TNCC ELECTRONIC RESERVES

CLASS:	CHM-111 College Chemistry I
INSTRUCTOR:	M. WORKMAN
TITLE:	Old Test
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Name_____ Chemistry 111 First Test Spring 92

Please show work where appropriate: no partial credit will be given unless work is shown.

1(15) Write the name for each of the following compounds:

Li_2SO_4 _____ K_3PO_4 _____

P_2S_5 _____ NH_4NO_3 _____

$Ca(CN)_2$ _____

2(15) Write the formula for each of the following compounds:

magnesium carbonate _____ aluminum hydroxide _____

sulfur trioxide _____ ammonium oxide _____

sodium dichromate _____

3(15) For each of the following atoms or ions, indicate the number of protons, neutrons and electrons it contains:

	^{200}Hg	^{90}Sr	^{59}Ni	$^{27}Al^{+3}$	$^{80}Br^{-}$
protons	_____	_____	_____	_____	_____
neutrons	_____	_____	_____	_____	_____
electrons	_____	_____	_____	_____	_____

4(15) Determine the empirical and molecular formula of a compound that is 69.0% C, 6.90% H and 24.1% N and has a molar mass of about 520.

9/2/92 DC

1st test

5(10) What is the volume of a piece of brass if it has a mass of 3.47 kg and a density of 8.50 g/mL ?

6(10) Calculate the percent tin in tributyltin hydroxide which is $(C_4H_9)_3SnOH$.

7(20)a. The subatomic particle which has a mass of 1 amu and a positive charge is called a/an (proton, electron, neutron)

b. The phase which takes the shape and volume of its container is (gas, liquid, solid, none of these)

c. The proper formula for converting Farenheit to Celsius is (C = 1.8(F + 32), C = (F + 32)/1.8, C = (F - 32)/1.8 none of these)

d. Density, temperature and state are properties which are (physical, chemical, both, neither)

e. A mole of any element is its atomic weight in (pounds, kilograms, ounces, grams, amu, none of these)

Name_____ Chemistry 111 Second Test Spring 92

Please show work where appropriate: no partial credit will be given unless work is shown.

1(15) Balance each of the following equations:

$$C_4H_{10} + O_2 \longrightarrow CO_2 + H_2O$$

$$Ca(OH)_2 + H_3PO_4 \longrightarrow Ca_3(PO_4)_2 + H_2O$$

2(15) Calculate the Molarity of a solution prepared by dissolving 50 g of $CoBr_2$ in enough water to make 300 mL of solution.

3(15) Calculate the yield of copper nitrate starting with 200 g of nitric acid and excess copper hydroxide by the equation shown:

$$Cu(OH)_2 + 2\ HNO_3 \longrightarrow Cu(NO_3)_2 + 2\ H_2O$$

4(15) Indicate which of the following substances is soluble in water:

_____ $Cd(OH)_2$ _____ Na_2S _____ $TiCl_4$ _____ KNO_3

_____ $PbCO_3$

9/2/92 DC

2nd

5(10) Determine which of the reactants is the limiting reagent, if 100 g of N_2 is mixed with 150 g of O_2 and reacted by the reaction shown:

$$N_2 + 2\ O_2 \longrightarrow 2\ NO_2$$

6(10) Calculate the percent yield if the theoretical yield is 520 g and the actual yield is 385 g.

7(10) Classify each of the following substances as an electrolyte or a nonelectrolyte:

_____ HCl _____ CH_3OH _____ $C_{12}H_{22}O_{11}$ _____ $Ba(OH)_2$

_____ $(NH_4)_3PO_4$

8(10) Determine the oxidation number for the designated atom in each of the following:

_____ S in $Na_2S_2O_3$ _____ O in O_3 (ozone) _____ N in N_2H_4

_____ Cl in Cl_2O_7 _____ N in HNO_2

Name_____ Chemistry 111 Third Test Fall 91

1(15) Calculate the heat of reaction for the following reaction. The heats of formation are given in kJ/mole.

$$2\ C_2H_6 + 7\ O_2 \longrightarrow 4\ CO_2 + 6\ H_2O$$

ΔH_f -85 -394 -241

2(15) Calculate the volume of a compressed gas tank if it has a pressure of 120 atm at 27°C and contains 4.0 kg of carbon dioxide.

3(15) When 1.00 g of SO_2 is burned in oxygen in a calorimeter containing 2.50 kg of water the temperature increased by 3.40°C. The specific heat for water is 4.2 J/g°C and the heat capacity of the calorimeter is 1500 J/°C. What is the heat for burning one mole of sulfur dioxide?

4(15) Calculate the final volume of a balloon if it has an initial volume of 250 L at 1.05 atm and 25°C and goes to a temperature of -10°C at 0.35 atm.

