Quiz VI General Chemistry I Lecture Spring 14 Dr. Hahn 20 pts 3/25 T 8:30 am Form A quiz # _____

Name _____ __Key__ _____ Name _____
(print name)   (sign name) (I can't read some of your handwriting.)

Please show all work for full credit. If you show work you may also get partial credit.
(1 atm = 760 torr=760 mm Hg) (Kelvin = °C + 273.15) [PV=nRT, R=0.08206 (L atm)/(mol K)]
[$(P_1V_1)/(P_2V_2) = (T_1/T_2)$]

1. Oxidation (being oxidized) means that the reactant [(loses) or (gains)] (circle one) electrons so that

the reactant oxidation state becomes more [(negative) or (positive)] (circle one) and is acting as the

[(oxidizing agent) or (reducing agent)] (circle one) (1 pt each, 3 pts)

2. Give the oxidation state for the following. Show work. (3 pts each, 6 pts)

   a. Na in Na Cl ___+1___   b. Na in Na ___zero___

   [handwritten: +1, group IA, -1]   element in most stable state
                                             has zero ox state

3. Convert 1.1 atmosphere to torr. (4 pts)

$$1.1 \; atm \times \frac{760 \; torr}{1 \; atm} = 846 \; torr$$

4. A gas exerts a pressure of 1.1 atmospheres at 278.2 Kelvin in a tank with a piston of volume 3.23
Liters. If the same gas tank is pressurized to 2.3 atmospheres by moving the piston at the same temperature,
what is the new volume? [$(P_1V_1)/(P_2V_2) = (T_1/T_2)$] (7 pts)

$P_1 = 1.1 \; atm$ $P_2 = 2.3 \; atm$ $\dfrac{P_2 V_2}{P_1 V_1} = \dfrac{T_2}{T_1}$

$T_1 = 278.2 \; K$ $T_2 = 278.2 \; K$

$V_1 = 3.23 \; \ell$ $V_2 = ?$ $\dfrac{(2.3 \; atm)(V_2)}{(1.1 \; atm)(3.23 \; \ell)} = \dfrac{278.2 \; K}{278.2 \; K} = 1$

$$V_2 = \frac{(1.1 \; atm)(3.23 \; \ell)}{(2.3 \; atm)} = 1.5 \; \ell \quad \leftarrow \; algebra$$

Extra Credit: If you do the following reaction, if you start the reaction with 1.2 moles of H_2 what is the
theoretical yield of the HCl (g) in liters? (1 mole gas = 22.4 Liters) (3 pts)

2 TiCl$_4$ (g) + H$_2$ (g) → 2 TiCl$_3$ (s) + 2 HCl (g)
    1.2   ?
    mol

$$1.2 \; mol \; H_2 \times \frac{2 \; mol \; HCl}{1 \; mol \; H_2} \times \frac{22.4 \; \ell}{1 \; mol \; HCl \; gas} = 53.76 \; \ell$$

[circled answer: 54 ℓ]   ↑ sig fig

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(1 atm = 760 torr = 760 mm Hg) (Kelvin = °C + 273.15) [PV=nRT, R=0.08206 (L atm)/(mol K)]
$[(P_1V_1)/(P_2V_2) = (T_1/T_2)]$

1.   Reduction (being reduced) means that the reactant [(loses) or (gains)] (circle one) electrons so that

the reactant oxidation state becomes more [(negative) or (positive)](circle one) and is acting as the

[(oxidizing agent) or (reducing agent)](circle one) (1 pt each, 3 pts)

2. Give the oxidation state for the following. Show work. (3 pts each, 6 pts)

a. N in N_2 __zero__   b.   N in NO_3^- __+5__

   most stable $N + 3(-2) = -1$ (charge of polyatomic ion)
   form element $N = -1 + 6 = +5$

3.   Convert 750.2 torr to atmosphere. (4 pts)

750.2 torr $\times \dfrac{atm.}{760\ torr} = 0.9871\ atm$

(correct sig fig)

4   A balloon is measured to occupy 1.2 Liters at 1.01 atmospheres at 298.14 Kelvin. The balloon is
moved into a room at 313.5 Kelvin and 1.31 atmospheres, what is the new volume of the balloon.
$[(P_1V_1)/(P_2V_2) = (T_1/T_2)]$ (7 pts)

