CHEM 4 – *Review session for Exam #2*

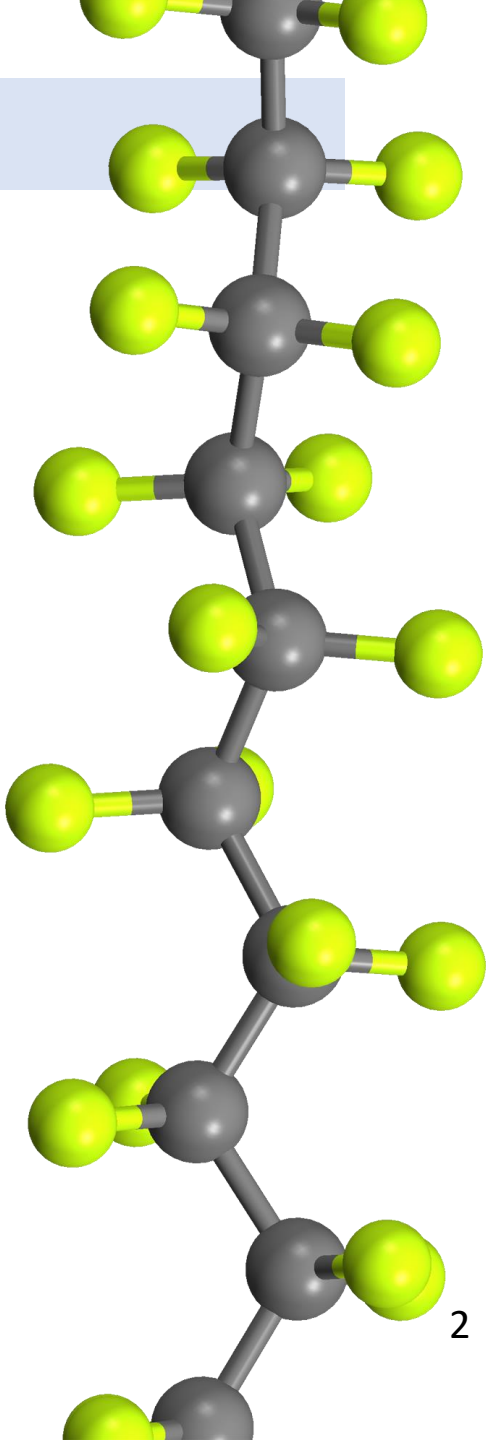
Covers various homework problems

Exam #2: Information

- **Exam #2 is Monday, Nov 2.**
  - During normal class period. Go to Canvas to take the exam.
  - Timed: 50 minutes
  - 20 multiple choice questions; worth 5 pts each.
  - Both questions and answers will be randomized for each student.

  - Can use class handouts, textbook, lecture notes, PowerPoint slides.
  - Get all your materials (such as handouts, calculator and paper/pencil) ready before you start the exam.

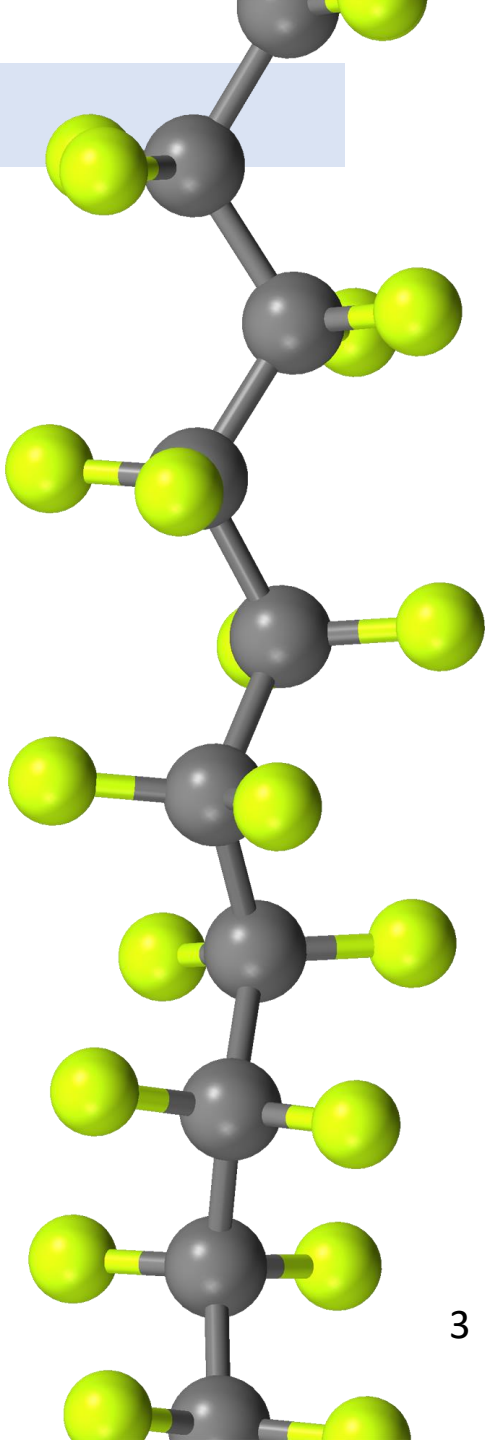
  - Even though it is open book, you will not have enough time to look up every single thing, so you must study and be fully prepared going into the exam.



