

Name key Name _____
 (print name) (sign name)

Please show all work for full credit and for partial credit. { $P_{total} = P_a + P_b + P_c + \dots$, $\chi_a = P_a / P_{total} = n_a / n_{total}$ }
 { $PV = nRT$, $(P_1 V_1) / (P_2 V_2) = T_1 / T_2$, $R = 0.08206 \text{ (L atm) / (mol K)}$, $K = ^\circ\text{C} + 273.15$ } molar V at STP = 22.4 Liters

1. Complete the following acid base reaction. Reaction does not need to be balanced. (6 pts)



2. For the following reagent, give the oxidation state of the element listed. Either explain why or show work for your oxidation state number answer. (8 pts, 4 pts each)

NaHCO_3 What is the oxidation state of Na in the molecule +1 *gpp. #1*

+1 What is the oxidation state of C in the molecule +4

$(+1) + 1 + C + 3(-2) = 0 \quad C = +6 - 2$
 $\text{Na} \quad \text{H} \quad + 2 + C - 6 = \text{zero} \quad C = +4$

3. If you have a gas in a cylinder with a volume of 7.998 Liter at 29.3 °C at 1.1 atm and then change the cylinder conditions to have a new volume of 2.305 Liter at 35.2 °C, what is the new pressure in your cylinder? (6 pts)

$V_1 = 7.998 \text{ L}$ $V_2 = 2.305 \text{ L}$ $T = 35.2^\circ\text{C} + 273.15 = 308.35 \text{ K}$ $P_2 = ?$
 $T_1 = 29.3^\circ\text{C} + 273.15 = 302.45 \text{ K}$ $\frac{V_2 P_2}{V_1 P_1} = \frac{T_2}{T_1} \rightarrow$
 $P_1 = 1.1 \text{ atm}$ $\frac{(2.305 \text{ L})(P_2)}{(7.998 \text{ L})(1.1 \text{ atm})} = \frac{308.25 \text{ K}}{302.45 \text{ K}}$ $P_2 = 3.9 \text{ atm}$

Attendance for 3/24/15 Tuesday: Mostly whose books are in the back of the room in the announcement video? Dr. Hahn's Dad's

$P_2 = \frac{(308.25 \text{ K})(7.998 \text{ L})(1.1 \text{ atm})}{(302.45 \text{ K})(2.305 \text{ L})}$

Extra Credit (2 pts): If the O_2 has a pressure of 0.37 atm and the gas in a cylinder has other gases in the same cylinder at pressure of 1.33 atm, what is the pressure of the other gases?

Total

$P_{total} = P_{\text{O}_2} + P_{\text{other}}$

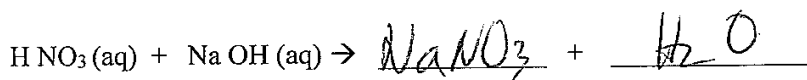
$1.33 \text{ atm} = 0.37 \text{ atm} + P_{\text{other}}$

$P_{\text{other}} = 1.33 \text{ atm} - 0.37 \text{ atm} = 0.96 \text{ atm}$

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2. For the following reagent, give the oxidation state of the element listed. Either explain why or show work for your oxidation state number answer. (8 pts, 4 pts each)

NO_3^- What is the oxidation state of the N in the molecule +5

$$N + 3(-2) = -1$$

$$N = -1 + 6 = +5$$

What is the oxidation state of the O (oxygen) -2

$$3P.O. - 8 = 6 - 8 = -2$$

3. If you have 3.4 moles of a gas at 278.2 K at 788 mm Hg pressure, what volume does the gas occupy? (6 pts)

$PV = nRT \rightarrow (1.04 \text{ atm}) V = (3.4 \text{ mol})(0.08206)(278.2 \text{ K})$

$n = 3.4 \text{ mol}$
 $T = 278.2 \text{ K}$
 $R = 0.08206$

$P = 788 \text{ mm Hg} \times \frac{1 \text{ atm}}{760 \text{ mm Hg}} = 1.04 \text{ atm}$

$V = 95 \text{ L}$

Attendance for 3/24/15 Tuesday: Give at least one gas law equation given during the videos?

$PV = nRT$ $\frac{P_2 V_2}{P_1 V_1} = \frac{T_2}{T_1}$

Extra Credit (2 pts): If you have 2 gases in a gas cylinder and one of the gases has pressure of 725 mm Hg and the other gas has pressure of 82.3 mm Hg, what is the pressure of the gases in the cylinder?

