General Chemistry I Lecture Fall 2017 8/28/17 Monday 9 am class Dr. Hahn Exam # _____

Name Key (print) Name _____ (sign)

Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If you run out of space, continue on the empty back pages but clearly label where the remaining answer can be found. (If I can't find your answer or cannot read it, I obviously cannot grade it). Return your entire exam including the periodic table. (Please count your exam pages and make sure there are 8 real pages + periodic table assembly) GC

It is your responsibility **to return the entire exam package** (with periodic table assembly inside the rest of the exam) **directly into Dr. Hahn's hands.** If you do not and the exam disappears or sits around for days NOT in Dr. Hahn's possession, t exam will count as an UNEXCUSED missed exam.

1 mole = ~~molar mass of atom or molecule (in grams) = 6.022×10^{23}~~ atoms or molecules

no partial credit MC

MULTIPLE CHOICE. Choose the one ~~alternative that best completes~~ the statement or answers the question. (2 pts each, 32 pts total)

1) A person weighs 68.04 kg (150.0 lb), and the correct dosage of a drug is given as 1.50 mg per kilogram of body weight. How many milligrams of the drug should be given? 1) D

A) 108 mg
B) None of the above
C) 112 mg
D) 102 mg
E) 115 mg

$68.04\,kg \times \frac{1.50\,mg}{kg} = 102.1$

2) What are the three states of matter? 2) E

A) Compound, solid, liquid
B) Solid, liquid, compound
C) Solid, liquid, element
D) Compound, element, mixture
E) Solid, liquid, gas

NA = not attempted
NW = no work ½ Credit
attempt ½ credit

3) How many electrons, protons, and neutrons are in a neutral atom of the following isotope of krypton? 3) A

$^{84}_{36}Kr$

A) 36 electrons, 36 protons, and 48 neutrons
B) 84 electrons, 24 protons, and 36 neutrons
C) 36 electrons, 48 protons, and 36 neutrons
D) 36 electrons, 36 protons, and 84 neutrons
E) None of the above are correct

4) What is the formula for dinitrogen monoxide? 4) C

A) N_2O_2 B) NO_2 C) N_2O D) 2NO E) NO

5) The number 1.050×10^9 has how many significant figures? 5) E

A) 2 B) 9 C) 13 D) 3 E) 4

6) A magnesium ion, Mg^{2+}, has 6) A

A) 12 protons and 10 electrons.
B) 24 protons and 26 electrons.
C) 12 protons and 13 electrons.
D) 12 protons and 14 electrons.
E) 24 protons and 22 electrons.

7) The SI prefixes *kilo* and *milli* represent, respectively: 7) E

A) 10^9 and 10^{-6}
B) 10^{-9} and 10^{-6}
C) 10^6 and 10^{-3}
D) 10^{-9} and 10^{-1}
E) 10^3 and 10^{-3}

8) Liquid nitrogen boils at –195.8°C. Express the boiling point of liquid nitrogen in kelvin. 8) E

A) –469.0 K
B) all temperatures are 0 K on the Kelvin scale (K = °C + 273.15)
C) 469.0 K
D) –77.4 K
E) 77.4 K

9) Express the number 0.000053 in scientific notation. 9) D

A) 5.3×10^{-4}
B) 5.3×10^{-6}
C) 5.3×10^{-2}
D) 5.3×10^{-5}
E) 5.3×10^{-3}

10) Which one of the following elements is most likely to form a 2+ ion? 10) E

A) fluorine B) carbon C) oxygen D) sodium E) calcium

11) What are the two different ions present in the compound CaS? 11) E

A) Ca^+, S^- B) Ca, S C) Ca^-, S^+ D) Ca^{2-}, S^{2+} E) Ca^{2+}, S^{2-}

12) Which of the following is true of an element? 12) C

A) An element is a substance composed of atoms of two or more elements
B) An element is combination of two or more substances in which the substances retain their distinct identities.
C) An element is a substance that cannot be separated into simpler substances by chemical means.
D) An element must be a solid at room temperature
E) An element must be heterogeneous