Exam #2: Resources

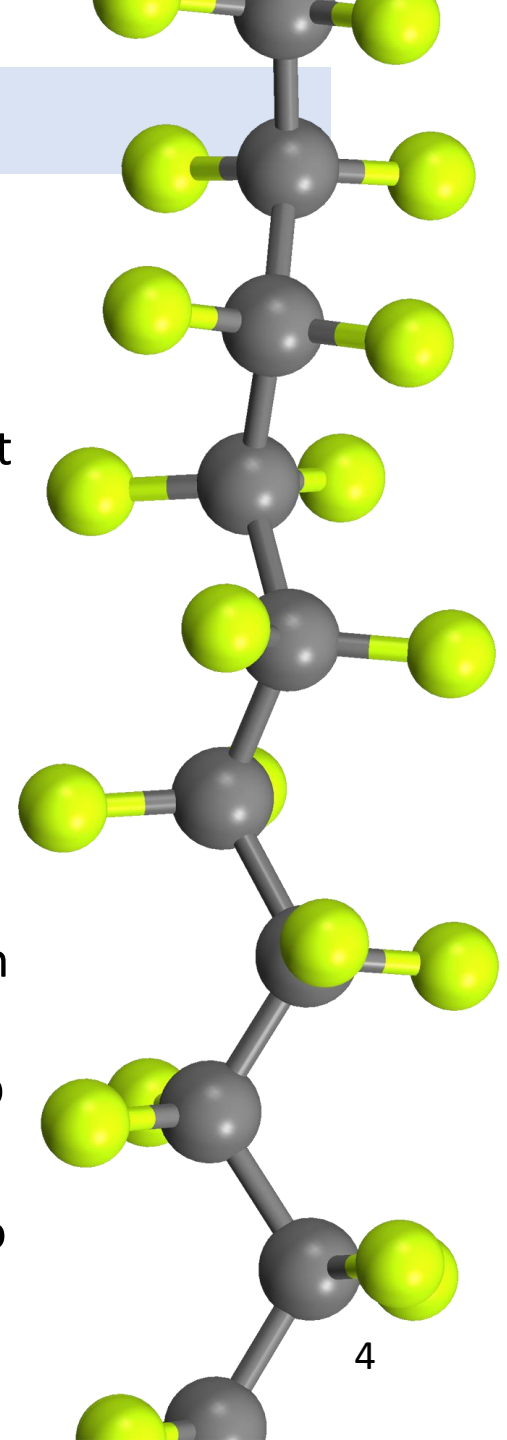
October calendar: tinyurl.com/SacStateChem4

- ✓ Learning Outcomes for Exam #2.
- ✓ PowerPoint slides and recordings of lecture.
- ✓ Practice exams, 4 versions: A, B, C, and D. [NOTE: they are not on Canvas]
  - ✓ Time yourself; take it like a real exam.
  - ✓ Make a list of the type of questions you are getting wrong and focus your study on those topics.
  - ✓ For extra practice on those topics, review: Video recording of lecture, PowerPoint slides, e-text, optional homework problems, PAL worksheets.
- ✓ Finish up any late homework for credit.



Academic dishonesty:

- ✓ Cannot use any online resources that are not explicitly associated with class.
- ✓ Students posting to sites like Chegg or Bartleby are cheating.
- ✓ **Remember:** Everyone get's hurt by cheating:
  - ✓ Cheaters are stealing the hard work of others by taking a grade that they haven't earned.
  - ✓ Cheaters hurt themselves because they won't be prepared for our next exam or for CHEM 1A/1E, not to mention the MCAT, EIT, DAT, PCAT.
  - ✓ Cheaters risk getting caught and being brought up on disciplinary charges.
  - ✓ SacState's reputation is hurt when employers realize our grads don't know anything!
- ✓ **Bottom line:** There is no reason to cheat in this class. You are smart enough to earn a good grade. So, do your studying and be proud of the grade that you earn. If you end up earning a grade that you are not happy with, then do *Commit to Study*, drop the exam grade and make changes so you do better on the next exam.
- ✓ **My promise to you:** There will be no surprises and no trick questions. I just want to see if you have been learning the material that we've covered.



Question 1

How much ice is required to cool a 14.0 oz drink from 71 °F to 34 °F if the heat capacity of the drink is 4.18 J/g°C? (Assume that the heat transfer is 100 % efficient.)

Express your answer using two significant figures.

When ice melts, it absorbs 0.33 kJ per gram.

$14.0\ \text{oz} \left(\frac{453.6\ \text{g}}{16\ \text{oz}}\right) = \_\_\_\ \text{g}$

$(°C - °C) = 20.556\ °C$

$q = m \cdot C \cdot \Delta T = 34{,}102.53\ \text{J} = 34.1\ \text{kJ}$

how much heat we need to remove from soda (using the ice)

$(34.1\ \text{kJ})\left(\frac{1\ \text{g ice}}{0.33\ \text{kJ}}\right) = 103\ \text{g}$

$= 1.0 \times 10^2\ \text{g}$

Question 2

A cook wants to heat 1.00 kg of water from 31.0 °C to 100.0 °C.

