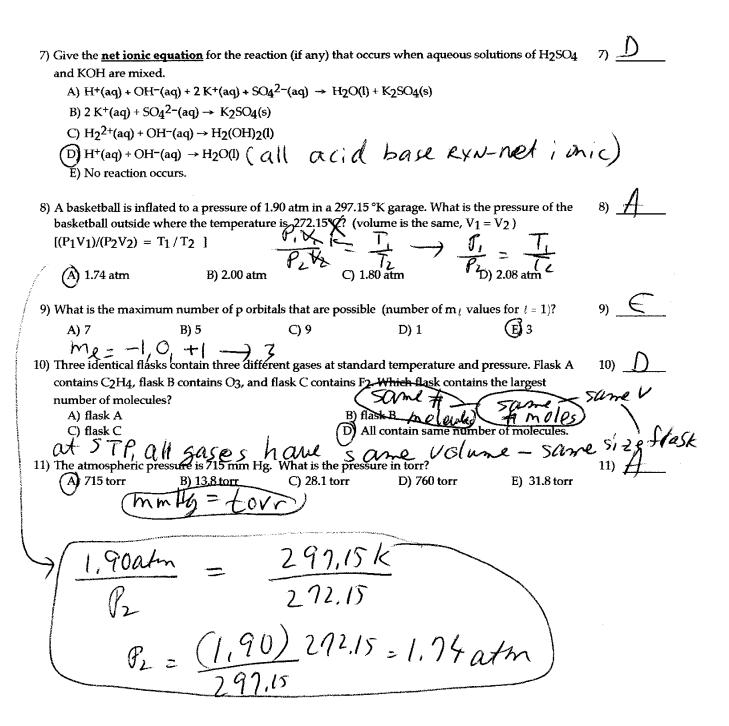
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Exam	III Ge	neral Chen	nistry I Lect	ture Spring	2014 4/1/14	Tuesday forn	n 8:30 A D	r. Hahn Exan	n#
Name_		Kay			(print) Nan	ne			(sign)
Multip work, l	show we le choice lobviou	ork for part e questions usly cannot	tial credit ar have no par grade it. (2	rtial credit. ! pts print and	Please write a	nything you w If you run out	vant graded l	Short Answer Que legibly. If I cann ease continue on t	ot read your
(1 atm	= 760 m	nm Hg = 76	60 torr) (Ke	$eIvin = {}^{O}C +$	273.15)(PV=n	RT, R = 0.0820	96 (L atm)/(n	nol K)] [(P2V2) / ($P_1 V_1 = T_2/T_1$
				se the one al question, 22 j		est complete	s the statem	ent or answers the	e question.
	A B C D	e the tempe) 32K and 1) 0°C and 1) 25°C and) 0°C and 1) 0K and 1.	torr Hg mm Hg 1.00 in Hg 1.00 atm	pressure at S	- ΓP (standard pi	ressure and at	mosphere).		1)
		vhich orbita) 5d	l below wou B) 2		n (on average) C) 4s	be closest to t D) 2		(E))2s	2)
		v many H+) 0	ions can the	e acid, H3PO B) 2	4 , donate per n	nolecule? C) 1	()3	3)
	A B C	number of) median) waveleng) area) frequency	rth	pass through	a stationary po	int in a wave	is called		4)
	A) B C) D	cribe the sh) spherical b) three ball) four balls) eight ball) dumbbell	s	rbital.					5)
	(other		quation forn o's Law Law Law Law	mixture is the $P_T = P_a + \frac{1}{2}$		rtial pressure	of its co m por	nents is known as	6) <u>D</u>

1



Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (42 pts)

For the following unbalanced precipitation reaction complete by filling in the blanks. The reaction 1. does not need to be balanced. (2 pts each, 8 pt total)

$$Ca(NO_3)_2 (aq) + Na_3 PO_4 (aq) \rightarrow Ca_3(PO_4)_2 (s) + NaNO_3 (aq)$$

a. Complete ionic form:

$$(aq) + 2 NO_3^{-1} (aq) + 3 Na^{+1} (aq) + PO_4^{-3} (aq) \rightarrow (2) (PO_2)_2 (s) + Na^{+1} (aq) + NO_3^{-1} (aq)$$

b. Net ionic form

$$\underline{Ca^{+2}}_{(aq)} + PO_4^{-3}(aq) \rightarrow Ca_2(PO_4)_{(s)}$$

2. Among the following compounds, circle all strong acids (1 pt each, 6 pts total)

For the following titration reaction if you neutralize a 1.5 M solution of HNO₃ of volume 250.0 mL with a 0.55 M NaOH solution, how many mL of NaOH do you need?

$$H NO_3 + Na OH \rightarrow Na NO_3 + H_2O \left(\frac{1.5}{0.55}\right) \left(250.0\right)_{-} 681.8$$

To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. (M_{acid}V_{acid}=M_{base}V_{base}). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)

$$M \text{ acid} = 1.5 \text{ M}$$

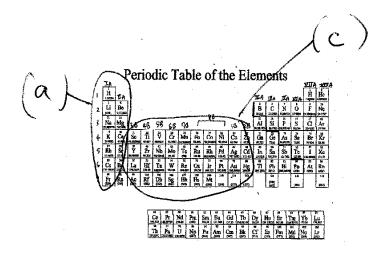
$$Vacid = 250.0 \text{ ml}$$

$$V \text{ base} = 0.55 \text{ M}$$

$$V \text{ base} = 250.0 \text{ ml}$$

- Give the oxidation state for the following. Show work. (2 pts each, 6 pts total)
 - a. 0 in O2 _ Zer0
- b. $S in SO_4^{-2} + 6$
- Fe in Fe O t2

- 5 = -2 + 8 5 = +6 6 = +2 5 = +6 6 = +2 6 = +2 6 = +2 6 = +2 6 = +2 6 = +2 6 = +2 7 = +2 7 = +2 8 = +2 8 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 9 = +2 1 = +2 1 = +2 1 = +2 1 = +2 1 = +2 1 = +2 2 = +2 2 = +2 3 = +2 4 = +2
- Ph= 0,8ah 1,2ah = PHe + Ph Ptatal = 1,2ah Ph= 0.8ah
- If the principal investigator number (n) = 3, what are the possible values of angular momentum quantum number (1) (circle one)
- N = 3, l = 0, ... (n-1) N-1=3-1=2l=0,1,2
- 7 Match the following to the letters shown. The letters may only be used one time or not at all. (2 pts each, 4 pts total)
 - (a) s block elements (b) p block elements (c) d block elements (d) f block elements



<u>Part III.</u> <u>Long Answer</u> Please <u>show work</u> for full credit and to receive partial credit. (34 pts)

**** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite
the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1. If a gas in a tank of volume 3.72 Liters is at temperature of 273.2 Kelvin has pressure 1.07 atmospheres. If the tank is allowed to heat up to 303.7 Kelvin temperature, what is the new pressure in atmospheres assuming that the volume has not changed ? $[(P_2V_2)/(P_1V_1) = (T_2/T_1)]$ (17 pts)

$$V_{1} = 3.72 l$$

$$T_{1} = 273.2 l$$

$$T_{2} = 3.72 l$$

$$T_{3} = 3.72 l$$

$$T_{$$

2. If you do the following reaction starting with 12.3 mL of a 2.5 M solution of H_3PO_4 (assume excess NaOH), what is the theoretical yield of the $H_2O(g)$ in Liters? (1 mole gas = 22.4 liters) (hint: think moles of H_3PO_4) (17 pts)

