

Using Practice Exams Effectively

This practice exam contains **actual questions** that have been asked on one of my exams in a previous quarter. This can be a useful studying tool if used properly.

Important notes about the practice exam:

- This practice exam should not be the only studying tool you are using, because **the practice exams only show a small subset of the possible questions that could be tested.**
- **Work the recommended book problems** to make sure that you fully understand all of the concepts that might be on the actual exams.
 - You need to be able to **explain why every step is done** in solving all of the recommended book problems (**without looking at the solutions**). Do not memorize the answers – this will not work.
 - Work problems multiple times to build skill and efficiency (but do not memorize).
- **The actual exam will contain questions that differ from the practice exams. They are not necessarily any easier or harder; they are just different.**
 - It would be pointless to give an exam with the exact same questions as the practice, because it would mean the exam is testing your memorization skills instead of your actual understanding of the material.
 - **To prepare for this, make sure you understand how to do all of the recommended book problems as discussed above.**

What this practice exam is intended to do:

- Help you diagnose general areas of strength/weakness and determine what you need to spend more time studying before the exam
- Allow you to check if you are answering questions quickly enough to complete the actual exam within the time limit
- Give you an idea of the general format of a multiple-choice exam

While taking the exam:

- Take this with a **50 minute time limit**, including the time it would take you to fill out a parscore
- **Do not use any outside notes or help**
- Do not look at any of the answers until you have completed the entire exam

After you complete the exam, check your answers against the key. For any problems you miss:

- Go through the worked-out solutions to see how to answer each question correctly
- **Make sure you understand why every step is done** in solving the problems you miss
- **Rework book problems** that are related to the questions you missed. This will help to strengthen your understanding of the topic. Without this, you will not gain a full understanding of the topic and risk missing similar questions on the actual exam.

Instructions: No hats or hoods allowed. No books or notes allowed. No sharing of calculators. Cell phones, iPods, headsets/headphones, and any other electronic devices must be turned off and put away.

There are a total of 7 pages (18 questions) on the exam. **Not every question is worth the same number of points**--point values are indicated for each question. You may work out the problems and write your answers on this exam; however, you must completely fill in the appropriate bubble(s) on your ParSCORE form. **Turn in the ParSCORE form only.** Keep the exam so you can check your work and your answers. If you are concerned that you might make bubbling errors on your ParSCORE form, you may choose to turn in your quiz. Answers will be posted on our course web page.

1. (5 pts) Element X forms a stable carbonate with the formula $X(\text{CO}_3)_2$. Predict the formula of a stable bromide formed with element X. Assume that the charge on element X is the same in both compounds.

- a) XBr
- b) XBr_4
- c) X_2Br
- d) X_3Br_2
- e) XBr_2

2. (5 pts) Which of the following is an isotope of a nucleus containing 35 protons and 35 neutrons?

- I. A nucleus containing 34 protons and 36 neutrons
- II. A nucleus containing 36 protons and 35 neutrons
- III. A nucleus containing 34 protons and 35 neutrons
- IV. A nucleus containing 35 protons and 34 neutrons

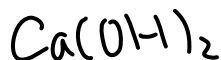
- a) I.
- b) II.
- c) IV.
- d) II. and III.
- e) None of these are isotopes of a nucleus containing 35 protons and 35 neutrons

3. (5 pts) Consider the following (unbalanced) equation: $w \text{ PCl}_5 + x \text{ H}_2\text{O} \rightarrow y \text{ POCl}_3 + z \text{ HCl}$
 When the equation is properly balanced, what are the coefficients?

- a) $w = 2, x = 2, y = 2, z = 4$
 b) $w = 1, x = 2, y = 2, z = 4$
 c) $w = 2, x = 2, y = 2, z = 2$
 d) $w = 1, x = 1, y = 1, z = 2$
 e) none of these

D

4. (5 pts) Determine the molar mass of calcium hydroxide.



