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CHEMISTRY 211, Lect. Sect. 003

Dr. G. L. Roberts

Fall 2000

**Exam #1**

Tuesday, September 26, 2000

**NAME** \_\_\_\_\_

Last First

**Lab Section #** \_\_\_\_\_

**SSN** \_\_\_\_\_

**CLOSED BOOK EXAM—No notes or books allowed. Calculators may be used.**

I, \_\_\_\_\_, understand the ramifications of willful misconduct during examinations and am not guilty of receiving assistance completing this exam. I further agree that I did not observe misconduct and not report it, making me an accessory to the wrongful act, which is a violation of the honor code at George Mason University.

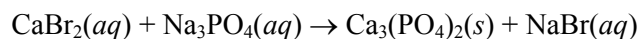
- If the formula for magnesium perbromate is  $\text{Mg}(\text{BrO}_4)_2$ , the formula for *sodium bromite* is:  
(a)  $\text{NaBrO}$  (b)  $\text{NaBrO}_2$  (c)  $\text{NaBrO}_3$  (d)  $\text{Na}(\text{BrO}_3)_2$  (e) none of these
- Among the species:  ${}^{28}_{13}\text{X}$   ${}^{31}_{15}\text{Y}^{-2}$   ${}^{31}_{14}\text{Q}^{+1}$   ${}^{34}_{16}\text{R}^{-2}$   ${}^{29}_{13}\text{T}^{+1}$ , which two elements are isotopes of each other?  
(a)  ${}^{28}_{13}\text{X}$  and  ${}^{31}_{15}\text{Y}^{-2}$  (b)  ${}^{31}_{15}\text{Y}^{-2}$  and  ${}^{31}_{14}\text{Q}^{+1}$  (c)  ${}^{28}_{13}\text{X}$  and  ${}^{29}_{13}\text{T}^{+1}$
- The Law of Mass Conservation states that mass is neither created nor destroyed in chemical reactions.  
(a) true (b) false
- Properties of matter can be classified depending on whether their value changes with respect to the size or amount of sample. Intensive properties are independent of the amount of sample whereas extensive properties are dependent on sample size. The melting point of ice or crystals is an example of an extensive property.  
(a) true (b) false
- The Group IA elements are referred to as alkaline earth metals and are typically shiny, soft metals that react violently with water and are rarely found in the pure form due to their high reactivity.  
(a) true (b) false
- Physical properties of matter are those characteristics that can be determined without changing the chemical makeup of the sample, whereas chemical properties refer to properties that do change the chemical makeup of the sample, i.e. the rusting of iron.  
(a) true (b) false
- Electrolytes can be categorized by the degree of ionization. An aqueous solution of  $\text{LiBr}$  would represent a weak electrolyte.  
(a) true (b) false

8. Which of the following does not properly describe the postulates set forth by Dalton's Theory?
- Elements consist of tiny particles called atoms.
  - Atoms of the same element have the same mass, but atoms of different elements have different masses.
  - Elements chemically combine in whole-number ratios to make different substances.
  - Chemical reactions not only rearrange the way that atoms are combined, the atoms themselves are changed.
  - None of the above
9. Which of the following equations is incorrectly balanced and/or classified? {combination (C), decomposition (D), single-replacement (SR), or double-displacement (DD)}
- $\text{CaCO}_3(s) \rightarrow \text{CaO}(s) + \text{CO}_2(g)$  **D**
  - $\text{NH}_3(g) + \text{HCl}(g) \rightarrow \text{NH}_4\text{Cl}(s)$  **C**
  - $\text{AgBr}(s) + \text{Cl}_2(g) \rightarrow \text{AgCl}(s) + \text{Br}_2(l)$  **SR**
  - $\text{Ag}_2\text{SO}_4(s) + 2\text{NaI}(aq) \rightarrow 2\text{AgI}(s) + \text{Na}_2\text{SO}_4(aq)$  **DD**
10. It was determined that 9.42 g of an unknown liquid occupied a volume of 0.0107 L. Based on the density of the liquid, what is the identity of the liquid?
- (a) 0.702 g/cm<sup>3</sup>, octane    (b) 0.789 g/cm<sup>3</sup>, ethanol    (c) 0.879 g/cm<sup>3</sup>, benzene
11. Menthol, a flavoring agent obtained from peppermint oil, contains carbon, hydrogen, and oxygen. On combustion analysis, 1.00 g of menthol yields 1.161 g of H<sub>2</sub>O and 2.818 g of CO<sub>2</sub>. What is the empirical formula of menthol?
- (a) C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>    (b) C<sub>7</sub>H<sub>8</sub>O<sub>3</sub>    (c) C<sub>5</sub>H<sub>10</sub>O<sub>2</sub>    (d) C<sub>20</sub>H<sub>10</sub>O<sub>2</sub>    (e) C<sub>10</sub>H<sub>20</sub>O
12. Planet SIGMA is approximately  $5.563 \times 10^9$  yoks from planet ZETA. If a spaceship travels the distance between the planets in only 0.135 days how fast is the space ship traveling (blips/sec)?
- (a) 5.72    (b) 0.006303    (c) 378    (d) 6.303    (e) 0.00572
- |                    |                     |                        |
|--------------------|---------------------|------------------------|
| 1 bod = 0.063 inch | 1 inch = 2.54 cm    | 1 blip = 387,145 miles |
| 1 mile = 5280 ft   | 1 yok = 8234 meters |                        |
13. Which of the following is not listed in the correct order as found on the periodic table?
- Sc, V, Mn, Co, Zn    (b) Y, Zr, Nb, Mo, Pd, Ag
  - Ga, As, Ge, Se, Br    (d) B, C, N, O, F, Ne
  - La, Hf, Ta, Re, Ir, Pt
14. The alkanes have a generalized formula of C<sub>n</sub>H<sub>2n+2</sub>. The names of the following compounds are: C<sub>7</sub>H<sub>16</sub>, CH<sub>4</sub>, C<sub>3</sub>H<sub>8</sub>, C<sub>5</sub>H<sub>12</sub>, C<sub>6</sub>H<sub>14</sub>
- hexane, methane, trimethene, pentamethene, heptene
  - hexane, methane, propane, pentane, heptane
  - heptane, methane, propane, pentane, hexane

