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Pressure conversions chem worksheet 13-1 answer key test questions

South Pasadena • AP Chemistry

Name Grove
Period ____ Date __/__/__

12 • The Gas Laws

PRESSURE UNITS

1 atm = 760 mmHg = 760 torr = 101.3 kPa = 14.7 psi

Background:
Pressure is defined as Force / Area such as pounds per square inch (psi).
The weight of air pushing down per square inch is 14.7 pounds per square inch or **14.7 psi.**

A barometer can be used to measure pressure. A column of mercury (Hg) that is 0.760 meter (760 mm) tall has the same weight as a column of air from sea level to the edge of the stratosphere. The height of this column is a good measure of air pressure… **760 mmHg.**

Evangelista Torricelli did a lot of experiments with pressure and so 1 mmHg is also called 1 torr. So, air pressure has a value of **760 torr.** This amount of pressure is also called **1 atm** (one atmosphere) because it IS the atmosphere.

In metric units, pressure if Newtons (force) per square meter (area). One Newton is not very much pressure… about the weight of a small apple (get it… apple… Newton)… and if that force is exerted over a square meter, the amount of pressure is very small and called a pascal (Pa). It is more useful to talk of kilopascals (kPa) which would be the weight of 1000 small apples exerted over a square meter. Air pressure is equal to **101.3 kPa.**

Since each of these values (see the top of the page) represent the same amount of pressure, any two of them can be used as a conversion factor. You can convert one pressure unit into another.

Example:

What is 515 mmHg in kPa? $515 \text{ mmHg} \times \frac{101.3 kPa}{760 mmHg} = 68.6440789 \text{ kPa} = 68.4 \text{ kPa}$

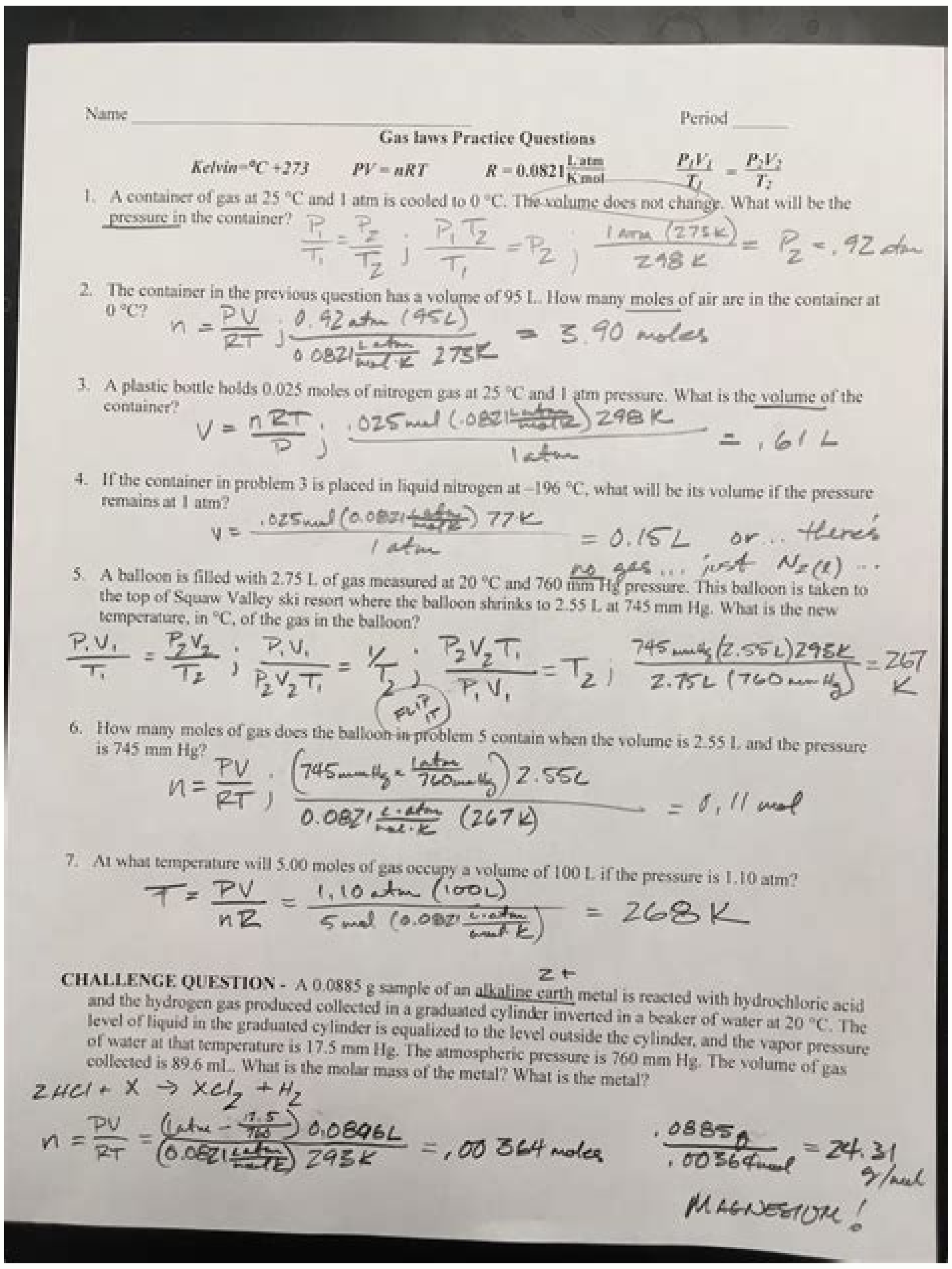
Problems:

1. 745 mmHg into psi
   $745 \text{ mmHg} \times \frac{14.7 \text{ psi}}{760 \text{ mmHg}} = \boxed{14.4 \text{ psi}}$
2. 727 mmHg into kPa
   $727 \text{ mmHg} \times \frac{101.3 \text{ kPa}}{760 \text{ mmHg}} = \boxed{96.9 \text{ kPa}}$
3. 52.5 kPa into atm
   $52.5 \text{ kPa} \times \frac{1 \text{ atm}}{101.3 \text{ kPa}} = \boxed{.518 \text{ atm}}$
4. 0.729 atm into mmHg
   $.729 \text{ atm} \times \frac{760 \text{ mmHg}}{1 \text{ atm}} = \boxed{554 \text{ mmHg}}$
5. 522 torr into kPa
   $522 \text{ torr} \times \frac{101.3 \text{ kPa}}{760 \text{ torr}} = \boxed{69.6 \text{ kPa}}$
6. 1.10 atm into psi
   $1.10 \text{ atm} \times \frac{14.7 \text{ psi}}{1 \text{ atm}} = \boxed{16.2 \text{ psi}}$
7. 800. mmHg into atm
   $800. \text{ mmHg} \times \frac{1 \text{ atm}}{760 \text{ mmHg}} = \boxed{1.05 \text{ atm}}$
8. 125 kPa into torr
   $125 \text{ kPa} \times \frac{760 \text{ torr}}{101.3 \text{ kPa}} = \boxed{938 \text{ torr}}$

Show your work for the following questions. Box your answer and include units.
(Don't use anything but your non-graphing calculator and a periodic table when you're doing these problems if you want a real "practice" test.)

You still need to know how to name and write formulas for covalent and ionic compounds
(know your polyatomic ions and diatomic molecules!)

1. Calculate the number of **molecules** in 3.50 mole of hydrogen gas.
   $3.5 \text{ mol } H_2 \cdot \frac{6.02\times10^{23} \text{ molecules}}{1 \text{ mol}} = \boxed{2.11\times10^{24} \text{ molecules } H_2}$
2. How many **moles** of carbon tetrachloride are in 2.10×10^{25} molecules?
   $2.10\times10^{25} \text{ molecules} \cdot \frac{1 \text{ mol}}{6.02\times10^{23} \text{ molecules}} = \boxed{34.88 \text{ mol } CCl_4}$
3. Find the **mass** of 1.20×10^{21} ~~molecules~~ formula units of silver nitrate.
   $1.20\times10^{21} \text{ units } AgNO_3 \cdot \frac{1 \text{ mol}}{6.02\times10^{23} \text{ units}} \cdot \frac{169.91 \text{ g}}{1 \text{ mol}} = \boxed{0.34 \text{ g}}$
4. What is the number of **formula units** of potassium chloride in 18.56 grams?
   $18.56 \text{ g KCl} \cdot \frac{1 \text{ mol}}{74.55 \text{ g}} \cdot \frac{6.02\times10^{23} \text{ units}}{1 \text{ mol}} = \boxed{1.50\times10^{23} \text{ formula units KCl}}$
5. Calculate the number of **molecules** in 50.0 grams of carbon dioxide.
   $50 \text{ g } CO_2 \cdot \frac{1 \text{ mole}}{44.01 \text{ g } CO_2} \cdot \frac{6.02\times10^{23} \text{ molecules}}{1 \text{ mol}} = \boxed{6.84\times10^{23} \text{ molecules } CO_2}$
6. How many **atoms of oxygen** are in 2.50 moles of sulfuric acid, H_2SO_4?
   $2.5 \text{ mol } H_2SO_4 \cdot \frac{6.02\times10^{23} \text{ units}}{1 \text{ mole}} \cdot \frac{4 \text{ atoms O}}{1 \text{ formula unit of } H_2SO_4} = \boxed{6.02\times10^{24} \text{ atoms O}}$
7. Find the **molar mass** of glucose ($C_6H_{12}O_6$)
   6 (12.01) – 72.06
   12 (1.01) – 12.12
   6 (16.00) – 96.00
   $\boxed{180.18 \text{ g/mol}}$
8. The molar mass of iron is 55.8 grams. State in words what this means.
   1 mole of Fe is equal to 55.8 grams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Gas laws Practice Questions

