Physics 206a

1. A molecule of carbon monoxide (CO), which consists of one atom of carbon and one atom of oxygen, is forced to break apart by the addition of a certain amount of energy. There is a net excess of energy of 3×10^{-19} joules which all goes to kinetic energy of the "fragments" (i.e., the atoms). What are the speeds of each of the two fragments? (Carbon has a mass of 12 amu and oxygen has a mass of 16 amu.)

2. A man with a mass of 199 kg stands on a skateboard which has a mass of 1 kg. There is no friction between the skateboard and the ground. He throws a baseball with a mass of 210 grams perfectly horizontally with a speed of $35 \frac{\text{meters}}{\text{second}}$ in a direction 12° North of East. What is the man's final velocity? Express this as a *vector* in component form. Take North to be the $+\hat{y}$ direction and East to be the $+\hat{x}$ direction.

3. In the previous problem, the initial velocity of the baseball was purely horizontal. However, we know that it will fall toward the earth as it flies. If the ball was thrown from an initial height of 1.5 meters, in the instant before it strikes the ground, what is the momentum change that was experienced by the planet earth due to the ball?