

Chem 1A Midterm 2

Practice Test

Credit will only be given for answers on this sheet. Units must be included in your answers and points will be taken off for incorrect or missing units. No partial credit will be awarded. Calculators are allowed. Cell phones may not be used as calculators.

Name:	Perm Number

Make sure your writing is dark and large enough to be picked up by a scanner. Failure to do this results in the loss of 5 points on the exam.

If you are sitting next to someone with the same version of the test you both will lose 5 points.

If you are still writing after time is called, you will lose 5 points on the exam.

Fundamental	
Question (Points)	Answer
1 (8 pts) 3,5	a. 0.161 M
	b. 62.05 mL
2 (8 pts) 2,3,3	a. Reactants = 0 Products = +3
	b. Cu
	c. Al
3 (6 pts)	16.1 mL
4 (5 pts)	$5.65 \times 10^{-21} \frac{J}{molecules}$
5 (6 pts)	32.7 L
6 (6 pts) 2,2,2	a. $(NH_4)_2SO_4(aq) + Ba(NO_3)_2(aq) \rightarrow 2NH_4NO_3(aq) + BaSO_4(s)$
	b. $2NH_4^+(aq) + SO_4^{2-}(aq) + Ba^{2+}(aq) + 2NO_3^-(aq) \rightarrow 2NH_4^+(aq) + 2NO_3^-(aq) + BaSO_4(s)$
	c. $SO_4^{2-}(aq) + Ba^{2+}(aq) \rightarrow BaSO_4(s)$

Multiple Choice	
Question (Points)	Answer
7 (6 pts)	☐ A ☐ B ☐ C ☐ D ☒ E
8 (5 pts)	☐ A ☐ B ☐ C ☒ D ☐ E
9 (7 pts)	☐ A ☒ B ☐ C ☐ D ☐ E
10 (6 pts)	☐ A ☐ B ☐ C ☐ D ☒ E
11 (7 pts)	☐ A ☐ B ☐ C ☒ D ☐ E
12 (6 pts)	☐ A ☐ B ☒ C ☐ D ☐ E

Challenge	
Question (Points)	Answer
13 (9 pts)	2.4x10 ⁴ L
14 (15 pts) 7,8	a. $\text{NO}_2^-(\text{aq}) + 2\text{Al}(\text{s}) + \text{H}_2\text{O}(\text{l}) + \text{OH}^-(\text{aq}) \rightarrow \text{NH}_3(\text{g}) + 2\text{AlO}_2^-(\text{aq})$
	b. 3.47 g

Fundamental

- 1a) 3 pts A solution is made by putting 21.0 g of barium nitrate into a volumetric flask and then add water to the 500. mL mark. What is the concentration of barium nitrate in the solution?
- 1a) 5 pts What volume (mL) of 0.460 M barium nitrate solution is needed to prepare 213.0 mL of 0.268 M nitrate ion solution?
- 2a) 2 pts Identify the oxidation numbers of aluminum on both the reactants and product side of the following equation.
$$2\text{Al(s)} + 3\text{CuSO}_4\text{(aq)} \rightarrow \text{Al}_2(\text{SO}_4)_3\text{(aq)} + 3\text{Cu(s)}$$
- 2b) 4 pts Identify what was reduced in the following equation.
$$2\text{Al(s)} + 3\text{CuSO}_4\text{(aq)} \rightarrow \text{Al}_2(\text{SO}_4)_3\text{(aq)} + 3\text{Cu(s)}$$
- 2c) 4 pts Identify the reducing agent in the following equation.
$$2\text{Al(s)} + 3\text{CuSO}_4\text{(aq)} \rightarrow \text{Al}_2(\text{SO}_4)_3\text{(aq)} + 3\text{Cu(s)}$$
- 3) 6 pts How many milliliters of 0.610 M NaOH solution are needed to reach the equivalence point with 20.0 mL of a 0.245 M H₂SO₄ solution?

- 4) 5 pts Calculate the average kinetic energy of CH₄ molecules at 0.°C. Report answer in $\frac{J}{molecule}$.
- 5a) 6 pts What volume (in L) is occupied by 35.2 g of nitrogen at 35°C and 0.975 atm.
- 6a) 2 pts Write the molecular equation for ammonium sulfate reacting with barium nitrate.
- 6b) 2 pts Write the complete ionic equation for ammonium sulfate reacting with barium nitrate.
- 6c) 2 pts Write the net ionic equation for ammonium sulfate reacting with barium nitrate.

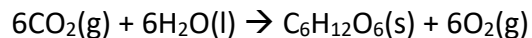
Multiple Choice

- 7) 7 pts Which gas is most dense at 1 atm and 25°C?
- A) hydrogen cyanide
 - B) hydrogen sulfide
 - C) nitrogen monoxide
 - D) carbon monoxide
 - E) nitrogen dioxide
- 8) 5 pts Consider the following statements
1. Real gases act more like ideal gases as the temperature increases.
 2. When n and T are constant, a decrease in P results in a decrease in V .
 3. At 1 atm and 273K, every molecule in a sample of a gas has the same speed.
 4. At constant T , CO_2 molecules at 1 atm and H_2 molecules at 5 atm have the same average kinetic energy.
- Which of these statements is true?
- A) 1 and 2
 - B) 3 and 4
 - C) 2 and 3
 - D) 1 and 4
 - E) None of the above
- 9) 8 pts A mixture of oxygen and helium is 92.3% by mass oxygen. What is the partial pressure of oxygen if atmospheric pressure is 745 Torr?
- A) 412 Torr
 - B) 446 Torr
 - C) 688 Torr
 - D) 333 Torr
 - E) 299 Torr
- 10) 6 pts A plot of the Maxwell distribution against speed for different molecules shows that
- A) heavy molecules have a higher average speed.
 - B) light molecules have a very narrow range of speeds.
 - C) heavy molecules have a wide range of speeds.
 - D) light molecules have a lower average speed.
 - E) heavy molecules travel with speeds close to their average values.

- 11) 8 pts What is the root mean square speed of carbon dioxide at 98 °C?
- A) $574 \frac{m}{s}$
 - B) $45.6 \frac{m}{s}$
 - C) $153 \frac{m}{s}$
 - D) $459 \frac{m}{s}$
 - E) None of the above
- 12) 6 pts Which of the following procedures will separate Cu^{2+} and Ba^{2+} ions?
- A) Add chloride ions
 - B) Add phosphate ions
 - C) Add sulphate ions
 - D) Add ammonium ions
 - E) None of these ways will separate the 2 ions

Challenge

- 13) 9 pts Through a series of enzymatic steps, carbon dioxide and water undergo photosynthesis to produce glucose and oxygen according to the equation



Given that the partial pressure of carbon dioxide in the troposphere is 0.26 Torr and that the temperature is 25°C, calculate the volume of air needed to produce 10.0 g of glucose.

- 14a) 7 pts Balance the following in basic conditions
 $\text{NO}_2^-(\text{aq}) + \text{Al}(\text{s}) \rightarrow \text{NH}_3(\text{g}) + \text{AlO}_2^-(\text{aq})$

- 14b) 8 pts If you have 1.23 L of 0.347 M KNO_2 , 11.0 g of Al, and 1.89 L of 3.2 M NaOH, what mass of NH_3 can be produced?