$V_1 = 1.2\ \ell$ $V_2 = ?$

$P_1 = 1.01\ atm$ $P_2 = 1.31\ atm$

$T_1 = 298.14\ K$ $T_2 = 313.5\ K$

$\dfrac{P_2 V_2}{P_1 V_1} = \dfrac{T_2}{T_1}$

$\dfrac{(1.31\ atm)\ V_2}{(1.01\ atm)(1.2\ \ell)} = \dfrac{313.5\ K}{298.14\ K}$

$V_2 = \left(\dfrac{313.5\ K}{298.14\ K}\right)\dfrac{(1.01\ atm)(1.2\ \ell)}{(1.31\ atm)}$
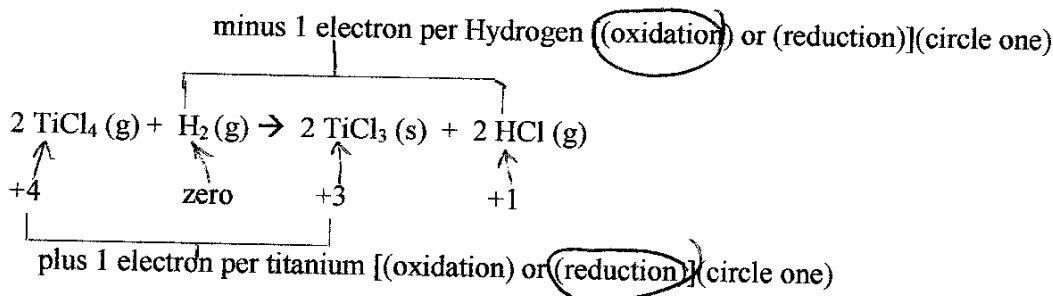
$V_2 = 0.97\ \ell$

Extra Credit: If you do the following reaction, if you start the reaction with 2.5 moles of NaN_3 what is
the theoretical yield of the N_2 (g)   in liters ? (1 mole gas = 22.4 Liters) (3 pts)

$2\ NaN_3\ (s) \rightarrow 2\ Na\ (s) + 3\ N_2\ (g)$

2.5 mol   ? ℓ

$2.5\ mol\ NaN_3 \times \dfrac{3\ mol\ N_2}{2\ mol\ NaN_3} \times \dfrac{22.4\ \ell}{1\ mol\ N_2} = 84\ \ell\ N_2$

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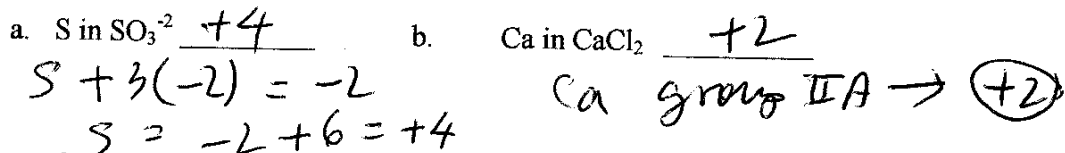
Name ___*Key*___   Name _____
(print name)   (sign name) (I can't read some of your handwriting.)

Please show all work for full credit. If you show work you may also get partial credit.
(1 atm = 760 torr=760 mm Hg) (Kelvin = °C + 273.15) [PV=nRT, R = 0.08206 (L atm)/(mol K)]
[(P$_1$V$_1$)/(P$_2$V$_2$) = (T$_1$/T$_2$)]

1.   In the reaction shown which atom is undergoing oxidation or reduction given the oxidation states shown ? (1.5 pts each, 3 pts)

minus 1 electron per Hydrogen [(oxidation) or (reduction)](circle one)   ← oxidation circled

2 TiCl$_4$ (g) + H$_2$ (g) → 2 TiCl$_3$ (s) + 2 HCl (g)
+4   zero   +3   +1

plus 1 electron per titanium [(oxidation) or (reduction)](circle one)   ← reduction circled

2.   Give the oxidation state for the following. Show work. (3 pts each, 6 pts)

a. S in SO$_3^{-2}$ ___+4___   b.   Ca in CaCl$_2$ ___+2___

$S + 3(-2) = -2$ Ca group IIA → (+2)
$S = -2 + 6 = +4$

3.   Convert 23.3 °C to Kelvin. (4 pts)

$K = °C + 273.15 = 23.3°C + 273.15 = 296.45 K$

4   A sample of gas at 303.2 Kelvin and 2.52 Liters has a pressure of 1.1 atmospheres. How many moles of the gas do you have ? (PV=nRT) (7 pts) $PV = nRT$

$T = 303.2 K$
$V = 2.52 l$ $(1.1\ atm)(2.52\ l) = n(0.08206)(303.2)$
$P = 1.1\ atm$ $n = \dfrac{(1.1\ atm)(2.52\ l)}{(0.08206\ \frac{l\ atm}{mol\ K})(303.2\ K)} = 0.11$ moles

