

Name: _____

June 5, 2012

Chemical Principles I

Exam 1

All problems are 3 points except 33 which is 4 points.

1 in = 2.54 cm (exactly) 1 ft = 12 in

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

- A) corrosiveness of sulfuric acid
- B) toxicity of cyanide
- C) flammability of gasoline
- D) neutralization of stomach acid with an antacid
- E) lead becomes a liquid when heated to 601°C

2. All of the following are properties of tin. Which one is a chemical property of tin?

- ~~A)~~ Tin can be hammered into a thin sheet.
- ~~B)~~ At -40°C a sheet of tin crumbles to a gray powder.
- ~~C)~~ Tin melts at 231.9°C.
- ~~D)~~ When a bar of tin is bent, it emits an audible "cry".
- E) Tin erodes when added to hydrochloric acid, and a clear gas forms.

3. The SI prefixes ^{10⁻³} milli and ^{10⁶} mega represent, respectively:

- A) 10⁶ and 10⁻⁶.
- B) 10⁻³ and 10⁶.
- C) 10³ and 10⁻⁶.
- D) 10⁻³ and 10⁹.
- E) 10⁻⁶ and 10⁻³.

4. The SI prefixes ^{10³} kilo and ^{10⁻²} centi represent, respectively:

- A) 10³ and 10⁻².
- B) 10⁶ and 10⁻¹.
- C) 10⁻³ and 10⁻².
- D) 10⁻⁶ and 10².
- E) 10² and 10⁻³.

5. Convert 500. milliliters to quarts. (1L = 1.06 qt)

- A) 1.88 qt B) 0.472 qt C) 0.528 qt D) 4.72×10^5 qt E) 5.28×10^5 qt

C $500. \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1.06 \text{ qt}}{1 \text{ L}} =$

6. Iridium is essentially tied with osmium for the distinction of being called the "densest element" with a density of 22.5 g/cm^3 . What would be the mass in pounds of a $1.0 \text{ ft} \times 1.0 \text{ ft} \times 1.0 \text{ ft}$ cube of iridium. (1 lb = 453.6 g)

- A) 1.5 lb B) 5.2 lb C) 6.20 lb D) 1.4×10^3 lb E) 6.4×10^5 lb

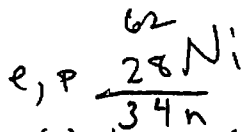
D $1 \text{ ft}^3 \times \left(\frac{12 \text{ in}}{1 \text{ ft}}\right)^3 \cdot \left(\frac{2.54 \text{ cm}}{1 \text{ in}}\right)^3 \times \frac{22.5 \text{ g}}{\text{cm}^3} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 1404.6$
 $1.4 \times 10^3 \text{ lb}$

7. _____ and _____ reside in the atomic nucleus.

- A) Protons, ~~electrons~~
B) ~~Electrons~~, neutrons
C) Protons, neutrons
D) none of the above
E) Neutrons, only neutrons

8. The atomic number indicates _____.

- ~~A) the number of neutrons in a nucleus~~
~~B) the total number of neutrons and protons in a nucleus~~
C) the number of protons or electrons in a neutral atom
~~D) the number of atoms in 1 g of an element~~
~~E) the number of different isotopes of an element~~



9. Give the number of protons (p), electrons (e), and neutrons (n) in one atom of nickel-62.

B

A) 28 p, 28 e, 28 n

C) 62 p, 28 e, 28 n

B) 28 p, 28 e, 34 n

D) 62 p, 62 e, 28 n

10. In the periodic table, the rows are called Per and the columns are called Groups.

C

A) octaves, groups

B) staffs, families

C) periods, groups

D) cogeners, families

E) rows, groups

11. The element _____ is the most similar to strontium in chemical and physical properties.

D

A) Li

B) At

C) Rb

D) Ba

E) Cs

12. When a metal and a nonmetal react, the met tends to lose electrons and the non tends to gain electrons.

A) ~~metal, metal~~

B) ~~nonmetal, nonmetal~~

C) metal, nonmetal

D) nonmetal, metal

E) None of the above, these elements share electrons.

13. The empirical formula of a compound with molecules containing 12 carbon atoms, 14 hydrogen atoms, and 6 oxygen atoms is _____.