9/2/92 DC

3rd

5(10) What volume of oxygen gas is required to react with 75 L of ammonia gas at the same temperature and pressure (reaction shown):

$$4\ NH_3 + 7\ O_2 \longrightarrow 4\ NO_2 + 6\ H_2O$$

6(15) For each of the quantum numbers indicate its symbol and what it is related to:

quantum number	symbol	related to
angular momentum	_____	_____
spin	_____	_____
magnetic	_____	_____
principle	_____	_____

7(5) Write out the electron configurations for each of the following atoms:

Sr

Se

8(5) What is the diffusion rate of carbon monoxide if the diffusion rate of carbon dioxide at the same temperature and pressure is 50 m/sec?

9(5) When a chemical reaction produces heat it is (exothermic, endothermic) and the sign for its enthalpy change is (+, -, 0).

Name_____ Chemistry 111 Test 4 Spring 91

1(15) Draw the dot structure for each of the following compounds:

CS_2 PF_3 $SiCl_4$ H_2S F_2CS

2(15) For each of the compounds in Question 1, indicate the shape of the molecule (word description of drawing). its polarity and any hybridization of the central atom:

shape _____ _____ _____ _____ _____

polarity _____ _____ _____ _____ _____

hybridization ____ ____ ____ ____ ____

3(10) For each of the following properties, indicate if it is the property of a metal, nonmetal, both or neither:

_____ electrical conductor _____ malleable _____ shiny

_____ brittle _____ heat insulator

4(20) For each of the following pairs of atoms, indicate the type of bond that will form (answers are ionic, polar covalent, nonpolar covalent, no bond):

_____ C,C _____ Na,Ne _____ Li, Br _____ C,F

_____ S,O _____ Mg,Mn _____ C,N _____ S,S

_____ Ca,Br _____ Ti,F

9/2/92 JC

5. (10) Periodic Table and its trends: (circle one) 4th

a) Which is the smallest (Ba, Ni, Mg, Si, O)?

b) Which is the most electronegative (Zr, Fe, Be, C, O)?

c) Which is the largest (Y, Pd, Ti, P, F)?

d) which has the largest ionization energy (Ba, K, Mg, Na, Li)

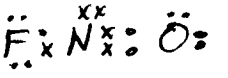
e) Which ~~of the~~ following has 25 Neutrons (^{55}Mn, ^{118}Sn, ^{50}V, ^{84}Kr, ^{75}As)

6. (2) Which of the following would you expect to form positive ions:

(O, Br, Ca, Na) Ca^{2+}, Na^{+}

7) (4) a) What is the Lewis dot structure for FNO?

F 7$\bar{e}$ distribute $\bar{e}$'s to
N 5$\bar{e}$ give each atom an octet.
O 6$\bar{e}$



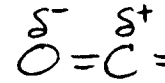
b) What is the bonding structure according to this dot structure?

Lewis str. determines bond str:

F–N=O

8. (4) a) which has polar bonds:

HF HCN H_2 CO_2 O_2 H_2O



b) which are polar molecules:

HF HCN H_2 CO_2 O_2 H_2O

O is more $\bar{e}$-neg. — attracts $\bar{e}$'s better.

---O=C=O--- no net polarity.

9. (12) Determine the oxidation #'s of the following elements in the compound indicated:

a) B in B_2O_3 +3 $3\times(-2) = -6$ B = +3

b) P in P_4O_{10} +5 $10\times(-2) = -20$ $20/4 = +5$

c) P in Na_3PO_4 +5 $4\times(-2) = -8$ $3\times(+1) = 3$ P = +5

d) Mn in Mn_2O_7 +7 $7\times(-2) = -14$ $14/2 = 7$

e) Mn in K_2MnCl_4 +2 $4\times(-1) = -4$ $2\times(+1) = +2$ Mn = +2

10. (10) Name the following compounds:

a) CuS ~~copper~~ sulfide

b) KH potassium hydride

c) AgBr silver bromide

d) KOH potassium hydroxide

e) LiCN lithium cyanide

11. (20) For each of the following, select an answer from the following list: 4+L

orbital shape, distance, orbital orientation, electron spin, endothermic, exothermic, isotopes, halogens, alkali metal, alkaline earth, inert gas, neutron, proton, electron

endo → $+\Delta H_f^\circ$ → $-q$

exo → $-\Delta H_f^\circ$ → $+q$

a) a reaction which absorbs heat is called endothermic,

b) and has a (positive, negative) ΔH_f°. (circle one)

c) The azimuthal quantum number is related to an electron's orbital shape.

