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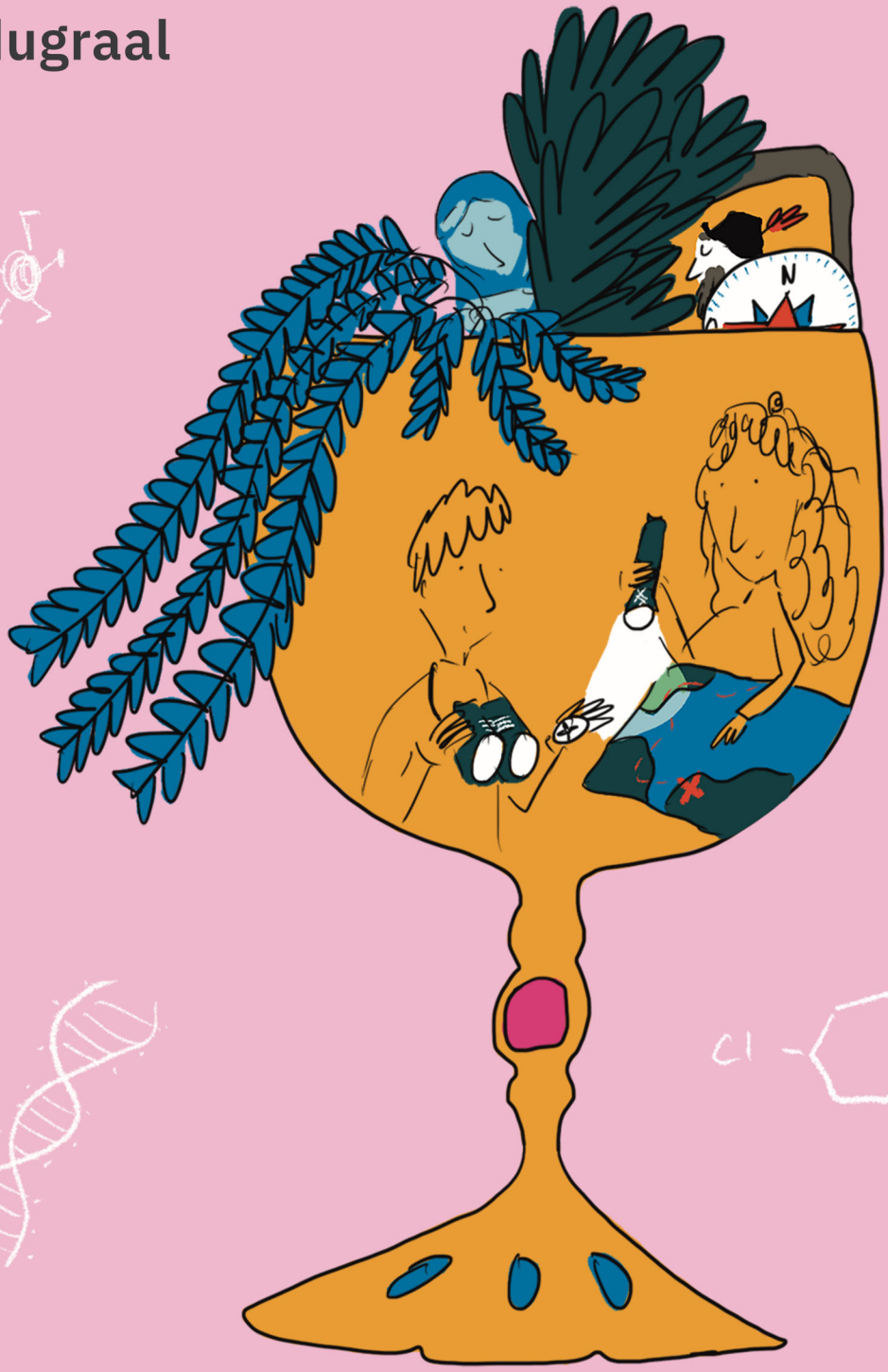


Einstein, the crazy scientist – Biology

13-14

Co-funded by the European Union

Einstein, the crazy scientist – Biology

Topic: Science – Biology

Level: Secondary education (13-14 years old)

Concepts: Digestive system – organs – food

Time required: +/- 30 min

Summary of the activity: A small scientist asks for your help to travel in his brother's digestive system to understand why he is sick.

Material needed: Paper, pen, biology knowledge and …. motivation!