 $H_3PO_4(aq) + 3 NaOH(aq) \rightarrow 3H_2O(g) + Na_3PO_4(aq)$

Name_	rey	(pri	nt) Name		(sign)
Multip work, l	show work for partial cred le choice questions have no lobviously cannot grade i exam and clearly tell me wl	partial credit. Pleas t. (2 pts print and sign	e write anything you want exam) If you run out of s	graded legibly. If I cann	not read your
(1 atm	= 760 mm Hg = 760 torr)	(Kelvin = °C + 273.1	5)(PV=nRT, R = 0.08206 (I	. atm)/(mol K)] [(P2V2) / (P ₁ V ₁)=T ₂ /T ₁
	MULTIPLE CHOICE. Cl			e statement or answers th	e question.
	1) Describe the shape of a A) eight balls B) spherical C) four balls D) dumbbell shaped E) three balls				1)
	2) Three identical flasks of contains C ₂ H ₄ , flask B	_	ases at standard temperatu C contains F2. Which flask	_	2)
	number of molecules?				
	A) flask A C) flask C		B) flask B (D) All contain sam	ne number of molecules.	
	3) The number of cycles to A frequency B) wavelength C) median D) amplitude E) area	hat pass through a stati	onary point in a wave is ca	illed	3) <u>/</u>
	basketball outside whe	re the temperature is 2	m in a 297.15 °K garage. W 72.15 °C? (volume is the sa		4)
	$[(P_1V_1)/(P_2V_2) = T_1/(P_1V_1)$	T ₂]	K		
	A) 1.80 atm	B 1.74 atm	C) 2.08 atm	D) 2.00 atm	0
	5) Give the temperature a A) 0°C and 1 mm H B) 0°C and 1.00 atm C) 0K and 1.00 atm D) 25°C and 1.00 in E E) 32K and 1 torr H	g Hg	ndard pressure and atmos	phere).	5)
	6) How many H+ ions can	n the acid, H3PO4 , don	ate per molecule?		6) <u>C</u>

7) The total pressure of a gas mixture is the sum of the partial pressure of its components is known as 7)	_
(otherwise in equation form: $P_T = P_a + P_b + P_c$)	
A) Boyle's Law	
B) Avogadro's Law	
C) Charles's Law	
D) Ideal Gas Law (E) Dalton's Law	
Liji Dalitoit 3 Law	
8) In which orbital below would an electron (on average) be closest to the nucleus?)
A) 5d B) 4s (C) 2s D) 2p E) 2p	
9) The atmospheric pressure is 715 mm Hg. What is the pressure in torr?	•
A) 28.1 torr B) 31.8 torr C) 715 torr D) 13.8 torr E) 760 torr	
10) What is the maximum number of p orbitals that are possible (number of m t values for $t = 1$)?)
A) 5 B) 1 C) 9 (D))3 E) 7	
wo co	ר
11) Give the <u>net ionic equation</u> for the reaction (if any) that occurs when aqueous solutions of H ₂ SO ₄ 11)	
and KOH are mixed.	
A) $2 K^{+}(aq) + SO_4^{2-}(aq) \rightarrow K_2 SO_4(s)$	
B) $H^+(aq) + OH^-(aq) + 2K^+(aq) + SO_4^2-(aq) \rightarrow H_2O(1) + K_2SO_4(s)$	
$\bigcirc H^{+}(aq) + OH^{-}(aq) \rightarrow H_{2}O(1)$	
D) $H_2^{2+}(aq) + OH^{-}(aq) \rightarrow H_2(OH)_2(1)$	
E) No reaction occurs.	

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (42 pts)

For the following unbalanced precipitation reaction by filling in the blanks. The reaction does not 1. need to be balanced. (2 pts each, 8 pt total)

$$Ca(NO_3)_2 (aq) + Na_3 PO_4 (aq) \rightarrow Ca_3(PO_4)_2 (s) + NaNO_3 (aq)$$

a. Complete ionic form:

$$Ca^{+2}(aq) + 2NO_3^{-1}(aq) + 2NO_4^{-1}(aq) + 2NO_4^{$$

b. Net ionic form:

$$\frac{2}{2} \frac{(aq)}{(aq)} + \frac{2}{2} \frac{P0_4^{-2}}{(aq)} \Rightarrow Ca_3(PO_4)_2(s)$$

2. Among the following compounds, circle all weak acids (1 pt each, 6 pts total)

X

 HNO_3



For the following titration reaction if you neutralize a 3.7 M solution of HNO₃ of volume 73.2 mL with a 2.55 M NaOH solution, how many mL of NaOH do you need?

 $H NO_3 + Na OH \rightarrow Na NO_3 + H_2O$

$$\frac{(3,1)(13,2)}{(2,55)} = 106,2ml$$

To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. (Macid Vacid=Mbase Vbase). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)

M acid =
$$\frac{3}{1}$$
 $\frac{1}{1}$ M

M base =
$$\frac{2.55}{M}$$

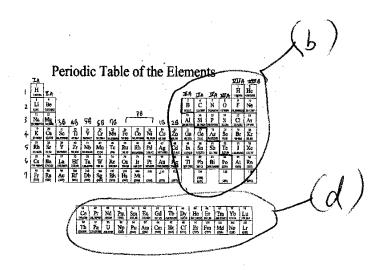
$$Vacid = 73,2 m$$

$$Vacid = \frac{93.2 \, \text{m}}{V \, \text{base}} = \frac{9.004 \, \text{m}}{V \, \text{m}}$$

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

a. K in KCl \pm 1 b. Ca in Ca \pm 200 c. C in K₂CO₃ \pm 4 \pm 4 \pm 6 \pm 7 c. C in K₂CO₃ \pm 4 \pm 6 \pm 7 c. C in K₂CO₃ \pm 4 \pm 7 c. C in K₂CO₃ \pm 7

- 6 If the principal investigator number (n) = 4, what are the possible values of angular momentum quantum number (/) (circle one) (6 pts) $l = 0, \dots (n-1)$
 - a) -2, -1, 0, +1, +2b) 0, 1, 2, 3c) $+\frac{1}{2}$ or $-\frac{1}{2}$ 1 1 = 3 1 1 = 3
- 7 Match the following to the letters shown. The letters may only be used one time or not at all. (2 pts each, 4 pts total)
 - (a) s block elements (b) p block elements (c) d block elements (d) f block elements



<u>Part III.</u> Long Answer Please show work for full credit and to receive partial credit. (34 pts)

**** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1. 7.23 moles of a gas at temperature of 278.2 Kelvin and pressure of 0.978 atmospheres occupies what volume in liters? [PV=nRT, R=0.08206 (Liter atm) / (mol Kelvin)] (17 pts)

$$N = 1.25 \text{ mole}$$
 $T = 278.2 \text{ K}$
 $\theta = 0.918 \text{ atm}$
 $V = 7.1$
 $V = 1000 \text{ RT}$
 $V = 1000 \text{ RT}$
 $V = (1.25 \text{ mol})(0.08206 \text{ latm})(278.2 \text{ mole})$
 $V = (1.25 \text{ mol})(0.08206 \text{ latm})(278.2 \text{ mole})$
 $V = (1.25 \text{ mol})(0.08206 \text{ latm})(278.2 \text{ mole})$
 $V = (1.25 \text{ mol})(0.08206 \text{ latm})(278.2 \text{ mole})$
 $V = (1.25 \text{ mol})(0.08206 \text{ latm})(278.2 \text{ mole})$
 $V = (1.25 \text{ mol})(0.08206 \text{ latm})(278.2 \text{ mole})$

If you do the following reaction starting with 250.2 mL of 1.5 M solution of H_2SO_4 (assume excess Al), what is the theoretical yield of the $H_2(g)$ in Liters? (1 mole gas = 22.4 liters) (hint: think moles of H_2SO_4) (show work) (17 pts)

 $2Al(s) + 3 H_2SO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + 3H_2(g)$

(250,2 ml) X (1,5 hold) (3 hold) (22,4,6 th (9)) (1504) (1504) (1504) (1504) (1504) (1504) (1504)

