Name KEY O (Print last name in CAPS)

SECTION _____(same as your lab section)

1.	Read each question carefully before answering.
2.	Mark the choice that best answers the question or completes the statement.
3.	Use the scantron provided. Use a no. 2 pencil and clearly mark your choice. If you change an answer, completely erase your previous mark.
4.	Answer each question. There is no penalty for guessing. However, multiple answers are graded as incorrect, and blank answers are graded as incorrect.
5.	On the scantron, fill in your last name, first name and initial. Blacken the corresponding letters.
6.	Fill in the department=CHEM, Course no. = 101, and Section= your lab section.
7.	If you want your score posted by a portion of your ID# mark A under the option column.
8.	Use the test for scratch paper.
9.	Mark your answers in the test as well as on the answer sheet so you can check your score with the key after the test.
10.	Turn in both the scantron and the exam, have your ID and your calculator ready to be checked.
11.	The key will be posted on my class web page sometime tomorrow.
12.	You may pick up your exams outside of room 410 HELD Friday AM, 27th Sep.'02

There are 30 questions for 125 points.

Good Luck!

Possibly Useful Information

1 cal = 4.184 J q = mass × sp ht × ΔT d = mass/vol Volume = $\ell \times h \times w$

O

Q.1 The correct chemical name for the compound $Ca(NO_3)_2$ is ...

a) Calcium dinitrate
b) Calcium(II)nitrate
c) Calcium dinitric oxide
(d) Calcium nitrate ←
e) Calcium nitroxide

Q.2 How many mols of sodium are needed to form 0.575 mol of sodium sulfide?

a) 0.575 b) 0.288 c) 0.144 (d) 1.15 e) 13.2

$0.575\ mol\ Na_2S \times \frac{2\ mol\ Na}{1\ mol\ Na_2S} = 1.15\ mol\ Na$

Q.3 Which of the following is an extensive property of matter?

a) Melting point
b) Boiling point
c) Density
(d) Volume ←
e) More than one of these

Q.4 The volume of a rectangular solid is given by Vol = length × width × height.
What is the volume of a solid of h = 12.0 cm
ℓ = 150 mm
w = 2.0 m

a) 360 m^3
b) 180 m^3
c) 90 m^3
(d) 0.036 m^3 ←
e) 0.36 m^3

$Vol. = 12.0\ cm \times \frac{10^{-2}\ m}{1\ cm} \times 150\ mm \times \frac{10^{-3}\ m}{1\ mm} \times 2.0\ m =$

$= 0.036\ m^3$

Q.5 The prefix nano means
a) 10^9
(b) 10^{-9} ←
c) 10^6
d) 10^{-6}
e) None of these

Q.6 Calculate the volume of 8.00 M NaOH solution required to prepare exactly 200 mL of a 0.800 M solution of NaOH.

a) 2.00 mL
b) 4.00 mL
c) 20.0 mL ←
d) 40.0 mL
e) 8.00 mL

$(8.00\ M)X = (0.800\ M)(200\ mL)$

$X = \frac{0.800}{8.00} * 200\ mL = 20.0\ mL$

Q.7 How many neutrons are there in a N-15 isotope?

15-7 = 8

a) 15 b) 8 c) 7 d) -7 e) 22

Q.8 How many electrons are there in the ion, N^{3-} ?

7+3 = 10

a) 1 b) 3 c) 7 d) 4 e) 10

Q.9 Carbon tetrachloride has a density of 1.59 g/mL at 20°C. What volume is occupied by 685 grams of CCl_4?

a) 1090 mL
b) 2.32×10^{-3} mL
c) 232 mL
d) 431 mL ←
e) 4.31 L

$\frac{685\ g}{1.59\ g/mL} = 430.81\ mL$

Q.10 How many atoms are there in exactly 2809 g of silicon?

a) 10 × Avogadro's number
b) 100 × Avogadro's number ←
c) Avogadro's number
d) 1000 × Avogadro's number
e) 0.01 × Avogadro's number

$\frac{2809\ g\ Si}{28.09\ g/mol} = 100\ mols\ Si$

$\therefore$ # atoms = $100 * N_A$

Q.11 How many grams of the element silver, Ag, would contain as many silver atoms as there are phosphorus atoms, P, in 6.00 moles of tetraphosphorus, P_4?

a) 186 g
b) 743 g
c) 2590 g ←
d) 647 g
e) 431 g

$$6.00\ mol\ P_4 * \frac{4\ mol\ P}{1\ mol\ P_4} = 24.0\ mol\ P$$

$$24.0\ mol\ Ag * \frac{107.9\ g\ Ag}{1\ mol\ Ag} = 2589.6\ g\ Ag$$

2590 g

Q.12 The molecular formula of acetic acid is $C_2H_4O_2$. What is its simplest formula?

