CHEM 4, Review session for Exam #2

**Questions taken from practice exams**

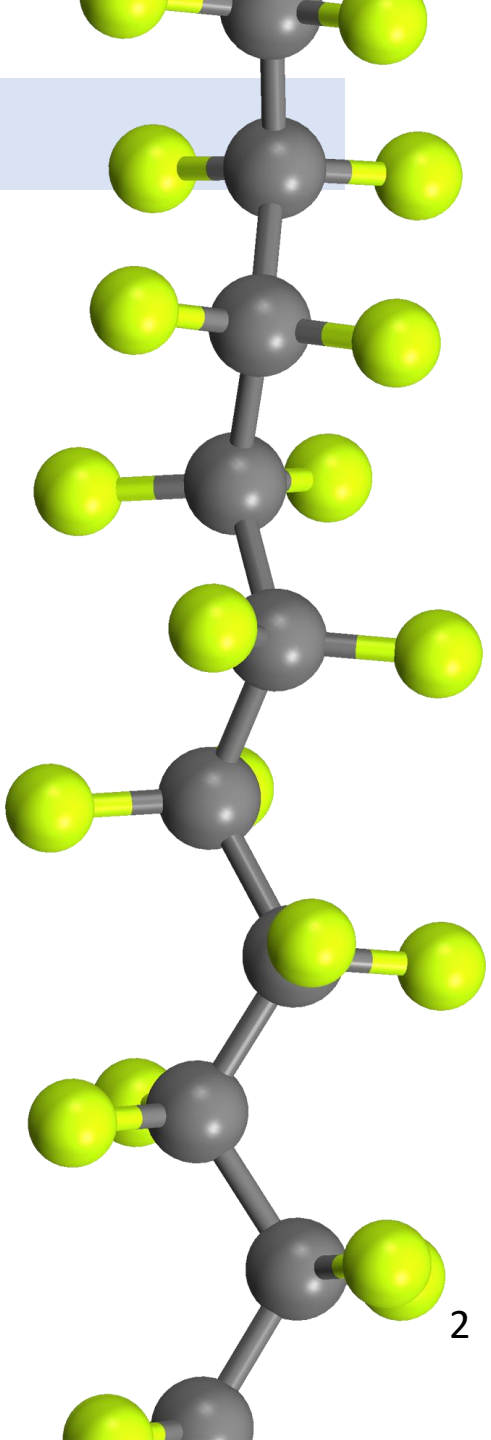
Version A: #7, 12, 15, 16, 17, 18, and 20

Version C: #17

# Exam #2: Information

- **Exam #2 is Monday, November 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.

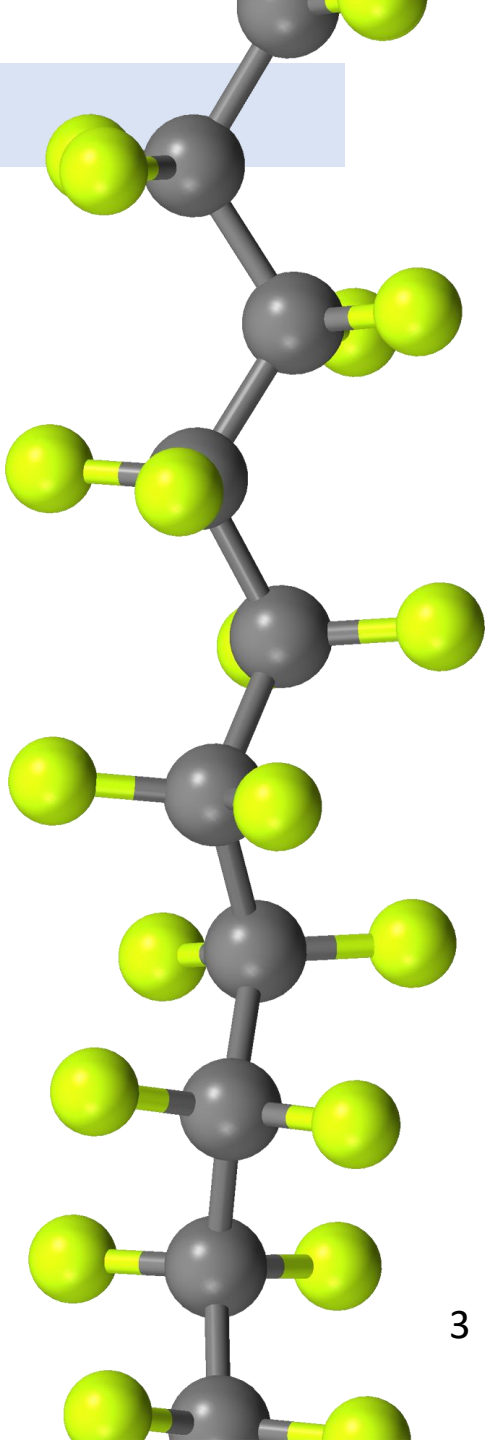
  - Can use class handouts, textbook, lecture notes, PowerPoint slides.
  - Get all your materials (such as handouts, calculator and paper/pencil) ready before you start the exam.
  - Even though it is open book, you will not have enough time to look up every single thing, so you must study and be fully prepared going into the exam.