$40 + 16 + 1$

- a) 74.1 g/mol
 b) 57.1 g/mol
 c) 97.2 g/mol
 d) 154 g/mol
 e) 114 g/mol

A

5. (6 pts) Europium (Eu) has two naturally occurring isotopes. If 47.8% of Eu is found as ^{151}Eu (150.9198 g/mol), what is the mass of the other isotope? The average mass of Eu is 151.965 g/mol.

- a) 144.8 g/mol
 b) 166.9 g/mol
 c) 1.04 g/mol
 d) 158.1 g/mol
 e) 152.9 g/mol

$$100 \times 151.965 = 150.9198 \times 47.8 + m(100 - 47.8)$$

$$m = 152.9221$$

E

6. (5 pts) Which of the following aqueous solutions contains the largest number of ions? Assume all solutes are soluble in water.

- a) 1.0 L of 1.5 M CaCl_2
 b) 1.0 L of 1.0 M SCl_4
 c) 1.0 L of 2.0 M NaCl

$1.5 \times 3 = 4.5$
 $1 \times 1 \times 5 = 5$
 $1 \times 2 \times 2 = 4$

A

SCl_4 Not Ionic

7. (5 pts) Which of the following will form a precipitate when added to aqueous barium chloride?

- I. NaOH
II. AgNO₃
III. (NH₄)₃PO₄

BaCl
Ba(OH)₂ soluble
AgCl insoluble
(NH₄)Cl
Ba₃(PO₄)₂ insoluble
NaCl soluble
Ba(NO₃)₂ soluble

- a) I. only
b) II. only
c) III. only
d) Either II. or III. will form a precipitate when added to aqueous barium chloride
e) Either I., II., or III. will form a precipitate when added to aqueous barium chloride

D

8. (5 pts) Determine how many of the following compounds are correctly named, according to the naming rules discussed in class:

Compound	Name
H ₂ CrO ₄	chromic acid ✓
NO ₂	nitrite ✗
(NH ₄) ₂ CO ₃	ammonium carbonate ✓
Fe(OH) ₃	iron hydroxide ✗

C

- a) 0 b) 1 c) 2 d) 3 e) 4

9. (6 pts) Determine the total number of neutrons present in a 22 gram sample of ⁵⁶Fe (molar mass = 55.935 g/mol).

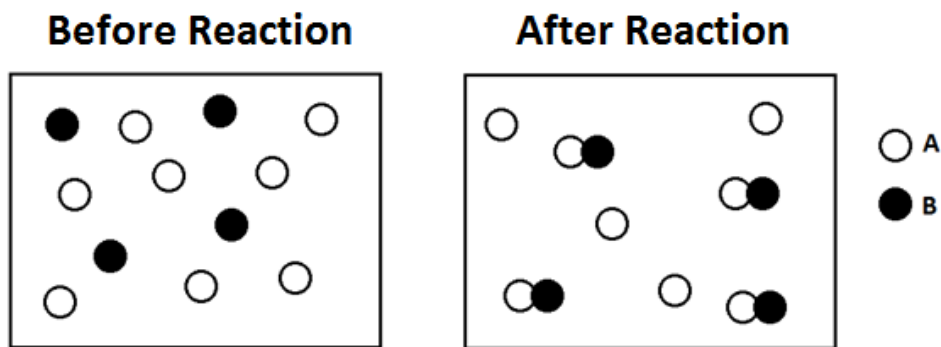
- a) 12
b) 6.2x10²⁴
c) 7.1x10²⁴
d) 1.3x10²⁵
e) 2.4x10²³

C

$$56 - 26 = 30$$

$$\frac{22}{55.935} \times 6.02 \times 10^{23} \times 30$$

10. (5 pts) Elements A and B are added to a container and react as shown below. Which of the following balanced equations best describes the reaction between A and B, using lowest whole-number coefficients?