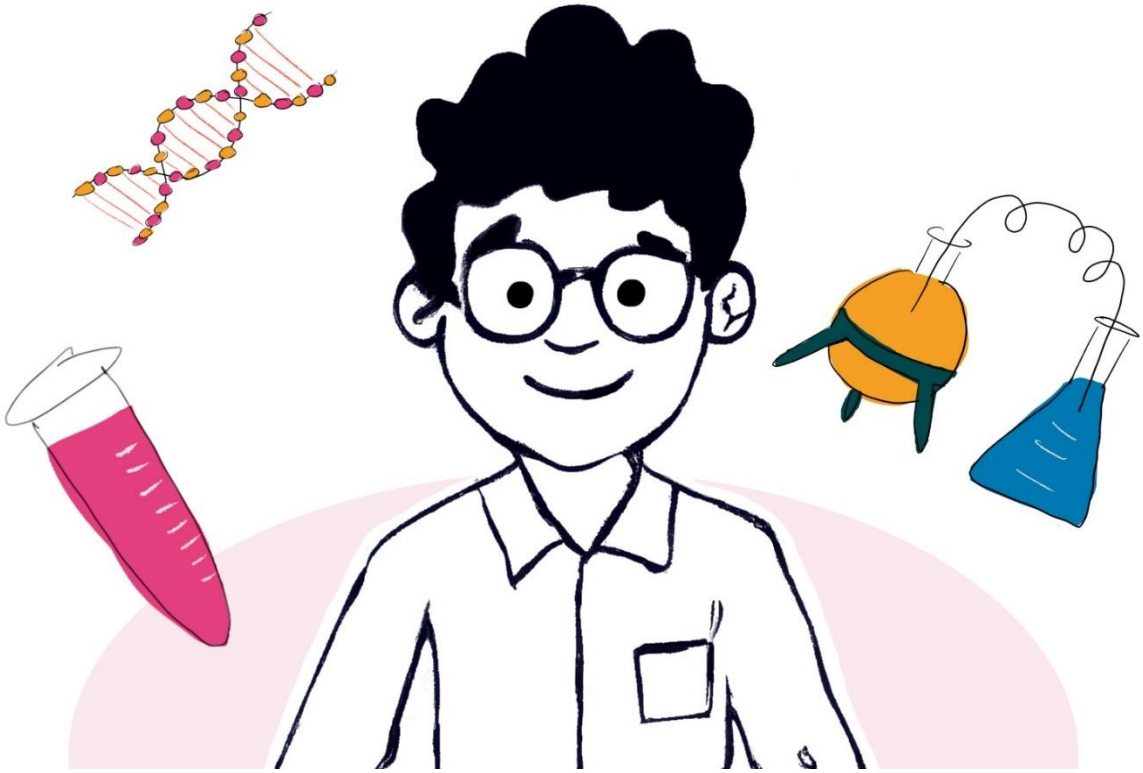
Paths/mechanisms summary: The path in this story is inspired by the natural path of food inside the body.

This is a classical path with multiple choices. The right choice leads to the continuity of the story. Generally, the wrong choice leads to an explanation and goes back to the previous paragraph to try again. Sometimes, the wrong answer doesn't have consequences, and sometimes, the wrong answer leads to another route before joining the correct route.

This adventure can be used online and offline.

Practical advice: Given the level of difficulty of this adventure, it would be most effective if used at the beginning of a sequence as an interactive introduction before a more extensive set of lessons on this subject.

1 Introduction



This is Einstein, a clever little scientist who already has a lot of inventions to his credit, usually to make family life easier.

He invented the autonomous vacuum cleaner and also created a machine that prepares breakfast and serves it in bed, perfect for Sunday mornings!

Nothing amazes this little genius and he always has an answer for everything!

However, one day, an event will give our little inventor a hard time…

Go to paragraph 4.

2

Einstein is a genius in a lot of topics but, unfortunately, he has little knowledge of biology. He doesn't know much about the digestive system, but he heard that you are a specialist in it. He asks for your help to go with him to the vessel. Guide him through the different organs and give him the necessary answers.

Are you ready for that?

Go to paragraph 18.

3

You decide to contact the central administration to get more information. She informs you that something is hiding in the large intestine but she can't figure out what it is.

You explain to her that this is why you are present in the body of Thales and that you are ready to help him.

You thus leave to explore the small intestine!

Go to paragraph 27.

