

Form P

Name (please print) _____

Chemistry 1441-023

Last Name

First Name

Test #2

Zumdahl, Chapters 4 and 5

October 7, 2004

IA										VIII A											
1 H 1.01	IIA																				2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 15.999	9 F 18.998	10 Ne 20.18				
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.086	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95				
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 51.996	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	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 106.4	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.30				
55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.2	77 Ir 192.22	78 Pt 195.09	79 Au 196.97	80 Hg 200.59	81 Tl 204.37	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	Unq (261)	Unp (262)	Unh (263)																

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	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)

Instructions:

- This exam consists of **23** questions.
- No scratch paper is allowed. You may do the work in the test margins and on the backs of the test pages.
- Mark the answers you choose on the test itself for your own information and also on the standard answer sheet you provided. Scoring will be based on the answer sheet.
- When you finish, turn in both the test form and the answer form. The test form and your personal report will be returned to you at the next class. Write your name on both forms.
Write the test version (A, B, C, etc.) on the top of the answer form.

Useful Information:

$$N_A = 6.022 \times 10^{23}$$

$$R = 0.08206 \text{ L}\cdot\text{atm/mol}\cdot\text{K} = 8.314 \text{ J/mol}\cdot\text{K}$$

- Which of the compounds listed below are weak electrolytes?

- AgNO₃
- Ba(OH)₂
- NH₃
- H₂SO₃
- HBr

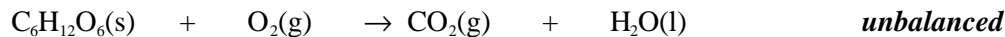
- IV only
- I and II
- II, IV, and V
- III and IV
- III only

2. Which of the compounds listed below are strong acids?
- I. $\text{HC}_2\text{H}_3\text{O}_2$
 - II. HI
 - III. HF
 - IV. HClO_4
 - V. H_3PO_4
- a) I, II, and III
 - b) II and IV
 - c) II, IV, and V
 - d) I and III
 - e) I, II, III, IV, and V
3. Based upon the solubility rules, which of the compounds below are expected to be soluble in water?
- I. $(\text{NH}_4)_2\text{CO}_3$
 - II. $\text{Mg}_3(\text{PO}_4)_2$
 - III. CaSO_4
 - IV. CaCl_2
- a) I, III, and IV
 - b) I, II, and IV
 - c) I and III
 - d) I and IV
 - e) II and IV
4. Which of the aqueous solutions below contains the greatest number of ions?
- a) 40.0 mL of 0.10 M calcium chloride
 - b) 60.0 mL of 0.20 M acetic acid
 - c) 50.0 mL of 0.15 M ammonium phosphate
 - d) 60.0 mL of 0.30 M sodium nitrate
 - e) 50.0 mL of 0.20 M aluminum sulfate
5. Which solution below, when mixed with an aqueous solution of BaCl_2 will result in the formation of a solid precipitate?
- a) $\text{NH}_4\text{Br}(\text{aq})$
 - b) $\text{Pb}(\text{NO}_3)_2(\text{aq})$
 - c) $\text{KNO}_3(\text{aq})$
 - d) $\text{LiCl}(\text{aq})$
 - e) none of these
6. What is the net ionic equation for the neutralization of phosphoric acid with potassium hydroxide?
- a) $3\text{H}^+(\text{aq}) + 3\text{OH}^-(\text{aq}) \rightarrow 3\text{H}_2\text{O}(\text{l})$
 - b) $3\text{K}^+(\text{aq}) + \text{PO}_4^{3-}(\text{aq}) \rightarrow \text{K}_3\text{PO}_4(\text{aq})$
 - c) $\text{H}_3\text{PO}_4(\text{aq}) + 3\text{KOH}(\text{aq}) \rightarrow \text{K}_3\text{PO}_4(\text{aq}) + 3\text{H}_2\text{O}(\text{l})$
 - d) $3\text{H}^+(\text{aq}) + 3\text{KOH}(\text{aq}) \rightarrow 3\text{K}^+(\text{aq}) + 3\text{H}_2\text{O}(\text{l})$
 - e) $\text{H}_3\text{PO}_4(\text{aq}) + 3\text{OH}^-(\text{aq}) \rightarrow \text{PO}_4^{3-}(\text{aq}) + 3\text{H}_2\text{O}(\text{l})$
7. What is the net ionic equation when aqueous solutions of sodium sulfide and zinc nitrate are mixed?
- a) $2\text{Na}^+(\text{aq}) + 2\text{NO}_3^-(\text{aq}) \rightarrow 2\text{NaNO}_3(\text{s})$
 - b) $\text{Zn}^{2+}(\text{aq}) + \text{S}^{2-}(\text{aq}) \rightarrow \text{ZnS}(\text{s})$
 - c) $\text{S}^{2-}(\text{aq}) + \text{Zn}(\text{NO}_3)_2(\text{aq}) \rightarrow \text{ZnS}(\text{s}) + 2\text{NO}_3^-(\text{aq})$
 - d) $\text{Na}_2\text{S}(\text{aq}) + \text{Zn}(\text{NO}_3)_2(\text{aq}) \rightarrow 2\text{NaNO}_3(\text{aq}) + \text{ZnS}(\text{aq})$
 - e) There is no net ionic equation because no reaction occurs.

