Problem 1.1

True or false? (a) A closed system cannot interact with its surroundings. (b) Density is an intensive property. (c) The Atlantic Ocean is an open system. (d) A homogeneous system must be a pure substance. (e) A system containing only one substance must be homogeneous.

Solution

(a) False, a closed system cannot exchange matter with its surroundings, but it can exchange energy with its surroundings.

(b) True, because density does not depend on the amount of substance present.

(c) True, because matter can go from the atmosphere into the ocean and vice-versa.

(d) False, a homogeneous system can also be a solution (a mixture).

(e) False, a cup of H_2O can have both ice and water in it, which would make the system heterogeneous.