Name: _____ Date: _____

Inside an E-Bike

Reading level 8 (4th grade) · 690 words

Rosa took the battery out of an electric bicycle. She set it on her workbench. Without it, the bicycle looked plain. It had two wheels, a chain and a seat. A customer stood watching. "How does it work?" he asked. "It has a motor and a battery," said Rosa. "Switch the power off, and it rides like any bicycle."

Rosa pointed to the back wheel. "The motor is in there," she said. "It is called a hub motor. The hub is the middle of the wheel. When power flows in, the wheel turns." Some bicycles put the motor low, by the pedals. That kind pushes the chain. Many bicycles use hub motors.

Rosa held up the battery. Inside its case are many small cells. They are lithium-ion cells, like the ones in phones and laptops. A safety circuit watches the cells. It checks the heat and the power flow. If something goes wrong, it can switch the battery off. Then Rosa slid the battery back into its place on the frame.

Next Rosa tapped a small box on the frame. "This is the controller," she said. "It sits between the battery and the motor." A sensor feels how hard or how fast you pedal. The controller sends the motor the right amount of power. Often, push harder and you get more help. Stop pedaling, and the help stops.

"Some have a throttle too," said Rosa. A throttle is a hand control on the handle, such as a twist grip. Press it, and the motor moves the bicycle. Your feet can be still. A bicycle that helps only while you pedal is called pedal assist. Both kinds are sold. The rules for them are not the same.

Rosa explained the classes. In most states, electric bicycles come in three. A Class 1 bicycle helps only while you pedal. A Class 2 bicycle may also have a throttle. Both stop helping at 20 miles an hour. After that, only your legs, or a hill, can make the bicycle go faster.

Rosa went on. A Class 3 bicycle keeps helping until 28 miles an hour. In the model law most states use, Class 3 riders must be 16 or older. They must wear a helmet. But rules differ by state and by city. Since 2025, New York City has a limit of 15 miles an hour for every e-bike.

Rosa hung a helmet on every bicycle she sold. A review of five studies of bicycle crashes found this. A helmet cuts the chance of a bad head or brain injury by more than half. Those crashes were on plain bicycles. A United States safety agency says to always wear one. That goes for scooters too.

Rosa liked to ask customers one question. How much more road does a bicycle need to stop if it goes twice as fast? The answer is about four times as much. A moving bicycle's energy grows with the square of its speed. A rider also travels while reacting. At a higher speed, that

distance grows too.

Rosa led him to an electric scooter. It works in a different way. You stand on a flat board, with one foot in front of the other. You steer with the handles. The wheels are small, usually 8 to 11 inches across. The motor sits in a wheel. A throttle on the handle sets your speed. A scooter has no pedals.

Rosa had a rule about charging. Use only the charger that came with the bicycle. Stay in the room while it charges. Never charge it while you sleep. Each cell holds a liquid that can burn. If a cell gets too hot, it can start a chain reaction called thermal runaway. The safety circuit helps stop that. It cannot stop every fault.

Rosa told the customer one last thing. The motor in his wheel was an old idea. In 1895 a man named Ogden Bolton, in Ohio, got a patent for an electric bicycle. Its motor was built into the wheel. The drawings are still online. His battery hung from the frame, like the one Rosa had slid back into place.

Questions

1. What is the hub motor in this book?

A. A motor built into the middle of a wheel
B. A motor that sits in the seat
C. A small box on the handlebar

2. Why does the controller sit between the battery and the motor?

A. To hold the bike up
B. To send the motor the right amount of power
C. To light the road

3. What does "throttle" mean here?

A. A helmet strap
B. A kind of tire
C. A handlebar control that makes the motor move the bike

4. Why does a bike going twice as fast need about four times as much road to stop?

A. The energy of a moving bike grows with the square of its speed
B. Fast bikes have weaker brakes
C. The road gets slippery at speed

5. Which charging rule does Rosa give?

A. Charge it overnight so it is ready
B. Use any charger that fits
C. Use only the charger that came with the bike

6. What is true about hub motors?

A. They were invented in 2015

B. An inventor patented a bicycle with one in 1895

C. They only work on scooters

Words to know

battery: stored power

controller: power manager

throttle: speed lever

assist: help

thermal: about heat

Answer key: Inside an E-Bike

1. A. A motor built into the middle of a wheel
2. B. To send the motor the right amount of power
3. C. A handlebar control that makes the motor move the bike
4. A. The energy of a moving bike grows with the square of its speed
5. C. Use only the charger that came with the bike
6. B. An inventor patented a bicycle with one in 1895