Kelvin=°C +273 $PV = nRT$ $R = 0.0821 \frac{L \cdot atm}{K \cdot mol}$ $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

1. A container of gas at 25 °C and 1 atm is cooled to 0 °C. The volume does not change. What will be the pressure in the container?
$\frac{P_1}{T_1} = \frac{P_2}{T_2}$; $\frac{P_1T_2}{T_1} = P_2$; $\frac{1\ atm\ (273K)}{298\ K} = P_2 = .92\ atm$

2. The container in the previous question has a volume of 95 L. How many moles of air are in the container at 0 °C?
$n = \frac{PV}{RT}$; $\frac{0.92\ atm\ (95L)}{0.0821 \frac{L \cdot atm}{mol \cdot K}\ 273K} = 3.90$ moles

3. A plastic bottle holds 0.025 moles of nitrogen gas at 25 °C and 1 atm pressure. What is the volume of the container?
$V = \frac{nRT}{P}$; $\frac{.025\ mol\ (.0821 \frac{L \cdot atm}{mol \cdot K})\ 298\ K}{1\ atm} = .61\ L$

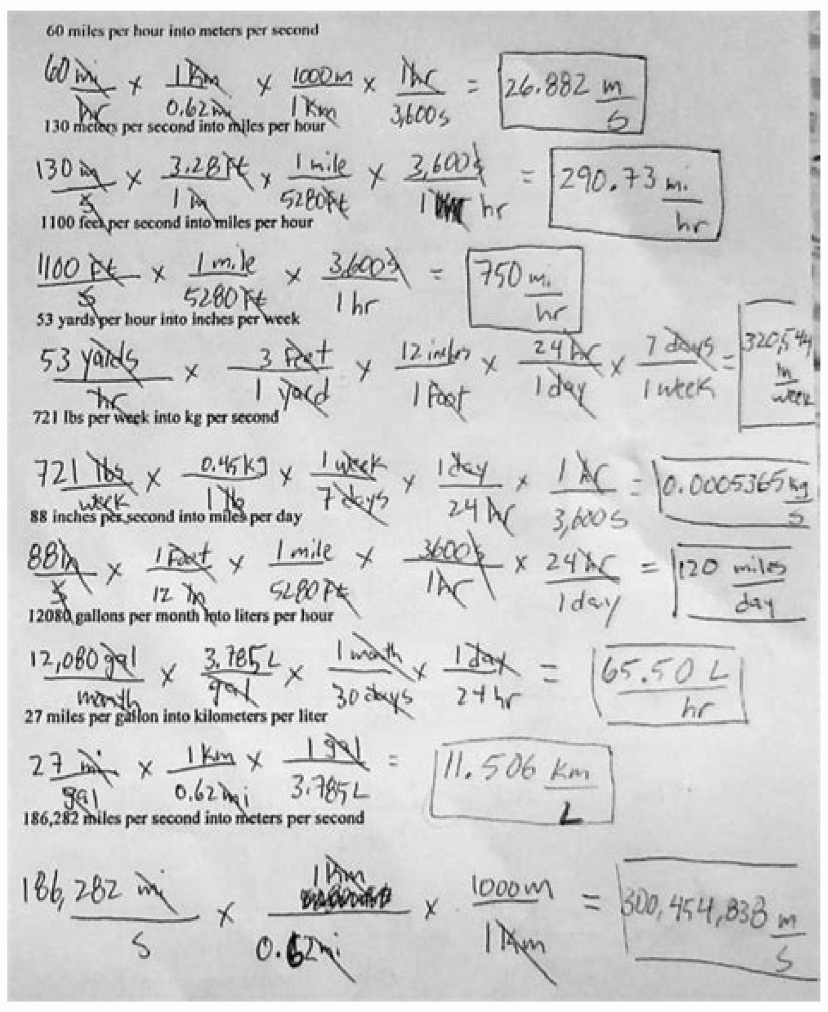
4. If the container in problem 3 is placed in liquid nitrogen at –196 °C, what will be its volume if the pressure remains at 1 atm?
$V = \frac{.025\ mol\ (0.0821 \frac{L \cdot atm}{mol \cdot K})\ 77K}{1\ atm} = 0.15\ L$ or.. there's no gas... just $N_2(l)$...

