Chem 4 -- Fall '08 Exam #2 Review -- KEY

You had better try these before looking at this key. You won't have a key for the exam, so you shouldn't rely on one here.

Before going to far, here are some more sig. fig. practice problems. DO THEM, you need the practice.

1) $\frac{-2.379\times10^{-5}}{6.23} = -3.81862\times10^{-6}$ 6.23 = 3 s.f., -2.379x10^{-5} = 4 s.f., so the answer has 3 s.f. → **-3.82x10^{-6}**

2)

$$\begin{array}{r} 72.368000 \\ -\ 432.80 \\ \hline -360.432000 \end{array} = \textbf{-360.43}$$

3) $\frac{9.81301\times0.00238}{2300} = 1.0154332\times10^{-5}$ 9.81301 = 6 s.f., 0.00238 = 3 s.f., 2300 = 2 s.f., answer = 2 s.f. → **1.0x10^{-5}**

4)

$$\begin{array}{r} 1.2863 \\ +\ 0.002493 \\ -\ 0.9248 \\ \hline 0.363993 \end{array} \rightarrow \textbf{0.3640}$$

5)

$$\begin{array}{r} 61.23 \\ -\ 0.000046 \\ \hline 61.229954 \end{array} \rightarrow \textbf{61.23}$$

6) 61.23 x 0.000046 = 0.00281658 61.23 = 4 s.f., 0.000046 = 2 s.f., so answer = 2 s.f. → **0.0028**

7)

$$51.16\,g\ \textbf{NaCl} \times \frac{1\,mol\ \textbf{NaCl}}{58.443\,g\ \textbf{NaCl}} \times \frac{6.02\times10^{23}\,molecules\ \textbf{NaCl}}{1\,mol\ \textbf{NaCl}} = 5.26980476704\times10^{23}\,molecules\ \textbf{NaCl}$$

51.16 = 4 s.f., 58.443 = 5 s.f., 6.02x10^{23} = 3 s.f., → **5.27x10^{23}**

8)

$$\begin{array}{r} 0.00258 \\ +0.004 \\ \hline 0.00658 \end{array} \rightarrow \textbf{0.007}$$

9)

$$\begin{array}{r} 16.22 \\ -\ 0.943 \\ +572.9 \\ \hline 588.177 \end{array} \rightarrow \textbf{588.2}$$

10)

$$\begin{array}{r} 1.3280 \\ -15.628 \\ \hline -14.3000 \end{array}$$

→ **-14.300**

11)

$$\begin{array}{r} 0.235600 \\ +11.283 \\ \hline 11.518600 \end{array}$$

→ **11.519**

12) $\frac{0.5423}{8.2}$ 0.5423 = 4 s.f., 8.2 = 2 s.f., answer = 2 s.f. → **0.066**

13) 457900 x 6.78 457900 = 4 s.f., 6.78 = 3 s.f., answer = 3 s.f. → **3.10×10^{6}**

Metric conversions:

Okay, here are some for you to try:

1) $23.6\ kJ \times \frac{1\times10^{3}\ J}{1\ kJ} = 2.36\times10^{4}\ J$

2) $58216\ \mu L \times \frac{1\times10^{-6}\ L}{1\ \mu L} \times \frac{1\ daL}{1\times10^{1}\ L} = 5.8216\times10^{-3}\ daL$

3) $46.875\ TB \times \frac{1\times10^{12}\ B}{1\ TB} \times \frac{1\ kB}{1\times10^{3}\ B} = 4.6875\times10^{10}\ kB$

4) $22.16\ ms \times \frac{1\times10^{-3}\ s}{1\ ms} \times \frac{1\ fs}{1\times10^{-15}\ s} = 2.216\times10^{13}\ fs$

5) $3.78\times10^{-2}\ Mg \times \frac{1\times10^{6}\ g}{1\ Mg} \times \frac{1\ cg}{1\times10^{-2}\ g} = 3.78\times10^{6}\ cg$

Conversion between systems of measure:

There are several "correct" ways of doing these. If you did them in a different way, but got the same answer, then you did them correctly

1) $103\ kg \times \frac{1\times10^{3}\ g}{1\ kg} \times \frac{1\ oz.}{28.3\ g} = 3.64\times10^{3}\ oz.$

2) $653\ nm \times \frac{1\times10^{-9}\ m}{1\ nm} \times \frac{1\ \text{Å}}{1\times10^{-10}\ m} = 6.53\times10^{3}\ \text{Å}$

3) $6.375\ pint \times \frac{1\ gal}{8\ pint} \times \frac{3.785\ L}{1\ gal} = 3.016\ L$

4) $0.75\ ton \times \frac{2000\ lb}{1\ ton} \times \frac{1\ kg}{2.20\ lb} = 680\ kg$