= 8.4 July Hz(g) (W correct sigfig)

				orand
Exam III General Chemistry I	Lecture Spring 2014 4/	/1/14 Tuesday forn	n 9:55 A Dr. Hahn	•
Name Kly	(prin	t) Name		(sign)
Please show work for partial cred Multiple choice questions have no work, I obviously cannot grade i of the exam and clearly tell me with	it and full credit on the L partial credit. Please t. (2 pts print and sign ex	ong Answers and in write anything you v am) If you run ou	some of the Short Anvant graded legibly.	If I cannot read your
(1 atm = 760 mm Hg = 760 torr)	(Kelvin = ${}^{\circ}$ C + 273.15)	(PV=nRT, R = 0.082)	06 (L atm)/(mol K)] [$(P_2V_2) / (P_1V_1) = T_2/T_1$
Part I MULTIPLE CHOICE. Co			es the statement or ar	nswers the question.
1) How many H+ ions car	n the acid, H2SO4 , donat	te per molecule?		1)
A) 0	B) 1	C) 3	D) 2	
2) Give the temperature a A) 0K and 1.00 atm B) 0°C and 1 mm H C) 0°C and 1.00 atm D) 25°C and 1.00 in	g	dard pressure and at	tmosphere).	2)
C) H2 ²⁺ (aq) + OH ⁻ (D) 2 K ⁺ (aq) + SO4 ²⁻	ation for the reaction (if an expension) \rightarrow H ₂ O(l) $\frac{1}{2} + 2 K^{+}(aq) + SO_4^{2-}(aq)$ $\frac{1}{2} + 2 K^{+}(aq) + SO_4^{2-}(aq)$ $\frac{1}{2} + 2 K^{+}(aq) \rightarrow K_2SO_4(s)$		-	of H ₂ SO ₄ 3) <u>A</u>
E) No reaction occur 4) Which of the following A) 1.09 mol Ne B)5.5 mol He		eatest volume at STI # m0les	" Las	4)
C) 0.31 mol Cl ₂ D) 3.12 mol O ₂	gylestest les would have the same		thas at STP	(A)
5) The atmospheric press A) 28.1 torr		•		5) <u>B</u>
6) The distance between a A) frequency B) median C) area D) wavelength E) amplitude	adjacent crests in a wave	is called		6 <u>D</u>

	nflated to a pressure of de where the temperat			hat is the pressure of the me, $V_1 = V_2$)	7) (3
$[(P_1V_1)/(P_2V_2)$		K	-		
A) 2.00 atm	B 1.74 atı	m	C) 2.08 atm	D) 1.80 atm	•
8) What is the ma	kimum number of d or	bitals that are p	ossible? (number of	m_t values for $t = 2$)	8)
A) 3	B)5	C) 9	D) 7	E) 1	
(otherwise in ed A) Boyle's La B) Charles's C) Ideal Gas (D))Dalton's L	ruation form: P _T = P _a w Law Law Law aw		partial pressure of its	components is known as	9)
E) Avogadro 10) Describe the sh. A) eight balls B) three balls C) four balls D) dumbbell	ape of a s orbital.				10)
E)spherical	below would an electr	on (on average) be farthest from th	ne nucleus?	11) D
A) 3s	B) 1s	C) 2p	D 4f	E) 3d	
P	rincipal	gener	Alm # 0	determine	(رو
	distance	fra	nicleus)	
	(1,90 atm) (P2?)(H) = (H) =	(297.15	(k) aleyeb	
	P2=		(2/2,15/C) 7,15K)	=1,74 atm	

<u>Part II Short Answer</u>: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (42 pts)

1. For the following unbalanced precipitation reaction, complete by filling in the blanks. The reaction does not need to be balanced. (2 pts each, 8 pt total)

$$Mg Cl_2 (aq) + Li_2S (aq) \rightarrow Mg S (s) + LiCl (aq)$$

a. Complete ionic form:

b. Net ionic form:

$$Mg^{+2}(aq) + \underbrace{S}^{-2}(aq) \rightarrow \underbrace{S}_{-}(s)$$

2. Among the following compounds, circle all strong bases (1 pt each, 6 pts total)

For the following titration reaction if you neutralize a 0.55 M solution of KOH of volume 125.0 mL with a 2.50 M H Cl solution, how many mL of H Cl do you need?

KOH + HCl
$$\rightarrow$$
 KCl + H₂O $\frac{(0.55)(125,0)}{(2.50)} = 27,5$
To answer this question fill in the blanks below. Just complete the following for using the acid base titration

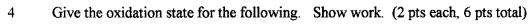
To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. ($M_{acid}V_{acid}=M_{base}V_{base}$). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)

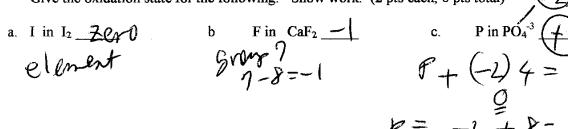
$$M \text{ acid} = \frac{2.50 \text{ M}}{2.55 \text{ M}}$$

$$Vacid = \frac{U \times k \times 0.0000}{V \text{ base}}$$

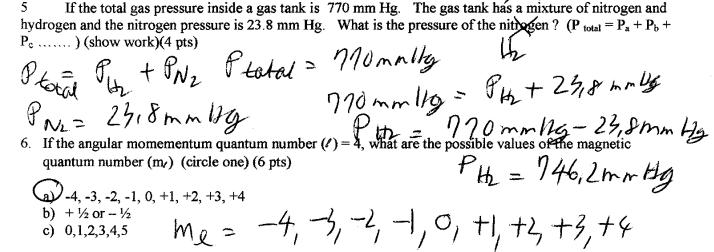
$$V \text{ base} = \frac{125.0 \text{ M}}{2.50000}$$

Dr. Hahn General Chemistry I Lecture Exam III Spring 2014 form (9:55 am T,R form A) page 3

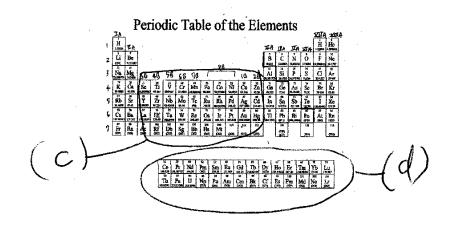




5 If the total gas pressure inside a gas tank is 770 mm Hg. The gas tank has a mixture of nitrogen and



- Match the following to the letters shown. The letters may only be used one time or not at all. (2 pts each, 4 pts total)
 - (a) s block elements (b) p block elements (c) d block elements (d) f block elements



Dr. Hahn General Chemistry I Lecture Exam III Spring 2014 form (9:55 am T,R form A) page 4 <u>Part III. Long Answer</u> Please <u>show work</u> for full credit and to receive partial credit. (34 pts)

**** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1. A gas in an internal combustion engine is heated from 298.2 K to 378.2 K. The volume of the gas changes from 1.58 Liters to 3.27 Liters. If the initial pressure was 0.987 atmospheres, what was the final pressure in atmospheres? $[(P_2V_2)/(P_1V_1) = (T_2/T_1)]$ (17 pts)

$$T = 298,2K \qquad T_{2} = 378,2K$$

$$V_{1} = 1.58l \qquad V_{2} = 3.27l$$

$$\theta_{1} = 0.987 \text{ atm} \qquad \theta_{2} = ?$$

$$\frac{(\theta_{2})(3.27l)}{(0.987 \text{ atm})(1.58l)} = \frac{(378,2K)}{298,2K} \text{ alegbra}$$

$$\theta_{2} = \frac{(378,2K)}{298.2K} \frac{(0.981)(1.58l)}{(3.27l)}$$

$$\theta_{2} = 0.6048 \text{ atm} \rightarrow 0.605 \text{ atm}$$

$$\sin \theta_{1} = 0.6048 \text{ atm} \rightarrow 0.605 \text{ atm}$$

$$\sin \theta_{2} = 0.6048 \text{ atm} \rightarrow 0.605 \text{ atm}$$

$$\sin \theta_{3} = 0.605 \text{ atm}$$

If you do the following reaction with 5.23 grams of the O_2 (Formula Mass of $O_2 = 32.00$ g/mol) (assume limiting reagent of O_2), what is the theoretical yield of the $N_2(g)$ in Liters? (hint: think moles of O_2) (1 mole gas = 22.4 Liters) (17 pts)

