

Practice Problem Set 8

Problem 1

Two objects are moving towards each other with the same speed v . They eventually reach each other and experience a completely **inelastic** collision, losing half of the initial kinetic energy in the process. What is the ratio of their masses? (see Wolfson 9.62)

Hint: Think and write separately about what the conservation of linear momentum and the conservation of energy tell you about how the initial and final velocities are related.

Problem 2

A 400-mg popcorn kernel is skittering across a non-stick frying pan at 8.2 cm/s. It heats up to the point where it bursts, and splits into two pieces of popcorn with equal mass. If one of the two pieces happens to remain at rest immediately after the burst, how much energy was released during the process? (see Wolfson 9.66)

Problem 3

An 80-kg astronaut working on the International Space Station is going on a routine space walk. While working 200 m away from the entry point – and at rest relative to it – her safety line becomes detached and her oxygen tank indicates she has 4 minutes of usable air remaining. To get herself back to the entry point, she throws her 10-kg tool kit exactly away from the entry point which then travels at 8 m/s relative to herself. Will she make it back to the station in time? (see Wolfson 9.89)