

AOS 100/101
Spring 2012
HMWK #1
Solutions

1)

The development of life, powered by photosynthesis, added oxygen (O_2) to the atmosphere for the first time. One important by-product of the presence of O_2 was the production of ozone (O_3). Ozone in the stratosphere absorbed lethal ultra-violet (UV) radiation thus shielding the surface of the Earth. This allowed life to move to dry land.

2)

This problem involves consideration of the kinetic energy. Recall that kinetic energy is product of the MASS of an object and its VELOCITY squared (divided by 2). If both ball A and ball B are moving at the same speed, then their kinetic energies will differ based only upon their different masses. The more massive ball will have more kinetic energy (i.e. more ability to do work on some form of matter). When the balls strike one another, the amount of work done by each ball can be related to the recoil distance of its partner since it takes work to make either ball recoil from the point of impact. Since ball B recoils farther from the point of impact than ball A, we know that ball A has done more work than ball B. Thus, ball A must have a greater mass and thus it has the greater density.

3)

a) The temperature of the air inside the balloon drops.

b) Temperature is the average kinetic energy of the molecules, so a drop in temperature is equivalent to a slowing down of the molecules.

c) Since the molecules move more slowly they impact the inside wall of the balloon with less force.

d) Since in a balloon the pressure can be maintained at a constant value, the smaller total force exerted by the molecules on the inside wall of the balloon must be spread over a smaller area. The only way for the surface area of the balloon to shrink is for the balloon's volume to decrease. Thus, we would observe the balloon shrink.