Chem 111 10:10a section Evening Exam #1

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.

$E = hv = \frac{hc}{\lambda}$	Some common ions: PO_4^{3-} CN ⁻ CH ₃ CO ₂ ⁻	$h = 6.626 x 10^{-34} J s$ $c = \frac{2.998 x 10^8 m}{10^8 m}$
$1 \text{ mL} = 1 \text{ cm}^3$	NO_2^{-} NO_3^{-} CO_3^{2-} SO_3^{2-} SO_4^{2-}	$N = \frac{6.022 \times 10^{23}}{mol}$

- What is the charge of ions formed from F?
 1) +1
 2) +2
 3) -1
 4) -2
 - (3) -1 (OWL question)

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

- 1) +1 2) +2 3) -1 4) -2 5) -3 (2) +2 (OWL question)
- 3. The correct molecular formula for the molecule at right is:
 1) C₃O₂NH₈
 2) C₂ONH₈
 3) C₃O₂NH₃
 4) C₃ONH₃
 (1)



5) -3

- 4. Which of the following describes the compound $Ba(NO_3)_2$?
 - 1) If the compound dissolved in water it would be a strong electrolyte.
 - 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)
 - (5) (OWL question)

Name: _

- 5. $K_2Cr_2O_7$ is:
 - 1) an element
 - 2) an ionic compound
 - 3) a nonionic compound

(2) (OWL question)

4) a homogeneous mixture

- 5) a heterogeneous mixture
- 6. What is the formula of the ionic compound expected to form between the elements **Cl** and **Mg**?

1) MgCl 2) Mg₂Cl 3) Mg₂Cl₃ 4) Mg₃Cl₂ 5) MgCl₂ (5) MgCl₂ - Mg²⁺ + 2Cl⁻ (OWL question)

- 7. What is the formula of the compound formed between the ions Co^{3+} and O^{2-} ?
 - 1) CoO 2) Co₂O 3) Co₂O₃ 4) Co₃O₂ 5) CoO₂ (3) Co₂O₃ - 2Co³⁺ + 3O²⁻ (OWL question)
- 8. What is the formula of the compound formed between the ions Co^{2+} and CN^{-} ?
 - 1) CoCN 2) Co₂CN 3) Co₂(CN)₃ 4) Co₃(CN)₂ 5) Co(CN)₂ (5) Co(CN)₂ - Co²⁺ + 2CN⁻ (OWL question)
- 9. Which of the following is *not* an ionic compound?

1) $Ca(CH_3CO_2)_2$ 2) NaCN 3) CrO 4) NO₂ 5) AgCl

(4) NO₂ both N and O want to be negatively charged

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

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

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

(1) **SO**₂
$$1\left(32.07\frac{g}{mol}\right) + 2\left(15.9994\frac{g}{mol}\right) = 64.1\frac{g}{mol}$$
 (OWL question)

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

1)
$$\text{FeCl}_2$$
 2) Fe_2Cl_2 3) Fe_4Cl_6 4) Fe_6Cl_4 5) Fe_4Cl_2
(1)

13. A sample of cinnamaldehyde, C₉H₈O, contains 0.104 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) 132 gFirst we need the molar mass of C₉H₈O:

9(molar mass of C) + 8(molar mass of H) + 1(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:

- (2) $(0.104 mol) \left(\frac{132.16g}{mol} \right) = 13.7g$ (OWL question)
- 14. What is the (mass) percent composition of C in C_9H_8O ?

1) 9% 2) 50% 3) 61.2% 4) 81.8% 5) 30.6% Mass of C in 1 mol of the compound: (9mol)(12.01g/mol) = 108gMass of 1 mol of the compound:

$$(1mol) \left[9 \left(12.011 \frac{g}{mol} \right) + 8 \left(1.0079 \frac{g}{mol} \right) + 1 \left(15.9994 \frac{g}{mol} \right) \right] = 132.16g$$
(4) Percent composition: $\frac{108g C}{132g C_9 H_8 O} 100\% = 81.8\%$ (owl

question)

- 15. Ethylene glycol, C₂H₆O₂, is an ingredient in automobile antifreeze. Its density is 1.11 g/cm³ at 20°C. If you need exactly 500 mL of ethylene glycol, what mass of the compound, in grams, is required?
 - 1) 555 g 2) 450 g 3) 1.80 g 4) 62.0 g 5) 68.6 g (1) $500mL\left(\frac{1cm^3}{1mL}\right)\left(\frac{1.11g}{cm^3}\right) = 555g$ (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 0.61 euros per liter.

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

1) \$2.77/gal 2) \$0.69/gal 3) \$2.44/gal 4) \$3.15/gal 5) \$4.72/gal
(4)
$$\left(\frac{0.61euro}{Liter}\right)\left(\frac{1.0\$}{0.88euro}\right)\left(\frac{4.546L}{gallon}\right) = \frac{3.15}{gallon}$$

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

blue light (6.8x10¹⁴ Hz)
 green light (6.0x10¹⁴ Hz)

4) microwaves (2.4x10⁹ Hz)
5) x-rays (5.0x10¹² Hz)

3) red light $(4.5 \times 10^{14} \text{ Hz})$

5) x-rays $(5.0 \times 10^{12} \text{ Hz})$

(4) It has the lowest frequency. Remember that $\lambda = c/v$

- 18. Which radiation below has the lowest energy (don't use your calculator!)?
 - 1) blue light (6.8x10¹⁴ Hz)
 4) microwaves (2.4x10⁹ Hz)

 2) green light (6.0x10¹⁴ Hz)
 5) x-rays (5.0x10¹² Hz)

 3) red light (4.5x10¹⁴ Hz)
 5) x-rays (5.0x10¹² Hz)

(4) It has the lowest frequency. Remember that E = hv

19. What is the wavelength of visible light with frequency 6.00×10^{14} Hz?

1) 614 nm 2) 300 nm 3) 500 nm 4) 162 nm 5) 280 nm

$$\lambda = \left(\frac{2.9998 \times 10^8 m}{s}\right) \left(\frac{1}{6.00 \times 10^{14} Hz}\right) \left(\frac{Hz}{1} \frac{s}{1}\right) = 5.00 \times 10^{-7} m$$
(3)

$$= 5.00 \times 10^{-7} m \left(\frac{10^9 nm}{m}\right) = 500 nm$$
(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)