 $4NH_3(g) + 4NO(g) + O_2(g) \rightarrow 4N_2(g) + 6H_2O(g)$

5.24g mole 4 mole x 224 = 14.64 P 02 72,00g 1 mol x 1 mol N2 Sig fig 14.6 l N2

Exam Name	1/2.	stry I Lecture Spring				
ivame	- tens	······································	(print) iN	ame		(sign)
Multi _l work,	ole choice questions had a obviously cannot g	eve no partial credit.	Please write d sign exam)	e anything you war If you run out o	me of the Short Answer Qu nt graded legibly. If I can f space , please continue on	not read your
(1 atn	n = 760 mm Hg = 760	torr) (Kelvin = °C +	- 273.15)(PV	=nRT, R = 0.08206	(L atm)/(mol K)] [(P2V2) /	(P ₁ V ₁)=T ₂ /T ₁]
		CE. Choose the one a 2 pts per question, 22			he statement or answers th	ne question.
	1) Describe the shap	pe of a s orbital.				1)
	A) four balls					-/
	B) three balls					
	C) dumbbell sl	haped				
	(D) spherical	1				
	E) eight balls					
	2) In which orbital k	elow would an electro	on (on averse	ra) ha farthact from	the prelove?	2)
	A) 1s	B) 2p	C) 3d	D) 3s	E)4f	2)
		e where the temperati			What is the pressure of the same, $V_1 = V_2$)	3)
	A) 2.00 atm	B) 1.80 atn	n	C) 2.08 atm	D 1.74 atm	
	4) The distance betw A) median B) wavelength C) amplitude D) frequency E) area	veen adjacent crests ir	ı a wave is ca	alled		4)
	5) Give the tempera A) 0°C and 1.0 B) 0°C and 1 m C) 32K and 1 t D) 25°C and 1. E) 0K and 1.00	nm Hg orr Hg 00 in Hg	TP (standard	pressure and atmo	osphere).	5) <u>A</u>
	6) How many H+ io	ns can the acid, H2SC	Mandonate ne	r molecule?		6) R
	A) 0	(B) 2	1, Pc	C) 3	D) 1	~, <u> </u>
				•	·	

	nation form: PT= v aw w s Law		ial pressure of its com	ponents is known as	7)
8) What is the maxi	mum number of d	orbitals that are poss	sible? (number of m _f v	values for $\ell = 2$)	8)
A) 7	B) 1	(C))5	D) 3	E) 9	,
and KOH are mi	xed.	•	occurs when aqueous	solutions of H ₂ SO ₄	9)
	$SO_4^{2-}(aq) \rightarrow K_2S_1^{2-}$	O4(s)			
	$H^-(aq) \rightarrow H_2O(1)$	_			
· · · · · · · · ·		$+ SO_4^2$ (aq) $\rightarrow H_2O$)(l) + K ₂ SO ₄ (s)		
	$OH^-(aq) \rightarrow H_2(O)$	H) ₂ (l)			
E) No reaction	occurs.				
10) Which of the foll (A) 5.5 mol He B) 0.31 mol C C) 3.12 mol C D) 1.09 mol No	e 1 ₂ 1 ₂	l have the greatest vo	olume at STP?		10)
E) All of these	samples would ha	ve the same volume	at STP.		
11) The atmospheric A) 28.1 torr	pressure is 715 mr B) 13.8 torr	n Hg. What is the pr	essure in torr? D) 760 torr	E) 31.8 torr	11) <u>C</u>

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (42 pts)

1. For the following unbalanced precipitation reaction, complete by filling in the blanks. The reaction does not need to be balanced. (2 pts each, 8 pt total)

$$Mg Cl_2 (aq) + Li_2S (aq) \rightarrow Mg S (s) + LiCl (aq)$$

a. Complete ionic form:

$$Mg^{+2}(aq) + \underline{Cl}^{-1}(aq) + 2Li^{+1}(aq) + S^{-2}(aq) \rightarrow MgS(s) + \underline{Ll}^{-1}(aq) + Cl^{-1}(aq)$$

b. net ionic equation

$$(aq) + \int (aq) \rightarrow Mg S (s)$$

2 Among the following compounds, circle all weak bases (1 pt each, 6 pts total)

For the following titration reaction if you neutralize a 3.77 M solution of KOH of volume 37.8 mL with a 2.55 M HCl solution, how many mL of HCl do you need?

KOH + HCl
$$\rightarrow$$
 KCl + H₂O $\frac{(3,17)(37,8)}{(2,55)}$ 55,9
To answer this question fill in the blanks below. Just complete the following for

To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. ($M_{acid}V_{acid}=M_{base}V_{base}$). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)

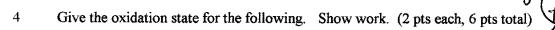
$$M a c i d = 2.55 M$$

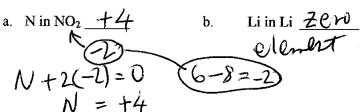
$$Vac i d = 2.55 M$$

$$Vac i d = 2.55 M$$

$$V bas e = 31.8 ml$$

Dr. Hahn General Chemistry I Lecture Exam III Spring 2014 form (9:55 am T,R form B) page 3





c.
$$\sin H_2SO_3 (74)$$

 $2(+1) + 5 + 5(-2) = 0$
 $4 + 5 = 0 - 2 + 6 = (74)$

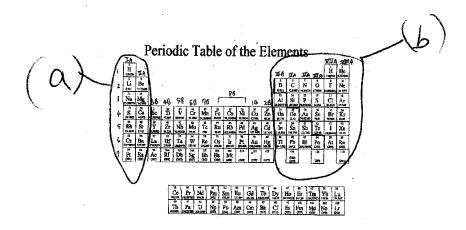
If the total gas pressure inside a gas tank is 1.13 atm. The gas tank has a mixture of oxygen and argon and the argon pressure is 0.7 atm. What is the pressure of the argon? ($P_{total} = P_a + P_b + P_c \dots$) (show work) (4 pts)

6 If the angular momementum quantum number (ℓ) = 3, what are the possible values of the magnetic quantum number (m_{ℓ}) (circle one) (6 pts) ℓ = 4

(a) -3, -2, -1, 0, +1, +2, +3
b) 0,1,2,3,4
c) 0,1,2,3,4,5

$$m_{\ell} = -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, +\frac{1}{2}, +\frac{1}{3}$$

- Match the following to the letters shown. The letters may only be used one time or not at all. (2 pts each, 4 pts total)
 - (a) s block elements (b) p block elements (c) d block elements (d) f block elements



<u>Part III.</u> <u>Long Answer</u> Please <u>show work</u> for full credit and to receive partial credit. (34 pts)

**** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1. If 2.33 moles of a gas at pressure 2.30 atmosphere occupies a volume of 325.3 liters, what is the temperature of the gas in kelvin? [PV=nRT, R=0.08206 (Liter atm) / (mol Kelvin)] (17 pts)

$$h = 2.33 \text{ mol}$$

$$\theta = 2.30 \text{ atm.}$$

$$V = 925, 31$$

$$T = ?$$

$$(2.30 \text{ atm}) (325.31) = (2.33) \frac{(0.08206 \text{ latm})}{\text{mol k}} (T)$$

$$T = \frac{(2.30 \text{ atm})(325.336)}{(2.33)(0.08206 \text{ Maxm})}$$

$$T = 3913 \text{ K} \rightarrow 3.91 \times 10^{3} \text{ K}$$

$$\text{Sig (overthermore figures)}$$

$$\text{Sig fig}$$

$$\text{Coverthermore figures}$$

$$\text{C3} \rightarrow \text{Not}$$

$$\text{ambiguous}$$

Dr. Hahn General Chemistry I Lecture Exam III Spring 2014 form (9:55 am T,R form B) page 5

If you do the following reaction starting with 7.237 grams of the Fe_2O_3 (s) (Formula Mass of Fe_2O_3 = 159.7 g/mole) (assume excess CO), what is the theoretical yield of the CO_2 (g) in Liters? (hint: think moles of Fe_2O_3 (1 mole gas = 22.4 Liters) (17 pts)