8. What is the sodium ion concentration when a solution is formed by mixing 60.0 mL of 0.150 M sodium carbonate with 75.0 mL of 0.225 M sodium bicarbonate?
- 0.258 M
 - 0.192 M
 - 0.317 M
 - 0.188 M
 - 0.383 M
9. What volume of 0.125 M $\text{Na}_3\text{PO}_4(\text{aq})$ is required to precipitate all of the lead(II) ions from 40.0 mL of 0.150 M $\text{Pb}(\text{NO}_3)_2(\text{aq})$?
- 16.0 mL
 - 24.0 mL
 - 72.0 mL
 - 32.0 mL
 - 48.0 mL
10. What volume of 0.100 M barium hydroxide is required to completely neutralize 25.0 mL of 0.125 M nitric acid?
- 31.3 mL
 - 15.6 mL
 - 62.5 mL
 - 20.0 mL
 - 40.0 mL
11. A solution of ethanol ($\text{C}_2\text{H}_5\text{OH}$) is prepared by dissolving 35.0 mL of ethanol in enough water to make 120.0 mL of solution. What is the molarity of the ethanol in this solution? (The molar mass of ethanol is 46.07 g/mol, and the density of ethanol is 0.79 g/mL.)
- 17.0 M
 - 13.9 M
 - 8.67 M
 - 8.01 M
 - 5.00 M
12. What spectator ions are present when an aqueous solution of aluminum nitrate is mixed with potassium hydroxide?
- Al^{3+} and OH^-
 - NO_3^- and K^+
 - K^+
 - OH^-
 - Al^{3+} and K^+
13. What volume of 0.100 M barium chloride contains 0.125 g of barium chloride?
- 6.00 mL
 - 7.24 mL
 - 1.73 mL
 - 12.0 mL
 - 3.46 mL