D

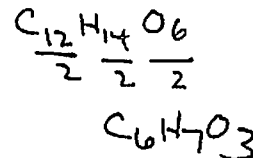
A) $C_{12}H_{14}O_6$

B) CHO

C) CH_2O

D) $C_6H_7O_3$

E) C_2H_4O



14. Which one of the following elements is most likely to form a 2+ ion?

A

A) beryllium

B) ~~carbon~~

C) ~~fluorine~~

D) ~~oxygen~~

E) ~~sodium~~

15. Which one of the following elements is most likely to form a 2- ion?

- A) scandium B) selenium C) silicon D) strontium E) iodine

B

16. Magnesium reacts with a certain element to form a compound with the general formula MgX^{2-} . What would the most likely formula be for the compound formed between potassium and element X?

- A) K_2X B) KX_2 C) K_2X_3 D) K_2X_2 E) KX

A

17. Predict the empirical formula of the ionic compound that forms from magnesium and fluorine.

- A) Mg_2F_3 B) MgF C) Mg_2F D) Mg_3F_2 E) MgF_2

E

18. The correct name for K_2S is _____.

- A) potassium sulfate B) potassium disulfide C) potassium bisulfide
D) potassium sulfide E) dipotassium sulfate

D

19. The correct name for Al_2O_3 is _____.

- A) aluminum oxide B) dialuminum oxide C) dialuminum trioxide
D) aluminum hydroxide E) aluminum trioxide

A

20. The correct name for SO is _____.

- A) sulfur oxide B) sulfur monoxide C) sulfoxide D) sulfate
E) sulfite

B

21. The correct name for H_2SO_3 is _____.

- A) sulfuric acid B) sulfurous acid C) hydrosulfuric acid
D) hydrosulfic acid E) sulfur hydroxide

B

22. The correct name for HClO_3 is _____.

- A) hydrochloric acid B) perchloric acid **C) chloric acid**
D) chlorous acid E) hydrochlorous acid

23. The correct formula for molybdenum(IV) hypochlorite is _____.

- A) $\text{Mo}(\text{ClO}_3)_4$ **B) $\text{Mo}(\text{ClO})_4$** C) $\text{Mo}(\text{ClO}_2)_4$ D) $\text{Mo}(\text{ClO}_4)_4$
E) MoCl_4 $\text{Mo}(\text{OCl})_4$

24. The name of the binary compound N_2O_4 is _____.

- A) nitrogen oxide B) nitrous oxide C) nitrogen(III) oxide
D) dinitrogen tetroxide E) oxygen nitride

25. What is the molar mass of acetaminophen, $\text{C}_8\text{H}_9\text{NO}_2$?

- A) 43 g/mol B) 76 g/mol **C) 151 g/mol** D) 162 g/mol E) 125 g/mol

$$8(12.01) + 9(1.008) + 14.01 + 2(16.00) = 151.16$$

26. A 2.25-g sample of magnesium nitrate, $\text{Mg}(\text{NO}_3)_2$, contains _____ mol of this compound.

- A) 38.4 B) 65.8 C) 148.3 D) 0.0261 **E) 0.0152**

$$\text{Mg}(\text{NO}_3)_2 \quad 2.25 \text{ g} \times \frac{1 \text{ mol}}{148.33 \text{ g}} = 0.0152$$
$$24.31 + 2(14.01) + 6(16.00) = 148.33$$

27. Calculate the percentage by mass of nitrogen in $\text{PtCl}_2(\text{NH}_3)_2$.

- A) 4.67 **B) 9.34** C) 9.90 D) 4.95 E) 12.67

Pt	195.1
2Cl	70.90
2N	28.02
6H	6.048
<hr/>	
	300.068

$$\frac{28.02}{300.068} \times 100\% = 9.338\%$$
$$9.34\%$$

28. What is the empirical formula of a compound that contains 49.4% K, 20.3% S, and 30.3% O by mass?

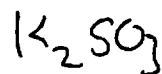
D

- A) KSO₂ B) KSO₃ C) K₂SO₄ **D) K₂SO₃** E) KSO₄

$$49.4 \text{ g K} \times \frac{1 \text{ mol K}}{39.10 \text{ g}} = 1.26 \text{ mol K} / 0.633 = 2 \text{ mol K}$$

$$20.3 \text{ g S} \times \frac{1 \text{ mol S}}{32.07 \text{ g}} = 0.633 \text{ mol S} / 0.633 = 1 \text{ mol S}$$

$$30.3 \text{ g O} \times \frac{1 \text{ mol O}}{16 \text{ g}} = 1.89 \text{ mol O} / 0.633 = 3 \text{ mol O}$$