 $Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$

Name_			(print) Nam	e		(sign)
Multipl work, I	le choice questions obviously cannot	have no partial credit	:. Please write an and sign exam) I	ything you want gr f you run out of spa	of the Short Answer Que aded legibly. If I cam ace , please continue on	not read your
(1 atm	= 760 mm Hg = 76	60 torr) (Kelvin = °C	+ 273.15)(PV=nI	RT, R = 0.08206 (L a	tm)/(mol K)] [(P2V2) / ($(P_1 V_1) = T_2/T_1$
		OICE. Choose the one		est completes the s	tatement or answers th	e question.
	1) Give the tempe A) 32K and B) 0°C and C) 25°C and D) 0°C and E) 0K and 1	1 mm Hg l 1.00 in Hg 1.00 atm	t STP (standard pr	essure and atmosph	iere).	1)
	2) In which orbita A) 5d	al below would an ele B) 2p	ctron (on average) C) 4s	be closest to the nuc D) 2p	leus? E) 2s	2)
	3) How many H+ A) 0	ions can the acid, H ₃ B) 2		nolecule? () 1	D) 3	3)
	A) The number of A) median B) wavelens C) area D) frequenc E) amplitud	y	igh a stationary po	int in a wave is calle	ed .	4)
	5) Describe the sk A) spherical B) three bal C) four balk D) eight ball E) dumbbel	ls s Is				5)
		equation form: PT = I co's Law s Law s Law Law Law		tial pressure of its c	omponents is known as	6)

 7) Give the net ionic equation for the reaction (if any) that occurs when aqueous solutions of H2SO4 and KOH are mixed. A) H+(aq) + OH-(aq) + 2 K+(aq) + SO4²⁻(aq) → H2O(l) + K2SO4(s) 							
A) $H^+(aq) + OH^-(aq)$	(aq) + 2 K+(aq) + SC)4∠-(aq) → F	12O(1) + K2SO4(s)				
B) 2 K ⁺ (aq) + SO ₄	μ^{2} -(aq) $\rightarrow \text{K}_{2}\text{SO}_{4}$ (s	s)					
C) H ₂ ²⁺ (aq) + OF	$H^-(aq) \rightarrow H_2(OH)_2$	(1)			•		
D) H ⁺ (aq) + OH ⁻ ((ag) → H2O(1)						
E) No reaction oc	· -						
8) A basketball is inflat basketball outside w [(P ₁ V ₁)/(P ₂ V ₂) = 7	here the temperatu	1.90 atm in a 2 ure is 272.15%	297.15 °K garage. What ?? (volume is the same,	is the pressure of the $V_1 = V_2$)	8)		
A) 1.74 atm	B) 2.00 atm	n	C) 1.80 atm	D) 2.08 atm			
9) What is the maximu	ım number of p orb	itals that are p	ossible (number of m	values for $t = 1$?	9)		
A) 7	B) 5	C) 9	D) 1	E) 3			
10) Three identical flasks contain three different gases at standard temperature and pressure. Flask A contains C ₂ H ₄ , flask B contains O ₃ , and flask C contains F ₂ . Which flask contains the largest							
number of molecule	s?		D) fleet, D	•			
A) flask A			B) flask B D) All contain same n	umber of molecules.			
C) flask C			D) I'm Comain same ii	MILLOI VI IIIVICOMICO			
11) The atmospheric pre	essure is 715 mm H	g. What is the	pressure in torr?		11)		
11) The atmospheric pressure is 715 mm Hg. What is the pressure in torr? A) 715 torr B) 13.8 torr C) 28.1 torr D) 760 torr E) 31.8 torr							

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

1. For the following unbalanced precipitation reaction complete by filling in the blanks. The reaction does not need to be balanced. (2 pts each, 8 pt total) Ca(NO ₃) ₂ (aq) + Na ₃ PO ₄ (aq) → Ca ₃ (PO ₄) ₂ (s) + NaNO ₃ (aq) a. Complete ionic form: (aq) + 2 NO ₃ ⁻¹ (aq) + 3 Na ⁺¹ (aq) + PO ₄ ⁻³ (aq) → (s) + Na ⁺¹ (aq) + NO ₃ ⁻¹ (aq) b. Net ionic form (aq) + PO ₄ ⁻³ (aq) → (s) 2. Among the following compounds, circle all strong acids (1 pt each, 6 pts total) H ₂ SO ₄ HF HNO ₃ CH ₃ COOH H Cl HC ₂ H ₃ O ₂ 3. For the following titration reaction if you neutralize a 1.5 M solution of HNO ₃ of volume 250.0 mL with a 0.55 M NaOH solution, how many mL of NaOH do you need? H NO ₃ + Na OH → Na NO ₃ + H ₂ O To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. (M _{acid} V _{acid} =M _{base} V _{base}). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)	Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (42 pts)
a. Complete ionic form: (aq) + 2 NO ₃ ⁻¹ (aq) + 3 Na ⁺¹ (aq) + PO ₄ ⁻³ (aq) ⇒ (s) + Na ⁺¹ (aq) + NO ₃ ⁻¹ (aq) b. Net ionic form (aq) + PO ₄ ⁻³ (aq) ⇒ (s) 2. Among the following compounds, circle all strong acids (1 pt each, 6 pts total) H ₂ SO ₄ HF HNO ₃ CH ₃ COOH H Cl HC ₂ H ₃ O ₂ 3. For the following titration reaction if you neutralize a 1.5 M solution of HNO ₃ of volume 250.0 mL with a 0.55 M NaOH solution, how many mL of NaOH do you need? H NO ₃ + Na OH ⇒ Na NO ₃ + H ₂ O To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. (M _{acid} V _{acid} =M _{base} V _{base}). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)	1. For the following unbalanced precipitation reaction complete by filling in the blanks. The reaction does not need to be balanced. (2 pts each, 8 pt total)
	$Ca(NO_3)_2 (aq) + Na_3 PO_4 (aq) \rightarrow Ca_3(PO_4)_2 (s) + NaNO_3 (aq)$
 b. Net ionic form (aq) + PO₄³ (aq) → (s) 2. Among the following compounds, circle all strong acids (1 pt each, 6 pts total) H₂SO₄ HF HNO₃ CH₃COOH H Cl HC₂H₃O₂ 3 For the following titration reaction if you neutralize a 1.5 M solution of HNO₃ of volume 250.0 mL with a 0.55 M NaOH solution, how many mL of NaOH do you need? H NO₃ + Na OH → Na NO₃ + H₂O To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. (M_{acid}V_{acid}=M_{base}V_{base}). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total) 	a. Complete ionic form:
(aq) + PO ₄ ⁻³ (aq) →(s) 2. Among the following compounds, circle all strong acids (1 pt each, 6 pts total) H ₂ SO ₄ HF HNO ₃ CH ₃ COOH H Cl HC ₂ H ₃ O ₂ 3 For the following titration reaction if you neutralize a 1.5 M solution of HNO ₃ of volume 250.0 mL with a 0.55 M NaOH solution, how many mL of NaOH do you need? H NO ₃ + Na OH → Na NO ₃ + H ₂ O To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. (M _{acid} V _{acid} =M _{base} V _{base}). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)	$\underline{\qquad} (aq) + 2 NO_3^{-1} (aq) + 3 Na^{+1} (aq) + PO_4^{-3} (aq) \rightarrow \underline{\qquad} (s) + Na^{+1} (aq) + NO_3^{-1} (aq)$
2. Among the following compounds, circle all strong acids (1 pt each, 6 pts total) H ₂ SO ₄ HF HNO ₃ CH ₃ COOH H Cl HC ₂ H ₃ O ₂ 3 For the following titration reaction if you neutralize a 1.5 M solution of HNO ₃ of volume 250.0 mL with a 0.55 M NaOH solution, how many mL of NaOH do you need? H NO ₃ + Na OH → Na NO ₃ + H ₂ O To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. (M _{acid} V _{acid} =M _{base} V _{base}). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)	b. Net ionic form
H ₂ SO ₄ HF HNO ₃ CH ₃ COOH H Cl HC ₂ H ₃ O ₂ 3 For the following titration reaction if you neutralize a 1.5 M solution of HNO ₃ of volume 250.0 mL with a 0.55 M NaOH solution, how many mL of NaOH do you need? H NO ₃ + Na OH → Na NO ₃ + H ₂ O To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. (M _{acid} V _{acid} =M _{base} V _{base}). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)	$\underline{\qquad}(aq) + PO_4^{-3}(aq) \rightarrow \underline{\qquad}(s)$
3 For the following titration reaction if you neutralize a 1.5 M solution of HNO₃ of volume 250.0 mL with a 0.55 M NaOH solution, how many mL of NaOH do you need? H NO₃ + Na OH → Na NO₃ + H₂O To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. (MacidVacid=MbaseVbase). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)	2. Among the following compounds, circle all strong acids (1 pt each, 6 pts total)
with a 0.55 M NaOH solution, how many mL of NaOH do you need? H NO ₃ + Na OH \rightarrow Na NO ₃ + H ₂ O To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. (M _{acid} V _{acid} =M _{base} V _{base}). <u>You do not need to solve for the actual final answer</u> . (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)	H ₂ SO ₄ HF HNO ₃ CH ₃ COOH H Cl HC ₂ H ₃ O ₂
To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. ($M_{acid}V_{acid}=M_{base}V_{base}$). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)	
equation. ($M_{acid}V_{acid}=M_{base}V_{base}$). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)	$H NO_3 + Na OH \rightarrow Na NO_3 + H_2O$
Macid ≡ Vacid =	equation. ($M_{acid}V_{acid}=M_{base}V_{base}$). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts
111 110111	M acid = Vacid =
M base = V base =	M base = V base =

