

Chem 1121

Spring 2012

Exam 4A

Name: _____

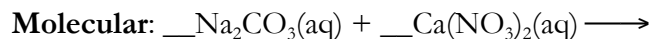
Show all work to receive credit. You must use the factor-label (conversion-factor) method for all conversions. Be sure to show all units and write your answers using the correct number of significant figures or decimal places.

Q1. [5 pts.] Predict whether the following compounds will be **soluble** or **insoluble** in water:

- a) Li_3PO_4 _____
- b) CaSO_4 _____
- c) $\text{Fe}(\text{NO}_3)_2$ _____
- d) $(\text{NH}_4)_2\text{CO}_3$ _____
- e) $\text{Mg}(\text{OH})_2$ _____

Q2. [20 pts.] Write the *balanced* molecular, full-ionic, and net-ionic equation for the reaction between aqueous sodium carbonate and aqueous calcium nitrate:

Be sure to include state symbols and charges (where necessary).



Full-Ionic:

Net-Ionic:

Q3. [3 pts.] What is meant by a *saturated* solution?

Q4. [5 pts.] Write the conversion factor corresponding to a 3.5 %(w/v) solution of $\text{MgCl}_2(\text{aq})$.

Q5. [5 pts.] How many moles of HCl are present in 125 mL of a 4.50 M $\text{HCl}(\text{aq})$ solution?

You must use the conversion-factor/factor-label method to receive credit.

Q6. [5 pts.] What is the molar concentration of a solution made by dissolving 82.4 g of NaBr in water, so that the total volume is 2.10 L?

Q7. [5 pts.] What is the *osmolarity* of 2.1 M $\text{CaCl}_2(\text{aq})$? Show all work to receive credit.

Q8. [10 pts.] What is a Toricelli barometer? Explain how it can be used to measure atmospheric pressure.

Q9. [10 pts.] 122 mL of helium gas with a pressure of 433 torr is squeezed until its volume changes to 31.2 mL. What will its pressure be? Assume the temperature of the gas does not change.

Q10. [10 pts.] 122 mL of helium gas is cooled from 34 °C to -178 °C. What will its volume become? Assume the pressure of the gas does not change.

Q11. [8 pts.] A mixture of helium gas, nitrogen gas, and oxygen has a total pressure of 813 mmHg. If the partial pressure of helium is 121 mmHg, and the partial pressure of nitrogen is 319 mmHg, then what is the partial pressure of oxygen? Also, what percent of the mixture is helium?

Q12. [6 pts.] What is Gay Lussac's law?

Q13. [8 pts.] Give two examples of colligative properties. What do colligative properties depend upon, and what makes them different from many other properties?

BONUS Question:

What is meant by the term: "hypotonic solution"?



Useful Information

$$1 \text{ atm} = 760 \text{ mmHg} = 760 \text{ torr} = 101,325 \text{ Pa} \quad P_1V_1 = P_2V_2 \quad \frac{V_1}{T_1} = \frac{V_2}{T_2} \quad \frac{P_1}{T_1} = \frac{P_2}{T_2} \quad T(\text{K}) = t(^{\circ}\text{C}) + 273$$

TABLE 6.1 General Solubility Guidelines for Ionic Compounds in Water

| SOLUBLE | EXCEPTIONS |
|---|--|
| Ammonium compounds (NH_4^+) | None |
| Lithium compounds (Li^+) | None |
| Sodium compounds (Na^+) | None |
| Potassium compounds (K^+) | None |
| Nitrates (NO_3^-) | None |
| Perchlorates (ClO_4^-) | None |
| Acetates (CH_3CO_2^-) | None |
| Chlorides (Cl^-) | |
| Bromides (Br^-) | Ag^+ , Hg_2^{2+} , and Pb^{2+} compounds |
| Iodides (I^-) | |
| Sulfates (SO_4^{2-}) | Ba^{2+} , Hg_2^{2+} , and Pb^{2+} compounds |

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Periodic Table

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|--------------------------|--------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------------------|--------------------------|---------------------------|--------------------------|
| 1 IA | 2 IIA | | | | | | | | | | | | 13 IIIA | 14 IVA | 15 VA | 16 VIA | 17 VIIA | 18 VIIIA |
| 1 H 1.01 | | | | | | | | | | | | | 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 Li 6.94 | 4 Be 9.01 | | | | | | | | | | | | 13 Al 26.98 | 14 Si 28.09 | 15 P 30.97 | 16 S 32.07 | 17 Cl 35.45 | 18 Ar 39.95 |
| 11 Na 22.99 | 12 Mg 24.31 | 3 IIIB | 4 IVB | 5 VB | 6 VIB | 7 VIIB | 8 | 9 VIIIB | 10 | 11 IB | 12 IIB | | | | | | | |
| 19 K 39.1 | 20 Ca 40.08 | 21 Sc 44.96 | 22 Ti 47.88 | 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 | |
| 37 Rb 85.47 | 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 101.07 | 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 127.6 | 53 I 126.9 | 54 Xe 131.29 | |
| 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 | 84 Po (209) | 85 At (210) | 86 Rn (222) | |
| 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) | 110 Ds (271) | 111 Rg (272) | | | | | | | | |

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|----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| * 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 |
| ^ 90 Th 232.0 | 91 Pa (231) | 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) |