Albert Einstein

The Amazing Story of a Rebel Genius

Author: Nick Quark · Recommended age: 7–12 · 8 chapters

Name: _____ Date: _____

1. Before you read

1. What do you already know about Albert Einstein? Where have you seen his face or heard his name?
2. The title calls him a "rebel genius." What do you picture when you hear the word *rebel*? Can you be a rebel and a good student at the same time?
3. Do you think time passes at the same speed for everyone, everywhere? Write down what you think now and look at it again when you finish the book.

2. Comprehension questions

Keep the book in front of you: look things up, reread, and answer in your own words. The labels tell you what kind of question it is: ***fact*** *(it's written in the book),* ***why*** *(you have to explain a cause), and* ***opinion*** *(there's no single right answer).*

Welcome and Chapter 1 · The Needle That Wouldn't Obey

1. What did Albert's father bring him when he was in bed with a fever? What did the needle do, however he turned it? FACT

2. Why was Albert so fascinated by his "sacred little geometry book"? WHY

Chapter 2 · The Student Who Said Enough

3. What did the Greek teacher, Joseph Degenhart, tell Albert in front of the whole class? FACT

4. He crushed the math and physics parts, so why did he fail the entrance exam for the Zurich Polytechnic? WHY

5. At fifteen, Albert walked out of high school and went to Milan on his own. Did he do the right thing? What would you have done? OPINION

Chapter 3 · The Olympia Academy

6. Why couldn't Albert get a job as an assistant at any university after he graduated? WHY

7. What was the club he started with Maurice Solovine and Conrad Habicht called, and what did they eat at their "gala dinners"? FACT

Chapter 4 · The Miracle Year

8. How many papers did Einstein write in 1905, and how old was he? FACT

9. In the train experiment, why does the friend on the platform see the light reach the rear door first? WHY

10. After the four papers came out, for a while nothing happened. How would you have felt? Would you have kept trying? OPINION

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Chapter 5 · The Happiest Thought of My Life

11. What was "the happiest thought" of Einstein's life? FACT

12. What number did Einstein get when he put Mercury's data into his new equations? FACT

Chapter 6 · The Eclipse That Changed Everything

13. Why did testing Einstein's theory require a total solar eclipse? WHY

14. What discovery did Einstein win the Nobel Prize for? Was it relativity? FACT

Chapter 7 · God Does Not Play Dice

15. Why did Leo Szilard need Einstein to be the one who signed the letter to President Roosevelt? WHY

16. Einstein said signing that letter was a great mistake, but that there was a reason for it. What do you think? OPINION

Chapter 8 · The Sage of Princeton

17. What did the State of Israel offer Einstein, and what did he answer? FACT

18. Einstein spent thirty years searching for a theory he never found. Is it worth chasing something you might never reach? OPINION

3. Timeline

Every date comes from the book. There are three blanks, marked ✎: find the year and write it in.

1879	Albert is born in Ulm, Germany, on March 14.
1894	The family business collapses. In winter, Albert leaves high school in Munich and crosses the Alps by train to Milan.
1896	In October, at seventeen, he finally starts at the Zurich Polytechnic.
1902	In June he starts work at the Patent Office in Bern as a technical expert, third class.
✎ _____	The miracle year: he writes four papers that change physics, including the one with $E = mc^2$.
1915	In November he presents general relativity in four lectures at the Prussian Academy of Sciences.
✎ _____	On May 29, a total solar eclipse: Eddington photographs the stars from the island of Príncipe.
1921	He is awarded the Nobel Prize in Physics.
✎ _____	Hitler comes to power in Germany. In October, Einstein lands in the United States, bound for Princeton.
1955	He dies in the early hours of April 18, in the hospital in Princeton.

4. Science vocabulary

Compass

A small case with a needle that always points the same way, however you turn it. Nobody touches it: an invisible force, magnetism, pushes it.

Quantum

A separate packet of energy. Einstein proposed that light comes in grains, like marbles. Today we call those quanta of light photons.

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Photoelectric effect
What happens when light hits certain metals and they give off electrons. It's the basis of solar panels, and explaining it won Einstein the Nobel Prize.

