CHEMISTRY 101
Hour Exam I
February 8, 2018
Dr. D. DeCoste

Name _____

Signature _____

T.A. _____

This exam contains 17 questions on 5 numbered pages. Check now to make sure you have a complete exam. You have one hour and thirty minutes to complete the exam. Determine the best answer to the first 15 questions and enter these on the special answer sheet. Also, circle your responses in this exam booklet. Show all of your work and provide complete answers to questions 16 and 17.

1-15	(30 pts.)	_____
16	(15 pts.)	_____
17	(15 pts.)	_____
Total	(60 pts)	_____

Useful Information:

Always assume ideal behavior for gases (unless explicitly told otherwise).

$PV = nRT$

$R = 0.08206$ Latm/molK

$K = °C + 273$

Avogadro's number = 6.022×10^{23}

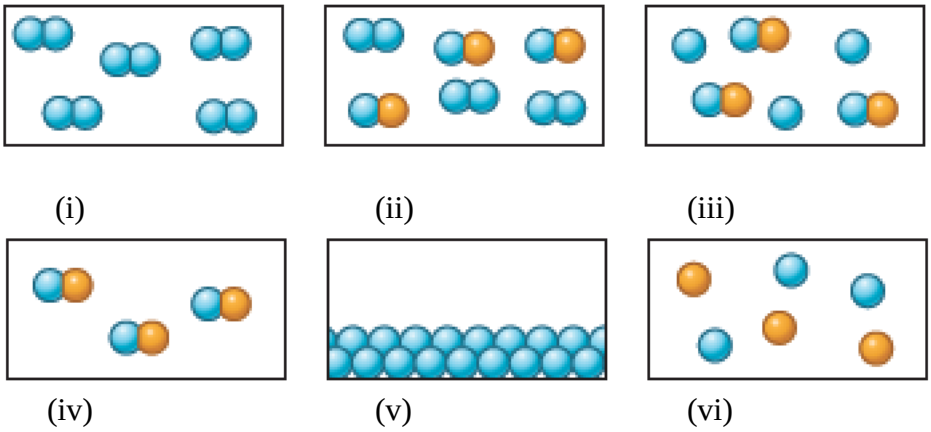
1. Consider the measurements 23.68 cm and 4.12 cm. The sum of these measurements has ____ significant figures, and the product of these measurements has ____ significant figures.

   a) 3, 3 b) 4, 4 c) 3,4 **d) 4,3** e) 4, 7

2. An ionic compound has the formula MSO_4 and the metal ion has 27 electrons. What is the identity of the metal?

   a) Mn b) Fe c) Co d) Ni **e) Cu**

3. Consider the following "microscopic" pictures below.



   How many of these pictures represent a mixture?

   a) 2 **b) 3** c) 4 d) 5 e) 6

4. How many of the following match the names and formulas **correctly**?

   I. $BaCl_2$: barium(II) chloride
   II. $NaCO_3$: sodium carbonate
   III. $Mg(OH)_2$: magnesium hydroxide
   IV. Fe_2O_3: iron(II) trioxide

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

5. Which of the following statements most accurately describes a mole?

   a) The mass of carbon (C) in a measured sample of carbon is a mole of carbon.
   b) The number of atoms in any given mass of a molecule is a mole of those molecules.
   c) A 6.022×10^{23} gram sample of an element is a mole of the atoms of that element.
   d) A 55.85 gram sample of iron (Fe) is a mole of iron atoms.
   e) At least two of the above (a-d) are accurate descriptions of the mole.

6. You have a 20.0-g sample of silver (Ag) metal. You are given 10.0 g sample of an unknown metal and told that this sample contains twice the number of atoms as the sample of silver metal. Identify the unknown metal.

a) Mercury (Hg)
b) Iron (Fe)
c) Cobalt (Co)
d) Platinum (Pt)
e) Aluminum (Al)

7. Which of the following has the **greatest** molar mass?

a) cobalt(II) sulfate
b) cobalt(II) oxide
c) cobalt(II) fluoride
d) cobalt(III) fluoride
e) cobalt(II) chloride

8. Given **equal masses** of each of the following, which contains the **greatest** mass of oxygen atoms?

a) CO
b) Na_2O
c) SnO_2
d) Al_2O_3
e) At least two of the above (a-d) contain an equally great mass of oxygen atoms.

9. A metal in Column 2A is part of an ionic compound with a chloride ion. This metallic chloride is 36.1% by mass metal. Determine the identity of the metal.

a) Be b) Mg c) Ca d) Sr e) Ba

10. Determine the percent by mass of oxygen in calcium nitrate.

a) 37.1% b) 47.1% c) 54.2% d) 58.5% e) 65.3%

11. Consider a steel container filled with 40 g of helium gas (He) and 40 g of argon gas (Ar). What is the ratio of pressures that each gas exerts (answers are for He:Ar)?

a) 1:1 b) 9:1 c) 1:9 d) 1:10 e) 10:1

12. Determine the pressure exerted by 1.80 mol of gas in a 2.92 L container at 32.0°C.

a) 1.62 atm b) 8.57 atm c) 15.4 atm d) 22.4 atm e) 45.0 atm

13. In a demonstration one day, you were shown two balloons of equal volume. One contained helium, and one contained hydrogen. Which of the following statements is **true**?

a) The pressures of the gases in the two balloons were different.
b) The masses of gases in the two balloons were different.
c) The temperatures of the gases in the two balloons were different.
d) The numbers of moles of gases in the two balloons were different.
e) At least two of the above statements (a-d) are true.

14. You have two separate containers each filled with gas. The containers have the same volume and are at the same temperature. The gases also exert the same pressure. Which of the following statements are **true**?

a) For conditions of P, V, and T to be the same, the gases can be different but the number of moles of gas must be the same.
b) For conditions of P, V, and T to be the same, the gases can be different but the mass of gas in each balloon must be the same.
c) For conditions of P, V, and T to be the same, the gases can be different but the gases must have the same molar mass.
d) For conditions of P, V, and T to be the same, the gases must be identical.
e) None of the above statements (a-d) is true.

15. You have a sample of argon (Ar) gas at a certain pressure, volume, and temperature. You double the volume, double the moles of argon, and double the temperature (measured in Kelvin). How does the final pressure (P_f) compare to the original pressure (P_o)?

$P_f =$

a) $(1/8)P_o$ b) $(1/2)P_o$ c) $2P_o$ d) $4P_o$ e) $8P_o$