

ENERGY-WORK-POWER

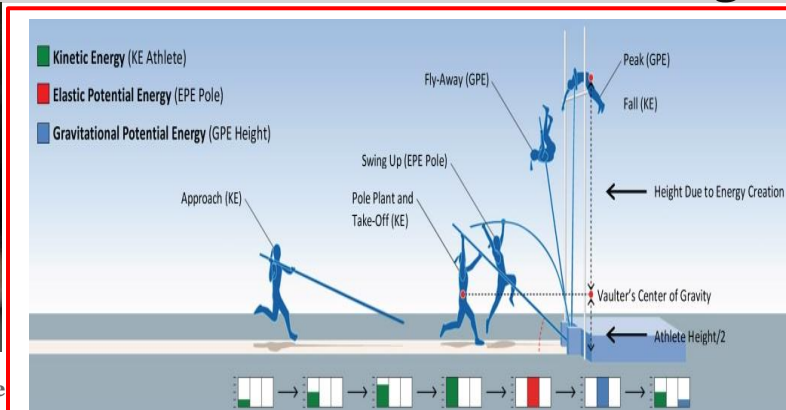
Unita 10 & 11 Dr. John P. Cise, Professor of

Physics, Austin Com. College, Austin, Texas USA, jpcise@austincc.edu & New York Times July 5, 2018 by Brian Pinelli. Dedicated to Gert Cabacungan, My wife

In Pole Vault, Sam Kendricks Is a Team Player



Sam Kendricks competing at the United States outdoor championships last month. He won his fifth consecutive national title in pole vault.



INTRODUCTION: Kendrick's weight is 170 lb (mg) & 6' tall. Thus, his center of mass (CM) is in the middle and is 3' off the ground when he plants the pole (see graphic above). **In (2) below he leaped 19' 8 1/4" (19.729 ft.) off level ground. Thus, his CM rose vertical h = 16.729 ft.** This was an increase in gravitational potential energy $U = mgh$. $g = 32 \text{ ft./s.}^2$ This increase in U was due to his running with pole kinetic energy $K = \frac{1}{2} m v^2$. Thus, $K = U$. $\frac{1}{2} m v^2 = mgh$, $v = (2gh)^{1/2}$

QUESTIONS: (a) Find speed (in ft./s.) minimum speed v Kendrick's had to run with pole to achieve the height of 16.729 ft.? (b) Convert the speed from ft./s. to mph? NOTE: 88 ft./s. = 60 mph, (c) Do your results to (a) & (b) seem plausible?

ANSWERS: (a) $v = 32.72 \text{ ft./s.}$, (b) $v \approx 22.3 \text{ mph}$, (c) Very plausible since Wikipedia states the fastest runner is $\approx 28 \text{ mph}$ with NO POLE

OSTRAVA, Czech Republic — When it comes to commanding attention to track and field's most daring event, Sam Kendricks is raising the bar. Kendricks, a 25-year-old pole-vaulter from Oxford, Miss., has impressed on the international circuit, not only with consistent performances and near-flawless technique, but in the cutthroat world that is international track and field, he has also managed to approach his craft with magnanimity. **(1).....On Saturday night at a Diamond League meet in Paris, Kendricks overtook the field with a vault of 5.96 meters, or 19 feet 6 3/4 inches, the world's best this year.**

In victory, he defeated the world-record holder, Renaud Lavillenie of France, on his home turf. But on Wednesday, at a street event in Lausanne, Switzerland, ahead of a Diamond League event, Lavillenie bested Kendricks — and everyone else — with a vault of 5.91 meters. Kendricks tied for third with a vault of 5.77 meters. **This season, Kendricks has**

claimed seven of 11 outdoor events, including Diamond League meets in Eugene, Ore., and Rome. He earned his fifth consecutive national title in June. Only Lavillenie, the 18-year-old Swedish-American Mondo Duplantis and Pawel Wojciechowski of Poland have beaten Kendricks outdoors this season. Kendricks said he was rooting for them when they did. "He wants everybody to do great. During a recent meet in the Czech Republic, he gave tips to Ivan Horvat of Croatia and Shawn Barber of Canada. He encouraged his American teammate Scott Houston and cheered on his friendly rival Wojciechowski as the duo battled for the highest bar. Image Kendricks explained that camaraderie mitigates the high risks of **the pole vault, which requires athletes to be upside down, approaching 20 feet in the air.** "It helps us all stay on the path. No amount of 10,000 in prize money is worth my friend getting hurt." The camaraderie between the elite group of about 10 pole-vaulters has never been more evident, thanks in part to Kendricks's lead. He is also happy to take selfies with teenage fans and high-five volunteers just 15 minutes before the start of his event, as he did ahead of the pole vault in the Czech Republic. Kendricks, a first lieutenant in the U.S. Army Reserve, describes track and field as a "gentleman's sport." "We have to move the sport to greater heights together," he said, "knowing that when we falter, another man will take the mantle of the victor."

- **(2)Upon takeoff, Kendricks is a virtuoso in flight, maximizing the kinetic energy of his 16-foot pole and rocketing skyward toward crossbars nearly four feet above. His personal best is 6 meters, or (19 feet 8 1/4 inches), established at the 2017 United States Outdoor Track and Field Championships in Sacramento.**