# Exam #2: Resources

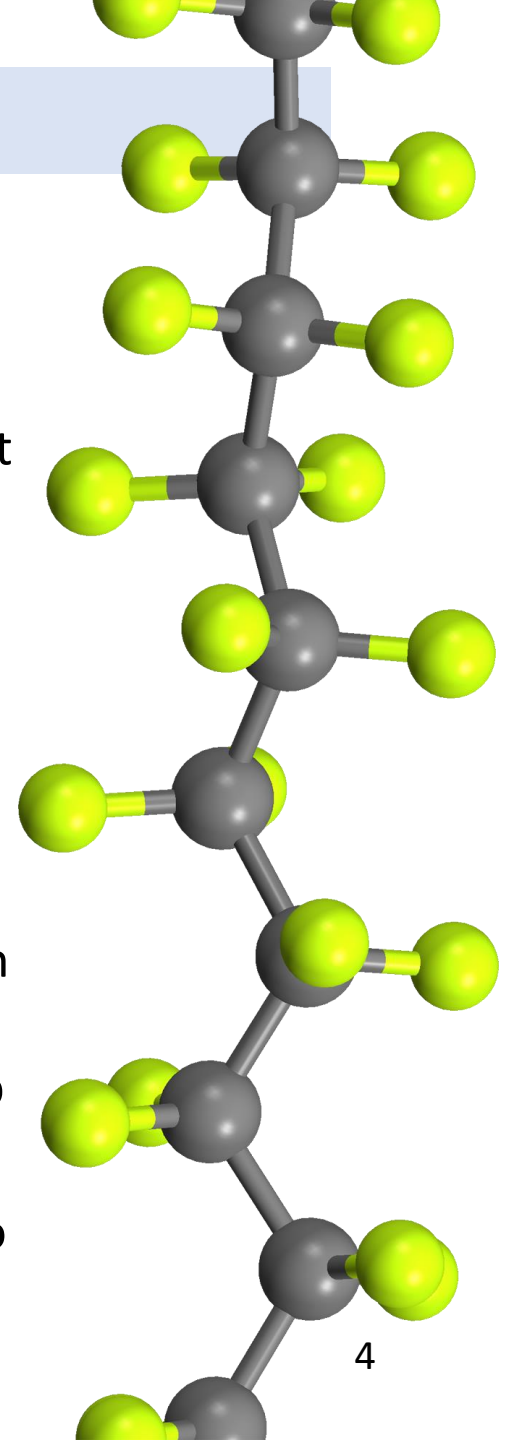
**October calendar:** tinyurl.com/SacStateChem4

- ✓ 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.



# Questions?

**Practice exam #2, version A, problem 7:** Which of the following perfect cubes has the highest density? A cube having...