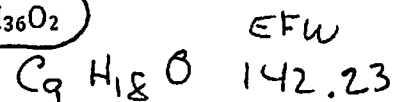
29. The percent composition by mass of a compound is 76.0% C, 12.8% H, and 11.2% O. The molar mass of this compound is 284.5 g/mol. What is the molecular formula of the compound?

- A) C₁₀H₆O B) C₉H₁₈O C) C₁₆H₂₈O₄ D) C₂₀H₁₂O₂ **E) C₁₈H₃₆O₂**

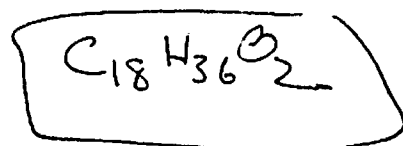
$$76.0 \text{ g C} \times \frac{1 \text{ mol}}{12.01 \text{ g}} = 6.33 / 0.7 = 9 \text{ mol C}$$

$$12.8 \text{ g H} \times \frac{1 \text{ mol}}{1.008 \text{ g}} = 12.7 / 0.7 = 18 \text{ mol H}$$

$$11.2 \text{ g O} \times \frac{1 \text{ mol}}{16.00 \text{ g}} = 0.7 / 0.7 = 1 \text{ mol O}$$



$$\frac{284.5}{142.23} = 2$$



30. Sulfur and fluorine react in a combination reaction to produce sulfur hexafluoride:



In a particular experiment, the percent yield is 79.0%. This means that a 7.90-g sample of fluorine yields _____ g of SF₆ in the presence of excess sulfur.

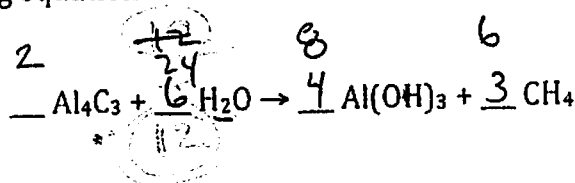
C

- A) 30.3 B) 10.1 **C) 7.99** D) 24.0 E) 0.110

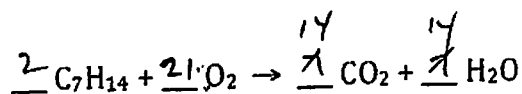
$$7.90 \text{ g F}_2 \times \frac{1 \text{ mol F}_2}{38.00 \text{ g F}_2} \times \frac{1 \text{ mol SF}_6}{3 \text{ mol F}_2} \times \frac{146.07 \text{ g SF}_6}{1 \text{ mol SF}_6} = 10.12 \text{ g SF}_6$$

$$10.12 \text{ g} \times 0.79 \% = 7.997 \text{ g}$$

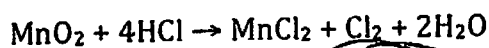
31. Balance the following equation:



32. Balance the following equation:



33. How many grams of Cl_2 can be prepared from the reaction of 16.0 g of MnO_2 and 30.0 g of HCl according to the following chemical equation?



- A) 0.82 g B) 5.8 g C) 13.0 g D) 14.6 g E) 58.4 g

$$16.0 \text{ g MnO}_2 \times \frac{1 \text{ mol MnO}_2}{86.94 \text{ g}} \times \frac{1 \text{ mol Cl}_2}{1 \text{ mol MnO}_2} \times \frac{70.90 \text{ g Cl}_2}{1 \text{ mol Cl}_2} = 13.05 \text{ g}$$

$$30.0 \text{ g HCl} \times \frac{1 \text{ mol HCl}}{36.46 \text{ g HCl}} \times \frac{1 \text{ mol Cl}_2}{4 \text{ mol HCl}} \times \frac{70.90 \text{ g Cl}_2}{1 \text{ mol Cl}_2} = 14.58$$