

The Making of a Scientist

Answers to NCERT Questions

READ AND FIND OUT

1. How did a book become a turning point in Richard Ebright's life?

Ans: The book 'The Travels of Monarch X' opened the world of science to Richard. After reading it, he became interested in tracking the migration of butterflies. This interest led to his other projects and experiments. Finally, he became a great scientist.

2. How did his mother help him?

Ans: Richard's mother proved to be a great help. She took him on trips and bought scientific equipment for him. She spent all her time in setting up challenges for him. This helped him learn a lot. She presented him the book, 'The Travels of Monarch X'. The book changed Richard's life forever.

3. What lesson does Ebright learn when he does not win anything at a science fair?

Ans: Ebright exhibited slides of frog tissues at a science fair. He did not get any prize. He learnt an important lesson that science is not just about display. It is about projects and experiments. He began conducting experiments from that day onwards.

4. What experiments and projects does he do then undertake?

Ans: He undertook many projects and experiments. He worked on viceroy butterflies to show that they copied monarch butterflies. He studied bright spots on the monarch pupa and discovered a new hormone. Also, he found out how cells read their DNA.

5. What are the qualities that go into the making of a scientist?

Ans: There are three essential qualities that make a scientist. The first is a first rate mind. Next is the presence of curiosity. Last but not the least, it is the will to do the best and win.

THINK ABOUT IT

1. How can one become a scientist, an economist, a historian ... ? Does it simply involve reading many books on the subject? Does it involve observing, thinking and doing experiments?

Ans: Reading many books on a subject is not enough. One must develop the skill of observation and thinking. Experiments need to be done. One needs to have curiosity to

explore and find new things. Above all, one must work hard and not get upset by failures.

2. You must have read about cells and DNA in your science books. Discuss Richard Ebright's work in the light of what you have studied. If you get an opportunity to work like Richard Ebright on projects and experiments, which field would you like to work on and why?

Ans: DNA carry the blue print of life and heredity. They pass information from one generation to the other.

If I get an opportunity to work like Richard Ebright, I would choose to study about diseases. By studying the DNA, I may find ways and means to cure many illnesses.

TALK ABOUT IT

1. Children everywhere wonder about the world around them. The questions they ask are the beginning of scientific inquiry. Given below are some questions that children in India have asked Prof. Yash Pal and Dr Rahul Pal as reported in their book, Discovered Questions. (NCERT, 2006).

- i. What is DNA fingerprinting? What are its uses?
- ii. How do honeybees identify their own honeycombs?
- iii. Why does rain fall in drops?

Can you answer these questions? You will find Prof. Yash Pal's and Dr Rahul Pal's answers (as given in Discovered Questions) on page 75.

Ans:

- i. DNA fingerprinting is a forensic technique used to identify individuals by the characteristics of their DNA. It is used in parentage testing. It is also used in criminal investigation to identify a person or to place him at the scene of crime.
- ii. Honeybees have signalling chemicals. They leave trails for fellow honeybees, so that they can reach their honeycomb.
- iii. The only solid things in the air are dust particles. Water vapour uses it as a centre of attraction when it becomes too heavy. Water vapour condenses on the dust particle as a drop and falls on Earth.

2. You also must have wondered about certain things around you. Share these questions with your class, and try and answer them.

Ans: Some of the questions are

- Why is the sky blue?
- Why do stars twinkle?
- What is a rainbow?

- Why do fruits fall on earth?

Additional Questions

Short Answer Questions (30-40 words)

1. Which project did Albright submit in his eighth grade? Why did he win?

Ans: For his eighth grade project, he tried to find the cause of a viral disease that killed all monarch caterpillars every few years. He thought it all happened because of a hectic and tried raising caterpillars in the presence of beetles, but he did not get any results, but he went ahead and showed his experiments and trials and won a prize.

2. Who were the important people in Ebright's life? Why?

Ans: Ebright's mother who encouraged him as a child and Dr Frederick A. Urquhart O. had inspired him to study about butterflies were quite important in Ebright's life. Also, Ridded A Weathered, Ebright's Social Studies teacher opened Ebright's mind to new ideas and praised him for his handwork and indomitable spirit.

3. Why did Ebright lose interest in tagging butterflies?

Ans: Ebright lost interest in tagging butterflies because it was a tedious work that did not provide much feedback.

4. Which project of Ebright won first prize in the County Science Fair?

Ans: Ebright didn't win anything at his first science fair, thereby realising that actual experiments alone worked. Later, he started winning prizes. Ebright with his scientist friend first built a device that showed that the tiny gold spots on a monarch pupa were producing a hormone necessary for the butterfly's full development. This project won them first prize in the County Science Fair and third prize in zoology in the International Science Fair.

5. What all hobbies did Ebright develop in kindergarten?

Ans: As a child, Ebright had a driving curiosity. He was interested in learning new things. He was good in studies and earned top grades in the class. He also collected rocks, fossils and coins. He became an eager astronomer too.

6. How did Ebright's mother help in his learning?

Ans: Ebright had a driving curiosity and a bright brain — essential ingredients to become a scientist. His mother encouraged him to learn more. She exposed him to the world around him by taking him to trips, bought him books, telescope, microscope, cameras, mounting materials and other equipment, which helped him in his learning.

7. “Science shows a connection between structure and function”. Show this to be so, for the spots Ebright saw on Monarch pupas.

Ans: Ebright grew cells from a monarch’s wing to show that cells could divide and develop into a normal butterfly wing scales only if they were fed with the hormones from the gold spots. Later, he identified the chemical structure of the hormone and found how cells can read the blueprints of its DNA.