a) CHO
b) CH_2O ←
c) $C_2H_2O_2$
d) $C_4H_8O_4$
e) C_2HO

$C_2H_4O_2 \rightarrow CH_2O$

molecular → simplest

Q.13 When the following chemical equation is balanced with the smallest integer coefficients, the sum of the coefficients in the balanced equation is,

$$1\ Cu_2S + 1\ O_2 \rightarrow 2\ Cu + 1\ SO_2$$

a) 2 b) 5 c) 3 d) 4 e) 6

Q.14 Tamoxifen, $C_{26}H_{29}NO$, molar mass = 371.53 g/mol, is a nonsteroidal estrogen antagonist used in the palliative treatment of breast cancer. How many millimoles of tamoxifen are there in 25.0 mg of this drug?

a) 673 mmol
b) 6.73 mmol
c) 0.673 mmol
d) 0.00673 mmol
e) 0.0673 mmol ←

$$25.0\ mg * \frac{10^{-3}\ g}{1\ mg} * \frac{1\ mol}{371.53\ g} * \frac{1\ mmol}{10^{-3}\ mol} =$$

$$= 0.06728 \Rightarrow 0.0673\ mmol\ Tamoxifen$$

$[26(12.01) + 29(1.008 + 14.01 + 16.00 = 371.53\ g/mol)]$

Q.15 In the correct formula for the ionic compound formed between the calcium ion and the hydroxide ion, the mol ratio of calcium, to oxygen, O, is,

a) 1 to 1
b) 2 to 1
c) 1 to 2 ←
d) 1 to 4
e) 3 to 2

Ca^{+2} OH^-

$Ca(OH)_2$

1 : 2

Q.16 The formula mass of phosphorous acid, H_3PO_3 (aq) is ...

a) 41.00 amu
b) 122.90 amu
c) 112.00 amu
d) 81.99 amu ←
e) 89.90 amu

$3(1.008) + 30.97 + 3(16.00) = 81.99$ amu

Q.17 How many mol oxygen, O_2, can be produced by the decomposition of 12.0 mol of reactant in each of the following reactions:

(i) $2KClO_3 \rightarrow 2KCl + 3\,O_2$ $12 * \frac{3}{2} = 18$

(ii) $KClO_4 \rightarrow KCl + 2O_2$ $12 * \frac{2}{1} = 24$

(iii) $2NaNO_3 \rightarrow 2\,NaNO_2 + O_2$ $12 * \frac{1}{2} = 6$

a) 8, 6, 24, respectively
b) 18, 24, 6, respectively ←
c) 36, 12, 24, respectively
d) 36, 24, 24, respectively
e) 36, 24, 12, respectively

Q.18 When the following numbers are added, the answer contains ___ significant figures.

822.68
+ 205.986
1028.666

1028.67 = 6 sig. fig.

a) 4 b) 5 c) 3 d) 6 e) 7

Q.19 Matter may be classified as a(n) ...

a) Solid, liquid or gas
b) heterogeneous or homogeneous mixture
c) Element
d) Compound
(e) All the above are ways of classifying matter

Q.20 Fumaric acid, $C_4H_4O_4$, is sometimes used as a substitute for citrus acid in fruit drinks. What is the % C in fumaric acid?

$4(12.01) + 4(1.008) + 4(16.00) = 116.072$ g/mol

a) 33.33 %
b) 0.25 %
c) 39.80 %
d) 40.00%
(e) 41.39% ←

$$\%\,C = \frac{4(12.01)}{116.072} * 100 = 41.388\,\%$$

Q.21 How many mols of lead are present in a piece of lead with a volume of 0.600 mL? The density of Pb is 11.34 g/mL.

a) 6.80
(b) 0.0328 ←
c) 11.0
d) 0.547
e) 0.0912

$$11.34\ \frac{g}{mL} * 0.600\ mL * \frac{1\ mol\ Pb}{207.2\ g\ Pb} =$$

$$= 0.0328\ mol\ Pb$$

Q.22 A compound is found to have the following % composition: 38.7% K, 13.8% N, 47.5% O. What is its simplest formula?

(a) KNO_3 ←
b) KNO_2
c) K_2NO_2
d) K_2NO_3
e) $K_2N_2O_3$

$$\frac{38.7\ g\,K}{39.10} = 0.989\ mol\ K/.985 = 1, K$$

$$\frac{13.8\ g\,N}{14.01} = 0.985\ mol\ N/.985 = 1, N$$

$$\frac{47.5\ g\,O}{16.00} = 2.960\ mol\ O/.985 = 3, O$$

$\therefore KNO_3$

Q.23 When the equation:

$$CS_2 + 3Cl_2 \rightarrow CCl_4 + S_2Cl_2$$

$$1 + 3 + 1 + 1 = 6$$

is balanced with the smallest integer coefficients, the sum of the coefficients is:

a) 5 (b) 6 c) 4 d) 3 e) 7

Q.24 The molarity of a solution that contains 14.7 grams of H_2SO_4 in exactly 200 mL of solution is ...