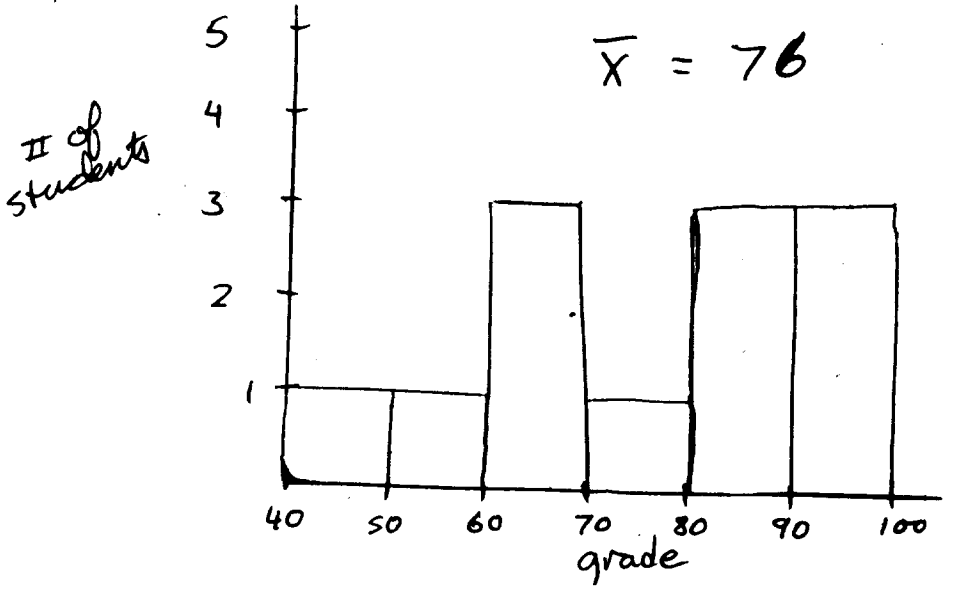
d) The magnetic quantum number is related to an electron's orbital orientation.

e) Atoms of the same element which have different masses are called isotopes.

ℓ	orbital	shape
0	s	0 (sphere)
1	p	
2	d	
3	f	

m

orientation along the three axes.



4th

5(10) Name a member of each of the following chemical families:

halogen _____ alkali metal _____

noble gas _____ alkaline earth metal _____

transition metal _____

6(15) From the list shown chose the element that has the property indicated: Sr, Mg, Fe, Ag, S, Br, F

lowest ionization energy _____ largest size _____

highest ionization energy _____ smallest size _____

highest electronegativity _____

7(15) a. A single bond is (sigma, pi, delta, all of these, none of these)

b. A double bond is (sigma, pi, delta, all of these, none of these)

c. Which of the following compounds will have six pairs of electrons around the central atom (silicon tetrafluoride, phosphorus pentachloride, sulfur hexafluoride, none of these, all of these)

d. The location of a chemical family in the periodic table is a (row, column, diagonal, all of these, none of these)

e. Which of the following is the smallest (Cl^-, S^{-2}, Ar, K^+, Ca^{+2}, all the same size)

Test Copy - Please Return

PERIODIC CHART OF THE ELEMENTS

IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII	IB	IIB	IIIA	IVA	VA	VIA	VIIA	INERT GASES
1 H 1.00797														1 H 1.00797	2 He 4.0026
3 Li 6.939	4 Be 9.0122									5 B 10.811	6 C 12.01115	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183
11 Na 22.9898	12 Mg 24.312									13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.870	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.9044	54 Xe 131.30
55 Cs 132.905	56 Ba 137.34	57 *La 138.91	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.967	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.980	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 †Ac (227)															

*Lanthanum Series	58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm (147)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.924	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97	2 8 18 32 9 2
†Actinium Series	90 Th 232.038	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (256)	103 Lr (257)	2 8 18 32 ? 9 2

( ) Numbers in parentheses are mass numbers of most stable or most common isotope

Atomic weights corrected to conform to the 1963 values of the Commission on Atomic Weights.

Name_____ CHM 111 Test 3 Summer 97

Please show work where appropriate; no partial credit will be given unless work is shown.

1(20) Classify each of the following substances (molecular polar, molecular nonpolar, covalent network, ionic and metallic) and indicate the forces between particles (electrostatic, electron sea, dipole, London and covalent bond):

substance	classification	forces
SiH_4	_____	_____
Pb	_____	_____
K_2SO_4	_____	_____
SO_2	_____	_____
C(diamond)	_____	_____

2(10) For each of the following properties, indicate if it is a property of graphite, diamond, both or neither:

___ very hard ___ very soft ___ high index of refraction

___ electrical conductor ___ layer structure

3(10) What is the pressure of oxygen in a mixture that has a total pressure of 1.25 atm if it contains 50 g of O_2, 50 g of He and 50 g of Ar?

4(10) Calculate the heat of formation of pentane C_5H_{12} if its combustion heat is - 3290 kJ and the heats of formation of CO_2 and H_2O are - 394 and - 242 kJ/mole respectively.