Simultaneous
Happening "at the same time." Einstein discovered that two events can be simultaneous for you and not for someone who is moving, and neither of you is wrong.

Equivalence principle
The idea that gravity and acceleration aren't just alike: they're the same thing. Inside a closed box there's no way to tell them apart.

Spacetime
Space and time together, understood not as an empty stage but as something flexible that matter can bend.

Total eclipse
The moment when the Sun is completely covered: the 1919 one gave six minutes of total darkness. Only then can you see the stars right next to it.

Nuclear fission
Splitting the nucleus of a uranium atom in two. It releases energy: exactly the hidden energy that $E = mc^2$ predicted.

5. Try it at home: the bedsheet of the universe

In Chapter 5, the book explains Einstein's gravity with a stretchy sheet. Here you'll build it for real.

You need

- An old sheet or a big towel.
- Four people (or two, if the towel is small).
- A heavy ball: a basketball, a soccer ball, or a melon.
- A few marbles or small balls.

Steps

1. Hold the sheet by the corners and stretch it tight, at waist height.
2. Roll a marble across the empty sheet. Watch the path it takes.
3. Put the heavy ball in the middle. The sheet sags.
4. Roll the marble again, sideways and near the edge, without aiming at the ball. Try rolling it faster and slower.

What to look for

With the ball in the middle, the marble no longer goes straight: it curves and circles around the dip, even though the ball never touches it. What happens when you roll it faster? And slower?

What it has to do with the story

It's the same picture the book uses for Einstein's big idea: gravity isn't a force that pulls. Matter bends spacetime, the way the ball bends the sheet, and the Earth goes around the Sun because the path it travels along is curved. "Matter tells space how to curve, and space tells matter how to move."

Safety: nothing dangerous here. With little children, have a grown-up nearby to make sure the marbles don't end up in anyone's mouth.

6. Talk or write about it

Class discussion

Albert said: "It's not that I'm so smart, it's just that I stay with problems longer." Which matters more for learning: being fast or not giving up? Find examples in the book and in your own life.

Writing (half a page)

Einstein got letters from children all over the world and answered a great many of them, by hand and seriously. Write him a letter: tell him what surprised you most about his life and ask him the question you'd most like him to answer.

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Answers for grown-ups

*The **opinion** questions (5, 10, 16, and 18) have no set answer: any well-reasoned response is fine. For the **why** questions we give the explanation the book offers, as a guide.*

Comprehension questions

1. A pocket compass. The needle kept pointing the same way, however he turned it.
2. Because it held truths that could be proved with a chain of reasons, not "because the teacher says so."
3. That he would never amount to anything in life (and that his very presence in the class undermined the respect the teacher needed).
4. Because he failed the other subjects: French, botany, zoology, and history.
5. *Opinion: no set answer.*
6. Because back then nobody hired a young physicist without a recommendation from his professor, and his professor was Heinrich Weber, whom he had ignored for four years.
7. The Olympia Academy. Dinner was sausage, a wedge of Gruyère, fruit, a jar of honey, and tea.
8. Four papers. He was twenty-six.
9. Because while the light travels, the train is moving: the rear door advances toward the light and the front door runs away from it.
10. *Opinion: no set answer.*
11. That if a person fell from the roof of a house, he would not feel his own weight while falling.
12. 43 arcseconds per century: exactly what astronomers observed.
13. To see a star right next to the Sun you have to look toward the Sun, which outshines everything. Only during a total eclipse can those stars be seen and photographed.
14. For his services to theoretical physics and especially for discovering the law of the photoelectric effect. Not for relativity.
15. Because nobody in the government would listen to an unknown Hungarian refugee; he needed a signature that would open every door.
16. *Opinion: no set answer.*
17. The presidency of the country. He turned it down in writing, saying he lacked the natural aptitude and experience to deal with people and to carry out official duties.
18. *Opinion: no set answer.*

Timeline blanks

- **1905** — the miracle year and the four papers.
- **1919** — the May 29 eclipse seen from Príncipe.
- **1933** — Hitler comes to power and Einstein settles in Princeton.

Before you read and Talk or write about it

No set answers: these are for sparking ideas and conversation.

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