8. How can Ebright’s theory of cell life be a revolution in the medical field, if it is proved correct?

Ans: Ebright identified the chemical structure of the gold spot hormone and found that cells can read the blueprint of its DNA. To further test his theory, he began doing experiments, if it proves correct it will be a big step towards understanding the process of life. It might lead to new ideas for preventing some types of cancer and diseases.

9. What are the essential qualities for becoming a scientist, according to Ebright’s teacher?

Ans: Sharp brain, observant, driving curiosity, the keen interest in the subject and strong will for the right cause are some of the essential qualities for the making of a scientist. He should not run after prizes, and have a competitive spirit but not in bad sense.

10. What results are expected if Richard Ebright’s theory is proved correct?

Ans: If Richard Ebright’s theory proves to be correct, it will be a big step towards understanding the processes of life. It might lead to new ideas for preventing some types of cancer and other diseases.

11. Why did Richard Ebright start a project of tagging the butterflies?

Ans: Once, Ebright’s mother bought him a book, ‘The Travels of Monarch X’. At the end of the book, the writer Dr A. Urquhart had invited the readers to help him in the study of butterfly migration by tagging them. So, he started tagging the butterflies.

12. How did Ebright spend his time in Pennsylvania?

Ans: Ebright grew up in Pennsylvania. He was the only child of his parents. His father died when he was in third grade. As a child, he was good in studies and also collected rocks, fossils and coins.

13. How did the book become a turning point in Richard Ebright’s life?

Ans: Once his mother bought the book, ‘The Travels of Monarch X’, at the end of the book, Dr A. Urquhart had invited readers to help him study the migration of monarch butterflies by tagging them. This became a turning point in his life.

14. Mention any two of Ebright’s contributions to the world of science.

Ans: He carried experiments to prove successfully that hormone produced by the gold spots of a pupa is responsible for the growth and formation of butterfly wings. He also discovered how a cell could read the blueprint of its DNA that controls heredity.

Long Answer Questions (100-150 words)

1. 'Success is failure turned inside out'. Prove the above statement with instances from the journey taken by Richard Ebright from losing at the science fair to winning at the international fair.

Ans: Success is the fruit of failure. It never comes straight but through failure. This can be seen in the life of Richard Ebright. Although he earned top grades in school, on everyday things he was just like every other kid. He faced many failures in his life, but every failure strengthened his will to succeed. When he was in seventh grade, he participated in County Science Fair with his slides of frog tissues. But he could not win a prize. This made him determined to win the prize and in his eighth grade, he again participated in the science fair with the experiment of viral disease in monarch caterpillars and won the prize. The very next year, he participated with his experiment of whether viceroy butterflies copy the monarch butterflies in order to save their life from the birds and this project won Ebright, third prize in overall County Science Fair.

His experiment regarding gold spots of monarch that the spots produced hormones necessary for the full development of butterflies won third prize in International Science and Engineering Fair.

Next year, his advanced experiments on the monarch pupa won him first place at the International Science Fair. Thus, for Richard Ebright, we can say that success is failure turned inside out.

2. How does Richard Ebright become a scientist?

Ans: Richard Ebright had been a curious child even when he was in kindergarten. His curiosity prompted him to collect rocks, fossils, coins and butterflies. His mother's encouragement and his bright mind also contributed to making him a success. His mother got him all that he needed to develop his scientific bent of mind. His response to Dr Fredrick A. Urquhart to collect butterflies for his research gave him an opportunity in his endeavours. Then in the seventh grade, he got a hint of what real science is when he entered a County Science Fair and lost. He realised that winners had tried to do real experiments, not simply make a neat display. Thereafter, Ebright worked sincerely on every science project he got every year in school. Then he stood first in a County Fair that gave him entry into international science and engineering fair where he won third place. He then went on to win the highest honours and graduated from Harvard. His high school research into the purpose of the spots on a monarch pupa eventually led him to his theory about cell life. Thus, he became a renowned scientist.

3. “Richard Ebright was a successful scientist who gave a new theory of cells to the scientific world.” Elucidate.

Ans: Ebright tried experiments on butterflies for a science fair. In his project, in the second year of high school, he tried to explain the purpose of twelve tiny gold spots on a Monarch pupa. He found out that those spots produced a hormone necessary for the full development of a butterfly. He continued with his experiments even after graduation using sophisticated instruments of the university. He discovered the chemical structure of the hormone. He came across his new theory of cell life. It gave an answer to one of the questions — “How a cell can read the blueprint of DNA.”

4. Ebright’s backbone was his mother. How did she contribute towards his learning? What kind of work did she find for him even at the dining table? What values did Ebright imbibe from his mother?

Ans: Ebright’s mother played an important role in making him a scientist. She motivated him to learn new things. She took him on trips, bought him telescopes, microscopes, cameras, mounting material and other equipment.

Every evening, mother and son worked together at the dining table. If Ebright had nothing to do, she would find his work — learning work. He was a keen learner, liked learning and got ‘A’ grade throughout his schooling. She also bought him a book, ‘The Travels of Monarch X’, which opened the world of science to him. Ebright’s mother helped him to become a scientist by sustaining his interest in the scientific field.

Self-Assessment Test

Short Answer Questions

1. “Richard was the focus of his mother’s attention”. Compose a thesis on this.
2. Comment on the role of Mr weathered in Ebright’s life.
3. Identify four values which Richard Ebright projected as a man of substance.
4. How did Richard’s mother help him to become a scientist?
5. What are the factors which contributed in making Ebright a scientist?

Long Answer Questions

1. Describe Richard Ebright’s childhood.
2. Discuss the role of Ebright’s mother in making him a scientist.
3. How did Ebright’s journey as a biologist begin with butterflies?