Name: _____

Chem 111   10:10a section   Evening Exam #1 Makeup

This exam is composed of 20 questions, 6 of which require mathematics that might require a calculator. Go initially through the exam and answer the questions you can answer *quickly*. Then go back and try the ones that are more challenging to you and/or that require calculations.

As discussed on the course syllabus, honesty and integrity are absolute essentials for this class. In fairness to others, dishonest behavior will be dealt with to the full extent of University regulations.

$E = h\nu = \dfrac{hc}{\lambda}$ $1\ mL = 1\ cm^3$	**Some common ions:** PO_4^{3-} CN^- $CH_3CO_2^-$ NO_2^- NO_3^- CO_3^{2-} SO_3^{2-} SO_4^{2-}	$h = 6.626x10^{-34}\ J\ s$ $c = \dfrac{2.998x10^8\ m}{s}$ $N = \dfrac{6.022x10^{23}}{mol}$

1. What is the charge of ions formed from **O**?

    1) +1   2) +2   3) -1   4) -2   5) -3

    (4) -2   (OWL question)

2. What is the charge of ions formed from **Rb**?

    1) +1   2) +2   3) -1   4) -2   5) -3

    (1) +1   (OWL question)

3. The correct molecular formula for the molecule at right is:

    1) $C_3O_2NH_3$ 2) C_2ONH_8 3) $C_3O_2NH_8$ 4) C_3ONH_3

    (3)

4. Which of the following describes the compound **$Ba(NO_3)_2$**?

    1) If the compound dissolved in water it would not conduct electricity.
    2) The compound is ionic.
    3) If the compound dissolved in water it would be a non-electrolyte.
    4) The compound is molecular.
    5) Both (1) and (2)

    (2)   (OWL question)

5. An aqueous solution of **$K_2Cr_2O_7$** is:

    1) an element   4) a homogeneous mixture
    2) an ionic compound   5) a heterogeneous mixture
    3) a nonionic compound

    (4)   (OWL question)

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6. What is the formula of the ionic compound expected to form between the elements **Cl** and **K**?

   1) KCl   2) K_2Cl 3) K_2Cl_3 4) K_3Cl_2 5) KCl_2

   (1) KCl - K^+ + $2Cl^-$ (OWL question)

7. What is the formula of the compound formed between the ions **Co^{3+}** and **O^{2-}** ?

   1) CoO   2) Co_2O 3) Co_2O_3 4) Co_3O_2 5) CoO_2

   (3) Co_2O_3 - $2Co^{3+}$ + $3O^{2-}$ (OWL question)

8. What is the formula of the compound formed between the ions **Co^{3+}** and **CN^-**?

   1) CoCN   2) Co_2CN 3) $Co(CN)_3$ 4) $Co_3(CN)_2$ 5) $Co(CN)_2$

   (3) $Co(CN)_3$ - Co^{3+} + $3CN^-$ (OWL question)

9. Which of the following is *not* an ionic compound?

   1) $Ca(CH_3CO_2)_2$ 2) CO   3) CrO   4) NaCN   5) AgCl

   (2) CO   both C and O want to be negatively charged

10. What is the formula for the **hydrogen phosphate** ion ?

    1) H_3PO_4 2) $H_2PO_4^-$ 3) HPO_4^{2-} 4) H_3P^- 5) HP^{2-}

    (3) HPO_4^{2-} (OWL question)

11. What is the molar mass of **carbon dioxide**?

    1) 64 g/mol   2) 28 g/mol   3) 44 g/mol   4) 16 g/mol   5) 128 g/mol

    (3) CO_2 $1\left(12.011\,\dfrac{g}{mol}\right) + 2\left(15.9994\,\dfrac{g}{mol}\right) = 44.0\,\dfrac{g}{mol}$ (OWL question)

12. Which of the following is a valid empirical formula?

    1) Fe_4Cl_6 2) Fe_2Cl_2 3) $FeCl_2$ 4) Fe_6Cl_4 5) Fe_4Cl_2

    (3)

13. A sample of cinnamaldehyde, **C_9H_8O**, contains 0.153 mol of the compound. What is the mass of this sample, in grams?