A) mass of 1 g and measuring 1 cm on each side

B) mass of 0.01 g and measuring 0.1 cm on each side

C) mass of 1000 g and measuring 10 cm on each side → 1 g/cm³

D) mass of 100 g and measuring 10 cm on each side → 0.1 g/cm³

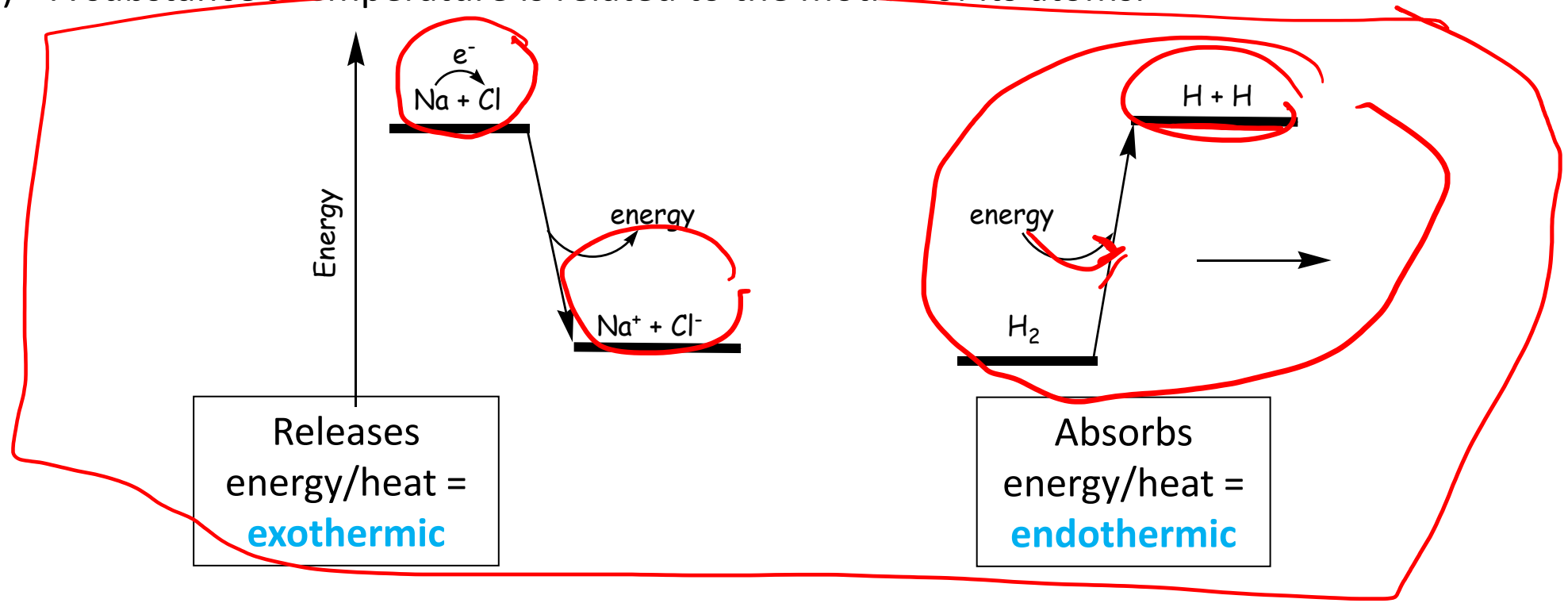
A) $d = \frac{m}{V} = \frac{1\,g}{(1\,cm)(1\,cm)(1\,cm)} = 1\,g/cm^3$

