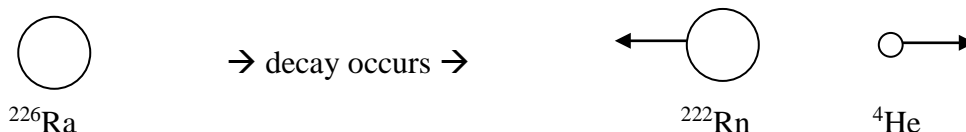


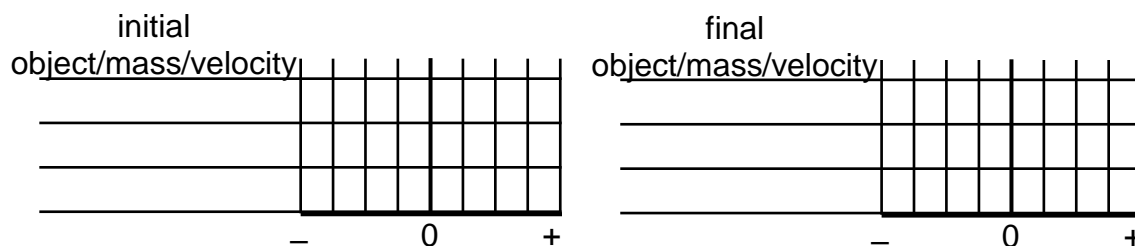


3. When radium-226 decays, it becomes radon-222 by ejecting an alpha particle - two protons and two neutrons (a helium nucleus).



- a. Complete a qualitative momentum conservation diagram for the radioactive decay of radium-226. (Recall from chemistry that the isotopic number of an element is related to its mass.)

event:



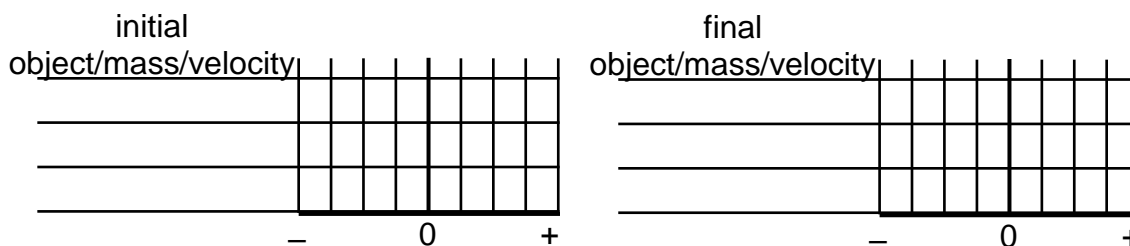
- b. Momentum conservation equation:

- c. How many times larger will the final velocity of the alpha particle be compared to the final velocity of the radon-222?

4. An apple falls from a tree.

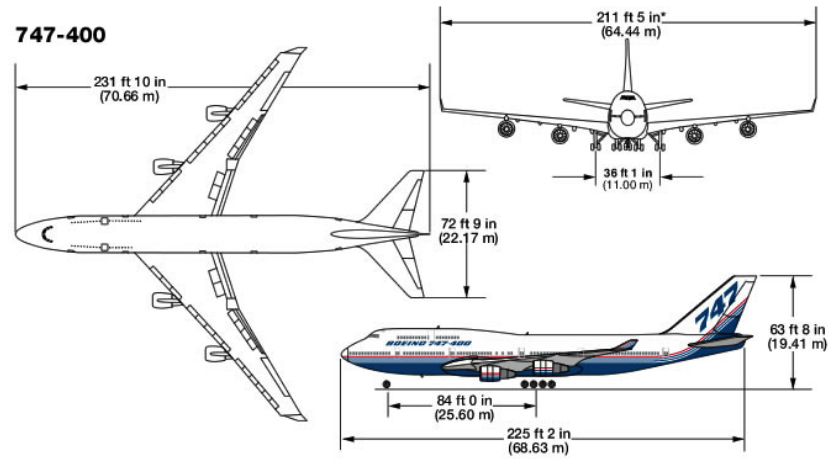
- a. Complete a **qualitative** conservation of momentum diagram where the apple is initially attached to the tree and the final situation is just before the apple hits the ground.

event:



- b. Momentum conservation equation:

5. Airplanes maneuver on the ground by using thrust from their jets or propellers. A fully loaded, 396,900 kg Boeing 747-400 gets a total of 1100 kiloNewtons of thrust from its jet engines. (Data from Boeing's website.) Takeoff speed depends on a number of factors like air temperature, airplane weight, and airport elevation, but let us say that liftoff will occur at 170 mph.



- Determine the time the plane takes to go from 0 to 170 mph. (1 mile = 1600 meters)
- Complete a conservation of momentum diagram showing how the initially stationary airplane gets to takeoff speed.

event:

initial		final
object/mass/velocity		object/mass/velocity

-                      0                      +                      -                      0                      +

- Momentum conservation equation:
- Determine the momentum of the airplane at takeoff.
- Calculate the impulse the plane receives from the engines during takeoff.
- What additional information would be needed to calculate the velocity of the exhaust gasses from the engines?