

What is the Planck Constant?

Quantum mechanics shows us that energy is exchanged in specific amounts, known as quanta. The Planck constant defines how much energy is in those quanta.



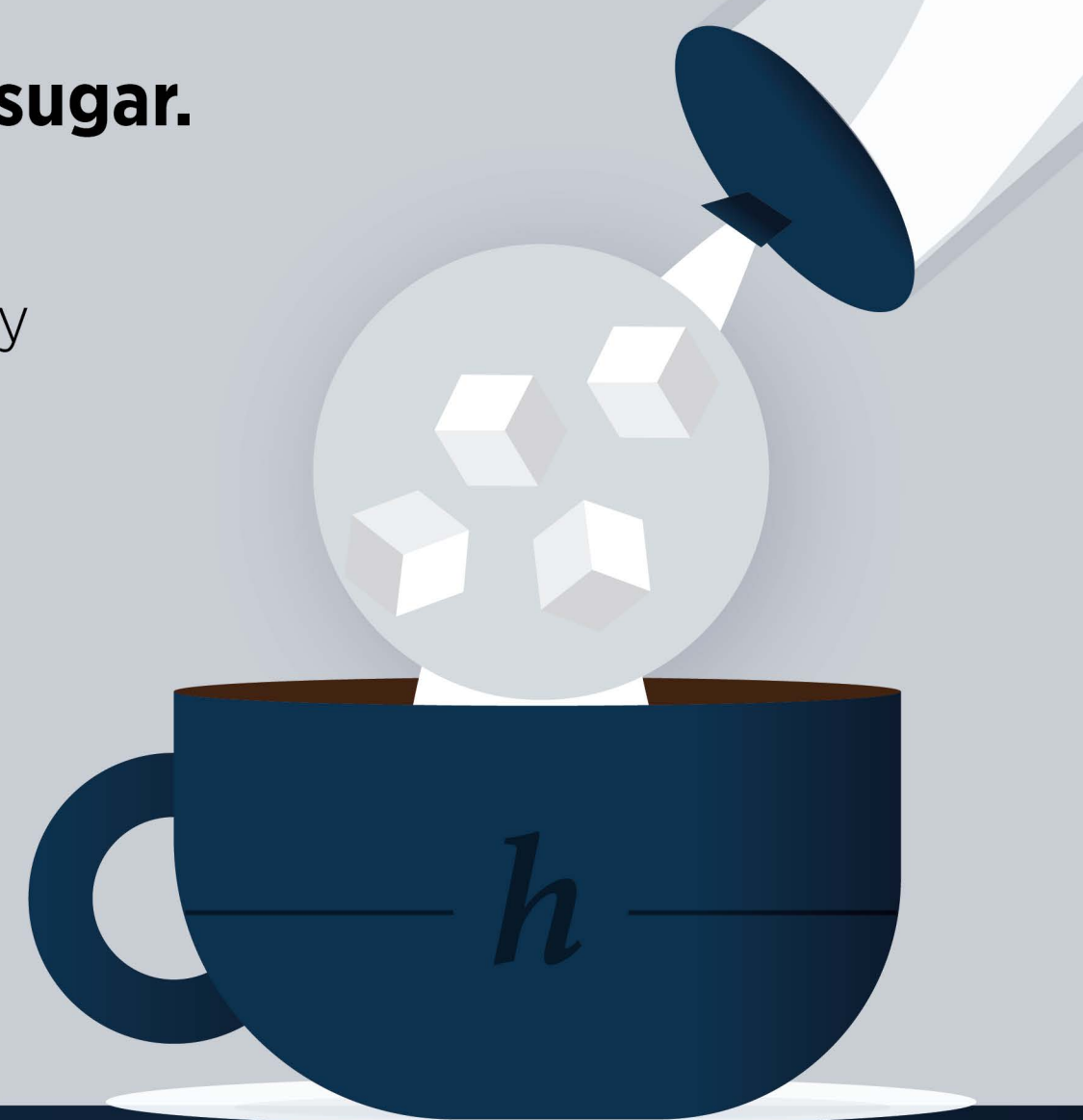
One way to understand the Planck constant is with coffee and sugar.

Classical physics

If energy is the sugar you pour into coffee, it appears as if you can pour any amount, large or small. This is the familiar world of classical physics, at the scale of coffee cups and people and cars.

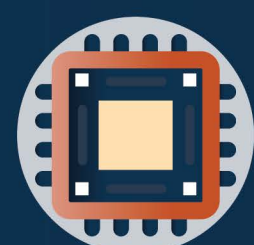
Quantum physics

But if you look at the sugar closely, you see that it's made up of individual crystals. Each **quantum** (the singular of quanta) is like a single sugar crystal. You can't add anything smaller than it to the coffee. And the Planck constant determines the size of the crystal.

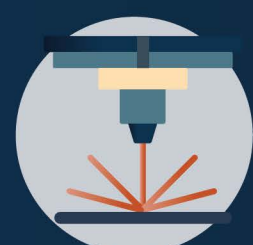


Why is the Planck constant important?

The Planck constant provides the foundation of quantum physics and continues to bring about revolutionary breakthroughs in technology. It has played a central role in:



Designing the computer chips in smartphones, tablets, laptops and desktops



Making possible the lasers and LEDs used in everything from television displays to lightbulbs



Generating electricity from sunlight in solar cells



Bringing about GPS, which depends on atomic clocks to pinpoint your location on Earth



Enabling photodetectors used in smoke detectors and garage doors



Defining the kilogram, the international unit of mass

So what is the value of the Planck constant?

The short answer is that it's a very small value. We can express it two ways:

$6.62607015 \times 10^{-34}$ Joule seconds

10^{-34} is a tiny number, equal to:
0.00000000000000000000000000000001

$4.1356679 \times 10^{-15}$ eV seconds

10^{-15} is a slightly larger number, equal to:
0.000000000000001

The two values are **equivalent**. It's kind of like how you can state the temperature in both degrees Fahrenheit and Celsius.