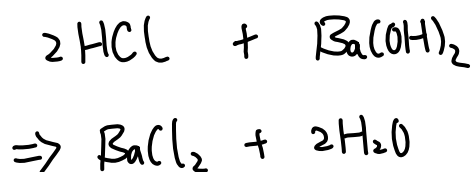
- a) $4 A + 4 B \rightarrow A_4B_4$
 b) $2 A + 1 B \rightarrow 2 AB + 1 A$
 c) $8 A + 4 B \rightarrow A_8B_4$
 d) $8 A + 4 B \rightarrow 4 AB + 4 A$
 e) $A + B \rightarrow AB$

E

11. (6 pts) Complete the following statement: When 35 mL of 2.0 M hydrochloric acid is added to 30 mL of 1.4 M barium hydroxide, the resulting solution will be _____

- a) acidic
 b) basic
 c) neutral

B



$$35 \times 2 = 70 \text{ mmol}$$

$$30 \times 1.4 = 42 \text{ mmol}$$

12. (6 pts) Consider the following reaction: $S_8 + 24 F_2 \rightarrow 8 SF_6$

When 10.0 grams of S_8 (256 g/mol) reacts with 30.0 grams of F_2 (38.0 g/mol) you actually obtain 18.3 grams SF_6 (146 g/mol). What is the percent yield for this reaction?

- a) 47.6%
- b) 45.8%
- c) 40.2%
- d) 61.0%
- e) 54.6%

A

$$\frac{10}{256} = 0.0390625 \text{ mol}$$

$$\frac{30}{38} = 0.789473 \Rightarrow 0.03289 < 0.0390625$$

F_2 limiting

$$0.26316 \text{ mol } SF_6 \quad 38.42g$$

13. (6 pts) A compound containing only V and F is 40.1% V by mass. Determine the empirical formula of this compound.

- a) V_2F
- b) VF_2
- c) VF
- d) VF_4
- e) V_2F_3

D

$$V \ 50.94g/mol \Rightarrow 0.7872 \text{ mol}$$

$$F \ 19 \ g/mol \Rightarrow 3.1526 \text{ mol} \quad 4:1$$

14. (6 pts) You have been given 50 mL of a 1.3 M aqueous solution of ammonium phosphate. What will be $[NH_4^+]$ after adding 75 mL of water to this solution? Assume the volumes are additive?