B) $\frac{0.01\,g}{(0.1\,cm)^3} = 10\,\frac{g}{cm^3}$

# Questions?

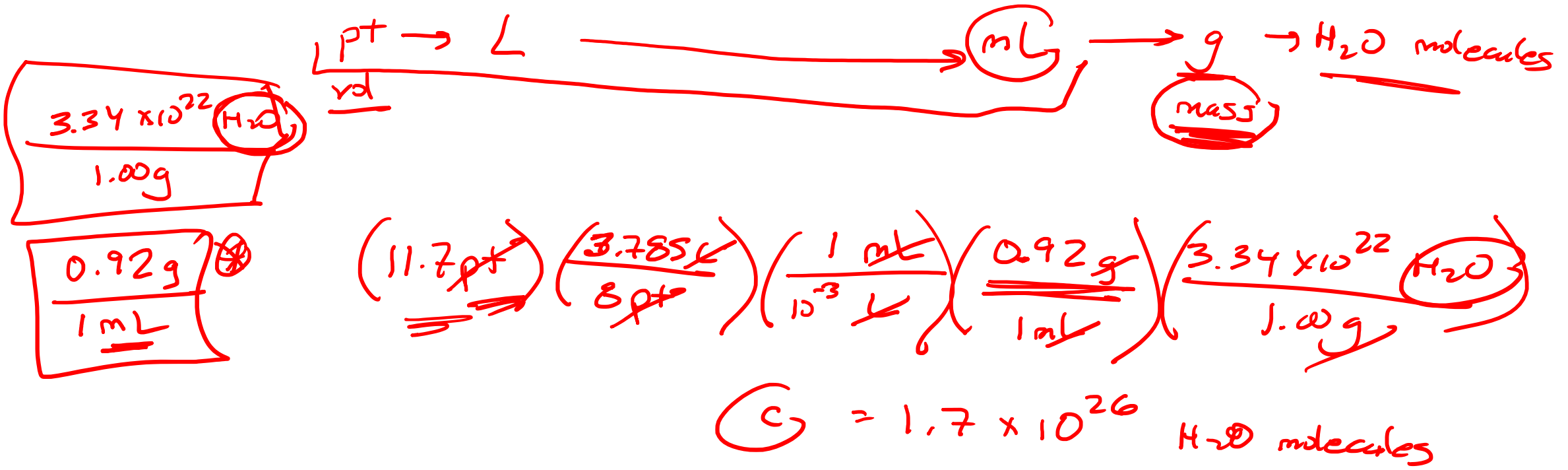
**Practice exam #2, version A, problem 12:** Which of the following statements is false?

A) The products of a chemical reaction are always lower in energy than the reactants.
B) Absolute zero (defined as 0 K) is the coldest possible temperature.
C) Melting ice is an endothermic process.
D) A temperature change of one Kelvin is the same as one degree Celsius.
E) The joule (J) is the SI unit of energy.
F) An exothermic chemical reaction releases energy.
G) A substance's temperature is related to the motion of its atoms.



# Questions?

**Practice exam #2, version A, problem 15:** A 1.00 g sample of pure ice contains approximately 3.34 x $10^{22}$ water molecules. How many water molecules are in a block of ice with a volume of 11.7 pt?




**Similar to Clicker question #1 on Wed, 10/21:** How many water molecules are there in an ice cube with a volume of 27.0 $in^3$? Pure ice contains 3.342 x $10^{22}$ water molecules per gram of ice; density of ice = 0.92 $g/cm^3$ .

# Questions?

**Practice exam #2, version A, problem 16:** It takes 180. J to increase the temperature of 0.0331 lb of an unknown substance from 55.0°F to 124.0°F. What is C (in J/g·°C) of the unknown substance?

$C = \frac{q}{m \cdot \Delta T}$

$m \cdot (T_F - T_i)$

$\Delta T\,°C \neq \Delta T\,°F$

$°C = \frac{°F - 32}{1.8}$

$(0.0331\,\text{lb})\left(\frac{453.6\,g}{1\,\text{lb}}\right) = 15.014\,g$

$°C \rightarrow 12.778\,°C$

$°C \rightarrow 51.111\,°C$

$C = \frac{q}{m \cdot (T_F - T_i)} = \frac{180.\,J}{(15.014\,g)(51.111\,°C - 12.778\,°C)}$

$C = 0.31275\,\frac{J}{g \cdot °C}$

# Questions?

**Practice exam #2, version A, problem 17:** A backpacker wants to carry enough propane to heat 2.00 L of water from 25.0°C to its boiling point. If each gram of propane can generate 29.5 kJ of heat, what volume of propane (in mL) should the backpacker take with her camping?