$2(1.008) + 32.07 + 4(16.00) = 98.086 = 98.09$ g/mol

a) 1.5 M
(b) 0.75 M ←
c) 0.77 M
d) 7.4 M
e) 3.0 M

$$M = \frac{\text{mol}}{L} = \frac{14.7\text{g}/98.09\text{ g/mol}}{0.200\text{L}} = 0.749 = \underline{0.75\text{M}}$$

Q.25 How many kJ of heat are needed to raise the temperature of 125 g of water 50.0 °C?

a) 262 kJ
(b) 26.2 kJ ←
c) 6.25 kJ
d) 62.5 kJ
e) 625 kJ

$$q = 125\text{g} \times \frac{4.184\text{J}}{\text{g}\cdot^\circ\text{C}} \times 50^\circ\text{C}$$

$$q = 26150\text{ J} \times \frac{1\text{kJ}}{10^3\text{J}} = \underline{26.15\text{ kJ}}$$

Q.26 Magnesium metal and molecular oxygen react to form magnesium oxide. If 46.5 g of magnesium and 37.2 g of molecular oxygen are caused to react, which reactant is limiting? [Hint: Write the balanced equation.]

(a) Mg ←
b) O_2
c) both
d) none

$$2Mg + O_2 \rightarrow 2MgO$$

smallest ∴ Mg limiting

For Mg: $\frac{46.5}{24.31} = 1.91$ mol Mg → 1.91 mol MgO

For O_2: $\frac{37.2}{32.00} = 1.16$ mol $O_2 \times \frac{2\ MgO}{1\ O_2} = 2.325$ mol MgO

Q.27 How much chlorine, Cl_2, in grams is required to produce 12.0 g CCl_4 according to the following balanced reaction:

$$CH_4 + 4\,Cl_2 \rightarrow CCl_4 + 4\,HCl$$

$12.01 + 4(35.45) = 153.81$ g/mol

a) 12.0 g
b) 5.52 g
c) 22.1 g ←
d) 1.38 g
e) 11.0 g

$$12.0\text{ g } CCl_4 \times \frac{1\text{ mol } CCl_4}{153.81\text{ g}} \times \frac{4\text{ mol } Cl_2}{1\text{ mol } CCl_4} \times \frac{70.90\text{ g } Cl_2}{1\text{ mol } Cl_2} =$$

$= 22.1259 \Rightarrow 22.1$ g Cl_2

Q.28 Calculate the % yield if 16.5 grams sodium carbonate is obtained from the thermal decomposition of 75.0 g of sodium hydrogen carbonate according to the reaction:

$$2\,NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$$

molar masses:
$NaHCO_3$ = 84.00 g/mol
Na_2CO_3 = 105.99 g/mol
H_2O = 18.01 g/mol
CO_2 = 44.01 g/mol

a) 47.3% b) 52.7% c) 16.5% d) 34.9% e) 50.6%

$$75.0\text{ g } NaHCO_3 \times \frac{1\text{ mol } NaHCO_3}{84.00\text{ g}} \times \frac{1\text{ mol } Na_2CO_3}{2\text{ mol } NaHCO_3} \times \frac{105.99\text{ g } Na_2CO_3}{1\text{ mol } Na_2CO_3} =$$

$= 47.31$ g Na_2CO_3 Theoretical

$$\%\text{ yield} = \frac{16.5}{47.31} \times 100 = 34.87\,\% = 34.9\,\%$$

Q.29 What is the correct ${}^{A}_{Z}X$ notation for an ion having 35 protons, 36 electrons, and 45 neutrons?

a) ${}^{45}_{35}Br^{+}$

b) ${}^{80}_{35}Br^{-}$ ←

c) ${}^{80}_{45}Br^{+}$

d) ${}^{45}_{35}Br^{-}$

e) ${}^{45}_{36}Br^{-}$

$35\,p + 45\,n = 80 = \text{mass \#}$ (35 = Z, 80 = A)

↓

Br

$36^{-} - 35^{+} = -1$ Charge on ion

electrons, protons

${}^{80}_{35}Br^{-}$

Q.30 One centimeter is equal to...

a) 100 m b) 1000 m c) 10 m d) 0.10 m e) 0.01 m

$1\,cm = 10^{-2}\,m = 0.01\,m$

End of Test

KEY Ex1 FORM O Magnuson 101 26 Sep 2002

	1	D
	2	D
	3	D
	4	D
	5	B
	6	C
	7	B
	8	E
	9	D
	10	B
	11	C
	12	B
	13	B
	14	E
	15	C
	16	D
	17	B
	18	D
	19	E
	20	E
	21	B
	22	A
	23	B
	24	B
	25	B
	26	A
	27	C
	28	D
	29	B
	30	E

There are 30 Q for 125 pt.

each question is worth 4.167 pt.