Name: _____ Section: _____

Solubility Rules

A compound is *soluble* in a particular liquid if it dissolves in that liquid. A compound is *insoluble* if it does NOT dissolve in the liquid. There is no easy way to tell whether a particular compound will be soluble or insoluble in water. For ionic compounds, however, there are empirical rules that have been deduced from observations of many compounds. Consider the following:

Compounds Containing the Following Ions Are Mostly Soluble*	**Exceptions**
Li^+, Na^+, K^+, NH_4^+	None
NO_3^-, $C_2H_3O_2^-$	None
Cl^-, Br^-, I^-	When any of these ions pairs With Ag^+, Hg_2^{+2}, Pb^{+2}, or Cu^+, it is *insoluble*
SO_4^{-2}	When SO_4^{-2} pairs with Sr^{+2}, Ba^{+2}, Pb^{+2}, or Ca^{+2}, it is *insoluble*
Compounds Containing the Following Ions Are Mostly Insoluble*	**Exceptions**
OH^-, S^{-2}	When either of these ions pairs with Li^+, Na^+, K^+, or NH_4^+, it is *soluble*
S^{-2}	When S^{-2} pairs with Sr^{+2}, Ba^{+2}, or Ca^{+2}, the compound is *soluble*
OH^-	When OH^- pairs with Sr^{+2}, Ba^{+2}, or Ca^{+2}, it is *slightly soluble***
CO_3^{-2}, PO_4^{-3}	When either of these ions pairs with Li^+, Na^+, K^+, or NH_4^+, it is *soluble*

*adapted from Tro, Nivaldo J. Introductory Chemistry, 2nd ed. Upper Saddle River: Prentice Hall, 2006.

** For our purposes, these can be considered *insoluble*

Name: _____ Section: _____

Vapor Pressure of Water

Temperature (ºC)	Vapor Pressure (mm Hg)
0	4.6
5	6.5
10	9.2
15	12.8
16	13.6
17	14.5
18	15.5
19	16.5
20	17.5
21	18.6
22	19.8
23	21.2
24	22.4
25	23.8
26	25.2
27	26.7
28	28.3
29	30.0
30	31.8
31	33.7
32	35.7
33	37.7
34	39.9
35	41.2
40	55.3
45	71.9
50	92.5
60	149.4
70	233.7
80	355.1
90	525.8
100	760.0
105	906.1
110	1074.6

1 atm = 760 torr = 760 mmHg

Name: _____ Section: _____

Names, Formulas, and Charges of Common Polyatomic Ions

Positive Ion (Cation)		
1+	Ammonium	NH_4^+
Negative Ions (Anions)		
1–	Acetate	$C_2H_3O_2^-$
	Bromate	BrO_3^-
	Chlorate	ClO_3^-
	Chlorite	ClO_2^-
	Cyanide	CN^-
	Hydride	H^-
	Hydrogen Carbonate (bicarbonate)	HCO_3^-
	Hydrogen Sulfate (bisulfate)	HSO_4^-
	Hydroxide	OH^-
	Hypochlorite	ClO^-
	Iodate	IO_3^-
	Nitrate	NO_3^-
	Nitrite	NO_2^-
	Perchlorate	ClO_4^-
	Permanganate	MnO_4^-
	Thiocyanate	SCN^-
2–	Carbonate	CO_3^{2-}
	Chromate	CrO_4^{2-}
	Dichromate	$Cr_2O_7^{2-}$
	Oxalate	$C_2O_4^{2-}$
	Peroxide	O_2^{2-}
	Sulfate	SO_4^{2-}
	Sulfite	SO_3^{2-}
3–	Arsenate	AsO_4^{3-}
	Phosphate	PO_4^{3-}
	Phosphite	PO_3^{3-}

