Marie Curie

The Woman Who Glowed in the Dark

Author: Nick Quark · Recommended age: 7–12 · 10 chapters

Name: _____ Date: _____

1. Before you read

1. What do you already know about Marie Curie? Why do you think she is famous?
2. The title says she "glowed in the dark." What things do you know that glow without being plugged in?
3. Imagine your country banned you from studying your own language and your own history. How would you learn what you wanted to know? Write it down and read 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).*

Chapter 1 · The Forbidden Kingdom

1. What did Manya's father keep in the glass cabinet in the living room, and why couldn't he use it at school? FACT

2. Why did the Flying University keep changing its location? WHY

3. Explain in your own words the pact between Manya and her sister Bronya. FACT

4. Manya put off her own studies for years so her sister could study first. Would you have done the same? OPINION

Chapters 2 and 3 · The Paris attic and the Curie marriage

5. Why did Marie faint in Paris? WHY

6. What was Marie's wedding dress like, and why did she choose it? FACT

Chapter 4 · The Magic Shed and the Glowing Stone

7. What did Marie find when she measured pitchblende that didn't fit with what was known about uranium? FACT

8. Why did she name her first element polonium? WHY

9. Marie and Pierre could have patented radium and become rich. What did they decide, and why? FACT

10. Do you agree with that decision? What would you have done? OPINION

Chapters 5 and 6 · The Nobel, the accident, and the empty chair

11. What did Pierre do when he learned that Marie's name had been left out of the 1903 Nobel Prize nomination? FACT

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12. On November 5, 1906, how did Marie begin her first lecture, and why did she start that way? WHY

Chapters 7 and 8 · The scandal and the Little Curies

13. A member of the Swedish Academy wrote asking her not to come and collect the 1911 prize. What did she answer, and what did she do? FACT

14. How did the X-ray vans get electricity on the battlefront, where there were no outlets? WHY

15. Irène was seventeen when her mother said: "Irène, you're coming with me." Would you have dared to go to the front? Why? OPINION

Chapters 9 and 10 · The Radium Institute and the end

16. What did ordinary American women and schoolgirls do so that Marie could have a gram of radium for her institute? FACT

17. Why are Marie's laboratory notebooks kept in lead-lined boxes? WHY

18. What did Irène and Frédéric show Marie in 1934, and what did the device they brought do? FACT

3. Timeline

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

1891	Marie arrives in Paris and moves into an attic room.
1893	She finishes her degree in physics, first in her class.
1895	On July 26 she marries Pierre Curie, in a dark blue wool dress.
1897	In September their daughter Irène is born.
✎ _____	They announce polonium in July and, on December 26, radium.
1903	Nobel Prize in Physics, shared with Pierre and Henri Becquerel.
✎ _____	Pierre is killed in a street accident on April 19. On November 5 Marie gives her first lecture at the Sorbonne.
1911	Nobel Prize in Chemistry. In December she travels to Stockholm to collect it.
1914	In August the war begins. Marie takes her laboratory's radium to safety and returns to Paris.
✎ _____	On July 4 she dies in a sanatorium at Sancellemoz, in the French Alps.

4. Science vocabulary

Radioactivity
Marie's name for the energy that comes from inside certain atoms. It doesn't come from outside: there's no battery and no plug.

Pitchblende
An ugly, black, greasy-looking mineral. Marie measured it as several times more radioactive than pure uranium, which made her suspect it was hiding unknown elements.

Element
A basic substance that can't be broken down into simpler ones. Marie and Pierre found two new ones in pitchblende: polonium and radium.

Polonium
The first new element, about 400 times more active than uranium. She named it after Poland, her country, which at the time didn't appear on maps.

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Radium
The second element, about 900 times more radioactive than uranium when they announced it. Its name comes from the Latin *radius*, "ray," and its tubes glowed in the dark.

Electrometer
The instrument invented by Pierre and his brother Jacques that Marie used to measure radiation with great precision.

X-rays
The "invisible light" that shows our bones. With them, surgeons at the front could see where the damage was before operating.

Aplastic anemia
The blood disease that killed Marie: years of radiation without protection had damaged the bone marrow, her body's blood factory.