$C_5H_{12} + 8\ O_2 \quad 5\ CO_2 + 6\ H_2O$

5(10) What is the pressure in a 30.0 Liter tank of Argon if it contains 90.0g of Ar at 22°C ?

6(10) How many seconds will it take for carbon monoxide to diffuse through a tube, if it takes sulfur dioxide at the same temperature and pressure 100 seconds?

7(30)a. The air pollutant associated with burning coal, and from volcanos is (CO_2, NO_2, SO_2, PO_2, none of these)

b. The most toxic air pollutant is (CO, NO_2, SO_2, O_3, all the same)

c. When a liquid evaporates the process is (exothermic. endothermic, both, neither).

d. The class of substances which conduct electricity in the liquid, but not solid state is (ionic, metallic, covalent network, polar, nonpolar, none of these).

e. The property of a soap solution which is most closely related to the ease of bubble formation is (viscosity, vapor pressure, intermolecular friction, surface tension, critical point, none of these).

f. Entropy is a measure of (pressure, heat content, order, disorder, compensation, none of these)

Name _____ CHM 111 Final Exam Fall 93

1(20) Calculate the solution concentration as percent solute, molarity, molality and mole fraction solute for a solution prepared by dissolving 50 g of sodium nitrate $NaNO_3$ in 200 g of water. The total volume is 220 mL.

%

Molarity

molality

mole fraction

2(15) Balance the following equations:

$$C_4H_{10} + O_2 \text{ -----> } CO_2 + H_2O$$

$$H_2SeO_4 + Al(OH)_3 \text{ -----> } Al_2(SeO_4)_3 + H_2O$$

3(15) Calculate the pressure in a 55.0 L tank of oxygen, if it contains 1800 g of O_2 at 27oC.

4(15) Calculate the theoretical yield (in grams) of $Na_2S_2O_3$ produced by the following reaction starting with 400 g of Na_2S.

$$2\ Na_2S + Na_2CO_3 + 4\ SO_2 \text{ -----> } 3\ Na_2S_2O_3 + CO_2$$

5(15) Determine the empirical formula for a compound which is 20.8% C, 5.20 % H and 74.0 % S.

6(30) Classify each of the following substances by crystal type (ionic, covalent, molecular polar, molecular nonpolar, metallic) and by the forces between particles (chemical bond, dispersion, electron sea, dipole and ionic):

Name	crystal type	forces
graphite	_____	_____
iodine	_____	_____
platinum	_____	_____
magnesium sulfate	_____	_____
sulfur difluoride	_____	_____

7(15) Calculate the freezing point of a solution made by dissolving 130 g of sucrose C12H22O11 in 600 g of water. The Kf for water is 1.86oC/m.

8(15) Calculate the heat of the reaction shown if the heats of formation (kJ/mole) are -46 for ammonia, +34 for nitrogen dioxide and -242 for water:

$$4\ NH_3 + 7\ O_2 \longrightarrow 4\ NO_2 + 6\ H_2O$$

Questions 9 through 23 are 4 points each:

9. The shape of the carbon dioxide molecule is (linear, angle, pyramid, tetrahedron, none of these)

10. Which of the following is a nonelectrolyte (HNO_3, $Ca(OH)_2$, LiI, C_2H_5OH, all are electrolytes, all are nonelectrolytes)

11. The reaction of an acid with a base is called (decomposition, redox, neutralization, none of these)

12. Isotopes have different numbers of (protons, electrons, neutrons, all the same, all different)

13. Which of the following atoms is the largest (Cs, Mg, Pd, F, I, all the same size)

14. The freezing of a liquid to a solid is (endothermic, exothermic, neither)

15. When two gases are at the same temperature and pressure, the one with the higher molecular mass moves (faster, slower, the same speed)

16. The oxidation number of S in $Na_2S_2O_3$ is (8, 7, 6, 5, 4, 3, 2, 1, 0, -1, -2, -3, -4, -5, -6, -7, -8, none of these)

17. The temperature above which a substance cannot exist as a liquid is called the (boiling point, sublimation point, triple point, evaporation point, none of these)

18. The sign of the enthalpy change for an endothermic process is (positive, negative, zero)

19. The name of P_2S_5 is (potassium sulfide, potassium pentasulfide, dipotassium pentasulfide, potassium sulfate, none of these)

20. The number of micrometers in a centimeter is (0.1, 0.01, 0.001, 0.0001, 10, 100, 1000, 10000, none of these)

21. The solubility of a gas in a liquid is increased when the temperature of the system is (raised, lowered, neither)

22. The atomic number of an element is equal to its number of (protons, neutrons, protons + neutrons, electrons + neutrons, none of these)

23. The hardest substance known is (graphite, silicon, silicone, diamond, titanium nitride, none of these)