

Name _____
PID _____
Section _____

Exam 1
Cem 151
Fall, 2014

Choose the *best* answer. Mark your answer on your bubble sheet (worth 6 points each).

1. Describe what happens when a beta particle moves through an electric field.
 - a. It is unaffected.
 - b. It veers toward the positive.**
 - c. It veers toward the negative.
 - d. It varies with the element it comes from.
 - e. alpha particles don't exist because atoms are indivisible.
2. Muliken used his oil drop experiment to:
 - a. directly determine the charge to mass ratio of the electron
 - b. directly determine the mass of the electron.
 - c. directly determine the charge of the electron.**
 - d. directly determine the charge of the proton.
 - e. directly determine the mass of the proton.
 - f. None of the above.
 - g. All of the above.
3. Which of the following will *result* in a homogeneous mixture
 - a. The addition of 1 mole of sodium chloride (which dissolves) to 1 liter of water.**
 - b. The addition of 5 moles of ammonium sulfate, only 4 moles of which dissolves, to 1 liter of water.
 - c. The distillation of water from sea water.
 - d. The crystallization of pure ammonium nitrate from an aqueous solution.
 - e. a and c.
 - f. a and b.
 - g. a, c and d.
4. Which pair of elements below should be the most similar in chemical properties?

a) C and O	c) F and O	e) Be and Mg	g) H and He
b) B and As	d) K and Kr	f) N and O	h) Cu and Fe
5. Which of the following was last to be discovered?

a) The proton	c) α particles	e) The electron
b) Radioactivity	d) The neutron	f) The atom

Use the following choices for the next 3 problems:

- | | | | | |
|------------------------------|-----------------------------|--------------------|---------------------------------------|----------------------------|
| a) NaClO_4 | c) Na_2SO_4 | e) KMnO_4 | g) $\text{NaC}_2\text{H}_3\text{O}_2$ | i) H_2SO_3 |
| b) Na_2ClO_4 | d) Na_3SO_4 | f) KMnO_2 | h) NaHCO_3 | j) H_2SO_4 |

6. Pick the formula corresponding to sodium perchlorate (b)

7. Pick the formula corresponding to sodium acetate. (g)

8. Pick the formula corresponding to sulfurous acid. (i)

9. Pick the formula corresponding to sodium bicarbonate. (h)

10. Which of the following are, or contain molecular species?

- | | | | |
|---------------------------|-----------------------|---------------------|------------------|
| a) oxygen | d) sodium nitrate | g) all of the above | j) all but e & f |
| b) sulfuric acid | e) potassium chloride | h) a and b | |
| c) potassium permanganate | f) potassium chlorate | i) all but e | |

11. Which of the following has the *smallest* number of neutrons:

- | | | |
|--------------------|---------------------|--------------------|
| a) ^{11}C | c) ^{11}B | e) ^{31}P |
| b) ^{12}C | d) ^{10}Be | f) ^{18}O |

12. Which of the following has the most electrons?

- | | | |
|-------------------------|------------------------|-------------------------|
| a) $^{18}\text{O}^{2-}$ | c) ^{39}K | e) ^{36}Ar |
| b) $^{15}\text{N}^{3-}$ | d) $^{40}\text{K}^{+}$ | f) $^{38}\text{Ar}^{+}$ |

13. How many pico-inches in a centimeter?

- | | | |
|------------------------------|----------------------------------|---|
| a) 3.393700787×10^8 | d) $3.393700787 \times 10^{-8}$ | g) $3.393700787 \times 10^{11}$ |
| b) 2.540000000×10^9 | e) $2.540000000 \times 10^{-9}$ | h) 2.540000000×10^9 |
| c) 2.540000000×10^9 | f) $3.393700787 \times 10^{-11}$ | i) none of the above |

Ans: Picoinches/cent = 1 inch/2.54 cm(1×10^{12} pico-inches/inch) = 0.39370078740157

14. Which of the following elements is most likely to lose 2 electrons and become a common stable species?

- | | | | | |
|-------|--------------|------|-------|-------|
| a) Na | c) Be | e) N | g) F | i) Ar |
| b) K | d) B | f) O | h) Ne | |

15. In the reaction of hydrogen with oxygen to produce water, 1 mole each of hydrogen and oxygen are reacted. Give the limiting reagent. And the total number of moles of products and unreacted starting material, if any. (limiting reagent, total moles)

- | | | | | |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| a. H_2 , 1 | c. H_2 , 2 | e. O_2 , 0.5 | g. O_2 , 1.5 | i. O_2 , 2.5 |
| b. H_2, 1.5 | d. H_2 , 2.5 | f. O_2 , 1 | h. O_2 , 2 | |

Free answer, *show your work!!*

16. Sulfur mustard, the active ingredient in mustard gas, has the molecular formula $\text{C}_4\text{H}_8\text{Cl}_2\text{S}$. A pure sample of an unknown compound was found in some luggage at an airport. When analyzed a 20.0 g sample of the material was found to contain 4.03 g of Sulfur.

a. Could the substance be Sulfur Mustard (show your work!!!! If you don't show your work, you will NOT receive anything like full credit.)?

b. What is the empirical formula for sulfur mustard?

17. Sulfur mustard ($\text{C}_4\text{H}_8\text{Cl}_2\text{S}$) can be synthesized by reacting ethylene (C_2H_4) with sulfur dichloride.

a. Write a balanced equation for the reaction described above:

b. If 56 g of ethylene is reacted with 110 g of sulfur dichloride, how much sulfur mustard can be synthesized?

c. If 110 g of sulfur mustard are actually produced in the reaction described in part b, what was the percent yield of the reaction?