5. Try it at home: separating what's hidden

Marie ground, boiled, and filtered tons of mine waste to get a tiny amount of radium. That was her work in the shed: separating, again and again, until only the substance she was looking for was left. Here you'll do it on a small scale.

You need

- A glass of warm tap water.
- Two spoonfuls of salt (coarse salt works best).
- A spoon and a dark plate or saucer.
- A quiet place where you can leave it for several days without anyone moving it.

Steps

1. Pour the salt into the warm water and stir until it disappears completely. Look at the glass: the salt is still there, but you can't see it.
2. Pour a finger's depth of the salty water onto the plate.
3. Leave the plate somewhere dry and write down the date. Don't touch it.
4. Look at it every day for a week and draw what you see.

What to look for

The water slowly goes off into the air and, little by little, cube-shaped salt crystals appear. What was mixed in and invisible is separate and visible again. Are the crystals big or small? Does anything change if you put the plate somewhere warmer?

What it has to do with the story

Marie did something similar, but with giant cast-iron cauldrons and enormous patience: grinding, boiling, filtering, and crystallizing, over and over, until she was left with a tiny amount of something new. You've just seen on a plate how something hidden in a mixture can appear; for her, getting radium out of pitchblende took years of work.

Safety: use warm tap water, never boiling, and have a grown-up nearby. Don't eat the salt from the experiment.

6. Talk or write about it

Class discussion

Instead of patenting it, Marie and Pierre gave the world the method for getting radium: "Radium is an element. It belongs to all people." Should a discovery that cures diseases belong to whoever finds it, or to everyone? Find arguments for both sides.

Writing (half a page)

Write the diary page Irène might have written the day she came back from the front with her mother, telling what she saw and how she felt.

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Answers for grown-ups

*The **opinion** questions (4, 10, and 15) 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. Scientific instruments: glass tubes, brass scales, a barometer, and an electroscope with gold leaves. The Russian officials who ruled Poland had forbidden him to use them at school: "Science makes people think, and people who think are dangerous."
2. So that the Tsar's secret police couldn't catch them: it was a secret network of classes.
3. Manya would put off her studies and work as a governess, sending money to Paris so Bronya could study medicine; once Bronya was a doctor, she would support Manya while she studied.
4. *Opinion: no set answer.*
5. Because she was barely eating: she lived on about three francs a day, and her diet was tea, bread and butter, and, as a luxury, a radish or a hard-boiled egg.
6. A comfortable, sturdy, dark blue wool dress, so she could wear it in the laboratory afterward, where acid stains and chalk dust wouldn't show.
7. That pitchblende was several times more radioactive than pure uranium, which made no sense if it only contained uranium: it had to be hiding something else.
8. After Poland, her country, which was occupied and had been wiped off the map. It was an act of rebellion.
9. They decided to publish the method and not patent it: it would be contrary to the scientific spirit, and radium was meant to heal the sick, not to make anyone rich.
10. *Opinion: no set answer.*
11. He wrote back at once that he very much wished to be considered together with Madame Curie for their research. In the end, the prize was shared with her.
12. "When one considers the progress that has been made in physics in the past ten years…" She picked up the course exactly where Pierre had left off in his last lesson: science doesn't stop, she was carrying on his work, and she wasn't there for anyone's pity.
13. That the prize was for the discovery of radium and polonium and that there was no connection between her scientific work and her private life. She went to Stockholm in December 1911.
14. She connected the X-ray machine to the car's engine through a dynamo: with the engine running, it made electricity.
15. *Opinion: no set answer.*
16. Ordinary women volunteered, knocking on doors across the country to collect a dollar or two at a time, and schoolgirls chipped in their dimes, to buy her a gram of radium.
17. Because they are still radioactive more than a hundred years later.
18. A substance that had never been radioactive before, which they had made radioactive: artificial radioactivity. The device was a Geiger counter, which clicks when it detects radiation.

Timeline blanks

- **1898** — polonium in July, radium on December 26.
- **1906** — Pierre's death and Marie's first lecture at the Sorbonne.
- **1934** — she dies on July 4 at Sancellemoz.

Before you read and Talk or write about it

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

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