

KINEMATICS

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Rosetta Mission Ends With Spacecraft's Dive Into Comet 67P



INTRODUCTION: The Rosetta spacecraft which was circling comet 67P has finally fallen into the surface of the comet from 25 km. in height. The Rosetta spacecraft had a initial vertical velocity of zero. The acceleration due to gravity at the surface of 67P is about 10^{-4} m./s.^2 from European Space Agency(who sponsored the mission) data. At 25 km. up from the surface.... gravity is much weaker due to the inverse square law. The average gravitational acceleration from 25 km. height to the surface is about $0.16 \times 10^{-4} \text{ m./s.}^2$

QUESTIONS: (a) Confirm(find) speed(in m./s.) of Rosetta spacecraft at surface of 67P after falling from a altitude of 25 km.?, (b) Convert speed to mph?, (c) Find time to fall from 25 km.?

HINTS: 1609 m. = 1 mile , $v^2 = v_0^2 + 2 a x$, $x = v_0 t + \frac{1}{2} a t^2$, 3600 s./hour

ANSWERS: (a) 0.89 m./s. , (b) ~ 2 mph (as in article),(c) $5.8 \times 10^4 \text{ s.}$, 16 hr.

An image taken by Rosetta of Comet 67P/Churyumov-Gerasimenko, when the spacecraft was about 14 miles away.(~ 25 km.) Radio signals from Rosetta flatlined at 7:19 a.m. Eastern after (((it did a soft belly-flop onto Comet 67P/Churyumov-Gerasimenko at a speed of two miles per hour, slower than the average walk.))) For the last few minutes, people at the European Space Operations Center in Darmstadt, Germany, watched their computer screens mostly in silence, but with some nervous chatter. When the radio signals ceased, they applauded and hugged in a celebration that was part joyous, part somber. "This is it," said Patrick Martin, the mission manager. "I can announce the full success of this historic descent of Rosetta toward 67P, and I declare the primary mission operations ended for Rosetta."