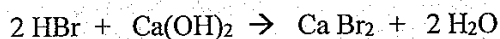
$P_{total} = P_A + P_B$

$P_{total} = 725 \text{ mm Hg} + 82.3 \text{ mm Hg} = 807 \text{ mm Hg}$

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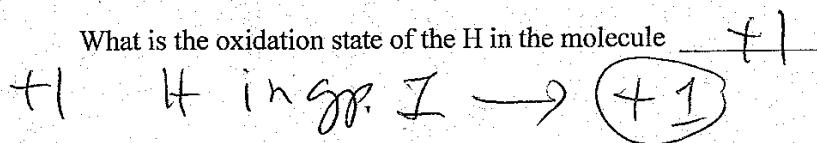
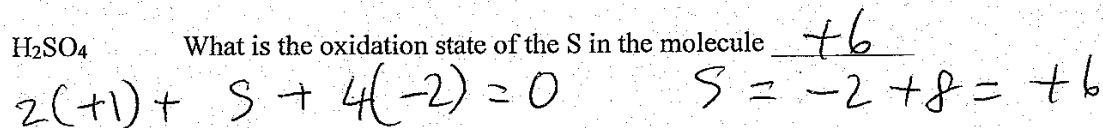
1. For the reaction shown below, if you start with 32.5 mL of HBr of concentration of 0.500 M solution and titrate it with Ca(OH)₂ of concentration of 0.250 M, how many mL of NaOH will you need at the equivalence point? (do not use the equation given here: $M_{acid}V_{acid} = M_{base}V_{base}$) (6 pts)



$$32.5 \text{ mL HBr} \times \left(\frac{0.500 \text{ mol HBr}}{1000 \text{ mL HBr soln.}} \right) \times \left(\frac{1 \text{ mol Ca(OH)}_2}{2 \text{ mol HBr}} \right) \times \frac{1000 \text{ mL}}{0.250 \text{ mol Ca(OH)}_2}$$

$$= 32.5 \text{ mL Ca(OH)}_2$$

2. For the following reagent, give the oxidation state of the element listed. Either explain why or show work for your oxidation state number answer. (8 pts, 4 pts each)



3. If you have N₂ (FW = 28.02 g/mol) and you have 78.7 grams of the gas, what is the volume at STP? (6 pts)

$$78.7 \text{ g N}_2 \times \frac{1 \text{ mol N}_2}{28.02 \text{ g N}_2} \times \frac{22.4 \text{ L}}{1 \text{ mol N}_2} = 62.9 \text{ L N}_2$$

Attendance for 3/24/15 Tuesday: What is the color of the background in the youtube video?

green - aqua

Extra Credit (2 pts): If you have 785.2 torr of a mixture of gases and you know pressure the Ne in the mixture is 75.2 torr, what is mole fraction of the the Ne in the total gas mixture?

$$\chi_{\text{Ne}} = \frac{P_{\text{Ne}}}{P_{\text{tot}}} = \frac{75.2 \text{ torr}}{785.2 \text{ torr}} = 0.0958$$

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1. For the reaction shown below, if you start with a 0.125 M $Ba(OH)_2$ and pour 50.0 mL into a beaker and titrate it with 75.5 mL what is the molarity of the HNO_3 (aq) solution? (do not use the equation given here: $M_{acid}V_{acid} = M_{base}V_{base}$) (6 pts)

$$2 HNO_3 + Ba(OH)_2 \rightarrow 2 H_2O + Ba(NO_3)_2$$

$$50.0 \text{ mL } Ba(OH)_2 \times \frac{0.125 \text{ mol } Ba(OH)_2}{1000 \text{ mL } Ba(OH)_2} \times \frac{2 \text{ mol } HNO_3}{1 \text{ mol } Ba(OH)_2} = 0.0125 \text{ mol}$$

$$m = \frac{0.0125 \text{ mol}}{(75.5 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}})} = 0.166 \text{ M}$$

2. For the following reagent, give the oxidation state of the element listed. Either explain why or show work for your oxidation state number answer. (8 pts, 4 pts each)

PO_4^{3-} What is the oxidation state of the P in the molecule +5

$$P + 4(-2) = -3 \rightarrow P = -3 + 8 = +5$$

What is the oxidation state of the O (oxygen) in the molecule -2

$$6 - 8 = -2$$

- 3 If you have 17.7 grams of He gas (FW = 4.00 g/mol), what volume will the gas occupy at STP ? (6 pts)

$$17.7 \text{ g He} \times \frac{1 \text{ mol He}}{4.00 \text{ g He}} \times \frac{22.4 \text{ L}}{1 \text{ mol He}} = 99.1 \text{ L He}$$

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Extra Credit (2 pts) : If ~~you~~ the mole fraction of H_2 in a gas mixture is 0.87 and the pressure of the total gas is 1.89 atm, what is the pressure of H_2 in atmosphere ?

$$\chi_{H_2} = \frac{P_{H_2}}{P_{total}} = 0.87 = \frac{P_{H_2}}{1.89 \text{ atm}} \rightarrow P_{H_2} = (0.87)(1.89) = 1.64 \text{ atm}$$

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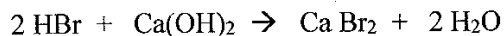
~~5/17~~
2-16 JB

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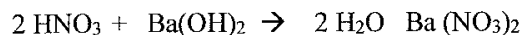
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