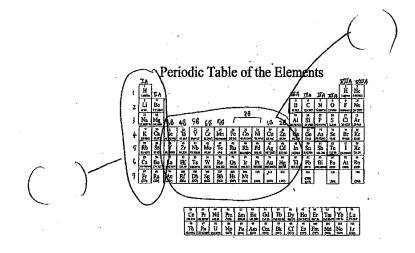
4 Give the oxidation state for the following. Show work. (2 pts each, 6 pts total)

a. O in O₂ _____

b. S in SO₄⁻²

c. Fe in Fe O

- If the total gas pressure inside a gas tank is 1.2 atm. The gas tank has a mixture of helium and hydrogen and the hydrogen pressure is 0.8 atm. What is the pressure of the helium? ($P_{total} = P_a + P_b + P_c$)(show work) (4 pts)
- If the principal investigator number (n) = 3, what are the possible values of angular momentum quantum number (ℓ) (circle one) (6 pts)
 - a) -1, 0, +1
 - b) 0, 1,2
 - c) $+\frac{1}{2}$ or $-\frac{1}{2}$
- 7 Match the following to the letters shown. The letters may only be used one time or not at all. (2 pts each, 4 pts total)
 - (a) s block elements (b) p block elements (c) d block elements (d) f block elements



Part III. Long Answer Please show work for full credit and to receive partial credit. (34 pts) **** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1. If a gas in a tank of volume 3.72 Liters is at temperature of 273.2 Kelvin has pressure 1.07 atmospheres. If the tank is allowed to heat up to 303.7 Kelvin temperature, what is the new pressure in atmospheres assuming that the volume has not changed ? $[(P_2V_2)/(P_1V_1) = (T_2/T_1)]$ (17 pts)

2. If you do the following reaction starting with 12.3 mL of a 2.5 M solution of H_3PO_4 (assume excess NaOH), what is the theoretical yield of the $H_2O(g)$ in Liters? (1 mole gas = 22.4 liters) (hint: think moles of H_3PO_4) (17 pts)

 $H_3PO_4(aq) + 3 NaOH(aq) \rightarrow 3H_2O(g) + Na_3PO_4(aq)$

Exam III General Chemistry I Lectu	re Spring 2014 4/1/14	Tuesday form 8:30 B	Dr. Hahn Exam	# 2-12
Name		ame		(sign)
Please show work for partial credit and Multiple choice questions have no parti work, I obviously cannot grade it. (2 p of the exam and clearly tell me where t	al credit. Please write ots print and sign exam)	e anything you want grace If you run out of space	led legibly. If I cann	ot read your
(1 atm = 760 mm Hg = 760 torr) (Kelv	rin = °C + 273.15)(PV	=nRT, R = 0.08206 (L atm	n)/(mol K)] [(P2V2) / (I	$P_1 V_1 = T_2/T_1$
Part I MULTIPLE CHOICE. Choose No partial credit for MC. (2 pts per qu	the one alternative the testion, 22 pts pts total)	at best completes the sta	tement or answers the	question.
 Describe the shape of a p orb A) eight balls B) spherical C) four balls D) dumbbell shaped E) three balls 	oital.			1)
2) Three identical flasks contains C2H4, flask B contains C2H4, flask B contains of molecules? A) flask A C) flask C	n three different gases a nins O3, and flask C con	t standard temperature a tains F2. Which flask cont B) flask B D) All contain same nu	tains the largest	2)
3) The number of cycles that pa A) frequency B) wavelength C) median D) amplitude E) area	ass through a stationary	point in a wave is called		3)
4) A basketball is inflated to a pasketball outside where the $ [(P_1V_1)/(P_2V_2)] = T_1/T_2 $ A) 1.80 atm	e temperature is 272.15	297.15 °K garage. What (? (volume is the same,) (C) 2.08 atm	is the pressure of the $V_1 = V_2$) D) 2.00 atm	4)
5) Give the temperature and properties A) 0°C and 1 mm Hg B) 0°C and 1.00 atm C) 0K and 1.00 atm D) 25°C and 1.00 in Hg E) 32K and 1 torr Hg	ressure at STP (standar	d pressure and atmosphe	re).	5)
6) How many H+ ions can the A) 1	acid, H3PO4 , donate p B) 2	C) 3	D) 0	6)
Dr. Hahn General Chemistry I	Lecture Exam III	Spring 2014	8:30 form B p	age 1

7) The total pressure of a (otherwise in equation A) Boyle's Law B) Avogadro's Law C) Charles's Law D) Ideal Gas Law	n form: $P_T = P_a +$	e sum of the partial $_{ m P}_{ m b}$ + $_{ m P}_{ m c}$)	oressure of its compo	nents is known as	7)	
E) Dalton's Law						
8) In which orbital below	w would an electro	on (on average) be cl	osest to the nucleus?		8)	
A) 5d	B) 4s	C) 2s	D) 2p	E) 2p		
9) The atmospheric pressure is 715 mm Hg. What is the pressure in torr? A) 28.1 torr B) 31.8 torr C) 715 torr D) 13.8 torr E) 760 torr						
10) What is the maximum number of p orbitals that are possible (number of m_l values for $l=1$)?						
A) 5	B) 1	C) 9	D) 3	E) 7		
 Give the <u>net ionic equation</u> for the reaction (if any) that occurs when aqueous solutions of H2SO₄ and KOH are mixed. A) 2 K⁺(aq) + SO₄²-(aq) → K2SO₄(s) 						
B) H+(aq) + OH-(aq) + 2 K+(aq) + S0	$O_4^{2-(aq)} \rightarrow H_2O(1)$	+ K ₂ SO ₄ (s)		,	
C) H ⁺ (aq) + OH ⁻ (aq) → H2O(l)	÷				
D) H2 ²⁺ (ag) + OH	-	(1)				

E) No reaction occurs.

<u>Part II Short Answer</u>: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (42 pts)

1.	For the following unbalanced precipitation reaction by filling in the blanks.	The reaction does not
	need to be balanced. (2 pts each, 8 pt total)	

$$Ca(NO_3)_2 (aq) + Na_3 PO_4 (aq) \rightarrow Ca_3(PO_4)_2 (s) + NaNO_3 (aq)$$

a. Complete ionic form:

$$Ca^{+2}(aq) + 2NO_3^{-1}(aq) + \underline{\qquad}_{(aq) +} PO_4^{-3}(aq) \rightarrow Ca_3(PO_4)_2(s) + Na^{+}(aq) + \underline{\qquad}_{(aq)}$$

b. Net ionic form:

$$(aq) + (aq) \rightarrow Ca_3(PO_4)_2(s)$$

- 2. Among the following compounds, circle all weak acids (1 pt each, 6 pts total)
- 3.

