

CHEM 30A—SP13

March 21, 2013

Exam 2

Name: _____

1. Draw a valid Lewis structure for each molecule/ion below. Please represent bonds as lines, and show all non-bonding electrons (as dots).

a) CHO_2^- (carbon is the central atom)

b) SO_3^{2-} (sulfur is the central atom)

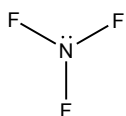
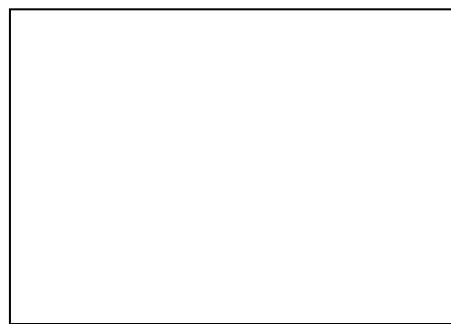
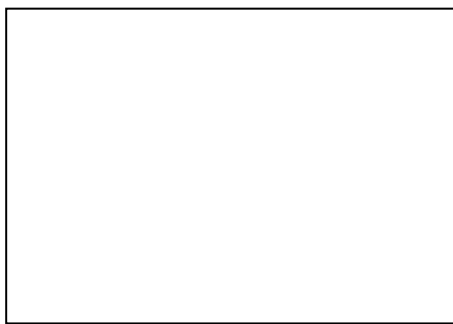
c) IF_3 (Iodine is the central atom)

d. $\text{CH}_3\text{CHCHCH}_3$

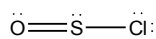
16_____

20_____

3. Using the VSEPR model, predict the shape of each molecule (or ion) below and (write it on the line), and draw a geometrically accurate representation of the molecule in the box. Indicate the predicted bond angles on the blank provided.



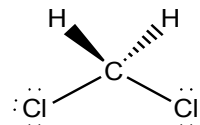
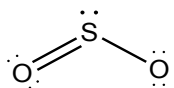
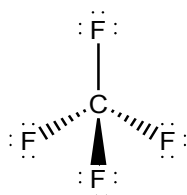
Bond Angles: _____



Bond Angles: _____

12_____

4. Circle the **two** compounds below that have dipole moments of exactly **zero**.



4_____

5. When a solution of strontium nitrate ($\text{Sr}(\text{NO}_3)_2$) is mixed with a solution of potassium potassium phosphate (K_3PO_4), a white precipitate forms. Write both a balanced complete reaction equation, **and** a net ionic equation for the reaction. Label the physical states of the products with the correct phase symbols (s, l, g, or aq).

6_____

6. When a solution of sulfuric acid (H_2SO_4) is added a solution of potassium sulfide, a foul smelling gas is formed. Write a complete equation for the reaction **and** a net ionic equation. Label the physical states of the products with phase symbols (s, l, g, or aq) and balance the equations.

6_____

7. Predict the products of the reaction between aqueous lithium hydroxide and nitric acid (HNO_3). Write both the balanced complete equation **and** the net ionic equation. Label the physical states of the products with phase symbols (s, l, g, or aq) and balance the equations.

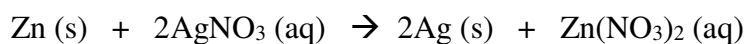
6_____

8. Using the electronegativity values on page 5, predict whether the bonding between each pair of elements show below is most likely to be nonpolar covalent, polar covalent or ionic.

- a. calcium and oxygen
- b. sulfur and chlorine
- c. silicon and chlorine

6_____

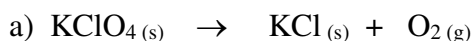
9. Which element is being oxidized and which element is being reduced in the reaction below?



Oxidized: _____ Reduced: _____

4_____

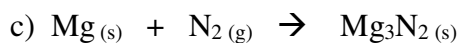
10. Classify the following reactions, and **balance** each equation. The possible categories are combination, decomposition, combustion and double displacement.



Classification: _____



Classification: _____



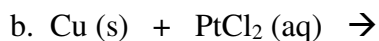
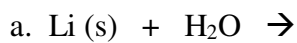
Classification: _____

12_____

11. Suppose you are handed a sample of an unknown solid compound that could be either sodium carbonate (Na_2CO_3) or sodium phosphate (Na_3PO_4). Propose how a double displacement reaction could be used to identify the unknown. Write a complete reaction equation for the key reaction. How will you interpret the evidence (or lack thereof) of the reaction?

5_____

12. Predict the products of the reactions below. Apply the correct phase symbols (s, l, g, aq) to the products, and balance the equations. The activity series is on page 5.



12_____

13. Suppose a piece of tin metal is placed in a solution of barium chloride. After several hours, no reaction is observed. What can we conclude about the activity of tin relative to barium? Fill in the blanks below to correctly complete the statement.

_____ is more active than _____

14. Rank the following molecules in order of increasing molecular polarity by numbering them 1-3 (1 = least polar, 3 = most polar). 3_____

IF

ClF

BrF

4_____



Li
Ca
Mg
Zn

Fe
Co
H
Cu
Ag
Hg
Pt

Periodic Table of the Elements

Note: all atomic masses are given to four significant figures.

	1 1A																17 7A	18 8A	
1	1 H 1.008	2 2A																	
2	3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18	
3	11 Na 22.99	12 Mg 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95	
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80	
5	37 Rb 85.49	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3	
6	55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)	
7	87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (264)	108 Hs (265)	109 Mt (268)										

Lanthanide Series	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
Actinide Series	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

Electronegativity

H	2.1
O	3.5
F	4.0
Ca	1.0
Si	1.9
S	2.5
Cl	3.0
As	2.0

Solubility Rules

- All Group IA metal and ammonium ion compounds are soluble.
- All nitrate ion and acetate ion containing compounds are soluble.
- Most metal sulfates (SO_4^{2-}) are soluble. (Except: Ba^{2+} , Sr^{2+} , Pb^{2+} , Hg_2^{2+})
- Most metal chlorides, bromides and iodides are soluble. (Except with: Ag^+ , Pb^{2+} , Hg_2^{2+})
- Most metal hydroxides are insoluble. (Except: IA metals and Ca^{2+} , Ba^{2+} , Sr^{2+})
- Most metal sulfides are insoluble. (Except: IA metals and Ca^{2+} , Ba^{2+} , Sr^{2+})
- Most metal carbonates (CO_3^{2-}) are insoluble. (Except: IA metals)
- Most metal phosphates (PO_4^{3-}) are insoluble. (Except with: IA metals and ammonium ion)