$C_{H_2O} = 4.18 \frac{J}{g \cdot °C}$ 100.0°C $(2.00 \text{ L})\left(\frac{1 \text{ mL}}{10^{-3} \text{ L}}\right)\left(\frac{1.00 \text{ g}}{1 \text{ mL}}\right) = 2000 \text{ g } H_2O$

$q = m \cdot C \cdot (T_f - T_i) = (2000 \text{ g})\left(4.18 \frac{J}{g \cdot °C}\right)(100.0°C - 25.0°C)$

$= 627{,}000 \text{ J}\left(\frac{1 \text{ kJ}}{10^3 \text{ J}}\right) = 627 \text{ kJ}$

amount of heat needed to boil 2.00 L of $H_2O$

$(627 \text{ kJ})\left(\frac{1 \text{ g}}{29.5 \text{ kJ}}\right)\left(\frac{1 \text{ mL}}{0.79 \text{ g}}\right) = 26.9 \text{ mL}$

density of propane

**Similar Clicker question #5 on Fri, 10/23:** You and some friends are planning a camping trip. One night you plan to make pasta and will be heating 2.0 kg of water from 25°C to its boiling point. If the fuel you are bringing gives off 35 kJ of heat per gram when it is burned, how many grams of fuel should you bring with you?

# Questions?

**Practice exam #2, version A, problem 18:** A 30.0 g sample of copper is heated and dropped into 150.0 g of water. If the water started at 35.0°C and ended up at 41.4°C after adding the copper, what was the starting temperature of the copper? Report your final answer with 3 sig figs.

$$q_{Cu} = -q_{H_2O}$$

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

$$m_{Cu} \cdot C_{Cu} \cdot (T_{f,Cu} - T_{i,Cu}) = -m_{H_2O} \cdot C_{H_2O} \cdot (T_{f,H_2O} - T_{i,H_2O})$$

$$(30.0\,g)\left(0.385\,\frac{J}{g \cdot °C}\right)(41.4°C - T_i) = -(150.0\,g)\left(4.18\,\frac{J}{g \cdot °C}\right)(41.4°C - 35.0°C)$$

$$= -4{,}012.8\,J$$

$$41.4°C - T_i = -347.43°C$$

$$+T_i = +388.83°C \quad (3)$$

# Questions?

**Practice exam #2, version A, problem 20:** A hybrid automobile gets 58 mpg. What is the car's gas mileage in km/mL?

$$\left(\frac{58 \text{ miles}}{1 \text{ gal}}\right)\left(\frac{1.609 \text{ km}}{1 \text{ mile}}\right)\left(\frac{1 \text{ gal}}{3.785 \text{ L}}\right)\left(\frac{10^{-3} \text{ L}}{1 \text{ mL}}\right) = 0.02467 \frac{\text{km}}{\text{mL}}$$

(D)

# Questions?

**Practice exam #2, version C, problem 17:** Brass is an alloy made from mixing copper and zinc. Assuming the density of brass varies linearly with the % of copper present, calculate the mass (in g) of a sample of brass that is 58.0% copper and has a volume of 0.336 $in^3$.

$$\text{density Brass} = \left(\text{fract}_{Cu}\right)\left(\text{density}_{Cu}\right) + \left(\text{Fract}_{Zn}\right)\left(\text{density}_{Zn}\right)$$

$$= (0.580)\left(8.92\ \frac{g}{cm^3}\right) + (0.420)\left(7.14\ \frac{g}{cm^3}\right)$$

$$= 8.1724\ \frac{g}{cm^3}$$

$in^3 \rightarrow cm^3 \rightarrow g$

$$(0.336\ in^3)\left(\frac{2.54\ cm}{1\ in}\right)^3\left(\frac{8.1724\ g}{1\ cm^3}\right) = 44.9497\ g$$

D