Type A

Step 1. YOUR NAME here _____ **and on the bottom of PAGE 3 of this EXAM!!!!**

KEY

Chemistry 121 September 2009 Midterm 1

D **I. Multiple choice. Select one best answer and enter in the space provided.** → 3pts each so (30pts)

__1. The number of significant figures in the mass measured as 0.09001 g is

a. 1
b. 2
c. 3
(d.) 4
e. 5

C __2. The distance between atoms is sometimes given in picometers, where 1 pm is equivalent to $1 * 10^{-12}$ m. *(star * is a sign for multiplication here and below).* If the distance between the carbon atoms in diamond is $2.54 * 10^{-8}$ cm, what is the distance in picometers?

a. 0.254
b. 2.54
(c.) 254
d. 2,540
e. 254,000

$$2.54 \times 10^{-8}\ cm \times \frac{10^{-2}\ m}{1\ cm} \times \frac{1\ pm}{10^{-12}\ m}$$

B __3. The volume of a 10.0% glucose solution is 8.25 mL. It's density is 1.039 g/mL. What mass does the solution have?

a. 8.25g
(b.) 8.57g
c. 0.0857kg
d. 0.00825kg
e. 825mg

$d = \frac{m}{V}$ $m = d \times V$

$m = 1.039\ \frac{g}{mL} \times 8.25\ mL$

division / multiplication → least sig. figs.

addition → least decimal places

C __4. What is the best answer to report for (3.478 * 1.164)/2.00 + 0.354 ?

a. 2.3782
b. 2.378
(c.) 2.38
d. 2.4
e. 2

$4.048392/2.00 = 2.024196$

$2.024196 + 0.354 = 2.378196$

A __5. Which of the following sets of numbers have the same number of significant figures?

1. 3.55 * 10^{-3} 2. 3.55 * 10^{3} 3. 3,550,0000.0

(a.) 1,2
b. 1,3
c. 2,3
d. 1,2,3
e. None match

E __6. How many joules are there in 7.72 kcal (1.000 calorie = 4.184 joules)

a. 1.78
b. 32.3
c. 1780
d. 12,900
e. 32,300

from worksheet

B __7. If the volume and mass measurements on a sample of aluminum at 20 °C are 15.56 g and 5.7 mL, the value for the density should have how many significant figures?

a. 1 b. 2 c.3 d. 4 e.5

2 sig. figs, take lowest when doing division.

last

Type A

E 8. Which of the following is a chemical property of gold?
a. it melts at 1083 °C b.it's density is 8.96 g/cm^3 c. it conducts electricity
d. it is malleable all others are physical (e.) it displaces silver ions in aqueous solution

E 9. Certain element can be found with three "varieties" of nuclei – containing 15, 16 and 17 neutrons. Which of the following is always true:
a. number of electrons for this element is 15, 16 or 17
b. atomic number for this element has to be 32
c. mass number for this element is 11
d. number of protons for this element has to be 15, 16 or 17
e. there are three isotopes for this element

B 10. Cathodes rays are
a. positively charged particles
(b.) streams of electrons
c. fast moving neutrons
d. nuclei of helium atoms
e. repelled by anode

1	2	3	4	5	6	7	8	9	10
D	C	B	C	A	E	B	E	E	B

30pts

II. Short answer question. Fill in the blanks in the boxes.

Nuclide or other	protons	neutrons	electrons
^{222}Rn	86 (1pt)	136 n	86 e
^{80}Br	35 p	45 (2pt)	35 (1pt)
57Fe (2pt)	26p	31n	26 e
4 (**four!**) molecules of $^{31}_{15}P_4$	240 (2pt)	256 (2pt)	240 (2pt)

12pts

$4 \times 4 = 16$ P

$15 \times 16 =$ P

$(31-15) \times 16$

III. Show your work. Pay attention to units and significant figures. Provide correct final answer clearly.

1. Copper makes up $2.2 * 10^{-4}$ **percent** by mass of a normal healthy human being. How many grams of copper would be found in the body of a person weighing 120. lb? (1.0 kg = 2.2 lb)
Reminder: the word "percent" stands for "multiply by 0.01"!

$$120\ lb \times \frac{1.0\ kg}{2.2\ lb} \times \frac{10^3\ g}{1\ kg} \times \underbrace{2.2\times10^{-4}}_{\text{given}} \times \underbrace{10^{-2}}_{\%} = 0.12\ g$$

10pts

2pt 2pt 2pt

Loct

Type A

7pts 2. Calculate the mass of copper that occupies the same volume as 75.0 g of magnesium. The density of Cu is 8.96 g/cm^3 and for Mg is 1.74 g/cm^3.

↑ Just eq-n 2pts. 3pts

Given: $V_{Cu} = V_{Mg}$, $m_{Mg} = 75.0\,g$, $d_{Mg} = 1.74\,g/cm^3$, $d_{Cu} = 8.96\,g/cm^3$, $m_{Cu} = ?$

$d = \frac{m}{V}$, $V = \frac{m}{d}$, $V_{Mg} = V_{Cu}$, hence $\frac{m_{Cu}}{d_{Cu}} = \frac{m_{Mg}}{d_{Mg}}$ (find; given)

$m_{Cu} = \frac{m_{Mg}}{d_{Mg}} \times d_{Cu} = \frac{75\,g}{1.74\,g/cm^3} \times 8.96\,g/cm^3 = 386.\,g$ ← Calculation attempt 2pts

3. A sample of milk is found to have arsenic concentration of 1.31 μg /L.
What is the concentration in ounces per gallon? ↳ Micro = 10^{-6}

1 qt = 946.4 mL 1gal = 4 qt 16 oz = 1 lb 1kg = 2.2 lb

$$\frac{1.31\,\mu g}{L} \times \frac{10^{-6}\,g}{1\,\mu g} \times \frac{1\,kg}{10^3\,g} \times \frac{2.2\,lb}{1\,kg} \times \frac{16\,oz}{1\,lb} \times \frac{1\,L}{10^3\,mL} \times \frac{946.4\,mL}{1\,qt} \times \frac{4\,qt}{1\,gal} =$$

(2pt) (2pt) (2pt) (2pt) (2pt) (2pt)

14pt $= 1.74 \times 10^{-7}\,oz/gal$

4. The atomic mass of Ga is 69.72 a.m.u. There are only two naturally occurring isotopes of gallium, ^{69}Ga and ^{71}Ga. Calculate the natural abundance for each of these isotopes.
[Hint: set up an equation where abundance of one isotope is "*x*", and then abundance of the other will be (1-*x*).]

← setting up eq-n 4pt

$69.X + 71(1-X) = 69.72$

$69X + 71 - 71X = 69.72$

$-2x = -1.28$

$x = 0.64$, i.e. fr. ab. of ^{69}Ga is 64%

and $1 - X = 0.36$ = 36% ← is fr. ab of ^{71}Ga

solving eqn 3pt →

both reporting answers 2pt

if nothing else → any reasonable info on isotopes and av. at. mass → 2pts

WRITE YOUR NAME (in print letters) _____

Lost Please do NOT write below this line _____ 80pts max

Points lost

total