4

Einstein's brother, Thales, has eaten something that made him sick...

No one understands what's happening to him. He has consulted every doctor in the region. He has also consulted the greatest medical specialists in Europe! No one can find what causes his sickness.

Einstein would like to understand why his brother is sick… But how?

Go to paragraph 8.

5

This is indeed the salivary glands. Well done! They make saliva, which aids in digestion, keeps your mouth moist and supports healthy teeth.

You arrive at the salivary glands; you notice a hole that justifies the large amount of saliva in Thales's mouth. You look in Einstein's box inside the vessel and find a sewing kit. Einstein remembers his sewing lessons with his grandmother; he decides to go outside the vessel to sew the hole. You help him.

You get to clog the salivary glands. The remaining saliva allows you to slide at the bottom of the mouth. You fall into a hole and you find yourself facing two roads. A sign is displayed but some letters are erased.

Go to paragraph 32.

6

Are you sure? Bile is a dark-green-to-yellowish-brown fluid produced by the liver of most vertebrates that aids the digestion of lipids in the small intestine. Does the liquid look like that?

Go to paragraph 10.

7

Everything starts to shake, lightning flashes and everything around you becomes gigantic. With your vessel, you land on Thales's plate, but it doesn't look like a plate anymore but more like a mountainous landscape. The salt pot looks like a huge statue and the mashed potatoes look like a hill covered with wheat fields, the broccolis look like a rainforest, the piece of meat like a huge rock overlooking a river of sauce. No time to be amazed! We have a mission!

Go to paragraph 10.

8

He remembers his brand-new invention: a machine that shrinks objects and people. Its goal? To be able to understand the infinitely small for his research. The machine is not quite perfected for now, but, as he really wants to understand what makes his brother sick, he wonders if he could use it to enter his body and find the reason for Thales's sickness. Could he do that alone?

Go to paragraph 2.

9

There is more and more saliva in Thales' mouth. The tongue becomes slippery and the vessel is more and more unstable. It is absolutely necessary to find the source of this saliva to stop its secretion. Without that, it will be impossible to go further. Einstein asks again for your help.

What is the organ that secretes saliva?

- Adrenal glands  **Go to paragraph 11.**
- Salivary glands  **Go to paragraph 5.**

10

You're wondering how you can be eaten by Thales. Einstein has an idea! Why not go into the mashed potatoes?

After a big bite, you find yourself in a big wet cavity. It's dark and impossible to see at 1 meter. But remember your checklist! You have lamp torches. You discover teeth, a tongue, a glottis … You are indeed in Thales's mouth. Suddenly, a sticky liquid spreads in the whole mouth. It is between white and transparent. The vessel has difficulties remaining stable.

What is this sticky liquid?

- Saliva  **Go to paragraph 13.**
- Bile  **Go to paragraph 6.**
- Mucus  **Go to paragraph 25.**

11

Einstein has some knowledge of the English language and remembers that adrenal is composed of two words. "Ad" means above and "renal" means kidney. Thus, it is a gland that is located above the kidneys. You realise this is not the right organ. It is necessarily the second answer: the salivary glands.

 **Go to paragraph 32.**

12

Just before you can explore the intestine, you face a large, closed door, like the entrance to the stomach. The door is closed by a code. You need this code to continue.

Some clues are scattered around:

- I have a Roman name.
- My name means "long organ".
- I am the first turn of the intestine.

I am...

- The duodenum  **Go to paragraph 19.**
- The anus  **Go to paragraph 14.**
- The scrotum  **Go to paragraph 30.**

13

Well done! This is the right answer. Indeed, saliva is a slightly sticky liquid that moistens and lubricates food particles, preparing the food for digestion. It is transparent/white.

 **Go to paragraph 9.**

14

The right answer is the duodenum. It is the initial segment of the small intestine. It follows the stomach through the pylorus. From the Latin duodenum digitorum "twelve fingers", called so because of its length, comparable to the width of twelve fingers.

Go to paragraph 31.

15

You decide to go right. You move forward thanks to Einstein's vessel and discover many ramifications and the paths get increasingly narrower. You keep on your way but suddenly get stuck because of the narrowness. Thales starts coughing harder and harder, you feel shaking, you are tilted in all directions and are finally ejected from this path. You were in his lungs! Go back the way you came to the crossroads and take another direction.

Go to paragraph 20.

