First Exam will be this Friday Sept 28 in ESS 001
It will cover through Chapter 5 plus Organic
You can bring and use one 5 x 8 inch card of notes.
Use class notes, lecture problems and workshop problems as your study guide.
After the exam we will start Chapter 12 (quantum)

1. Name this molecule

2. Draw (Z)-4-ethyl-3,4-dimethyloct-2-ene

How many alkenes of formula $C_7H_{14}$?

A 1-10
B 11-15
C 16-20
D 21-25
E 26-30
F 31-35
G more than 35

How many are chiral?
Name these salts.
Na$_2$HPO$_4$
K$_2$PO$_3$
LiClO$_4$
KO$_2$

What are the oxidation states

\[
\begin{align*}
\text{Cr}_2\text{O}_7^{2-}(aq) + \text{HNO}_2(aq) &\rightarrow \text{Cr}^{3+}(aq) + \text{NO}_3^{-}(aq) \\
\text{Cr}_2\text{O}_7^{2-}(aq) &\rightarrow \text{Cr}^{3+}(aq) \\
\text{Cr}_2\text{O}_7^{2-}(aq) &\rightarrow 2\text{Cr}^{3+}(aq) \\
\text{Cr}_2\text{O}_7^{2-}(aq) &\rightarrow 2\text{Cr}^{3+}(aq) + 7 \text{H}_2\text{O}(l) \\
14\text{H}^{+}(aq) + \text{Cr}_2\text{O}_7^{2-}(aq) &\rightarrow 2\text{Cr}^{3+}(aq) + 7 \text{H}_2\text{O}(l) \\
14\text{H}^{+}(aq) + \text{Cr}_2\text{O}_7^{2-}(aq) + 6\text{e}^{-} &\rightarrow 2\text{Cr}^{3+}(aq) + 7 \text{H}_2\text{O}(l)
\end{align*}
\]

A student had an unknown organic compound containing the elements C, H, and Cl. A 0.100 gram sample was subjected to combustion analysis. The CO$_2$ collected had a mass of 0.235 gram and the H$_2$O collected had a mass of 0.0403 grams. What is the empirical formula?

\[
\begin{align*}
\text{Cl} &\text{ 35.45 g/mol} \\
0.235 \text{ g CO}_2 \times 12 \text{ g C} / 44 \text{ g CO}_2 = 0.064 \text{ g C} \\
0.0403 \text{ g H}_2\text{O} \times 2 \text{ g H} / 18 \text{ g H}_2\text{O} = 0.0045 \text{ g H} \\
0.100 \text{ total} - 0.064 \text{ g C} - 0.0045 \text{ g H} = 0.031 \text{ g Cl} \\
0.064 \text{ g C} \times 1 \text{ mol C/12g C} = 0.0053 \text{ mol C} \\
0.0045 \text{ g C} \times 1 \text{ mol H/1g C} = 0.0045 \text{ mol H} \\
0.031 \text{ g Cl} \times 1 \text{ mol Cl/35.4g Cl} = 0.00088 \text{ mol Cl} \\
0.0053/0.00088 = 6.0 \quad 0.0045/0.00088 = 5.1
\end{align*}
\]

\[C_6\text{H}_5\text{Cl}\]

Suppose you had a mixture of NaCl and CsCl. You dissolved 0.520 grams of the mixture in H$_2$O and added an excess of AgNO$_3$ solution. The amount of precipitated AgCl was 0.984 g. What is the mass percentage of NaCl in the mixture?

\[\begin{align*}
\text{NaCl} &\text{ 58.44} \\
\text{CsCl} &\text{ 168.9} \\
\text{AgCl} &\text{ 143.4} \\
\text{Y g of NaCl} &\text{ 0.520 - Y g of CsCl} \\
\text{NaCl} \times 143.3/169.9 + (0.520 - Y) \times 143.3/169.9 &= 0.984 \\
2.45Y + 0.843(0.520 - Y) &= 0.984 \\
1.61Y &= 0.546 \\
Y &= 0.339 \text{ g} &\text{Y} &= 100\% \times 0.339 \text{ g} / 0.520 = 65.2\%
\end{align*}\]
A gas of unknown molecular mass was allowed to effuse through a small opening under constant pressure conditions. It required 42 s for 1.0 L of the gas to effuse. Under identical experimental conditions it required 23 s for 1.0 L of O₂ gas to effuse. Calculate the molar mass of the unknown gas.

Consider 1 mole of chlorine gas in a 1 liter container at 25° C?

What is the calculated pressure assuming it is an ideal gas?

What is the calculated pressure according to the van der Waals equation?

\[
P = \frac{nRT}{V} = \frac{1 \text{mole} \times 0.082 \text{ L atm K}^{-1}\text{mol}^{-1} \times 298\text{K}}{1\text{L}}
\]

\[
P = 24.4 \text{ atm}
\]

\[
P = \frac{nRT}{(1L - 1\text{mol} \times 0.056 \text{ L/mol})}
\]

\[
- 6.49 \text{ atm L}^2/\text{atm}^2 (1\text{mol}^2/1\text{L}^2) = 19.3 \text{ atm}
\]