14. Suppose you have three different containers of gas: 1.0 L of N_2 , 1.0 L of He, and 1.0 L CH_4 , all at $25^\circ C$ and 1.0 atm pressure. Which of the statements below is/are correct?
- The mass of each gas is the same.
 - The molecules in each container each have the same root mean square velocity.
 - The number of moles of gas in each container is the same.
- a) I
b) II
c) III
d) I and II
e) II and III
15. If 1.30 g of dry ice (solid carbon dioxide) is placed in an empty balloon, what will be the volume of the balloon at $15.0^\circ C$ and 740 torr once all of the dry ice has sublimed (i.e., converted to gaseous CO_2)?
- a) 0.717 L
b) 0.680 L
c) 0.216 L
d) 0.821 L
e) 0.562 L
16. A 5.50 L container contains 3.27 g of an unknown gas at $500.^\circ C$ and 650 torr. Which of the gases below could possibly be the unknown gas?
- a) C_3H_8
b) He
c) SO_2
d) none of these
e) any of these
17. What is the effect on the pressure of one mole of an ideal gas at constant volume when the temperature is increased from 300 K to 600 K?
- a) The new pressure is twice the original pressure.
b) The pressure is one-half the original pressure.
c) The new pressure is four times the original pressure.
d) The new pressure is $\sqrt{2}$ times the original pressure.
e) In order to calculate the new pressure, you would need to know the volume of the gas.
18. What is the average kinetic energy of the gas molecules in a 2.50 L container of nitrogen gas at $150.^\circ C$ and 1.75 atm pressure?
- a) 614 J
b) 18.5 J
c) 52.1 J
d) 1.87×10^3 J
e) 5.28×10^3 J
19. Which statement below is the best statement of Avogadro's Law?
- a) The number of moles of a gas is inversely proportional to the absolute temperature at constant pressure and volume.
b) The number of moles of a gas is directly proportional to the pressure at constant temperature and volume.
c) The number of moles of a gas is directly proportional to the volume at constant pressure and temperature.
d) The volume of a gas is inversely proportional to the pressure at constant temperature.
e) The volume of a gas is directly proportional to the absolute temperature at constant pressure.

20. Consider the following *unbalanced* chemical equation:



What volume of oxygen gas, measured at 760 torr and 0.0°C, is required to react completely with 7.50 g of $\text{C}_6\text{H}_{12}\text{O}_6$? (The molar mass of $\text{C}_6\text{H}_{12}\text{O}_6$ is 180.2 g/mol.)

- a) 0.155 L
 b) 0.932 L
 c) 1.86 L
 d) 2.80 L
 e) 5.59 L
21. It takes 3.75 minutes for 1.0 L of $\text{N}_2(\text{g})$ (molar mass = 28.02 g/mol) to effuse through a porous barrier, and it takes 4.73 minutes for 1.0 L of an unknown gas to effuse under the same conditions. What is the molar mass of the unknown gas?
- a) 63 g/mol
 b) 18 g/mol
 c) 45 g/mol
 d) 22 g/mol
 e) 35 g/mol
22. A mixture of 1.00 g of $\text{He}(\text{g})$ and 1.00 g of $\text{N}_2(\text{g})$ is in a container under 1.00 atm pressure. What is the partial pressure of He in this mixture?
- a) 0.125 atm
 b) 0.500 atm
 c) 0.875 atm
 d) 0.778 atm
 e) 0.222 atm

23. The van der Waals equation is shown below:

$$[P + (n^2a/V^2)](V - nb) = nRT$$

This equation incorporates corrections to the ideal gas law in order to account for the properties of real gases. Which of the statements below are correct?

- I. The correction to the volume term is required because the actual volume available to the gas molecules is greater than the volume of the container.
 II. The correction to the pressure term is required because the pressure exerted by a real gas is less than the pressure exerted by an ideal gas.
 III. Real gases deviate most from ideal behavior at high temperature and low pressure.
 IV. The van der Waals equation takes into account the attractive forces that occur among gas particles in a real gas.
- a) I and II
 b) I, III, and IV
 c) II, III, and IV
 d) II and IV
 e) I, II, III and IV

Answers:

- | | | | | |
|------|-------|-------|-------|-------|
| 1. D | 6. E | 11. E | 16. A | 21. C |
| 2. B | 7. B | 12. B | 17. A | 22. C |
| 3. D | 8. A | 13. A | 18. E | 23. D |
| 4. E | 9. D | 14. C | 19. C | |
| 5. B | 10. B | 15. A | 20. E | |