May 19, 2016
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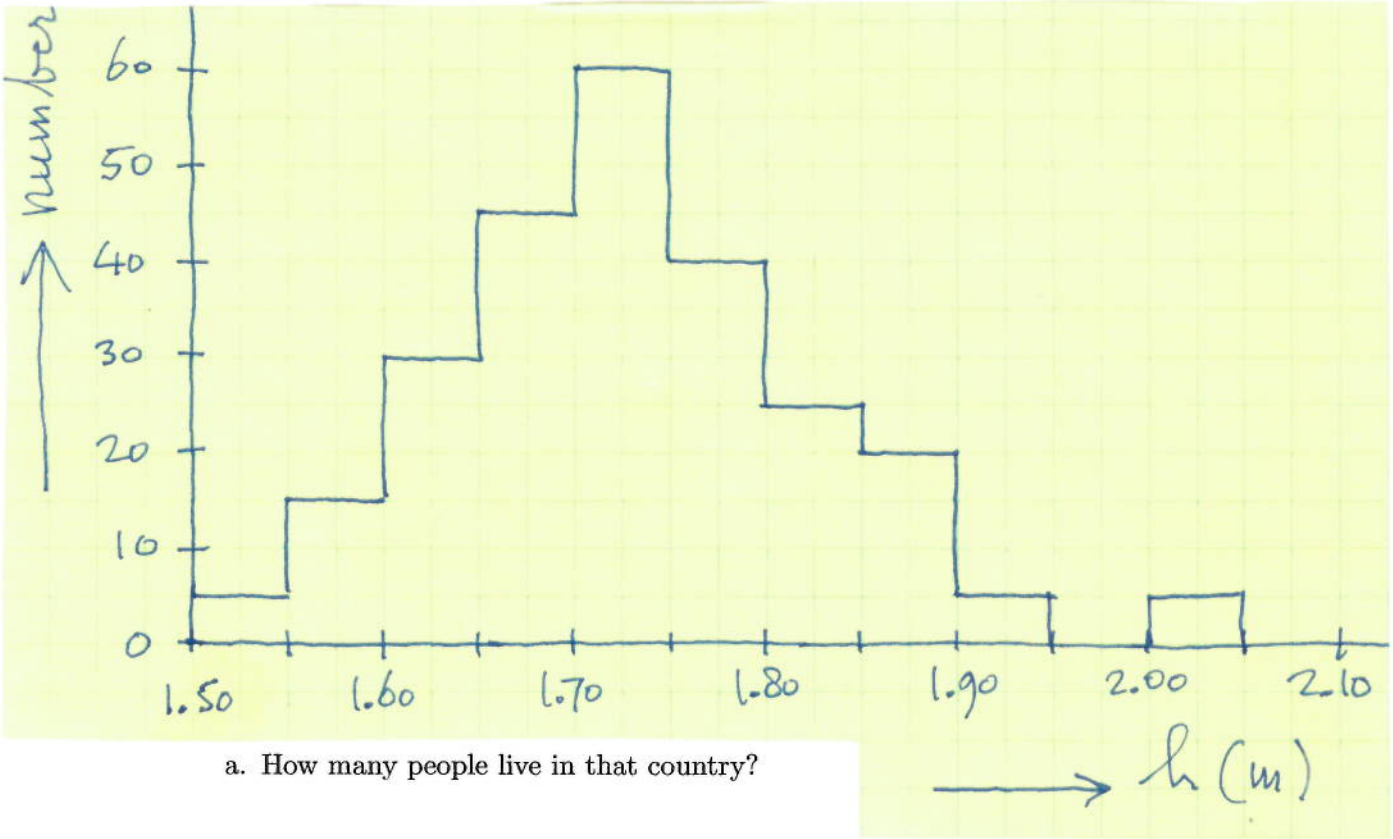
4B QUIZ #4

This Quizz is closed book and no notes and no crib sheet. Calculators are ok but they should not contain physics equations nor text in their memory. Make large and neat figures. Specify the units of numerical answers. Justify your answers. Simply stating them without a justification or calculation will not result in credit.
$N_A = 6.0x \times 10^{26}$, 1 atm = 101.3 kPa, $R = 8.3\,\mathrm{kJ/(kmol\,K)}$

PROBLEM 1 (20 points)

The height of all people in a country is histogrammed as shown below



a. How many people live in that country?

b. What is the probabilitythat any one person has a height greater than 1.8 m?

c. What is the average height?

d. What is the probability that someone's height is greater than 2.2 m?

e. What is the probability that someone's height is between 1.60 m and 1.65 m?

PROBLEM 2 (20 points)

A market researcher notes the prices of cars and their country of origin. She find the following information: \$21,000 (US); \$33,000 (Germany), \$31,000 (Japan); \$29,000 (Japan); \$21,000 (US); \$39,000 (Germany); \$18,000 (US); \$23,000 (Japan); \$26,000 (Japan); \$26,000 (US); \$28,000 (Germany); \$44,000 (Germany); \$33,000 (Japan); \$16,000 (US); \$41,000 (Germany).

a. Calculate the average price of cars irrespective of country of origin.

b. Calculate the three average prices of cars by country of origin.

c. Neatly histogram to price of all cars. Label your axes. Make the binwidth \$5,000 and the bin boundaries \$15,000; \$20,000, \$25,000; etc.

d. Calculate the average price of cars irrespective of country using only the histogram.

e. What is the probability that a car costs less than \$22,000?

f. What is the probability that a German made car costs less than \$32,000?

g. What is the probability that a Japanese car costs between \$25,000 and \$30,000?

PROBLEM 3 (20 points)

A container of volume 2 m^3 contains hydrogen gas at 27 K. It has $N = 3.0 \times 10^{27}$ molecules.

a. What is the pressure?

b. What is the average energy per molecule?

c. What is the total energy of the gas?

d. The temperature is raised by 100 C. What is the new pressure?

PROBLEM 4 (40 points)

The barometric pressure formula for the density of molecules is

$$n(h) = n_0 \, \mathrm{e}^{-mgh/(kT)} \tag{1}$$

where it is assumed that the temperature T is the same at all heights. The letters have the usual meaning.

a. Calculate the pressure as function of height. Set the pressure at $h = 0$ equal to P_0.

b. At what height is the pressure reduced to half its value at $h = 0$?