13) Which of the following are isotopes? 13) D

A) ^{12}C and ^{12}CO
B) ^{14}N and $^{14}N^{3-}$
C) ^{14}N and $^{14}N_2$
D) ^{14}C and ^{13}C
E) ^{14}C and ^{14}N

14) Name the following binary compound: FeS.(Fe ion is usually charged +2 or +3) 14) D

A) Iron (I) sulfide
B) Iron sulfite
C) Iron sulfide
D) Iron (II) sulfide
E) Iron (I) sulfite

15) There are the seven elements that naturally occur as diatomic molecules. This list contains four of those plus one that does not fit this distinction. Which one of the following does not occur naturally as a diatomic molecule? 15) C

A) Nitrogen
B) Chlorine
C) Neon
D) Fluorine
E) Hydrogen

16) An *anion* is defined as 16) A

A) a charged atom or group of atoms with a net negative charge.
B) an atom or group of atoms with a net positive charge.
C) a stable atom.
D) a group of stable atoms.

Part II: Short Answers (39 pts) Show work on all questions for partial and full credit even on questions which do not specify.

1. Periodic Table and atom symbols: (1 pts each blank, 9 pts total)

(a) Give the symbol for the element **chlorine** Cl

(b) How many protons 17

(c) How many electrons for the neutral atom 17

(d) Give the symbol in the format ${}^{A}_{Z}X$ for the same element $^{35}_{17}Cl$

(e) What group is the element in 7A e) What period is the element in 3

(f) What is the likely charge on the element −1. Explain or show work.

$7 - 8 = -1$

(g) Is the element a [(metal) or (nonmetal)]

2. Metric Measurements: (6 pts, 3 pts each)

meter equals 100 centimeters or 10 raised to what power 10^{-2} (don't forget sign) (6 pt)

3. Given the following list of chemical formulas, circle all which are covalent (your book calls this molecular) (4 pts total, ½ pts each)

K Cl CO_2 Sr_3P_2 MgF_2 SO_2 Li_2O CCl_4 $CaCl_2$

4. If you have a compound made up of the elements **Mg and N** (6 pts total)

a) What are the charges on the ions made from those elements (show work) (2 pts)

NW -1

wrong sign -½ pt

2A +2

5A 5 − 8 = −3

b) Write the formula for the compound made from those elements. Showing work on how you arrived at the formula. (4 pts)

