

WORK, ENERGY, POWER

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With New Ioniq, Hyundai Goes After Prius



The Ioniq is a family of fuel-efficient vehicles, and its hybrid model could help Hyundai sway drivers. Watch out, Prius.

INTRODUCTION: This Ioniq output power(P_{OUT}) goes into doing (output work/unit time) where

$W_{OUT} = \text{Useful kinetic energy} = \frac{1}{2} m v^2$. Thus $P_{OUT} = \frac{1}{2} m v^2/t$

$X = \text{efficiency} = P_{OUT}/P_{input}$, $X = [\frac{1}{2} m v^2]/t(P_{INPUT})$

At Wikipedia weight of Ioniq is listed at 3000 lb.

QUESTIONS: (a) Find mass of Ioniq ? (b) Convert Ioniq total HP (Gas + electric) HP to ft. lb./s.? (c) Find efficiency X of Ioniq?, (d) Does this efficiency seem reasonable for a Hybrid?

HINTS: $w = mg$, $g = 32 \text{ ft./s.}^2$, $60 \text{ mph} = 88 \text{ ft./s.}$, $550 \text{ ft. lb./s.} = 1 \text{ HP}$

ANSWERS: (a) 93.75 slugs, (b) 147 HP = 80,850 ft. lb./s., (c) **~ 50%**

(d) Usually gas – electric hybrids are 50% or more efficient. Happyness!

It is the **most efficient gasoline-powered car you can buy in America**. There's generous room for four, five if need be. It's quiet, comfortable and comes with a lifetime battery warranty. And it is not the [Toyota Prius](#). It's the Hyundai Ioniq (rhymes with iconic) Hybrid. Yes, Hyundai has out-Priused the Prius with the Ioniq.

Specifically, the Ioniq Hybrid Blue model (available in many other colors) **averages 58 miles per gallon**, according to the Environmental Protection Agency, two more than the Prius Eco. But Ioniq isn't just a hybrid: There's an all-electric model currently (no pun intended) exclusive to California and a plug-in hybrid version due later this year. I have driven the Electric and the base, at \$23,035, Hybrid Blue. I'll cut to the chase: These are exceptionally well-done vehicles that deserve to be on any fuel miser's test-drive list. Buyers seem to be shunning ultraefficient cars for sport utility vehicles, but that's another story. Ioniq is a hatchback with an aerodynamic silhouette dictated by Mother Nature. I see hints of a [Saab 900](#) without the droopy back end. Inside and out, Ioniq avoids the riotous lines of the Prius. I parked next to one and asked a dozen people to vote on looks. Ioniq won unanimously. The interior is straightforward, with the gauge cluster in front of the steering wheel. Right where God intended it to be. I'll focus mainly on the Hybrid model

since it's the volume seller. The working bits include a **((1.6-liter 4-cylinder with 104 horsepower and 109 pound-feet of torque, paired with a 32-kilowatt electric motor that provides 43 horsePower))** and 125 pound-feet. In total, the front wheels have 139 horsepower to work with. The Hybrid's transmission is a 6-speed dual clutch (most hybrids use a continuously variable unit). The lithium-ion polymer battery lives under the back seat.

((Taking about nine seconds to reach 60 miles an hour,)) Ioniq beats Prius by a second. The Hyundai is also quieter and feels more engaged in corners, though the low-rolling-resistance tires lack the bite needed for a truly fun dynamic. Ioniq has the same glass panel on the back of the trunk lid as Prius, but Toyota wins in the visibility department.