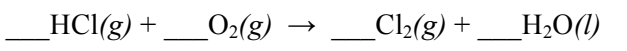
Name _____ **ID#**_____ **Section #** _____

CH 101 EXAM 1 Spring 2009 - Form A

Fill in your name, ID#, and section on this test booklet. Fill in and bubble in your name, ID#, and section on the scantron form. For question #60 mark A. Mark the best answer after reading all possible choices. Use a #2 pencil and make clean erasures to insure proper scoring. When finished, turn in your scantron sheet and show this booklet and your CUID to the proctor. Good Luck!

1. Balance the equation below and choose the correct statement.



___$HCl(g)$ + ___$O_2(g)$ → ___$Cl_2(g)$ + ___$H_2O(l)$

   A. The total number of chlorine atoms on the right is 4
   B. There are more atoms of oxygen on the products' side than on the reactants' side
   C. There are four molecules of chlorine on the right
   D. The correct stoichiometric coefficient for molecular oxygen (O_2) is 2

2. A student measures the mass of a substance and records the data in the table below. The balance has not been zeroed and the values are off by two grams! How does this situation affect the measurements?

Trial	Mass (g)
1	4.3420
2	4.3421
3	4.3422
4	4.3425

   A. Precision is affected but not accuracy
   B. Accuracy is affected but not precision
   C. Both accuracy and precision are affected
   D. Neither one in affected

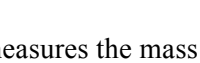
3. A sample that can't be broken down into simpler substances is considered:

   A. a homogeneous mixture
   B. a compound
   C. an element
   D. a solute
   E. an electron

4. Molecules can be described as:

   A. homogeneous mixtures of more than one element
   B. substances produced when a metal and a non-metal react
   C. two or more atoms joined together
   D. representations of chemical compounds
   E. Atoms of the same element bonded together

5. What does X represent in the following symbol:



$^{80}_{35}X$?

   A. mercury, Hg
   B. chlorine, Cl
   C. scandium, Sc
   D. bromine, Br
   E. selenium, Se

6. Consider you have 2.5 moles of water (H_2O, molar mass 18.00 g/mol) and 2.5 moles of molecular oxygen (O_2, molar mass 32.00 g/mol).

   A. you have the same mass of both substances
   B. you have more molecules of oxygen than molecules of water since molecular oxygen has a larger molar mass
   C. you have a larger mass of water since there are three atoms in each molecule
   D. you have less mass of oxygen since it is a gas and it is lighter than water
   E. all of the above are incorrect

7. Which of the following substances, S_8, C_4H_{10}, $BaCl_2$, $Fe(NO_3)_3$, SF_2 would exist as ionic lattices?

   A. only S_8
   B. C_4H_{10}, SF_2, and S_8
   C. all of them except S_8
   D. $BaCl_2$, $Fe(NO_3)_3$
   E. only $BaCl_2$

8. Calculate the average atomic mass of gallium from the information below.

Ga-69	68.9256	60.11%
Ga-71	70.9247	39.89

A. 68.95
B. 69.72
C. 70.92
D. 60.11
E. 69.01

9. Consider the reaction:

$$2\ N_2O_5(g) \rightarrow 4\ NO_2(g) + O_2(g)$$

Calculate how many moles of NO_2 and O_2 form when 10.5 g of N_2O_5 completely react.

	Moles NO_2	Moles O_2
A.	0.194	0.194
B.	0.0972	0.0486
C.	0.194	0.0486
D.	0.0486	0.0243
E.	0.388	0.194

10. A compound contains only phosphorus (P) and chlorine (Cl). Its analysis shows it contains 22.55% by mass of phosphorus. What is its empirical formula?

A. PCl_2
B. P_2Cl_3
C. PCl
D. P_2Cl
E. PCl_3

11. Consider the following balanced equation and information.

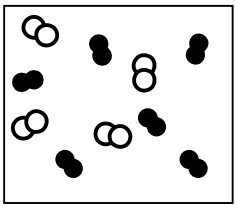
$$O_2 + C \rightarrow CO_2$$

Initially you have 12.0 g of carbon (C) and 16 g of molecular oxygen (O_2)

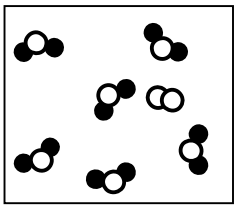
Choose the correct statement

A. there is no limiting reactant since the stoichiometric coefficients are the same
B. Carbon is the limiting reactant since there is less grams of carbon than grams of molecular oxygen
C. oxygen is the limiting reactant since it will be used up before carbon
D. the theoretical yield is 34.0 g of CO_2 (one mole)

12. The first diagram represents a mixture of hydrogen and oxygen before reaction. (White spheres are oxygen atoms, black hydrogen.)