Mg^{+2} N^{-3} Mg_3N_2 NW -2

$(+2)(\#Mg) + (-3)(\#N) = zero$

5. Name the compound (4 pts)

Na_2CO_3

2pt Sodium 2pt Carbonate

gave # prefix -1 each side

6. Given the following name, give the formula (4 pts)

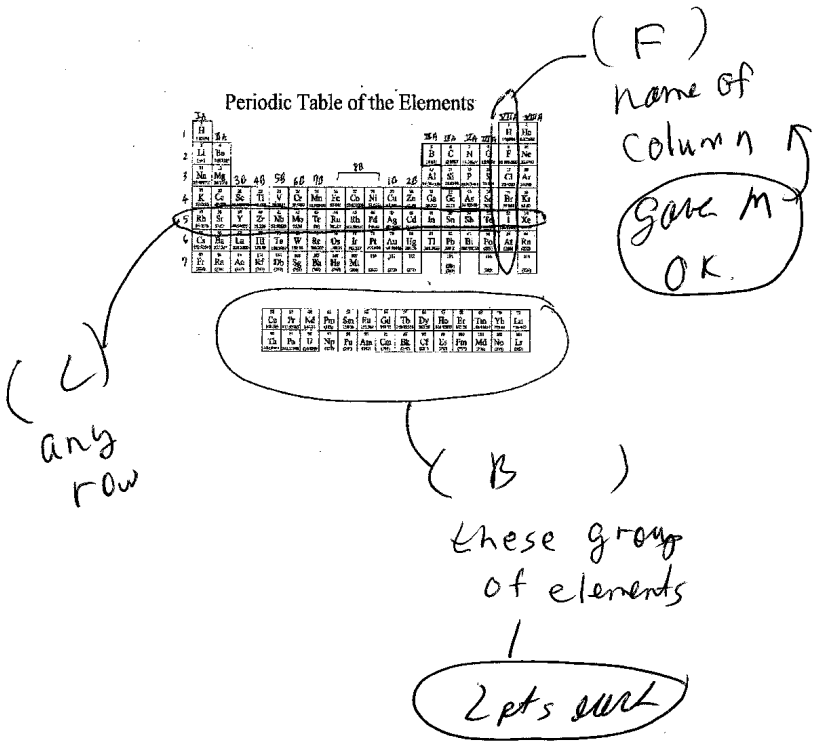
Carbon tetrachloride

CCl_4

wrong -1

5. Match the following to the letters shown. The letters may only be used one time or not at all. (6 pts total, 2 pts each)

(A) transition metal elements (B) lanthanide, actinide elements (C) main group elements (D) alkali metal elements (E) alkaline earth elements (F) halogens (G) noble gases (L) a period (M) a group



Part III: Long Answers (31 pts) Show work on all questions for partial and full credit even on questions which do not specify.

1. Dimensional Analysis Problem: (15 pts)

   a. The **density** of a liquid pharmaceutical is **8.77 g / mL**. You need **2.3 grams** of the liquid pharmaceutical. How many mL of the pharmaceutical do you need to get 2.3 grams ? [density = mass (grams) / volume (mL)] (7 pts)

3pt 2pt 2pt

$$2.3\,g \times \frac{mL}{8.77\,g} = 0.26\,mL$$

math -1
algebra -2
Save extra step -1

   b. How many cups is 78.2 mL of a solution ? (4 cups = 1 quart, 1 L = 1.06 quart) (8 pts)

$$78.2\,mL \times \frac{1\,L}{1000\,mL} \times \frac{1.06\,quart}{1\,L} \times \frac{4\,cups}{1\,quart} = 0.332\,cups$$

2pt 2pt 2pt 2pt

attempt -4
math -1pt
left off step -2pt

2. Mole Dimensional Analysis Question: (16 pts)

molar mass	=	1 mole	=	6.022×10^{23}
atomic mass or molecular weight		of atoms of molecules		atoms molecules

a. What is the molar mass (in grams) for a molecule with the formula $C_6H_{12}O_6$? (8 pts)

C H O

$6(12.01) + 12(1.01) + 6(16.00) = 180.18 g/mol$

2pt 2pt 2pt 2pt

attempt – 4pt

b. If I have 72.3 grams of the compound, how many **moles** of $C_6H_{12}O_6$ do I have ? (5 pts)

$72.3\ g\ C_6H_{12}O_6 \times \frac{1\ mol\ C_6H_{12}O_6}{180.18\ g\ C_6H_{12}O_6} = 0.401\ mol\ C_6H_{12}O_6$

2pt 2pt 1pt

math – ½pt Consistent w above no pts off

c. If you are told that for 1 mole of $C_6H_{12}O_6$ you have 6 moles of oxygens, how many atoms of oxygen do I have in the 72.3 grams of the compound ? (3 pts)

$72.3\ g\ C_6H_{12}O_6 \times \frac{1\ mol\ C_6H_{12}O_6}{180.18\ g\ C_6H_{12}O_6} \times \frac{6\ mol\ O}{1\ mol\ C_6H_{12}O_6} \times \frac{6.022 \times 10^{23}\ atoms\ O}{1\ mol\ O}$

1pt 1pt ½pt ½pt

$= 1.45 \times 10^{24}$ atoms O

attempt – 1½pt math – ½pt

General Chemistry I Lecture Fall 2017 8/28/17 Monday (10 am) class Dr. Hahn Exam # _____

