NAME _____

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CLASS _____

HISPANIC HERITAGE MONTH

Ellen Ochoa

From Optical Engineering to the Flight Deck

The Engineer Who Went to Orbit

Ellen Ochoa was born in Los Angeles in 1958 and grew up in La Mesa, California. Her grandparents had come from Mexico. She was a serious flute player who almost studied music, but she chose physics instead, and then went on to earn a master's degree and a doctorate in **electrical engineering** from Stanford University in 1985.

Her research was in **optics** — the science of light. She helped develop systems that let a computer analyze an image and pick out what matters in it, the same basic idea behind the machine vision used today in factories and self-driving cars. Ochoa is a co-inventor on three patents covering an optical inspection system, an optical object-recognition method, and a technique for removing noise from images.

NASA selected her as an astronaut candidate in 1990. On her first mission in April 1993, aboard Discovery, she became the first Hispanic woman to fly in space. Her crew studied the Sun and Earth's atmosphere, including the chemistry of the **ozone layer**. Across four flights she logged nearly 1,000 hours in orbit, operated the shuttle's robotic arm, and helped deliver equipment and supplies to the International Space Station.

In 2013 Ochoa became director of NASA's Johnson Space Center — the first Hispanic director and only the second woman to hold the job. She led it until she retired in 2018.

Part 1 · Reading Comprehension

1. What field did Ochoa research before joining NASA, and what modern technology uses the same basic idea?

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2. How many patents is Ochoa a co-inventor on, and what do they cover?

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3. What did Ochoa's first crew study, and why would that research matter to people on Earth?

4. Describe two different roles Ochoa held at NASA and how they were different from each other.

Part 2 · Critical Thinking

Ochoa nearly became a professional musician instead of an engineer. Does a background in something like music make someone a worse engineer, or a better one? Defend your answer.

Part 3 · STEM Challenge

Time in Orbit

A space shuttle in low Earth orbit circled the planet roughly once every 90 minutes. Ochoa logged about 1,000 hours in space across four missions. Show your work.

1. Convert 1,000 hours into minutes.
2. At one orbit every 90 minutes, about how many times did Ochoa circle the Earth in total?
3. If those hours were split evenly across her four missions, how many days did each mission last?
4. A shuttle astronaut sees one sunrise on every orbit. Using your answer from step 2, about how many sunrises did Ochoa see?