Chemi	stry	/ II
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C₂H₅OH

Chapter 11 Test

Name	

SHOW ALL WORK

$$(P + \frac{n^2a}{v^2}) (V - nb) = nRT$$

Table 11.3. The van der Waals constants for real gases

 $a (L^2 atm/mol^2)$ b (L/mol) He 0.034 0.0237 O_2 1.36 0.0318 NH₃ 4.17 0.0371 H₂O 5.46 0.0305 CH₄ 2.25 0.0428 C₂H₆ 5.489 0.06380 CH₃OH 9.523

12.02

T emp . (°C)	Pressure (torr)	Temp. (°C)	Pressure (torr)	Temp. (°C)	Pressure (torr)
0	4.6	18	15.5	40	55.3
1	4.9	19	16.5	45	71.9
2	5.3	20	17.5	50	92.5
3	5.7	21	18.7	55	118.0
4	6.1	22	19.8	60	149.4
5	6.5	23	21.1	65	187.5
6	7.0	24	22.4	70	233.7
7	7.5	25	23.8	7 5	289.1
8	8.0	26	25.2	80	355.1
9	8.6	27	26.7	85	433.6
10	9.2	28	28.3	90	525.8
11	9.8	29	30.0	95	634.1
12	10.5	30	31.8	96	657.6
13	11.2	31	33.7	97	682.1
14	12.0	32	35.7	98	707.3
15	12.8	33	37.7	QQ	733 2

39.9

760.0

787.6

A sample of ${\rm SO_2}$ occupies 1.45 L at 2.75 atm. If we assume no temperature change, how many liters will this gas occupy at 800 torr?

0.06702

0.08407

2. Calculate the pressure, in torr and atmospheres, that would be exerted by 25.0 kg of steam (H_2O) in a 1000-L boiler at 200°C if we assume ideal gas behavior.

3. An important reaction in the production of nitrogen fertilizers is the oxidation of ammonia

$$4NH_{3(g)} + 5O_{2(g)} 4NO_{(g)} + 6H_{2}O_{(g)}$$

How many liters of $\rm O_2$, measured at 25°C and 0.895 atm, must be used to produce 100 liters of NO at 500°C and 750 torr?

4. A gas is collected by the displacement of water until the total pressure inside a 100 mL flask is 70 torr at 25° C. How many milliliters would the dry gas occupy at STP?

5. The density of a gas was found to be 1.81 g/ \oplus L at 30°C and 760 torr. What is its molecular mass?

6. Use the van der Waals equation to calculate the pressure, in atm, exerted by 1.000 moles of He at 0.00° C in volume of 22.400 L. Use R = 0.082057 L atm/mol K. Compare this to the pressure an ideal gas would exert under these same conditions.

7. Why did van der Waals subtract a correction from the measured volume? Why did he add a correction to the measured pressure?