

CHEM 2141 Survey of Physical Chemistry Homework #5

Chapter 1: 3, 6, 9, 11, 12, 13, 15, 19, 22, 23, 29 Due Thursday March 23rd 5:00 PM

Since answers listed in back of book, grading is based on work shown describing how you obtained answers.

Pressure (Force/Area) units:

$$760 \text{ Torr} = 1 \text{ atm}, 1.01325 \times 10^5 \text{ Pascals (Pa)} = 1 \text{ atm}, 1 \text{ bar} = 10^5 \text{ Pa}$$

$$1 \text{ Pascal} = 1 \text{ Kg m}^{-1} \text{ s}^{-2}$$

Problem #11 – note that pressure under water has 2 contributions: atmospheric and the water pressure (computed by ρgh) g = acceleration due to gravity = 9.8 m s^{-2}

Problem #12 – You may treat this as a “2 change” problem with the initial pressure at sea level of 1.00 atm. Volume of a sphere of radius r is $(4/3)\pi r^3$

Problem #15 – See Box 1.2 $M = \frac{\bar{n}RT}{P}$

Problem #22 – note $c \neq$ speed of light, but the RMS speed of Ar molecules: $\left(\frac{3RT}{M}\right)^{\frac{1}{2}}$

Problem #23 – Note that the total number of collisions per second for all molecules within a given volume may be determined as follows:

Total # collisions per second = (# collisions per molecule per second) × (# molecules per L) × volume ÷ 2

Note we need to divide by 2 so not as to count the same collisions twice.

Problem #29 – The answer in the back of your text is incorrect, it gives 4.37 MPa which is the van der Waals value of pressure however the difference in pressure between the Perfect Gas Law and the Van der Waals model is 12.49 atm or 1.27 MPa.