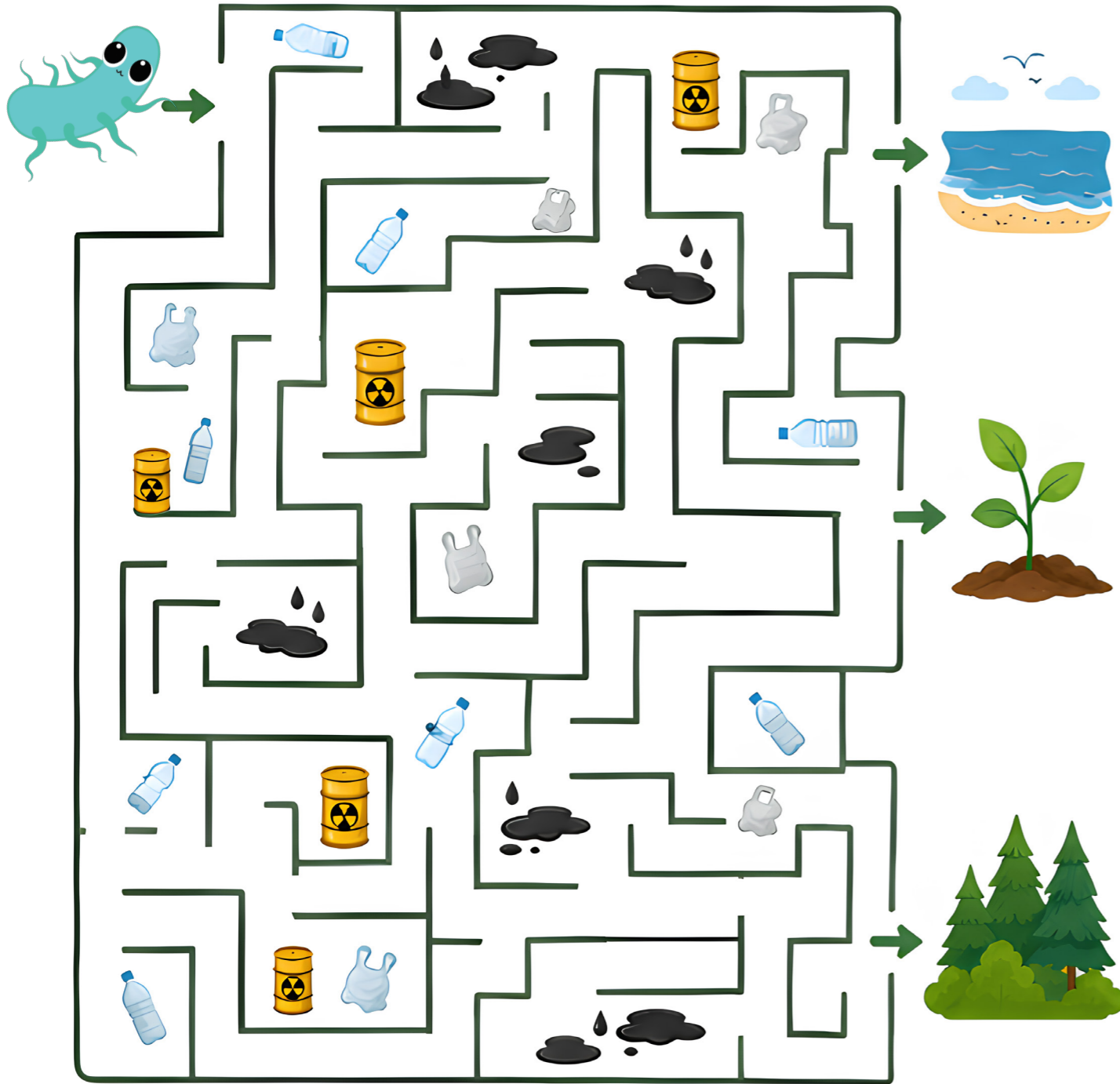


# MAZE GAME

**Story:** A superhero microbe must travel through underground groundwater tunnels to reach and clean pollution.

**Instructions:** Help the microbe avoid: ✗ Plastic waste ✗ Oil spills ✗ Toxic barrels

**And reach:** ✓ Clean water ✓ Healthy plants ✓ Safe ecosystems



# SOLUTIONS

## Page 3

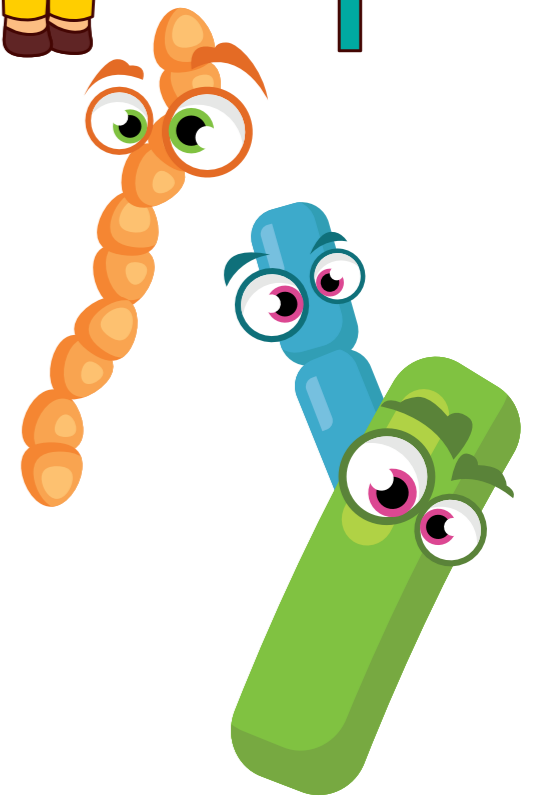
Let's circle all the living things that can help bioremediation.

**Correct answers:** Tree, Microbe, Fungus, Flower



## Page 6 Sudoku

**Answer:**

## Page 7 MULTIPLE CHOICE QUIZ

**Answer:** Q1: B / Q2: C / Q3: A / Q4: C / Q5: A



## Page 12 Crossword

**Across:** 1A: WATER / 2A: MICROBIOLOGY / 3A: BIOREMEDIATION / 4A: METAGENOMIC / 5A: BIODEGRADATION

**Down:** 1D: BACTERIA / 2D: MICROORGANISMS / 3D: SOIL / 4D: REACTOR / 5D: CONTAMINANT





# THE BIOSYSMO CONSORTIUM



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