

Practice Exam 1 For Chem 1124, Fall 2011


Name Key

By submitting this exam, I affirm that I have neither given nor received unauthorized aid on this assignment.

You must show all work for credit. Express each answer to the correct number of significant figures.

Useful information: $1 \text{ m} = 1.094 \text{ yd}$, 2.2 lbs , $1 \text{ mL} = 1 \text{ cm}^3$, $1 \text{ L} = 1.056 \text{ qt}$
 $^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32)$ $^{\circ}\text{F} = \frac{9}{5} (^{\circ}\text{C}) + 32$, $1 \text{ in} = 2.54 \text{ cm}$, $1 \text{ kg} =$

(1)(4 points) Describe the difference between the plum or raisin pudding model of the atom and Rutherford's model of the atom.

The plum pudding model spread the positive & negative particles throughout the atom . Rutherford's model put all the positive particles in the center (nucleus) surrounded by the electrons.

(2)(2 points) Fill in the following table

isotope	protons	neutrons	electrons
$^{32}_{14}\text{Si}$	14	18	14
$^{210}_{82}\text{Pb}$	82	128	82

(3)(3.5 points) List the 7 base SI units and the property each one measures

in book

(4)(8 points) Conversions

(a) Convert 37 in to m

$$\frac{37 \text{ in}}{1} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = 940 \text{ cm}$$

$$\frac{940 \text{ cm}}{1} \times \frac{10^{-2} \text{ m}}{1 \text{ cm}} = \boxed{0.94 \text{ m}}$$

(b) What is -40°C in $^\circ\text{F}$?

$$^\circ\text{F} = (-40) \times \frac{9}{5} + 32 = \boxed{-40^\circ\text{F}}$$

(c) Convert 26.5 cm to nm

$$\frac{26.5 \text{ cm}}{1} \times \frac{10 \text{ m}}{1 \text{ cm}} = 0.265 \text{ m}$$

$$\frac{0.265 \text{ m}}{1} \times \frac{1 \text{ nm}}{10^{-9} \text{ m}} = 2.65 \times 10^8 \text{ nm}$$

(d) 4.04×10^2 mL to quarts

$$\frac{4.04 \times 10^2 \text{ mL}}{1} \times \frac{10^{-3} \text{ L}}{1 \text{ mL}} = 0.404 \text{ L}$$

$$\frac{0.404 \text{ L}}{1} \times \frac{1.05668 \text{ qt}}{1 \text{ L}} = 0.427 \text{ qt}$$

(5)(5 points) List 4 points of Dalton's Atomic theory

(1) All matter is composed of atoms

(2) ~~Matter composed of~~ Pure substances composed of 1 type of atom are elements. Different ~~atoms~~ ^{atoms} combine in small whole number ratios to form compounds

(3) Atoms of the same type have the same mass.

Atoms of different types have different masses.

(4) Atoms are not created, destroyed or changed in a normal chemical reaction, they are merely rearranged

(answer may vary)

(6)(5 points) The density of mercury is 13.59 g/mL. What volume of mercury has a mass of 100 kg? Would this fit into a 2 L pop bottle?

$$\begin{aligned}
 & \cancel{100 \text{ kg}} \times \frac{1000 \text{ g}}{1 \text{ kg}} = 100,000 \text{ g} \\
 & \frac{100,000 \text{ g}}{13.59 \text{ g/mL}} = 7.36 \times 10^3 \text{ mL} \\
 & \frac{7.36 \times 10^3 \text{ mL}}{1} \times \frac{10^{-3} \text{ L}}{1 \text{ mL}} = \boxed{7.36 \text{ L}}
 \end{aligned}$$

No, it won't fit.

(7)(4 points) Classify the following as either element, compound, heterogeneous mixture, or homogeneous mixture.

- (a) table salt *compound*
- (b) water *compound*
- (c) sucrose *compound*
- (d) Windex® window cleaner *homogeneous mixture*

(8)(4 points) Perform the following calculations to the correct number of significant figures.

(a) $62.375 - 0.055 =$

$$\begin{array}{r}
 263.5973 \\
 + 2.37 \\
 \hline
 205.9673 = 206.0
 \end{array}
 \rightarrow
 \begin{array}{r}
 4 \text{ sig figs} \\
 205.0 \\
 62.375 \\
 \hline
 152.625
 \end{array}
 = 3.2895 \rightarrow \boxed{3.290}$$

↑
5 sig figs

(b) $763.63 + 0.004 + 0.007 + 0.05 =$

$$\boxed{763.69}$$

$$\begin{array}{r}
 763.63 \\
 + 0.004 \\
 + 0.007 \\
 + 0.05 \\
 \hline
 763.691
 \end{array}$$

(9) Fill in the following table of electron configurations

element	n=1	n=2	n=3
aluminum	2	8	3
Be	2	2	0
P	2	8	5
He	2	0	0

(10) A sample contains 4.50 g of NH_3 .

(a) How many moles of NH_3 are in the sample?

3 sig figs

$$\begin{array}{r}
 1N \quad 1(14.01 \text{ g/mole}) \\
 + 3H \quad 3(1.01 \text{ g/mole}) \\
 \hline
 17.04 \text{ g/mole}
 \end{array}$$

$$4.50 \text{ g} \times \frac{1 \text{ mole}}{17.04 \text{ g}} = 0.264 \text{ moles } \text{NH}_3$$

(b) How many hydrogen atoms are in the sample? $6.022 \times 10^{23} \text{ H atoms} = 1 \text{ mole}$

$$0.264 \text{ moles } \text{NH}_3 \times \frac{6.022 \times 10^{23} \text{ molecules } \text{NH}_3}{1 \text{ mole } \text{NH}_3} = 1.59 \times 10^{23} \text{ } \text{NH}_3 \text{ molecules}$$

$$1.59 \times 10^{23} \text{ } \text{NH}_3 \times \frac{3 \text{ H atoms}}{1 \text{ } \text{NH}_3} = 4.77 \times 10^{23} \text{ H atoms}$$

(11) A β -particle is an electron from the nucleus. How do you get an electron from the nucleus of an atom?

a neutron is essentially a proton + an electron

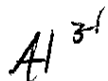


(12) Fill in the table with the number of protons, neutrons and electrons in the following species:

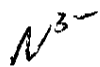
Species	protons	neutrons	electrons
${}^{17}\text{O}$	8	9	8
${}^{33}\text{S}^{2-}$	16	17	18
${}^{23}\text{Na}$	11	12	11

(13) What ion will each of the following atoms form?

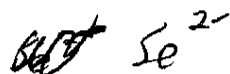
(a) Al



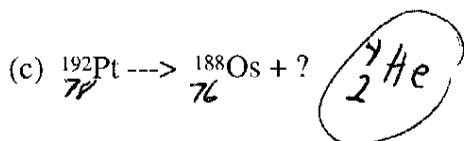
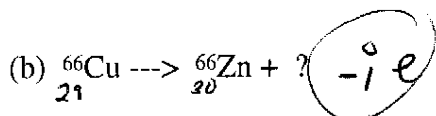
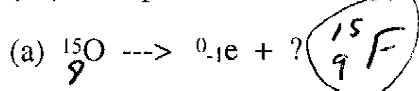
(b) N



(c) Se



(14) Complete the following nuclear equations



(15) How are radioactive isotopes used to determine bone density?

An isotope is used that emits an x-ray and a γ ray.
The bones absorb the x-rays, but not the γ rays.
By measuring the ~~ratio~~ ratio of x-rays to γ -rays,
the amount of x-rays absorbed at the bone density
can be determined.