16

You should have chosen the shield that resists acid. Acid-resistant protection is the best because it allows one to resist gastric juices and bile, which are very acidic and aim to break down food. Resistance to viruses and bacteria is not the most relevant to prevent the decomposition of the vessel. Fortunately, Einstein has some knowledge of chemistry. He thus changes the protection and allows you to be safe from the acid.

Go to paragraph 43.

17

The answer to the last question is the appendix. It is a growth of the large intestine. It does not play a very important role in the digestive system but it can become inflamed. This inflammation usually leads to its removal.

"An appendicitis!" shouts the central administration. "Send the defensive globules right away!".

Go to paragraph 42.

18

Before going on this incredible adventure, you need to make a checklist to prepare the vessel Einstein has built for the machine.

Helmets? Check!

Microphones? Check!

Suit? Check!

Gloves? Check!

Non-slip shoes? Check!

Lamp torches? Check!

Let's go on an adventure! Einstein presses the button that activates the shrinking machine he has just invented…

Go to paragraph 7.

19

Absolutely! The duodenum is the initial segment of the small intestine. It follows the stomach through the pylorus. From the Latin duodenum digitorum, "twelve fingers", called so because of its length, comparable to the width of twelve fingers.

Go to paragraph 31.

20

How do you know which road to take? Look around you! There is a glottis that determines who goes to the road on your right and who goes to the road on your left. You notice that some kind of bubbles have a green-coloured pass to go right. "Oxygen bubbles!" Einstein cries out. When you look in another direction, you see nutrients in food having a blue-coloured pass to go left.

"Which direction do we have to take?" Einstein asks.

- You decide to go right  **Go to paragraph 15.**
- You decide to go left  **Go to paragraph 22.**

21

You end up in the stomach. You fall into a kind of big pot filled with liquid. However, the stomach is a muscle, so you are tilted in all directions and the liquid starts to attack the walls of the vessel. You definitely need extra protection!

Einstein had foreseen such a case but doesn't know which protection to choose among all those he had created.

Can you help him? You need…

- A shield that resists acid and allows to float
   **Go to paragraph 24.**
- A light but virus-resistant shield
   **Go to paragraph 23.**
- A very heavy shield but resistant to bacteria
   **Go to paragraph 16.**

22

You find yourself in the oesophagus which starts to contract. This contraction allows you to descend little by little to the bottom of the duct until you reach a large door that is closed. This is the food customs: the central administration of the human body asks you some questions.

"Welcome, dear food, to the stomach border. We need to ask you one question".

"Which way did you enter?"

- The mouth  **Go to paragraph 46.**
- The intestine  **Go to paragraph 41.**

23

You should have chosen the shield that resists acid. Acid-resistant protection is the best because it allows one to resist gastric juices and bile, which are very acidic and aim to break down food. Resistance to viruses and bacteria is not the most relevant to prevent the decomposition of the vessel. Fortunately, Einstein has some knowledge of chemistry. He thus changed the protection and allows you to be safe from the acid.

 **Go to paragraph 43.**

24

Well done! By using this shield, you allow the vessel to resist gastric juices and bile, which are very acidic and aim to break down food.

Go to paragraph 43.

25

Are you sure? Mucus is a slippery aqueous secretion produced by, and covering, mucous membranes like inside the nose or genital organs.

Go to paragraph 10 and try again.

26

Did you find a gastric juice machine? If yes, well done! If not, never mind; the central administration appreciates your effort and sees that you are not a bad virus here to get Thales sick!

Go to paragraph 21.

27

After a while, Einstein gets impatient: "But there is no end to this! How much longer will this go on? It's true that the small intestine is a very long organ!"

- How many meters long do you think the average small intestine is (to the nearest meter)?

  .....

Go to paragraph 34.

28

Well done! This is indeed the large intestine. It allows to recover water from indigestible matters, then to compact them in the form of stools.

Go to paragraph 39.

29

Think about where Einstein and you came from: you got through the mouth, fell into a hole and now have two roads in front of you. What do you think is is the name of this crossroad?

You still don't see? Think about the name "larynx".

Go to paragraph 32.

30

The right answer is the duodenum. The duodenum is the initial segment of the small intestine. It follows the stomach through the pylorus. From the Latin duodenum digitorum, "twelve fingers", called so because of its length, comparable to the width of twelve fingers.

Go to paragraph 31.

