

Name: \_\_\_\_\_

Chemistry 121

Worksheet Ch 11, 2, 3.

Chapters 2-3

Fall'09

Work in groups of 3-4. Use the textbook as needed. Make sure everyone in the group is on the same page and following the discussion.

1. Which of the following compounds is expected to have the **HIGHEST** boiling point?

- a.  $\text{CH}_3\text{OCH}_3$
- \*b.  $\text{CH}_3\text{CH}_2\text{OH}$
- c.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
- d.  $\text{CH}_3\text{CH}_2\text{CH}_3$
- e.  $\text{CH}_3\text{Cl}$

2. Which of the following has the lowest boiling point?

- a.  $\text{H}_2\text{O}$
- b. HF
- \*c. HCl
- d. HBr
- e. HI

3. Which of the following compounds shows an abnormal boiling point because of hydrogen bonding?

- \*a.  $\text{CH}_3\text{NH}_2$
- b.  $\text{CH}_3\text{OCH}_3$
- c.  $\text{CH}_3\text{SH}$
- d.  $\text{CH}_3\text{Cl}$
- e. HCl

4. The formulas of the nitrite, phosphide, and nitrate ions are represented, respectively, as

(See if you remember those before going for the book! Remember- these HAVE to be MEMORIZED)

$\text{NO}_2^-$ ,  $\text{P}^{3-}$ ,  $\text{NO}_3^-$

5. The formula for europium oxide is  $\text{Eu}_2\text{O}_3$ . On the basis of this information, the formula for the chlorate of europium would be expected to be

Your steps: A. Europium is a Metal or Non-metal (circle), so it will form Anion or Cation (circle)?

(Eu is in the lowest part of periodic table, Atomic # 63.)

B. Oxygen - metal or non metal? Anion or Cation? What ion charge will O have? 0-2

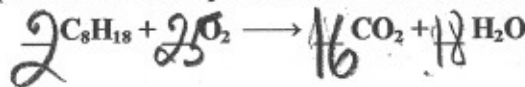
C. Based on charge of O from part "B" - what is the charge of Eu in  $\text{Eu}_2\text{O}_3$ ? Eu +3

(remember  $\text{Eu}_2\text{O}_3$  is a neutral molecule)

D. What is the charge and formula for chlorate ion?  $\text{ClO}_3^-$

E. Based on "C" and "D" - write the formula for the europium chlorate  $\text{Eu}(\text{ClO}_3)_3$

6. Balance the equation of the complete combustion of octane,  $\text{C}_8\text{H}_{18}$ , that yields carbon dioxide and water:



7. What is the ratio of oxygen atoms to hydrogen atoms in the mineral cacoxenite,  $\text{Fe}_4(\text{PO}_4)_3(\text{OH})_3 \cdot 12\text{H}_2\text{O}$ ?

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(Note: In the case of crystallohydrates as above  $12\text{H}_2\text{O}$  molecules become a part of the large formula – they are attached to each molecule of  $\text{Fe}_4(\text{PO}_4)_3(\text{OH})_3$  !)

Follow the steps:

- A. How many oxygen atoms do you have per molecule (formula)  $4 \times 3 + 3 + 12 = 27$
- B. How many hydrogen atoms do you have per formula unit:  $3 + 12 \times 2 = 27$
- C. What is the ratio O : H (give the answer in simplest form):  $27 : 27 = 1 : 1$

8. How many carbon atoms are there in 1.00 g of TNT,  $\text{C}_7\text{H}_5\text{N}_3\text{O}_6$  (potent explosive)?

Follow the steps (KEEP TRACK of UNITS!!):

- A. Calculate molar mass of TNT (add up all atomic masses).  $227$  g/mol
- $12 \times 7 + 5 \times 1 + 3 \times 14 + 6 \times 16 = 227 \text{ g/mol}$
- B. Convert 1.00 g of TNT to moles of TNT using molar mass from A as conversion factor.:
- $1 \text{ g} \times \frac{1 \text{ mol}}{227 \text{ g}} = 4.41 \times 10^{-3}$  moles of TNT
- C. Use Avogadro's number to convert from moles of TNT to molecules of TNT:

$4.41 \times 10^{-3} \text{ mol} \times 6.02 \times 10^{23} = 2.65 \times 10^{21}$  TNT molecules

D. How many H atoms are in TNT molecule?  $5$  H atoms/TNT molecule. Use this to convert from molecules of TNT (in C) to atoms of H:

$2.65 \times 10^{21} \text{ molecules} \times \frac{5 \text{ H}}{1 \text{ molecule TNT}} = 1.33 \times 10^{22}$  H atoms

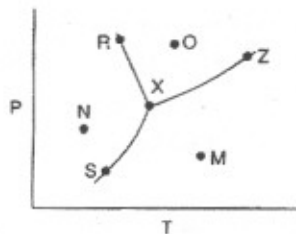
9. Which of the following phase changes are exothermic?

1. vaporization
2. sublimation
3. condensation

- a. 1 only
- b. 2 only
- \*c. 3 only
- d. 1 and 2 only
- e. 2 and 3 only

10. The solid and gas phases are represented, respectively, by

- a. N and O.
- b. O and N.
- c. M and N.
- \*d. N and M.
- e. O and M



Extra 1.

When you rub a balloon on your head, it is attracted to almost any object

that it is placed near. In part, this can be explained by static electricity (i.e. picking up excess electrons). The balloon is "sticky" because:

- I. Like charges are attracted to the balloon surface
- II. Hydrogen bonding with the balloon
- III. A fixed or induced charge separation (dipole)
- IV. You did not wash your hair

Combination or one!

\*e. III only