5. A balloon is filled with 2.75 L of gas measured at 20 °C and 760 mm Hg pressure. This balloon is taken to the top of Squaw Valley ski resort where the balloon shrinks to 2.55 L at 745 mm Hg. What is the new temperature, in °C, of the gas in the balloon?
$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$; $\frac{P_1V_1}{P_2V_2T_1} = \frac{1}{T_2}$; (FLIP IT) $\frac{P_2V_2T_1}{P_1V_1} = T_2$; $\frac{745\ mmHg\ (2.55L)\ 298K}{2.75L\ (760\ mmHg)} = 267\ K$

6. How many moles of gas does the balloon in problem 5 contain when the volume is 2.55 L and the pressure is 745 mm Hg?
$n = \frac{PV}{RT}$; $\frac{(745\ mmHg \times \frac{1\ atm}{760\ mmHg})\ 2.55L}{0.0821 \frac{L \cdot atm}{mol \cdot K}\ (267K)} = 0.11\ mol$

7. At what temperature will 5.00 moles of gas occupy a volume of 100 L if the pressure is 1.10 atm?
$T = \frac{PV}{nR} = \frac{1.10\ atm\ (100L)}{5\ mol\ (0.0821 \frac{L \cdot atm}{mol \cdot K})} = 268\ K$

CHALLENGE QUESTION - A 0.0885 g sample of an alkaline earth metal is reacted with hydrochloric acid and the hydrogen gas produced collected in a graduated cylinder inverted in a beaker of water at 20 °C. The level of liquid in the graduated cylinder is equalized to the level outside the cylinder, and the vapor pressure of water at that temperature is 17.5 mm Hg. The atmospheric pressure is 760 mm Hg. The volume of gas collected is 89.6 mL. What is the molar mass of the metal? What is the metal?
$2HCl + X \rightarrow XCl_2 + H_2$
$n = \frac{PV}{RT} = \frac{(1\ atm - \frac{17.5}{760})\ 0.0896L}{(0.0821 \frac{L \cdot atm}{mol \cdot K})\ 293K} = .00364$ moles $\frac{.0885\ g}{.00364\ mol} = 24.31\ g/mol$
MAGNESIUM!


60 miles per hour into meters per second
$\frac{60\ mi}{hr} \times \frac{1\ km}{0.62\ mi} \times \frac{1000\ m}{1\ km} \times \frac{1\ hr}{3600\ s} = 26.882\ m/s$
130 meters per second into miles per hour
$\frac{130\ m}{s} \times \frac{3.28\ ft}{1\ m} \times \frac{1\ mile}{5280\ ft} \times \frac{3600\ s}{1\ hr} = 290.73\ mi/hr$
1100 feet per second into miles per hour
$\frac{1100\ ft}{s} \times \frac{1\ mile}{5280\ ft} \times \frac{3600\ s}{1\ hr} = 750\ mi/hr$
53 yards per hour into inches per week
$\frac{53\ yards}{hr} \times \frac{3\ feet}{1\ yard} \times \frac{12\ inches}{1\ foot} \times \frac{24\ hr}{1\ day} \times \frac{7\ days}{1\ week} = 320,544\ in/week$
721 lbs per week into kg per second
$\frac{721\ lbs}{week} \times \frac{0.45\ kg}{1\ lb} \times \frac{1\ week}{7\ days} \times \frac{1\ day}{24\ hr} \times \frac{1\ hr}{3600\ s} = 0.0005365\ kg/s$
88 inches per second into miles per day
$\frac{88\ in}{s} \times \frac{1\ foot}{12\ in} \times \frac{1\ mile}{5280\ ft} \times \frac{3600\ s}{1\ hr} \times \frac{24\ hr}{1\ day} = 120\ miles/day$
12080 gallons per month into liters per hour
$\frac{12,080\ gal}{month} \times \frac{3.785\ L}{1\ gal} \times \frac{1\ month}{30\ days} \times \frac{1\ day}{24\ hr} = 63.50\ L/hr$
27 miles per gallon into kilometers per liter
$\frac{27\ mi}{gal} \times \frac{1\ km}{0.62\ mi} \times \frac{1\ gal}{3.785\ L} = 11.506\ km/L$
186,282 miles per second into meters per second
$\frac{186,282\ mi}{s} \times \frac{1\ km}{0.62\ mi} \times \frac{1000\ m}{1\ km} = 300,454,838\ m/s$