31

You find yourself in the small intestine. You notice that all the food becomes liquid and is absorbed by the walls of the intestine. The nutrients in the food go into the bloodstream to feed the cells.

This whole scene fascinates Einstein, he takes pictures and notes for his future research but this fascination quickly gives way to the desire to find out what is making Thales sick.

Go to paragraph 3.

32

P__A__Y__X. One hole corresponds to one letter. According to you, what is the name of this place?

- You think you have the right answer? **Go to paragraph 36.**
- Do you have difficulties finding out? **Go to paragraph 29.**

33

This answer is not correct. It is the liver. Indeed, the liver is a major organ which performs many essential biological functions, such as detoxification of the organism, and the synthesis of proteins and biochemicals necessary for digestion and growth.

Go to paragraph 12.

34

The answer to the last question is: about 7 meters.

Once you reach the end of the small intestine, the passageway becomes larger; there is less and less liquid and an accumulation of waste (that which has not been absorbed by the intestine).

This is the opportunity for you to get out of the vessel with your suits and explore the rest of this cavity on foot.

“Yuck! But what a smell!" exclaims Einstein, “Where are we?”

In which body part are you?

- Cecum **Go to paragraph 28.**
- Rectum **Go to paragraph 38.**

35

You had difficulties finding the answer? Never mind, the central administration appreciates your effort and sees that you are not a bad virus here to get Thales sick!

Go to paragraph 21.

36

Did you find "Pharynx"? If yes, well done! If not, don't worry, you tried! The pharynx carries air, food and fluid down from the nose and mouth. It is the site of common illnesses, including sore throat and tonsillitis.

Go to paragraph 20.

37

Correct! Well done. Indeed, the liver is a major organ which performs many essential biological functions, such as detoxification of the organism, and the synthesis of proteins and biochemicals necessary for digestion and growth.

Go to paragraph 12.

38

The rectum is the final part of the intestine. This is where all the waste is stored before going out by the anus. The large intestine allows to recover water from indigestible matters, then to compact them in the form of stools.

Go to paragraph 39.

39

You keep going and you start to hear a strange noise in the distance... You get closer and, in a cavity, next to the intestine, you see a huge colony of little ant-like beings.

"Bacteria!" shouts Einstein. "That's probably why Thales isn't feeling well! We have to tell the central administration of the human body!"

You call headquarters and they ask you where you noticed the bacteria. Einstein can't figure out where.

Can you help him?

- What is the name of the cavity where the bacteria hide?

  .....

Go to paragraph 17.

40

This answer is not correct. It is the liver. Indeed, the liver is a major organ which performs many essential biological functions, such as detoxification of the organism, and the synthesis of proteins and biochemicals necessary for digestion and growth.

Go to paragraph 12.

41

Unfortunately, this is not the correct answer.

Food enters the body by the mouth, is shredded by the teeth and falls into the oesophagus before entering the stomach. The intestine is also part of the digestive system.

The central administration takes you aside before rejecting you from the human body because you are not considered "digestible".

This is your last chance to convince them and to find out what is making Thales sick. You decide to be honest with them and explain why you are here and that you are not a bacterium harmful to Thales' body.

After some hesitation about your good faith, the central administration accepts but on one condition: to help them put the pieces of a machine's manual back together. They don't know which machine it is, and it is very important to properly file the instructions in case of a problem or malfunction.

The letters out of order are the following: C I I G A S R T E C J U.

You need to find the name of the machine.

_ _ _ _ _ _ _ _ _ _ _ _ _ MACHINE

- You think you have the right answer?
  
  Go to paragraph 26.

- You have difficulties finding the answer?
  
  Go to paragraph 35.

42

The administration thanks you for helping them with this research. They still ask you to consult a doctor to consider removing the appendix.

To thank you, and to keep you from leaving Thales with the rest of the garbage, the administration asks the lymphocytes to escort you back to the nasal passages.

Once there, Einstein releases pepper to make Thales sneeze.


Go to paragraph 44.

43

It recognises you and allows you to pass, but only if you do it a favour. It asks you to find the gallbladder because the administration can no longer contact it.

In which organ is the gallbladder located?

