



# Polytechnic Tutoring Center

## Midterm I REVIEW – CM 1013, Fall 2021

*Disclaimer: This mock exam is only for practice. It was made by tutors in the Polytechnic Tutoring Center and is not representative of the actual exam given by the Academic Department.*

### **Multiple-Choice Problems:**

1. A flask has a mass of 62.90 g when empty and 578.30 g when filled with water. When the same flask is filled with concentrated sulfuric acid,  $\text{H}_2\text{SO}_4$ , its mass is 1011.24 g. What is the density of concentrated sulfuric acid? (Assume water has a density of  $1.000 \text{ g/cm}^3$ )

- A) 1.479 g/mL
- B) 1.840 g/mL
- C) 1.749 g/mL
- D) 1.962 g/mL

2. How many grams of oxygen ( $\text{O}_2$ ) are required to react with calcium (Ca) to produce 102.0 g of calcium oxide?

- A) 357.5 g
- B) 204.0 g
- C) 29.1 g
- D) 58.2 g

3. What is the percent mass of iron in  $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$ ?

- A) 45% Fe
- B) 26% Fe
- C) 33% Fe
- D) 58% Fe

4. An average atom of uranium (U) is approximately how many times heavier than an atom of potassium (K)?

- A) 2.4 times
- B) 6.1 times
- C) 7.7 times
- D) 12.5 times

5. Which set of elements below contains, respectively, an alkali metal, a halogen, and a transition metal?

- A) Rb, Br, Ag
- B) H, F, V
- C) Li, S, Fe
- D) Ca, Kr, Mn

6. Which of these pairs of elements would most likely form an ionic compound?

- A) Cu and K
- B) Al and Rb
- C) At and K
- D) P and Br

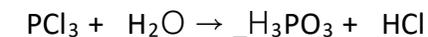
7. How many protons, neutrons, and electrons are there in an atom of potassium-40?

- A) 19 protons, 21, neutrons, and 19 electrons
- B) 40 protons, 19 neutrons, and 40 electrons
- C) 21 protons, 19 neutrons, and 19 electrons
- D) 19 protons, 21 neutrons, and 40 electrons

8. One mole of H<sub>2</sub>

- A) contains  $6.022 \times 10^{23}$  H atoms because the atomic weight is 1g/ mole H
- B) contains  $6.022 \times 10^{23}$  H<sub>2</sub> molecules
- C) contains 1 g of H<sub>2</sub> by definition
- D) is equivalent to  $6.022 \times 10^{23}$  amu per reaction

9. What are the correct coefficients for the reaction below?



- A) 1, 3, 1, 1
- B) 1, 3, 1, 3
- C) 1, 1, 1, 3
- D) 2, 3, 2, 3

10. What is the correct chemical name of CoCl<sub>3</sub>?

- A) cobaltous chloride
- B) cobalt trichloride
- C) cobalt(III) chloride
- D) cobalt(III) trichloride

11. What is the correct chemical formula of chromium(III) nitrite?

- A) Cr(NO<sub>2</sub>)<sub>3</sub>
- B) CrNO<sub>3</sub>
- C) Cr<sub>3</sub>(NO<sub>2</sub>)<sub>2</sub>
- D) Cr(NO<sub>3</sub>)<sub>3</sub>

12. Assume that magnesium consists of three isotopes having the abundances and masses given below. According to the data, what is the average atomic mass of magnesium?

Isotope	Abundance	Mass
$^{24}\text{Mg}$	78.70%	23.985 amu
$^{25}\text{Mg}$	10.13%	24.986 amu
$^{26}\text{Mg}$	11.17%	25.983 amu

- A) 25.00 amu
- B) 24.62 amu
- C) 24.74 amu
- D) 24.31 amu

13. When comparing a 10.00 g sample of iron with a 10.00 g sample of lead:

- A) there are more lead atoms than iron atoms because lead is heavier
- B) it is not possible to tell which sample contains more atoms without knowing density
- C) each sample has the same number of atoms because the atomic radii are similar
- D) there are more iron atoms than lead atoms

14. Which of the following is an example of a physical property?

- A) Polymerization of DNA creates a double helix shape
- B) Proteins are synthesized by ribosomes in plants and transport macromolecules.
- C) Water corrodes an iron tank and changes color to orange
- D) Lithium battery explodes when punctured
- E) Heated water turns into steam at 100C, but condenses again at high pressure

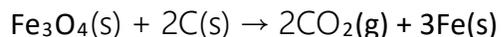
15. Which of the following is an extensive property?

- A) Average atomic radii of an ideal gas
- B) Melting and freezing points at two different pressures
- C) Mass of chemical sample at 1atm
- D) Heat capacity of 5M NaCl

**Short Answer Problems:**

1. A compound composed of hydrogen and carbon contains 85.7% C and 14.3% H, and has a molar mass of 84 g/mol. What is the empirical formula and molecular formula of the compound?

2. Iron (Fe) can be produced by the following reaction:



What is the percent yield of Fe if 950 g of  $\text{Fe}_3\text{O}_4$  were used and 533 g of Fe were isolated from the reaction mixture?

3. How many potassium (K) atoms are present in 57.7 mg of  $\text{K}_2\text{MnF}_6$ ?