5) $3.89266\times10^{-17}\ lb \times \frac{1\ kg}{2.20\ lb} \times \frac{1\ amu}{1.6606\times10^{-27}\ kg} = 1.07\times10^{10}\ amu$

6) $8.00\ ft \times \frac{12\ in}{1\ ft} \times \frac{2.54\ cm}{1\ in} \times \frac{1\times10^{-2}\ m}{1\ cm} \times \frac{1\ \mu m}{1\times10^{-6}\ m} = 2.44\times10^{6}\ \mu m$

7) $26.22\ mile \times \frac{1.609\ km}{1\ mile} \times \frac{1\times10^{3}\ m}{1\ km} \times \frac{1\ mm}{1\times10^{-3}\ m} = 4.219\times10^{7}\ mm$

8) $2.336\ gal \times \frac{3.785\ L}{1\ gal} \times \frac{1\ nL}{1\times10^{-9}\ L} = 8.842\times10^{9}\ nL$

Problem Solving:

$$9.536\times10^{10}\ lb \times \frac{453.59\ g}{1\ lb} \times \frac{1\ cm^3}{1.84\ g} \times \left(\frac{1\times10^{-2}\ m}{1\ cm}\right)^3 = 2.35\times10^{7}\ m^3$$

$$2.500\times10^{6}\ L \times \frac{1\ mL}{1\times10^{-3}\ L} \times \frac{1\ cm^3}{1\ mL} \times \left(\frac{1\ in}{2.54\ cm}\right)^3 \times \frac{1\ s}{54.5\ in^3} \times \frac{1\ hr}{3600\ s} \times \frac{1\ day}{24\ hr} = 32.4\ day$$

Practice word problems and dimensional analysis problems

1) A cyclist is traveling downhill at 55 km/hr. How fast is she moving in feet per second?

$$\frac{55\ km}{hr}\times\frac{0.62137\ mile}{1\ km}\times\frac{5280\ ft}{1\ mile}\times\frac{1\ hr}{60\ min}\times\frac{1\ min}{60\ s}=50.\frac{ft}{s}$$

2) Carl Lewis, a sprinter in the 1899 Olympic Games, ran the 100.-m dash in 9.92 s. What was is speed in miles per hour?

$$\frac{100.\ m}{9.92\ s}\times\frac{1\ km}{1\times10^{3}\ m}\times\frac{1\ mile}{1.609\ km}\times\frac{60\ s}{1\ min}\times\frac{60\ min}{1\ hr}=22.6\frac{mile}{hr}$$

3) When the space probe *Galileo* reached Jupiter in 1995, it was traveling at an average speed of 27,000 mi/hr. What was its speed in kilometers per second?

$$\frac{27000\ mile}{hr}\times\frac{1.609\ km}{1\ mile}\times\frac{1\ hr}{60\ min}\times\frac{1\ min}{60\ s}=12\ km/s$$

4) The Sun is approximately 93 million miles from the Earth. How many seconds will it take for light from the Sun to travel to the Earth if the velocity of light is $3.00\text{x}10^{8}$ m/s?

$$9.3\times10^{7}\ mile\times\frac{1.609\ km}{1\ mile}\times\frac{1\times10^{3}\ m}{1\ km}\times\frac{1\ s}{3.00\times10^{8}\ m}=5.0\times10^{2}\ s$$

5) A very strong camel can carry 990. lb. If one straw weighs 1.5 grams, how many straws can the camel carry without breaking it's back?

$$990.\ lb\times\frac{1\ kg}{2.20\ lb}\times\frac{1\times10^{3}\ g}{1\ kg}\times\frac{1\ straw}{1.5\ g}=3.00\times10^{5}\ straw$$

6) The largest nugget of gold on record was found in 1872 in New South Wales, Australia, and had a mass of 93.3 kg. Assuming the nugget is pure gold, what is its volume in cubic centimeters? What is it worth by today's standards if gold is \$345/(troy oz)? (14.85 troy oz = 1 lb., density of gold is 19.3g/cm^{3})

$$93.3\ kg\times\frac{1\times10^{3}\ g}{1\ kg}\times\frac{1\ cm^{3}}{19.3\ g}=4830\ cm^{3}$$

$$93.3\ kg\times\frac{2.20\ lb}{1\ kg}\times\frac{14.85\ troy\ oz}{1\ lb}\times\frac{\$345}{1\ troy\ oz}=\$1.05\times10^{6}$$

7) Some Honda Preludes used to come with a 2.0L engine. What was the volume of the engine in cubic feet?

$$2.0\ L\times\frac{1\ mL}{1\times10^{-3}\ L}\times\frac{1\ cm^{3}}{1\ mL}\times\left(\frac{1\ in}{2.54\ cm}\right)^{3}\times\left(\frac{1\ ft}{12\ in}\right)^{3}=0.071\ ft^{3}$$