

과제 #1

마감일: 9월 19일 9시 30분

제출방법:

- 강의실 교탁

주의사항:

- 숙제를 베껴 내면 관련된 모든 학생에게 불이익이 있습니다.
- 마감일시를 반드시 준수.

Problem 1 Consider two gases A and A' in separate containers. Initially, the average energy of a molecule of gas A is quite different from that of a gas A molecule. The two containers are then placed in contact with each other so that energy in the form of heat can be transferred from gas A to the molecules of the container walls and hence to gas A'. Is the ensuing process reversible or irreversible? Give an argument as precise as possible for your answer.

Problem 2 Consider N_2 gas at room temperature and atmospheric pressure. Using the numerical values given in the text (교재 #1 1장), find the average number of N_2 molecules striking a 1-cm^2 area of the container walls per second.

Problem 3 Consider the infinitesimal quantity $A dx + B dy \equiv dF$, where A and B are both functions of x and y.

- Suppose that dF is an exact differential so that $F=F(x,y)$. Show that A and B must then satisfy the condition $\frac{\partial A}{\partial y} = \frac{\partial B}{\partial x}$.
- If dF is an exact differential, show that the integral $\int dF$ evaluated along any closed path in the xy plane must vanish.

Problem 4 A box is separated by a partition that divides its volume in the ratio of 3:1. The larger portion of the box contains 1000 molecules of Ne gas; the smaller, 100 molecules of He gas. A small hole is punctured in the partition, and one waits until equilibrium is attained.

- (a) Find the mean number of molecules of each type on either side of the partition.
- (b) What is the probability of finding 1000 molecules of Ne gas in the larger portion and 100 molecules of He gas in the smaller (i.e., the same distribution as in the initial system)?

Problem 5 A glass bulb contains air at room temperature and at a pressure of 1 atmosphere. It is placed in a chamber filled with helium gas at 1 atmosphere and at room temperature. A few months later, the experimenter learned that the glass bulb is permeable to helium but not to other gases. Assuming that equilibrium has been attained by this time, what gas pressure will he measure inside the bulk?