**ENERGY UNIT ASSIGNMENT**

1. Write the energy-transformation equation for the following situation:

A hair dryer, in your home, powered by a nuclear power plant. Start with the energy stored in the uranium.

1. Show the equations for alpha, beta and gamma decay of element 55.
2. Solar sails are made of ultrathin, highly reflective material. When a photon from the sun hits the mirror-like surface, it bounces off the sail and transfers its momentum to the spacecraft—the same way that a cue ball transfers its momentum when it smacks into another ball in a game of pool. Given enough time, a spacecraft equipped with a solar sail can eventually accelerate to higher speeds than a similarly sized spacecraft propelled by a conventional chemical rocket.

“A sail wins the race in terms of final velocity because it's the tortoise and the hare,” says Les Johnson, the Technical Advisor for NASA’s [Advanced Concepts Office](https://www.nasa.gov/centers/marshall/capabilities/advanced_concepts.html) at the Marshall Space Flight Center. A chemical rocket provides tremendous initial thrust, but eventually burns up its fuel. “Since the sail doesn't use any fuel, we can keep thrusting as long as the sun is shining.”

IKAROS (Interplanetary Kite-craft Accelerated by Radiation Of the Sun) is a Japan Aerospace Exploration Agency (JAXA) experimental spacecraft. The spacecraft was launched on 21 May 2010, aboard an H-IIA rocket, together with the Akatsuki (Venus Climate Orbiter) probe and four other small spacecraft. IKAROS is the first spacecraft to successfully demonstrate solar sail technology in interplanetary space.

On 8 December 2010, IKAROS passed by Venus at about 80,800 km distance, completing the planned mission successfully, and entered its extended operation phase. IKAROS has a mass of 320 kg.

1. If Venus has a gravitational field of 8.87 N/kg, and IKAROS was travelling 12,000 m/s when it began to free fall from 81,000 km, determine the speed it would have when it hit the surface of Venus.
2. Determine how far above the surface of Venus IKAROS must have been to have the same gravitational potential energy as if it was in a low Earth orbit, 220 km above the surface of the Earth.
3. A bald eagle is flying 125 km/h, when it releases a turtle, from a height of 672 m. If the turtle has a mass of 14.3 kg, determine its height when it is travelling 55 m/s and its speed just before it hits the ground.
4. A 1100 g sample of a metal is heated to 95.0oC and placed in 8000.0 mL of slush at 1.100oC. If the specific heat capacity of the metal is 272 J/(kgoC)and the specific heat capacity of water is 4180 J/(kgoC), determine the final temperature of the mixture.
5. A coffee pot, rated at 1050 W takes 6.25 minutes to make coffee. Assuming you make coffee twice each day for a regular year, determine the energy used. Express your answer in both joules and kilowatt·hours.