|         |          |          |        |          |
|---------|----------|----------|--------|----------|
| K 39.1  | Pt 195.1 | Cl 35.45 | N 14.0 | Fe 55.85 |
| C 12.00 | H 1.00   | O 16.00  |        |          |

**SHOW ALL WORK FOR THE FOLLOWING PROBLEMS**

15. Write the complete ionic and net ionic equations for the following reaction.



Complete Ionic:

Net Ionic Eqn:

16. Cisplatin, an anticancer agent used for the treatment of solid tumors, is prepared by the reaction of ammonia with potassium tetrachloroplatinate:



Assume that 10.0 g of  $\text{K}_2\text{PtCl}_4$  and 0.360 g of  $\text{NH}_3$  are allowed to react.

- (a) Which reactant is limiting?  
(b) How many grams of cisplatin are formed theoretically?  
(c) What is the %yield if 2.45 g of cisplatin are formed? **Show all work for credit.**

(a) \_\_\_\_\_

(b) \_\_\_\_\_

(c) \_\_\_\_\_

17. An element has four naturally occurring isotopes. Given the following information, determine the atomic weight and name of the element. The mass and percentage abundance of each isotope are as follows:

| % Abundance | Mass (amu) |
|-------------|------------|
| 1.48        | 203.973    |
| 23.6        | 205.9745   |
| 22.6        | 206.9759   |
| 52.3        | 207.9766   |

\_\_\_\_\_  
amu

\_\_\_\_\_  
element

## Key Equations

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$$\lambda = h/mv$$

$$v = c/\lambda$$

$$c = 3.00 \times 10^8 \text{ m/s}$$

$$h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$E = nh\nu$$

$$E = -R_H/n^2$$

$$\Delta E = |E_i - E_f|$$

$$\Phi = h\nu_0$$

$$\text{K.E.} = h\nu - \Phi$$

$$R_H = 2.18 \times 10^{-18} \text{ J}$$

$$\text{K.E.} = mv^2/2$$

$$m_e = 9.11 \times 10^{-31} \text{ kg}$$

$$m_p = 1.673 \times 10^{-27} \text{ kg}$$

$$m_n = 1.675 \times 10^{-27} \text{ kg}$$

$$J = \text{N}\cdot\text{m}$$

$$N = \text{m}\cdot\text{kg}\cdot\text{s}^{-2}$$

$$E_n = -(2.18 \times 10^{-18} \text{ J})Z^2(1/n^2)$$

$$Z_{\text{eff}} = Z - \sigma$$

$$N_0 = N_A = 6.02 \times 10^{23} \text{ units/mol}$$

$$d(\text{Hg}) = 13.6 \text{ g/mL}$$

$$d(\text{H}_2\text{O}) = 1.00 \text{ g/mL}$$

$$R = 0.0821 \text{ L}\cdot\text{atm/mol}\cdot\text{K}$$

$$R = 8.314 \text{ J/mol}\cdot\text{K}$$

$$1 \text{ atm} = 760 \text{ torr} = 760 \text{ mmHg}$$

$$1 \text{ Pa} = 1 \text{ kg}/(\text{m}\cdot\text{s}^2) = 1 \text{ N/m}^2$$

$$1 \text{ atm} = 1.10 \times 10^5 \text{ Pa}$$

$$g = 9.807 \text{ m/s}^2$$

$$1.00 \text{ L}\cdot\text{atm} = 101 \text{ J} = 0.101 \text{ kJ}$$

$$M = n/V$$

$$M_m = (dRT/P)$$

$$5280 \text{ ft} = 1 \text{ mile}$$

$$2.54 \text{ cm} = 1 \text{ inch}$$