The second diagram represents the mixture after the reaction.



A. The reaction is $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$ and there is an excess of hydrogen
B. the reaction is $H_2(g) + O_2(g) \rightarrow H_2O_2(g)$
C. hydrogen is the limiting reactant
D. the reaction is $H_2O_2(g) \rightarrow H_2(g) + O_2(g)$

13. Consider a sample of 9.70 g of caffeine, $C_4H_5N_2O$. How many hydrogen atoms are there in this sample?

A. 3.11×10^{23}
B. 0.5×10^{23}
C. 5
D. 12.04×10^{23}
E. 6.02×10^{23}

14. A laboratory procedure calls for making 400.0 mL of a 1.1 mol/L solution of $NaNO_3$. What mass of $NaNO_3$ is needed?

A. 37.4 mg
B. 37.4 g
C. 3.74 kg
D. 37.4 kg
E. 374 g

15. Choose the statement that is correct:

A. Two atoms of different elements can have the same number of electrons.
B. Two atoms of different elements can have the same number of protons
C. All atoms are neutral because all elements have neutrons.
D. Atoms become isotopes upon gaining or losing electrons.

16. Aluminum metal (Al) can be dissolved in acid to form molecular hydrogen (H_2) according to the following equation:

$$2Al + 2H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2$$

What mass of aluminum must be reacted to produce 0.5 moles of H_2?

A. 9.0 g
B. 26.98 g
C. 53.96 g
D. 1.0 g
E. 0.0962 g

17. What is the formula of the compound formed when Al^{3+} and S^{2-} combine?

A. Al_3S_2
B. Al_2S_3
C. AlS
D. 3Al2S
E. AlS^+

18. Calculate the mass percent of oxygen in $Na_2C_6H_6O_7$ (sodium hydrogen citrate).

A. 19%
B. 33%
C. 47%
D. 6.8%
E. 16%

19. A sample of 50.0 mL of 0.100M NaCl*(aq)* is heated in the laboratory until the volume is reduced to 25.0 mL. Which of the following statements is correct?

A. the amount of substance of NaCl has increased since there is less volume of the solution
B. the final concentration of the solution is 0.050M
C. the number of moles of the solvent increased
D. the solution is diluted
E. the concentration of the solution is approximately 0.2 M

20. How many grams of H_2O will be formed when 32.0 g of H_2 is mixed with 32.0 g of O_2 and allowed to react to from water?

$$2H_2 + O_2 \rightarrow 2H_2O$$

A. 36.0 g
B. 288 g
C. 144 g
D. 18.0 g
E. 64.0 g

21. You are given 50.0 mL of a 12.0 mol/L HNO_3 solution. To what final volume should you dilute this sample so that the final molarity is 3.0 mol/L?

A. 300 mL
B. 200 mL
C. it cannot be done
D. 250 mL
E. 4.0 L

22. Calculate the mass in grams of 1.505×10^{24} molecules of SO_3

A. 200 g
B. 80.0 g
C. 250 g
D. 2.5 g
E. 20 g

23. Select the correct statement.

A. Protons and electrons are held together within an atom due to their chemical bonds.
B. Metals have a tendency to gain electrons to become anions
C. Formation of ionic bonds always requires transfer of electrons and formation of ions.
D. Covalent bonds can only occur between two atoms of the same element.

60. Answer A.

USEFUL INFORMATION: $N_A = 6.0221 \times 10^{23}$

PERIODIC TABLE OF THE ELEMENTS

IA 1	IIA 2	IIIB 3	IVB 4	VB 5	VIB 6	VIIB 7	8	VIIIB 9	10	IB 11	IIB 12	IIIA 13	IVA 14	VA 15	VIA 16	VIIA 17	VIIIA 18
1 H 1.008																	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305											13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.066	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.88	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.847	27 Co 58.933	28 Ni 58.69	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.905	56 Ba 137.327	57 La 138.906	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (210)	85 At (210)	86 Rn (220)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110	111	112						

Lanthanides	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
Actinides	90 Th 232.04	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Name _____ ID#_____ Section # _____

CH 101 EXAM 1 Spring 2009

Essay questions

(1)Pick a chemistry topic, law or concept of your interest (Chapters 1-4) and discuss its relevance. You may comment on its impact on the development of chemistry, how it helped you better comprehend chemistry or science, its significance in your field of study, etc. You may define the term, law or concept; however, just a definition will not be enough!

(2) "J.J. Thomson measured the charge-to-mass ratio of the particles within the cathode rays by deflecting them using electric and magnetic fields. The value he measured implied that the cathode ray particle was about 2000 times lighter than hydrogen, the lightest known atom." (Tro, p. 52) Why was this experimental finding relevant?