Extra Credit: If you do the following reaction, if you start the reaction with 3.2 moles of HCl what is the theoretical yield of the H$_2$O (g) in liters ? (1 mole gas = 22.4 Liters) (3 pts)

Zn(s) + 2 HCl (aq) → ZnCl$_2$ (aq) + H$_2$O (g)
3.2 mol   ? l
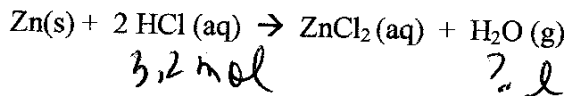
$\dfrac{3.2\ mol}{HCl} \times \dfrac{1\ mol\ H_2O}{2\ mol\ HCl} \times \dfrac{22.4\ l\ H_2O (g)}{1\ mol\ H_2O (g)} = 35.84\ l$

Name _____ Key _____

(print name)

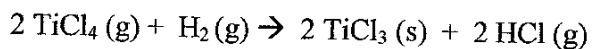Name _____

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(1 atm = 760 torr=760 mm Hg) (Kelvin = °C + 273.15) [PV=nRT, R=0.08206 (L atm)/(mol K)]
$[(P_1V_1)/(P_2V_2) = (T_1/T_2)]$

1.   In the reaction shown which atom is undergoing oxidation or reduction given the oxidation states shown ? (1.5 pts each, 3 pts)

Minus 2 electron / Oxygen [(oxidation) or (reduction)](circle one)

$2 HgO (s)$ → $2 Hg (l) +$ $O_2 (g)$

+2   -2   zero   zero

Plus 2 electrons /mercury [(oxidation) or (reduction)] (circle one)

2.   Give the oxidation state for the following. Show work. (3 pts each, 6 pts)

a. Cl in $CaCl_2$ ___-1___   b.   Cl in Cl_2 _zero_

Cl - group VIIA

$7 - 8 = -1$

(most stable form of element)
(zero)

3.   Convert 310.1 Kelvin to °C. (4 pts)

$K = °C + 273.15 \longrightarrow K - 273.15 = °C$

$310.1 K - 273.15 = 36.95 °C$

4   How many Liters does a 2.33 mole sample of gas occupy at 298.14 Kelvin, and pressure of 0.987 atmosphere? (PV=nRT) (7 pts)

$n = 2.33 mol$

$T = 298.14 K$

$P = 0.987 atm$

$V = 7 l$

$(0.987 atm) V = (2.33 mol)(0.08206)(298.14 K)$

$V = \dfrac{(2.33 mol)(0.08206 \frac{l atm}{mol K})(298.14 K)}{(0.987 atm)}$

$V = 57.8 liters$

Extra Credit: If you do the following reaction, if you start the reaction with 7.8 moles of NH_4NO_3 what is the theoretical yield of the $O_2 (g)$ in liters? (1 mole gas = 22.4 Liters) (3 pts)

$2 NH_4NO_3 (g) \rightarrow 2N_2 (g) + 4H_2O (g) + O_2 (g)$

7.8 mol   ? l

$7.8 mol \ NH_4NO_3 \times \dfrac{1 mol \ O_2}{2 mol \ NH_4NO_3} \times \dfrac{22.4 \ l \ O_2 (g)}{1 mol \ O_2 (g)} = 87.36 \ l$

87 l

↑ sig fig

Quiz VI General Chemistry I Lecture Spring 14 Dr. Hahn 20 pts 3/25 T 8:30 am Form A quiz # __1—4__

Name _____ Name _____
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(1 atm = 760 torr=760 mm Hg) (Kelvin = °C + 273.15) [PV=nRT, R=0.08206 (L atm)/(mol K)]
[$(P_1V_1)/(P_2V_2) = (T_1/T_2)$]

1.   Oxidation (being oxidized) means that the reactant [(loses) or (gains)] (circle one) electrons so that

the reactant oxidation state becomes more [(negative) or (positive)](circle one) and is acting as the

[(oxidizing agent) or (reducing agent)](circle one) (1 pt each, 3 pts)

2.   Give the oxidation state for the following. Show work. (3 pts each, 6 pts)

   a. Na in Na Cl _____   b.   Na in Na _____

3.   Convert   1.1 atmosphere to torr. (4 pts)

4   A gas exerts a pressure of 1.1 atmospheres at 278.2 Kelvin in a tank with a piston of volume 3.23
Liters. If the same gas tank is pressurized to 2.3 atmospheres by moving the piston at the same temperature,
what is the new volume ? [$(P_1V_1)/(P_2V_2) = (T_1/T_2)$]   (7 pts)

Extra Credit: If you do the following reaction, if you start the reaction with 1.2 moles of H_2 what is the
theoretical yield of the HCl (g) in liters ?   (1 mole gas = 22.4 Liters) (3 pts)

2 $TiCl_4$ (g) + H_2 (g) → 2 $TiCl_3$ (s) + 2 HCl (g)

Name _____   Name _____
(print name)   (sign name) (I can't read some of your handwriting.)