H₂SO₄ HF HNO₃ CH₃COOH H Cl HC₂H₃O₂

For the following titration reaction if you neutralize a 3.7 M solution of HNO₃ of volume 73.2 mL with a 2.55 M NaOH solution, how many mL of NaOH do you need?

$$H NO_3 + Na OH \rightarrow Na NO_3 + H_2O$$

To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. ($M_{acid}V_{acid}=M_{base}V_{base}$). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)

M acid = _____ Vacid = _____ M base = ____ V base = ____

Dr. Hahn General Chemistry I Lecture Exam III Spring 2014 form (8:30T,R form B) page 3

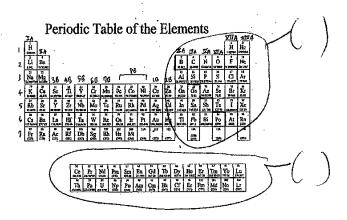
4 Give the oxidation state for the following. Show work. (2 pts each, 6 pts total)

a. K in KCl

b. Ca in Ca

c. C in K₂CO₃ _____

- If the total gas pressure inside a gas tank is 738 torr. The gas tank has a mixture of helium and hydrogen and the hydrogen pressure is 28 torr. What is the pressure of the hydrogen? ($P_{total} = P_a + P_b + P_c$ ) (show work) (4 pts)
- If the principal investigator number (n) = 4, what are the possible values of angular momentum quantum number (ℓ) (circle one) (6 pts)
 - a) -2, -1, 0, +1, +2
 - b) 0, 1,2, 3
 - c) $+\frac{1}{2}$ or $-\frac{1}{2}$
- 7 Match the following to the letters shown. The letters may only be used one time or not at all. (2 pts each, 4 pts total)
 - (a) s block elements (b) p block elements (c) d block elements (d) f block elements



<u>Part III. Long Answer</u> Please <u>show work</u> for full credit and to receive partial credit. (34 pts)
**** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite
the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1. 7.23 moles of a gas at temperature of 278.2 Kelvin and pressure of 0.978 atmospheres occupies what volume in liters? [PV=nRT, R=0.08206 (Liter atm) / (mol Kelvin)] (17 pts)

If you do the following reaction starting with 250.2 mL of 1.5 M solution of H_2SO_4 (assume excess Al), what is the theoretical yield of the $H_2(g)$ in Liters? (1 mole gas = 22.4 liters) (hint: think moles of H_2SO_4) (show work) (17 pts)

 $2Al(s) + 3H_2SO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + 3H_2(g)$

		(print) Name			(sign)
lease show work for part noice questions have no p bviously cannot grade it. cam and clearly tell me w	rial credit and full cred partial credit. Please (2 pts print and sign e	it on the Long Ans write anything yo xam) If you run	wers and in some of ou want graded legib	the Short Answer Q	uestions. Muli
l atm = 760 mm Hg = 760	otorr) (Kelvin = °C ,	+ 273.15)(PV=nRT	Г, R = 0.08206 (L atm)/(mol K)] [(P ₂ V ₂) /	(P ₁ V ₁)=T ₂ /T ₁]
art I MULTIPLE CHOI artial credit for MC. (2 pt	CE. Choose the one a ts per question, 22 pts	lternative that bes pts total)	st completes the stat	ement or answers th	ne question. N
1) How many H+ i	ons can the acid, H2SC)4 , donate per mol	lecule?		1)
A) 0	B) 1	C)		D) 2	1)
2) Give the tempera A) 0K and 1.00 B) 0°C and 1 r C) 0°C and 1.0 D) 25°C and 1. E) 32K and 1 t	nm Hg 10 atm .00 in Hg	TP (standard press	sure and atmosphere	:).	2)
and ROTT are Itily	c equation for the reacted. H ⁻ (aq) \rightarrow H ₂ O(l)	tion (if any) that o	ccurs when aqueous	solutions of H ₂ SO ₄	3)
	H=(aq) + 2 K+(aq) + SC	1.2-6-3 TT 06	*		
C) H ₂ 2+(a ₀) + 0	$OH^{-}(aq) \rightarrow H_{2}(OH)_{2}($	'4- (aq) → H ₂ O(.	I) + K ₂ SO ₄ (s)		
	$O_4^{2-}(aq) \rightarrow K_2 SO_4(s)$				
E) No reaction	occurs. $(uq) \rightarrow K2504(s)$,			
4) Which of the follo A) 1.09 mol Ne B) 5.5 mol He C) 0.31 mol Cl ₂ D) 3.12 mol O ₂		e the greatest volu	ime at STP?		4)
E) All of these s	amples would have th	e same volume at	STP.	,	
5) The atmospheric p A) 28.1 torr	ressure is 715 mm Hg. B) 715 torr	What is the press C) 31.8 torr	ure in torr? D) 760 torr	E) 13.8 torr	5)
6) The distance betwee A) frequency B) median C) area D) wavelength	een adjacent crests in a	wave is called			6)

7) A basketball is inflate basketball outside where $I(P_1V_1)/(P_2V_2) = T_1$	rere are temperature	.90 atm in a	297.15 °K g X? (volume	arage. What is the is the same, $V_1 = 0$	e pressure of the = V ₂)	7)
A) 2.00 atm	B) 1.74 atm		C) 2.08 at	n [D) 1.80 atm	
8) What is the maximum	n number of d orbita	als that are	oossible? (m	imher of mayaba	on for ()	
A) 3	B) 5	C) 9		D) 7	E) 1	8)
9) The total pressure of a (otherwise in equation	gas mixture is the solution form: $P_T = P_{a+P}$	sum of the j	oartial press	ure of its compor	ents is known as	9)
A) Boyle's Law B) Charles's Law	, u	υ - ()				
C) Ideal Gas Law						
D) Dalton's Law						
E) Avogadro's Law						
10) Describe the shape of a	s orbital.					
A) eight balls						10)
B) three balls						
C) four balls						
D) dumbbell shaped	[
E) spherical						
11) In which orbital below A) 3s	Would an electron (On arraya	ale Control			
A) 3s	B) 1s	C) 2p	pe rarthest D	from the nucleus) 4f	? E) 3d	11)

<u>Part II Short Answer</u>: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work. (42 pts)

1. For the following unbalanced precipitation reaction, complete by filling in the blanks. The reaction does not need to be balanced. (2 pts each, 8 pt total)

 $Mg Cl_2 (aq) + Li_2S (aq) \rightarrow Mg S (s) + LiCl (aq)$

a. Complete	ionic	form:
-------------	-------	-------

- $(aq) + 2Cl^{-1}(aq) + 2Li^{+1}(aq) + S^{-2}(aq) \rightarrow (s) + Li^{+1}(aq) + Cl^{-1}(aq)$

b. Net ionic form:

 $Mg^{+2}(aq) + ___(aq) \rightarrow __(s)$

2. Among the following compounds, circle all strong bases (1 pt each, 6 pts total)

NaOH

NH₄OH

 $Ba(OH)_2$

Ca(OH)₂

NH₃

LiOH

For the following titration reaction if you neutralize a 0.55 M solution of KOH of volume 125.0 mL with a 2.50 M H Cl solution, how many mL of H Cl do you need?

