Manometers & Story Problems

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carl

Name _____

Date _____

Come for assistance and cheerful encouragement after school Tues, Thurs, or every day at lunch

Answers

You will always be given these numbers on tests and quizzes.

0°C = 273 degrees K; 760 torr = 760 mmHg = 1.00 atm = 101 kPa = 101,300 pascals = 14.7 p.s.i.

never use °C for a gas math problem

1. Name and draw the apparatus we use to measure atmospheric (ambient) pressure.

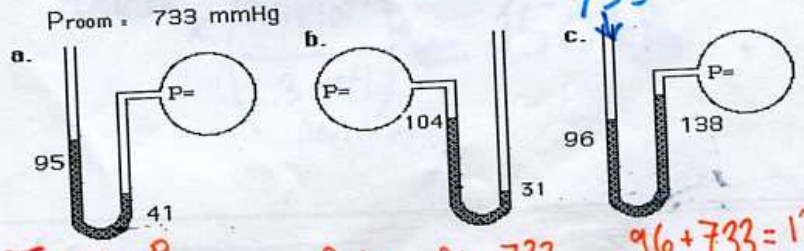
Barometer

2. There are many correct answers to this question. Name two places on Earth where the ambient pressure is usually more than in Madison. (You might look on a map or globe that shows elevations of places compared to sea level.) Los Angeles, Boston, Miami, etcetera (elevation 0 feet above sea level)

3. Name a place on Earth where the ambient pressure is usually less than in Madison. Denver, CO. (5,000 feet) La Paz, Bolivia (13,000 feet)

4. Why is the fluid in a barometer mercury, rather than water or another liquid? Mercury works if it is 0.76 meters. Water would need to be much taller. About thirty feet!

5. In each case, solve for the pressure inside the flask.



$733 + 95 = 41 + P$

$787_{mm} = P$

$P + 104 = 31 + 733$

$P = 660\ mmHg$

$96 + 733 = 138 + P$

$691\ mmHg = P$

6. Hydrogen gas is collected at 0.0 °C. The total pressure of the sample is 755 millimeters of mercury. The sample then warms to 24 °C while volume remains unchanged. What is the final pressure of the hydrogen gas?

1.

Write numbers for *initial* and *final*.

	P (mm)	T (K)	V	n
Initial	755	273.0	–	–
Final	?	297.0	–	–
Effect		makes pressure int. fence	–	–

Do math with ratios (dimensional analysis) to solve for a numerical answer. Don't forget units.

$$755\ \text{mm Hg} \times \left(\frac{297.0\ \text{K}}{273.0\ \text{K}}\right) = 821\ \text{mm Hg}$$

7. A sample of 0.010 mole of oxygen gas is confined at 127 °C and 0.80 ~~atm~~osphere. What would be the pressure of this sample at 27 °C and the same volume?

Write numbers for *initial* and *final*.

	P	T (K)	V	n
Initial	0.80 atm	400	–	0.010 mol
Final	?	300	–	0.010 mol
Effect	–	decreases pressure	–	–

Do math with ratios (dimensional analysis) to solve for a numerical answer. Don't forget units.

$$0.80\ \text{atm} \times \left(\frac{300\ \text{K}}{400\ \text{K}}\right) = 0.60\ \text{atm}$$

8. A 2.00-liter sample of nitrogen gas at 27 °C and 600. millimeters of mercury is heated until it occupies a volume of 5.00 liters. If the pressure remains unchanged, the final temperature of the gas is

Write numbers for *initial* and *final*.

	P (mm)	T (K)	V (L)	n
Initial	600	300	2.00	—
Final	600	?	5.00	—
Effect	—		increase temp.	—

Do math with ratios (dimensional analysis) to solve for a numerical answer. Don't forget units.

$$300\,K \times \left(\frac{5.00\,L}{2.00\,L}\right) = 750\,K$$

9. A closed flask of air (0.250L) contains 2.3×10^{21} particles. The pressure probe on the flask reads 93 kPa. A student uses a syringe to add an additional 1.3×10^{21} particles of air through the stopper. Find the new **total** amount of particles and then find the new pressure inside the flask.

Write numbers for *initial* and *final*.

	P	T	V (L)	n
Initial			.250	2.3×10^{21}
Final			.250	3.6×10^{21}
Effect			—	

we add the original plus the new particles

Do math with ratios (dimensional analysis) to solve for a numerical answer. Don't forget units.

$$93\,kPa \times \left(\frac{3.6 \times 10^{21}\ \text{particles}}{2.3 \times 10^{21}\ \text{particles}}\right) = 150\,kPa$$