Moorpark College Chemistry Department Laboratory Report Rubric

Name: _____ Experiment: _____ Total: _____

CATEGORY	4 – Accomplished	3 – Good	2 – Developing	1 – Beginning	0 – Substandard	Score
Abstract	Clear, concise (~½ page), and thorough summary of results with appropriate literature references.	Refers to most of the major results; some minor details are missing or not clearly stated.	Misses one or more major aspects of the results.	Missing several major aspects of the results and merely repeats information from the introduction.	None, unrelated, or plagiarized.	_____×2
Introduction	A cohesive, well-written summary (including relevant reaction chemistry) of the background material pertinent to the experiment with appropriate literature references (at least one scientific reference if required by your instructor) and a statement of purpose.	Introduction is nearly complete but does not provide context for minor points. Contains relevant information but fails to provide background for one aspect of the experiment, or certain information is not cohesive.	Certain major introductory points are missing (e.g., background, theory, reaction chemistry), or explanations are unclear and confusing. References are not scholarly.	Very little background information is provided, and information is incorrect. No references are provided.	None, unrelated, or plagiarized.	_____×2
Methods & Materials	Contains a complete listing of safety information, a narrative of experimental procedures followed, and materials used. Omits information that can be assumed by peers. Includes observations when appropriate and only important experimental details.	Narrative includes most important experimental details. Missing one or more relevant pieces of safety information or experimental procedure.	Narrative is missing several experimental details and safety information or includes insignificant procedural details.	Several important experimental details and safety information are missing. Procedural steps are incorrect, illogical, or occasionally copied directly from the laboratory manual.	None, unrelated, or plagiarized (including completely copied from the laboratory manual).	_____
Results & Calculations	All figures, graphs, and tables are numbered with appropriate titles and captions. Sample calculations are shown and correctly solved. All data is explicitly mentioned in the text.	All figures, graphs, and tables are correctly drawn, but some have minor problems or could still be improved. All data and sample calculations are mentioned in the text.	Most figures, graphs, and tables are included, but some important or required features are missing. Certain data and sample calculations are not explained in the text and/or solved incorrectly.	Figures, graphs, and tables are poorly constructed, have missing titles, captions or numbers. Certain data and sample calculations are not referenced in the text and solved incorrectly.	None, unrelated, or plagiarized.	_____×2

CATEGORY	4 – Accomplished	3 – Good	2 – Developing	1 – Beginning	0 – Substandard	Score
Discussion & Conclusion	Demonstrates a logical, coherent working knowledge and understanding of important experimental concepts, forms appropriate conclusions based on interpretations of results and/or spectrum (spectra) analysis, addresses any post-lab questions in paragraph format, includes applications of and improvements in the experiment, refers to the literature when appropriate, and demonstrates accountability by providing justification for any errors.	Demonstrates an understanding of the majority of important experimental concepts, forms conclusions based on results and/or spectrum (spectra) analysis but either lacks proper interpretation, does not answer post-lab questions in paragraph format, suggests inappropriate improvements in the experiment, refers to the literature insufficiently, or lacks overall justification of error.	While some of the results have been correctly interpreted and discussed, partial but incomplete understanding of results is still evident. Student fails to make one or two connections to underlying theory.	Does not demonstrate an understanding of the important experimental concepts, forms inaccurate conclusions, does not answer post-lab questions in paragraph format, suggests inappropriate improvements in the experiment, refers to the literature insufficiently, and lacks overall justification of error.	None, unrelated, insignificant error analysis and incorrect explanation, or plagiarized.	_____×2
References* (see sample below)	All sources (information and graphics) are accurately documented in ACS format. At least one reference is taken from primary scientific literature relevant to the report if required by instructor.	All sources are accurately documented, but a few are not in ACS format. Some sources are not accurately documented.	All sources are accurately documented, but many are not in ACS format. Most sources are not directly cited in the text.	All sources are accurately documented but not directly cited in the text.	Sources are not documented nor directly cited in the text.	_____
Miscellaneous (check all that apply) ☐ Mechanics, grammar, and appearance ☐ Appendix ☐ Lab Notebook ☐ VSEPR and Valence Bond drawings	Grammar and spelling are correct. All required components are included, complete, and/or illustrated correctly. Paper is not written in first person. Includes ChemSketch image(s) if required by instructor. For Chem 1A XY lab, see lab manual for more details.	Less than three grammatical and spelling errors are present. Missing one required component or features an improperly labeled molecular representation.	More than three grammatical and spelling errors are present or paper is written in first person. Features multiple errors with labeled molecular representation.	Frequent grammatical and spelling errors, and writing style lacks cohesion and fluidity. Paper is written in first person. Labeled molecule contains multiple errors.	None, unrelated, or plagiarized.	_____×2

*Journal citations must include author or editor, *title (in italics)* followed by a period, **year (boldface)**, *volume (in italics)*, and page numbers. For example: Schrauzer, G.N.; Windgassen, R.J. *J. Am. Chem. Soc.* **1966**, *99*, 3738–3743. For additional examples, see the *ACS Style Guide* (summary can be found online).

Periodic Table of the Elements

I A												III A	IV A	V A	VI A	VII A	VIII A
1																	18
1 H 1.008	II A 2																2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305	III B 3	IV B 4	V B 5	VI B 6	VII B 7	---- 8	VIII B 9	---- 10	I B 11	II B 12	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.066	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.88	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.847	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.03	89 Ac 227.03	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (281)	111 Rg (272)	112 Cn (285)	113 Nh (284)	114 Fl (289)	115 Mc (288)	116 Lv (293)	117 Ts (294)	118 Og (294)

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.92	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	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)