Please show all work for full credit. If you show work you may also get partial credit.
(1 atm = 760 torr=760 mm Hg) (Kelvin = °C + 273.15) [PV=nRT, R=0.08206 (L atm)/(mol K)]
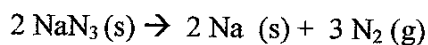[$(P_1V_1)/(P_2V_2) = (T_1/T_2)$]

1.   Reduction (being reduced) means that the reactant [(loses) or (gains)] (circle one) electrons so that

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2. Give the oxidation state for the following.   Show work. (3 pts each, 6 pts)

a. N in N_2 _____   b.   N in NO_3^- _____

3.   Convert 750.2 torr to atmosphere. (4 pts)

4   A balloon is measured to occupy 1.2 Liters at 1.01 atmospheres at 298.14 Kelvin. The balloon is moved into a room at 313.5 Kelvin and 1.31 atmospheres, what is the new volume of the balloon.
[$(P_1V_1)/(P_2V_2) = (T_1/T_2)$]   (7 pts)

Extra Credit: If you do the following reaction, if you start the reaction with 2.5 moles of NaN_3 what is the theoretical yield of the N_2 (g)   in liters ? (1 mole gas = 22.4 Liters) (3 pts)

2 NaN_3 (s) → 2 Na (s) + 3 N_2 (g)

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[$(P_1V_1)/(P_2V_2) = (T_1/T_2)$]

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+4   zero   +3   +1

    plus 1 electron per titanium [(oxidation) or (reduction)](circle one)

2.   Give the oxidation state for the following. Show work. (3 pts each, 6 pts)

    a. S in SO$_3^{-2}$ _____   b.   Ca in CaCl$_2$ _____

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theoretical yield of the H$_2$O (g)   in liters ?   (1 mole gas = 22.4 Liters) (3 pts)

Zn(s) + 2 HCl (aq) → ZnCl$_2$ (aq) + H$_2$O (g)

Orergt (handwritten)

Name _____ Name _____
(print name)   (sign name) (I can't read some of your handwriting.)

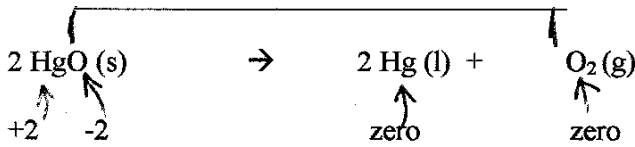Quiz VI General Chemistry I Lecture Spring 14 Dr. Hahn 20 pts 3/25 T 9:55 am   Form B   quiz # _____

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1.   In the reaction shown which atom is undergoing oxidation or reduction given the oxidation states
       shown ? (1.5 pts each, 3 pts)

                Minus 2 electron / Oxygen [(oxidation) or (reduction)](circle one)

$$2 \; HgO \; (s) \quad \rightarrow \quad 2 \; Hg \; (l) \; + \quad O_2 \, (g)$$

+2   -2   zero   zero

           Plus 2 electrons /mercury [(oxidation) or (reduction)] (circle one)

2.   Give the oxidation state for the following.   Show work. (3 pts each, 6 pts)

   a. Cl in $CaCl_2$ _____   b.   Cl in Cl_2 _____

3.   Convert 310.1 Kelvin to °C. (4 pts)

4   How many Liters does a 2.33 mole sample of gas occupy at 298.14 Kelvin, and pressure of 0.987
atmosphere? (PV=nRT) (7 pts)

Extra Credit: If you do the following reaction, if you start the reaction with 7.8   moles of NH_4NO_3 what
is the theoretical yield of the $O_2 \, (g)$ in liters?   (1 mole gas = 22.4 Liters) (3 pts)

$2 \; NH_4NO_3 \, (g) \;\rightarrow\; 2N_2 \, (g) + \; 4H_2O \; (g) \; + \; O_2 \, (g)$