Review | Constants | Periodic Tabl

Part A

If he uses the combustion of natural gas (which is exothermic) to heat the water, how much natural gas will he need to burn? Natural gas produces 49.3 kJ of heat per gram. (For the sake of simplicity, assume that the transfer of heat is 100 % efficient.)

$m =$ 5.86 g

$q = ?$

$C = 4.184 \ \frac{J}{g \cdot °C}$

$m = 10^3 \ g$

$\Delta T = 100.0°C - 31.0°C = 69.0°C$

$q = m \cdot C \cdot \Delta T$

$= (10^3 \ g)(4.184 \ \frac{J}{g \cdot °C})(69.0°C)$

$= 288,696 \ J = 288.696 \ kJ$

$288.696 \ kJ \left(\frac{1 \ g}{49.3 \ kJ} \right) = 5.86 \ g$

Question 3

How much heat in joules is required to heat a 44 g sample of aluminum from 72 °F to 145 °F? (The specific heat capacity of aluminum is 0.903 J/(g · °C).)

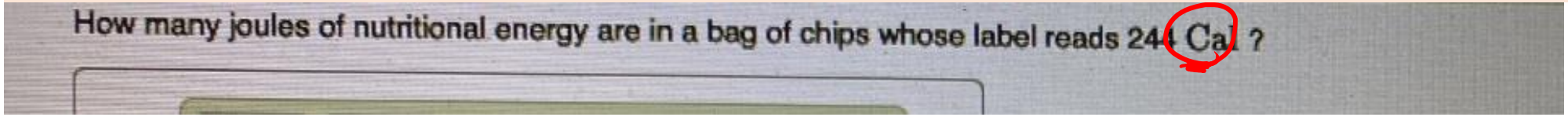
Express your answer using two significant figures.

$$°C = \frac{°F - 32}{1.8} = 22.22\overline{2}\ °C \qquad = 62.77\overline{7}\ °C$$

$$q = m \cdot c \cdot (T_F - T_i)$$

$$= 1611.35\ J \qquad = 1.6 \times 10^3\ J$$

Questions 4



Cal → cal → J

$$(244\ \text{Cal})\left(\frac{1000\ \text{cal}}{1\ \text{Cal}}\right)\left(\frac{4.184\ \text{J}}{1\ \text{cal}}\right) = 1{,}020{,}896\ \text{J}$$

$$= 1.02 \times 10^{6}\ \text{J}$$

Questions 5

The density of platinum is 21.4 $\mathrm{g/cm^3}$.

What is its density in pounds per cubic inch?

$\rho =$ 0.773 $\mathrm{lb/in^3}$

$(1\ \mathrm{in})^3 = (2.54\ \mathrm{cm})^3$

$$\left(\frac{21.4\ \mathrm{g}}{1\ \mathrm{cm^3}}\right)\left(\frac{1\ \mathrm{lb}}{453.6\ \mathrm{g}}\right)\left(\frac{2.54\ \mathrm{cm^3}}{1\ \mathrm{in^3}}\right) = 0.773\ \frac{\mathrm{lb}}{\mathrm{in^3}}$$

$$\left(\frac{16.\overline{0}\ \mathrm{cm^3}}{1\ \mathrm{in^3}}\right)$$

Questions 6

A backpacker carries 2.3 L of white gas as fuel for her stove.

How many pounds does the fuel add to her load? Assume the density of white gas to be 0.79 $\mathrm{g/cm^3}$.

Express your answer using two significant figures.

$m_{\mathrm{gas}} = 4.0\ \mathrm{lb}$

L → cm^3 → g → lbs

vol → mass

$$(2.3\,\mathrm{L})\left(\frac{1000\,\mathrm{cm^3}}{1\,\mathrm{L}}\right)\left(\frac{0.79\,\mathrm{g}}{1\,\mathrm{cm^3}}\right)\left(\frac{1\,\mathrm{lb}}{453.6\,\mathrm{g}}\right) = 4.0\ \mathrm{lb}$$

Question 7

Calculate the final temperature of 30. mL of ethanol initially at 18 °C upon absorption of 536 J of heat. (density of ethanol =0.789 g/mL)

Express your answer using two significant figures.

T_f = 27 °C

$30.\,\text{mL}\left(\frac{0.789\,\text{g}}{1\,\text{mL}}\right) = 23.67\,\text{g}$

$q = m \cdot C \cdot \Delta T = m \cdot C \cdot (T_f - T_i)$

$536\,\text{J} = (23.67\,\text{g})\left(2.42\,\frac{\text{J}}{\text{g}\cdot^\circ\text{C}}\right)(T_f - 18^\circ\text{C})$

$9.357^\circ\text{C} = T_f - 18^\circ\text{C}$

$T_f = 27^\circ\text{C}$