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no partial credit me

1 mole = molar mass of atom or molecule (in grams) = 6.022×10^{-23} atoms or molecules

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts each, 32 pts total)

1) What is the formula for dinitrogen monoxide? 1) C

A) N_2O_2 B) NO_2 C) N_2O D) NO E) 2NO

2) How many electrons, protons, and neutrons are in a neutral atom of the following isotope of krypton? 2) A

$^{84}_{36}Kr$

A) 36 electrons, 36 protons, and 48 neutrons
B) 84 electrons, 24 protons, and 36 neutrons
C) 36 electrons, 36 protons, and 84 neutrons
D) None of the above are correct
E) 36 electrons, 48 protons, and 36 neutrons

NA = not attempted
NW = no work (- ½ credit)
attempt - ½ credit

3) Which of the following is true of an element? 3) E

A) An element must be heterogeneous
B) An element must be a solid at room temperature
C) An element is a substance composed of atoms of two or more elements
D) An element is combination of two or more substances in which the substances retain their distinct identities.
E) An element is a substance that cannot be separated into simpler substances by chemical means.

4) Liquid nitrogen boils at –195.8°C. Express the boiling point of liquid nitrogen in kelvin. 4) B

A) all temperatures are 0 K on the Kelvin scale (K = °C + 273.15)
B) 77.4 K
C) 469.0 K
D) –77.4 K
E) –469.0 K

5) A person weighs 68.04 kg (150.0 lb), and the correct dosage of a drug is given as 1.50 mg per kilogram of body weight. How many milligrams of the drug should be given? 5) D

A) 112 mg
B) 108 mg
C) None of the above
D) 102 mg
E) 115 mg

6) The number 1.050×10^9 has how many significant figures? 6) E

A) 13 B) 3 C) 9 D) 2 E) 4

7) Express the number 0.000053 in scientific notation. 7) A

A) 5.3×10^{-5}
B) 5.3×10^{-6}
C) 5.3×10^{-2}
D) 5.3×10^{-3}
E) 5.3×10^{-4}

8) What are the three states of matter? 8) D

A) Solid, liquid, element
B) Compound, solid, liquid
C) Compound, element, mixture
D) Solid, liquid, gas
E) Solid, liquid, compound

9) An *anion* is defined as 9) A

A) a charged atom or group of atoms with a net negative charge.
B) a stable atom.
C) a group of stable atoms.
D) an atom or group of atoms with a net positive charge.

10) The SI prefixes *kilo* and *milli* represent, respectively: 10) B

A) 10^{-9} and 10^{-1}
B) 10^{3} and 10^{-3}
C) 10^{9} and 10^{-6}
D) 10^{-9} and 10^{-6}
E) 10^{6} and 10^{-3}

11) A magnesium ion, Mg^{2+}, has 11) E

A) 12 protons and 13 electrons.
B) 24 protons and 22 electrons.
C) 24 protons and 26 electrons.
D) 12 protons and 14 electrons.
E) 12 protons and 10 electrons.

12) Name the following binary compound: FeS.(Fe ion is usually charged +2 or +3) 12) C

A) Iron sulfite
B) Iron (I) sulfide
C) Iron sulfide
D) Iron (I) sulfite
E) Iron (II) sulfide

13) Which one of the following elements is most likely to form a 2+ ion? 13) D

A) oxygen B) fluorine C) carbon D) calcium E) sodium

14) Which of the following are isotopes? 14) A

A) ^{14}C and ^{13}C
B) ^{14}N and $^{14}N^{3-}$
C) ^{12}C and ^{12}CO
D) ^{14}C and ^{14}N
E) ^{14}N and $^{14}N_2$

15) There are the seven elements that naturally occur as diatomic molecules. This list contains four of those plus one that does not fit this distinction. Which one of the following does not occur naturally as a diatomic molecule? 15) B

A) Nitrogen
B) Neon
C) Chlorine
D) Fluorine
E) Hydrogen

16) What are the two different ions present in the compound CaS? 16) B

A) Ca^{2-}, S^{2+} B) Ca^{2+}, S^{2-} C) Ca, S D) Ca^{-}, S^{+} E) Ca^{+}, S^{-}

Part II: Short Answers (39 pts) Show work on all questions for partial and full credit even on questions which do not specify.

