Bellwork for Aug. 23, 2004

Practice these problems: if you can do these you will be able to do most of the problems in this class.

$4A^2mz = (1/2)zh^2$

Solve for m

Solve for A

Solve for h

Solve for z

Find the atomic mass of water.

Find the mass of 1 mole of water.

How many atoms in 3 moles of water?

Convert:

2 gurts to kits

6 kits to braps

9 gurts to ohzes

How many meters in a mile?

6 moles of water is split up into its components with an electric charge. The resulting 9 moles of gas expand adiabatically to produce 18 liters at 300^o K. What is the pressure within the container?

You mix two gases and produce 6 liters of gas at 275 ^{o} K and 1.2 atm. How many moles of gas were made?

Given:

12 in = 1 ft 3.3 ft = 1 m 1 mile = 5, 280 ft

Planck's Constant: h = 6.63 x 10^{-34} joules(sec)

Gas Constant: R = 0.0821 (L · atm)/ (mol · K)

Avogadro's number: 6.02 x 10^{23}

14 gurts = 1 brap

3.5 braps = 2 kits

1 kit = 225 mirts

4 mirts = 1 ohzs

If an amps = volt/ohms, how many ohms make 4 amps if there are 2 volts?

SOLUTIONS

$4A^2mz = (1/2)zh^2$

Solve for m:

$4A^2mz = (1/2)zh^2$
(z's cancel because on both sides)
$4A^2m = (1/2)h^2 = (h^2/2)$
(by cross –mult. $4A^2$ moves to bottom right)
So, $m = h^2/(2 \times 4A^2) = h^2/8A^2$

Solve for A:
$4A^2mz = (1/2)zh^2$
$4A^2m = h^2/2$ (z's cancelled out)
(use cross-mult, move 4m to bottom right)
So, $A^2 = h^2/(2x4m) = h^2/8m$
(take square root on both side)

$$A = \sqrt{\frac{h^2}{8m}} = h\sqrt{\frac{1}{(4x2)m}} = \frac{h}{2}\sqrt{\frac{1}{2m}}$$

Solve for h:

$$4A^2mz = (\frac{1}{2})zh^2$$
$$4A^2m = (\frac{1}{2})h^2$$
(mult.both sides by 2)
$$8A^2m = h^2$$
(take square)
$$h = \sqrt{8A^2m} = 2A\sqrt{2m}$$

Solve for z:
$4A^2mz = (1/2)zh^2$
(z's cancel because on both sides)

So you can't solve for z!

Find the atomic mass of water.
Water is H_2O, so 2 H's and 1 O.
(H = 1.01 amu; O = 16.00 amu)
2(1.01)amu + 1(16.00)amu = (2.02 + 16.00)amu
18.02 amu
(amu is unit for mass at the atomic level)

Find the mass of 1 mole of water.
1 mol H_2O = 18.02 grams (a mole means you have Avogadro's number of molecules or atoms. Then you just change amu to grams—really, it's that easy!)

How many molecules in 3 moles of water?
1 mole = 6.02×10^{23} atoms or molecules

So, make a conversion factor from this equality:

$$\left(\frac{6.02 \times 10^{23} \text{ atoms}}{1 \cancel{\text{mole}}}\right)\left(\frac{3 \cancel{\text{moles}}}{1}\right) = 3 \times 6.02 \times 10^{23} \text{ atoms}$$

(and yes, you can multiply the numbers out)

Given:
12 in = 1 ft 3.3 ft = 1 m 1 mile = 5, 280 ft
Planck's Constant: h = 6.63 x 10^{-34} joules(sec)
Gas Constant: R = 0.0821 (L · atm)/ (mol · K)
Avogadro's number: 6.02 x 10^{23}
14 gurts = 1 brap
3.5 braps = 2 kits
1 kit = 225 mirts
4 mirts = 1 ohzs

Use the given equations to make the conversion factors. Notice that each of the conversion factors actually equals 1, so you really aren't changing the amount, just what you call it.

Convert:

2 gurts to kits → $\left(\frac{2\ \text{gurts}}{1}\right)\left(\frac{1\ \text{brap}}{14\ \text{gurts}}\right)\left(\frac{2\ \text{kits}}{3.5\ \text{braps}}\right)=\left(\frac{(2)(2)\text{kits}}{(14)(3.5)}\right)$

6 kits to braps → $\left(\frac{6\ \text{kits}}{1}\right)\left(\frac{3.5\ \text{braps}}{2\ \text{kits}}\right)=\left(\frac{(6)(3.5)\text{braps}}{2}\right)$

9 gurts to ohzes → $\left(\frac{9\ \text{gurts}}{1}\right)\left(\frac{1\ \text{brap}}{14\ \text{gurts}}\right)\left(\frac{2\ \text{kits}}{3.5\ \text{braps}}\right)\left(\frac{225\ \text{mirts}}{1\ \text{kit}}\right)\left(\frac{1\ \text{ohzs}}{4\ \text{mirts}}\right)=\left(\frac{(9)(2)(225)\text{ohzs}}{(14)(3.5)(4)}\right)$

How many meters in a mile? → $\left(\frac{1\ \text{mile}}{}\right)\left(\frac{5{,}280\ \text{feet}}{1\ \text{mile}}\right)\left(\frac{1\ \text{meter}}{3.3\ \text{feet}}\right)=\left(\frac{(5{,}280)\ \text{meters}}{(3.3)}\right)$

6 moles of water is split up into its components with an electric charge. The resulting 9 moles of gas expand adiabatically to produce 18 liters at 300° K. What is the pressure within the container?

Use the above Gas Constant because it has the units you need buried inside (pressure [atm]). Also remember to use 9 moles because you are asked to find the pressure of the gas (and you can't use the gas constant with a liquid).

$$\left(\frac{0.0821\ \text{L}\bullet\text{atm}}{\text{mol}\bullet\text{K}}\right)\left(\frac{9\ \text{moles}\bullet 300\text{K}}{18\ \text{L}}\right)=\left(\frac{(0.0821)(9)(300)\text{atm}}{18}\right)$$

Of course, you are going to use the Gas constant again here, BUT you need to find the number of moles. REMEMBER: it's OK to invert to get moles in the numerator.

You mix two gases and produce 6 liters of gas at 275 ° K and 1.2 atm. How many moles of gas were made? volts?

$$\left(\frac{\text{mol}\bullet\text{K}}{0.0821\ \text{L}\bullet\text{atm}}\right)\left(\frac{6\ \text{L}\bullet 1.2\ \text{atm}}{275\ \text{K}}\right)=\left(\frac{(6)(1.2)\text{mol}}{(0.0821)(275)}\right)$$

Inverted Gas constant

Trick here is to realize that you must start by making a substitution. If amps = volts/ohms, then you can put volts/ohms in for amps.

If an amps = volt/ohms, how many ohms make 4 amps if there are 2 volts?

$4\ \text{amps} = 4\ \frac{\text{volts}}{\text{ohms}}$ Then invert to get ohms on top. $\left(\frac{1\ \text{ohm}}{4\ \text{volts}}\right)\left(\frac{2\ \text{volts}}{1}\right)=(1/2)\text{ohms}$

Need proof? V = IR
Where V is in volt; I is in amps; R is in ohms

Do the algebra and you get the same thing.