To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. ($M_{acid}V_{acid}=M_{base}V_{base}$). You do not need to solve for the actual final answer. (this question is each, 8 pts total)

M acid = _____ Vacid = _____ M base = ____ V base = ____

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

a. I in I_2

b F in CaF₂____

c. P in PO₄-3

If the total gas pressure inside a gas tank is 770 mm Hg. The gas tank has a mixture of nitrogen and hydrogen and the nitrogen pressure is 23.8 mm Hg. What is the pressure of the nitrogen? ($P_{total} = P_a + P_b +$

H

6. If the angular momementum quantum number $(\ell) = 4$, what are the possible values of the magnetic quantum number (m_{ℓ}) (circle one) (6 pts)

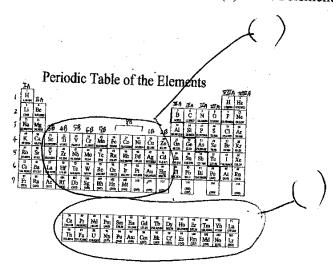
a) -4, -3, -2, -1, 0, +1, +2, +3, +4

b) $+\frac{1}{2}$ or $-\frac{1}{2}$

c) 0,1,2,3,4,5

Match the following to the letters shown. The letters may only be used one time or not at all. (2 pts each, 4 pts total)

(a) s block elements (b) p block elements (c) d block elements (d) f block elements



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<u>Part III. Long Answer</u> Please <u>show work</u> for full credit and to receive partial credit. (34 pts) **** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1. A gas in an internal combustion engine is heated from 298.2 K to 378.2 K. The volume of the gas changes from 1.58 Liters to 3.27 Liters. If the initial pressure was 0.987 atmospheres, what was the final pressure in atmospheres? $[(P_2V_2)/(P_1V_1) = (T_2/T_1)]$ (17 pts)

If you do the following reaction with 5.23 grams of the O_2 (Formula Mass of O_2 = 32.00 g/mol) (assume limiting reagent of O_2), what is the theoretical yield of the N_2 (g) in Liters? (hint: think moles of O_2) (1 mole gas = 22.4 Liters) (17 pts)

 $4NH_3(g) + 4NO(g) + O_2(g) \rightarrow 4N_2(g) + 6H_2O(g)$

Exam III	General Chemistry	I Lecture Sprin	g 2014 4/1/14	I Tuesday fo	orm 9:55 B 1	Dr. Hahn E	kam #
Name		anakaran a	(print) N	lame			(sign)
Multiple o	ow work for partial cr hoice questions have bviously cannot grad m and clearly tell me	no partial credit. e it. (2 pts print a	Please writ and sign exam)	e anything you If you run	u want grade	d legibly.	annot read your
(1 atm = 7)	760 mm Hg = 760 tors	r) (Kelvin = ${}^{\circ}$ C	+ 273.15)(PV	=nRT, R = 0.0	8206 (L atm)/	(mol K)] [(P2V2	$)/(P_1 V_1)=T_2/T_1]$
	ULTIPLE CHOICE. l credit for MC. (2 pt				etes the state	ment or answers	the question.
1)	Describe the shape o A) four balls B) three balls C) dumbbell shap D) spherical E) eight balls						1)
2)	In which orbital belo A) 1s	w would an elec B) 2p	tron (on averag C) 3d		from the nuc)) 3s	leus? E) 4f	2)
3)	A basketball is inflate basketball outside with $(P_1V_1)/(P_2V_2) = T$	here the tempera $_1/\mathrm{T}_2$]	ture is 272.15°	X? (volume is	s the same, V ₁	1 = V2)	ae 3)
	A) 2.00 atm	B) 1.80 a	tm	C) 2.08 atm		D) 1.74 atm	
4)	The distance between A) median B) wavelength C) amplitude D) frequency E) area	n adjacent crests	in a wave is ca	alled			4)
5)	Give the temperature A) 0°C and 1.00 at B) 0°C and 1 mm C) 32K and 1 torr D) 25°C and 1.00 at E) 0K and 1.00 at	tm Hg Hg in Hg	STP (standard	l pressure and	atmosphere)	•	5)
6)	How many H+ ions		O4 , donate pe			D) 1	6)
	A) 0	В) 2		C) 3		D) 1	

7) The total pressure (otherwise in equa A) Boyle's Law B) Charles's La C) Dalton's Lav D) Avogadro's E) Ideal Gas La	ation form: PT = Pa .w v Law	the sum of the partial $_{1}+P_{b}+P_{c}$)	al pressure of its comp	onents is known as	7)
8) What is the maxim	num number of d o	rbitals that are possi	ble? (number of m į va	lues for $t = 2$)	8)
A) 7	B) 1	C) 5	D) 3	E) 9	
and KOH are mix A) 2 K+(aq) + S B) H+(aq) + OI C) H+(aq) + OI	ed. O4 ^{2−} (aq) → K2SO4 H−(aq) → H2O(l) H−(aq) + 2 K+(aq) + 4 OH−(aq) → H2(OH)	4(s) SO4 ²⁻ (aq) → H ₂ O	occurs when aqueous s (I) + K2SO4(s)	solutions of H2SO4	9)
(0) Which of the follo A) 5.5 mol He B) 0.31 mol Cl C) 3.12 mol O ₂ D) 1.09 mol Ne E) All of these	2	e the same volume a			10)
(1) The atmospheric A) 28.1 torr	pressure is 715 mm B) 13.8 torr	Hg. What is the pre C) 715 torr	ssure in torr? D) 760 torr	E) 31.8 torr	11)

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit.

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1. For the following unbalanced precipitation reaction, complete by filling in the blanks. The reaction does not need to be balanced. (2 pts each, 8 pt total)

 $Mg Cl_2 (aq) + Li_2S (aq) \rightarrow Mg S (s) + LiCl (aq)$

a.	Complete	ionic	form:
----	----------	-------	-------

 $Mg^{+2}(aq) + \underline{\qquad} (aq) + 2Li^{+1}(aq) + S^{-2}(aq) \Rightarrow Mg S(s) + \underline{\qquad} (aq) + Cl^{-1}(aq)$

b. net ionic equation

 $\underline{\hspace{1cm}} (aq) + \underline{\hspace{1cm}} (aq) \rightarrow Mg S (s)$

2 Among the following compounds, circle all weak bases (1 pt each, 6 pts total)

NaOH

NH₄OH

Ba(OH)₂

Ca(OH)₂

NH₃

LiOH

For the following titration reaction if you neutralize a 3.77 M solution of KOH of volume 37.8 mL with a 2.55 M HCl solution, how many mL of HCl do you need?

KOH + HCl → KCl + H₂O

To answer this question fill in the blanks below. Just complete the following for using the acid base titration equation. ($M_{acid}V_{acid}=M_{base}V_{base}$). You do not need to solve for the actual final answer. (this question is designed to allow you to complete your exam on time by not completely answering the question.) (2 pts each, 8 pts total)

M acid = _____ Vacid = _____ M base = ____ V base =

Dr. Hahn General Chemistry I Lecture Exam III Spring 2014 form (9:55 am T,R form B) page 3

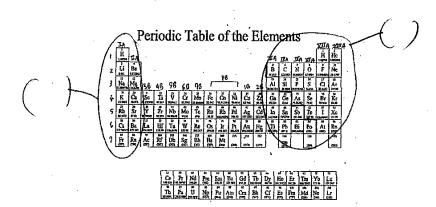
4 Give the oxidation state for the following. Show work. (2 pts each, 6 pts total)

a. N in NO₂ _____

b. Li in Li

c. $S in H_2SO_3$

- If the total gas pressure inside a gas tank is 1.13 atm. The gas tank has a mixture of oxygen and argon and the argon pressure is 0.7 atm. What is the pressure of the argon? ($P_{total} = P_a + P_b + P_c \dots$) (show work) (4 pts)
- 6 If the angular momementum quantum number (ℓ) = 3, what are the possible values of the magnetic quantum number (m_{ℓ}) (circle one) (6 pts)
 - a) -3, -2, -1, 0, +1, +2, +3
 - b) 0,1,2,3,4
 - c) 0,1,2,3,4,5
- Match the following to the letters shown. The letters may only be used one time or not at all. (2 pts each, 4 pts total)
 - (a) s block elements (b) p block elements (c) d block elements (d) f block elements



<u>Part III. Long Answer</u> Please <u>show work</u> for full credit and to receive partial credit. (34 pts)
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the question with no change in anything.****

Please show all work on this exam itself. If you are going to show work on the scratch paper and want me to grade it, clearly indicate where I can find your work

1. If 2.33 moles of a gas at pressure 2.30 atmosphere occupies a volume of 325.3 liters, what is the temperature of the gas in kelvin? [PV=nRT, R=0.08206 (Liter atm) / (mol Kelvin)] (17 pts)

If you do the following reaction starting with 7.237 grams of the Fe_2O_3 (s) (Formula Mass of Fe_2O_3 = 159.7 g/mole) (assume excess CO), what is the theoretical yield of the CO_2 (g) in Liters? (hint: think moles of Fe_2O_3 (1 mole gas = 22.4 Liters) (17 pts)

 $Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$