　　1) 3.02 g　　　　2) 13.7 g　　　　3) 27.4 g　　　　4) 0.0730 g　　　　5) 20.2 g

First we need the molar mass of C_9H_8O:

$9(\text{molar mass of C}) + 8(\text{molar mass of H}) + 1(\text{molar mass of O}) =$

$9\left(12.011\frac{g}{mol}\right) + 8\left(1.0079\frac{g}{mol}\right) + 1\left(15.9994\frac{g}{mol}\right) = 132.16\frac{g}{mol}$

Use that to calculate the mass:

(5) $(0.153 mol)\left(\frac{132.16g}{mol}\right) = 20.2g$　　　　　(OWL question)

14. What is the (mass) percent composition of **H** in **C_9H_8O**?

　　1) 6.87%　　　　2) 50%　　　　3) 61.2%　　　　4) 81.8%　　　　5) 30.6%

Mass of C in 1 mol of the compound: $(9mol)(1.008g/mol) = 9.07g$

Mass of 1 mol of the compound:

$(1mol)\left[9\left(12.011\frac{g}{mol}\right) + 8\left(1.0079\frac{g}{mol}\right) + 1\left(15.9994\frac{g}{mol}\right)\right] = 132.16g$

(1) Percent composition: $\frac{9.07g\ C}{132g\ C_9H_8O}100\% = 6.87\%$　　　　(OWL question)

15. Ethylene glycol, $C_2H_6O_2$, is an ingredient in automobile antifreeze. Its density is 1.11 g/cm^3 at 20°C. If you need exactly 450 mL of ethylene glycol, what mass of the compound, in grams, is required?

　　1) 555 g　　　　2) 500 g　　　　3) 1.80 g　　　　4) 62.0 g　　　　5) 68.6 g

(2) $450mL\left(\frac{1cm^3}{1mL}\right)\left(\frac{1.11g}{cm^3}\right) = 500g$　　　　(book question)

16. You've decided you don't like Chemistry after all and have decided to travel Europe instead. You're driving a rental car through France and see petrol selling at 0.81 euros per liter.

| 0.88 euro = 1.0 US dollar |
| 4.546 liters = 1 gallon |

How much does petrol cost in U.S. dollars per gallon?

1) $2.77/gal 2) $0.81/gal 3) $4.20/gal 4) $3.15/gal 5) $4.72/gal

(3) $$\left(\frac{0.81\,euro}{Liter}\right)\left(\frac{1.0\$}{0.88\,euro}\right)\left(\frac{4.546\,L}{gallon}\right) = \$4.20\Big/gallon$$

17. Which radiation below has the shortest wavelength (don't use your calculator!)?

1) blue light (6.8×10^{14} Hz)   4) microwaves (2.4×10^{9} Hz)
2) green light (6.0×10^{14} Hz)   5) x-rays (5.0×10^{12} Hz)
3) red light (4.5×10^{14} Hz)

(1) It has the highest frequency.   Remember that $\lambda = c\big/\nu$

18. Which radiation below has the lowest energy (don't use your calculator!)?

1) blue light (6.8×10^{14} Hz)   4) gamma rays (8.0×10^{21} Hz)
2) green light (6.0×10^{14} Hz)   5) x-rays (5.0×10^{18} Hz)
3) red light (4.5×10^{14} Hz)

(3) It has the lowest frequency.   Remember that $E = h\nu$

19. What is the wavelength of visible light with frequency 5.00×10^{14} Hz?

1) 600 nm 2) 300 nm 3) 500 nm 4) 162 nm 5) 280 nm

(1) $$\lambda = \left(\frac{2.9998 \times 10^{8}\,m}{s}\right)\left(\frac{1}{5.00 \times 10^{14}\,Hz}\right)\left(\frac{Hz}{1}\frac{s}{1}\right) = 6.00 \times 10^{-7}\,m$$

$$= 6.00 \times 10^{-7}\,m\left(\frac{10^{9}\,nm}{m}\right) = 600\,nm$$

(OWL question)

20. What is the catalog number for this class?

1) 241   2) 111   3) 222   4) 3.14159 5) 68.6 g

(2)