There are other units used to measure pressure (see the table below) USEFUL FOUATIONS FORCE 1.00 atm = 101300 Pa 1.00 atm = 760 mmHg AREA 1.00 atm = 101.3 kPa 1.00 atm = 760 to AREA 1.00 atm = 14.7 psi 1 cm = 10 mm 1 in. John Erickson, 2005 WS/IP Cams Register for solutions, replies, and use board search function. Normal atmospheric pressure in Mexico City is about 56.5 cm Hg. Convert this to atmospheres 10. Business, Finance, Economics, Accounting, Operations Management, Computer Science, Electrical Engineering, Mechanical Engineering, Civil Engineering, Chemical Engineering, Algebra, Precalculus, Statistics and Probabilty, Advanced Math, Physics, Chemistry, Biology, Nursing, Psychology, Certifications, Tests, Prep, and more. Many pneumatic tools operate at an air pressure of 90 psi. 6. 3. The pressure is recorded as 738 mmHg. Convert this measurement to atmospheres (atm). Answer Happy Forum is an archive of questions covering all technical subjects across the Internet. The safety disk in a scuba tank will blow at a pressure of approximately 25000 kPa. Convent this pressure to mmHg 8. A ball is inflated to a pressure of 32.0 pounds per square inch (psi). The atmosphere supports a column of mercury that is 748 mm in height. What is atmospheric pressure in torr? A gas pressure results from the many collisions between gas particles and their container. What is the pressure of the master cylinder in torr! 9. You must be registered to use and view the SEARCH and full board access! Answer Happy Forum is an archive of questions and answers covering all technical subjects across the Internet. If the gas in a container can support 74 inches of mercury. When a brake pedal is pressed with a pressure of 100 psi the pressure is converted about 1200 psi in the master cylinder. What is the equivalent pressure kilopascals (kPa)? 104N 147 TOLDIN Atmospheric pressure is reported as 30.1 inHg. Convert this to torr 10 1.Me Use the conversion factors in the table to solve the following problems. 5. This unit is called a pascal (Pa). 2. Since it is so small it is often reported in thousands of pascals or kilopascals (kPa). One common unit for pressure is the newton per square meter (N/m). 1. Convert this pressure to atmospheres (atm). What is the pressure in pascals if the pressure is equal to 380 torr! 4. answerhappygod Site Admin Posts: 249695 Joined: Mon Aug 02, 2021 1:13 pm Post by answerhappygod » Thu Feb 17, 2022 5:14 pm Pressure Conversions Name Chem Worksheet 13 1 Pressure Is Defined As The Force Pushing Over A Certain Area A Gas Pressu 1 (56.23 KiB) Viewed 188 times Pressure Conversions Name Chem Worksheet 13-1 Pressure is defined as the force pushing over a certain area. What is this pressure in kilopascals? what is the gas pressure in pascals (Pay? 7. = 2.54 cm PRESSURE - PORCE examples A container of gas measures the pressure to be 1049 kPa. Convert this pressure to psi. The gases surrounding the earth exert a pressure of approximately 1 atmosphere (atm) at sea level. The air pressure in a tire is 2.38 atm.

Password requirements: 6 to 30 characters long; ASCII characters only (characters found on a standard US keyboard); must contain at least 4 different symbols; Chemical Engineering Design Principles Practice and Economics of-Plant and Process Design Analytical Chemistry Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch

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