- a) 0.33 M
- b) 1.6 M
- c) 2.6 M
- d) 0.87 M
- e) 0.52 M

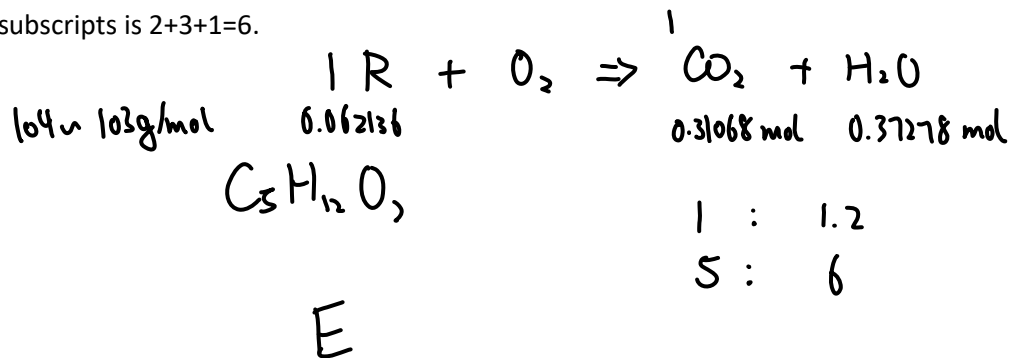
$(NH_4)_3(PO_4)$

$$\frac{50 \times 1.3 \times 3}{50 + 75} \Rightarrow 1.56$$

B

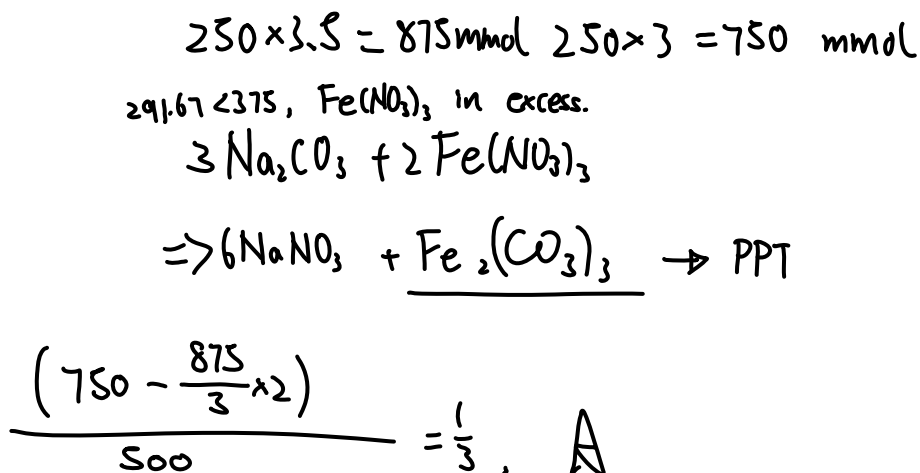
15. (6 pts) A 6.46 gram sample of an unknown compound containing C, H, and O is combusted in excess oxygen gas to produce 13.67 grams of CO_2 (44 g/mol) and 6.71 grams of H_2O (18 g/mol). Calculate the **SUM of ALL subscripts** in the empirical formula of the unknown compound. Include subscripts of 1. For example, if the empirical formula is $\text{C}_2\text{H}_3\text{O}$ then the sum of all subscripts is $2+3+1=6$.

- a) 13
b) 24
c) 12
d) 16
e) 19



16. (6 pts) 250 mL of an aqueous 3.5 M Na_2CO_3 solution is added to 250 mL of an aqueous 3.0 M $\text{Fe}(\text{NO}_3)_3$ solution, resulting in the formation of a precipitate. After the reaction goes to completion, what will be the final $[\text{Fe}^{3+}]$ in the resulting solution? Assume the volumes of the solutions are additive.

- a) 0.33 M
b) 1.5 M
c) 0.92 M
d) 0.0 M
e) 0.67 M



17. (6 pts) How many grams of solid AlBr_3 (266.7 g/mol) must be added to 430 mL of an aqueous 1.9 M CaBr_2 solution in order to bring the total concentration of bromide ion to 4.6 M? Assume the volume of added solid is negligible.

- a) 92 g
- b) 310 g
- c) 176 g
- d) 31 g
- e) 103 g

$$\frac{2 \times \frac{430 \times 1.9}{1000} + 3 \times \frac{m}{266.7}}{430/1000} = 4.6$$

1.634 initially

1.978 mol in the end

0.344 mol needed.

$$0.344 = 3 \times \frac{\text{mass}}{266.7}$$

$$m = 30.58 \approx 31$$

D

18. (6 pts) When 9.5 grams of a solid metal nitrate $\text{M}(\text{NO}_3)_2$ is added to 140 mL of water, the concentration of the nitrate ion $[\text{NO}_3^-]$ is 0.45 M. What is molar mass of metal M? Assume the volume of added solid is negligible.

- a) 26.8 g/mol
- b) 178 g/mol
- c) 302 g/mol
- d) 116 g/mol
- e) 240 g/mol

B

$$\frac{0.45 \times 140/1000}{2} = 0.0315 \text{ mol}$$

$$(M + 124) = \frac{9.5}{0.0315}$$

$$M = 301.6 - 124$$

$$M = 177.59$$

Answers:	1) B	2) C	3) D	4) A	5) E	6) A
	7) D	8) C	9) C	10) E	11) B	12) A
	13) D	14) B	15) E	16) A	17) D	18) B

For more practice, work the assigned problems from the textbook! Lists of problems and solutions are on Gauchospace.