- Intestine → **Go to paragraph 40.**
- Stomach → **Go to paragraph 45.**
- Liver → **Go to paragraph 37.**
- Appendix → **Go to paragraph 33.**

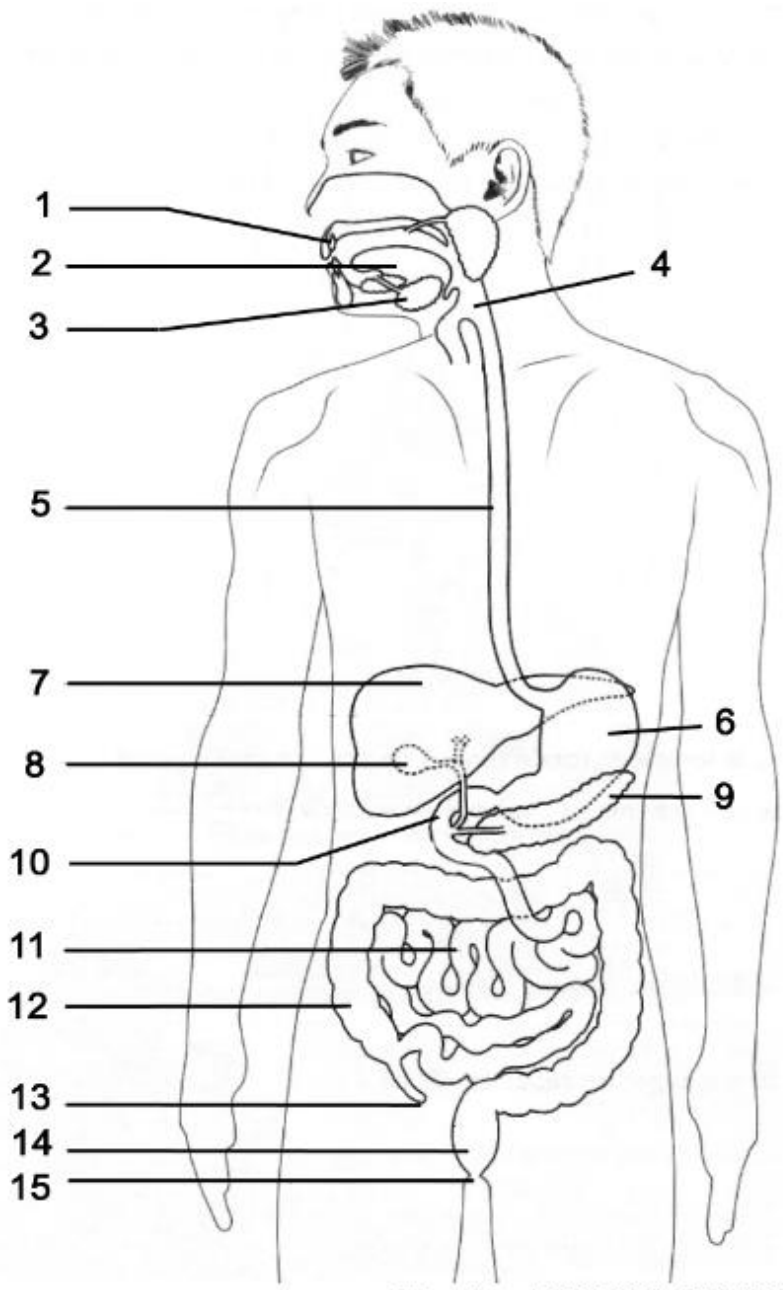
44

"Aaaaaatchouuuuuuuum!!!". You are finally outside! Einstein presses the button on the shrinking machine again and you finally get back to your normal size!

Despite a slight headache, everything is fine! You contact the doctor; he operates on Thales and he is finally out of the woods!

Now that this adventure is over, **can you help Einstein fill in the digestive system diagram on the next page?**

The end



Sciences Action, COCRIAMONT M., FABREV., KUYL B., 2008, Van In

1	6	11
2	7	12
3	8	13
4	9	14
5	10	15

45

This answer is not correct. It is the liver. Indeed, the liver is a major organ which performs many essential biological functions, such as detoxification of the organism, and the synthesis of proteins and biochemicals necessary for digestion and growth.

Go to paragraph 12.

46

Well done! Indeed, food enters the body by the mouth, is shredded by the teeth and falls into the oesophagus before entering the stomach.

Go to paragraph 21.

Designed by 6 European organisations, the project intends to create efficient, engaging pedagogical materials and tools for teachers in order to implement an innovative gamified Homework methodology with pupils. In doing so, we wish to contribute to boosting their efficiency and engagement rate in remote work and, more specifically, in Homework.

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