1. Periodic Table and atom symbols: (1 pts each blank, 9 pts total)

(a) Give the symbol for the element **oxygen** O

(b) How many protons 8

(c) How many electrons for the neutral atom 8

(d) Give the symbol in the format ${}^{A}_{Z}X$ for the same element $^{16}_{8}O$

(e) What group is the element in 6A e) What period is the element in 2

(f) What is the likely charge on the element −2 Explain or show work. $6 - 8 = -2$

(g) Is the element a [(metal) or (nonmetal)]

2. Metric Measurements: (6 pts, 3 pts each)

liter equals 1000 milliliter or 10 raised to what power 10^{-3} (don't forget sign) (6 pt)

3. Given the following list of chemical formulas, circle all which are ionic (4 pts total, ½ pts each)

KCl CO_2 Sr_3P_2 MgF_2 SO_2 Li_2O CCl_4 $CaCl_2$

3. If you have a compound made up of the elements **In and Se** (6 pts total)

a) What are the charges on the ions made from those elements (show work) (2 pts)

wrong sign -1 pt

3A +3

6A

6 − 8 = −2

NW −1

b) Write the formula for the compound made from those elements. Showing work on how you arrived at the formula. (4 pts)

In^{+3} Se^{-2}

$(+3)(\#\ In) + (-2)(\#\ Se) = 2e_0$

In_2Se_3

NW −2

4. Name the compound (4 pts)

K_3PO_4

potassium phosphate 2pt 2pt

gave # prefix −1 each side

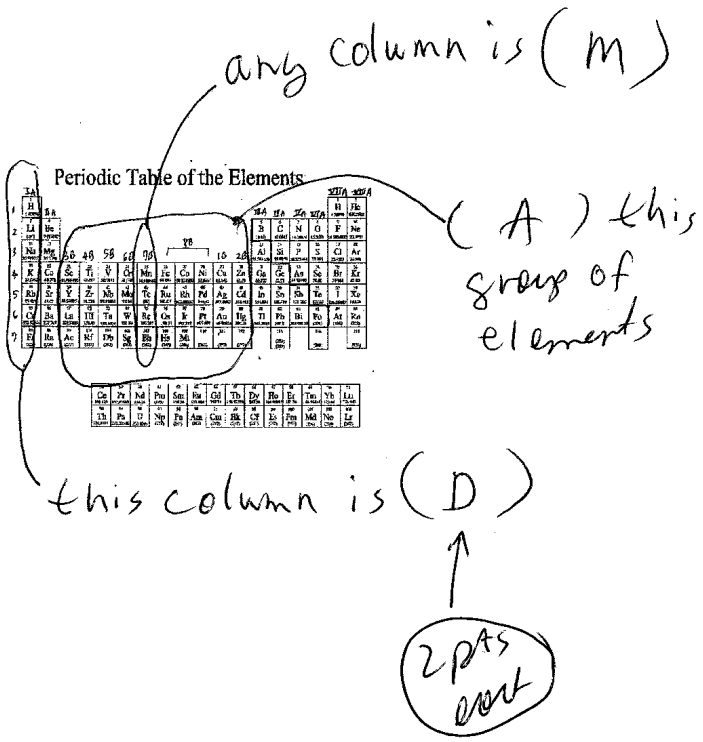
5. Given the following name, give the formula (4 pts)

carbon dioxide

CO_2

5. Match the following to the letters shown. The letters may only be used one time or not at all. (6 pts total, 2 pts each)

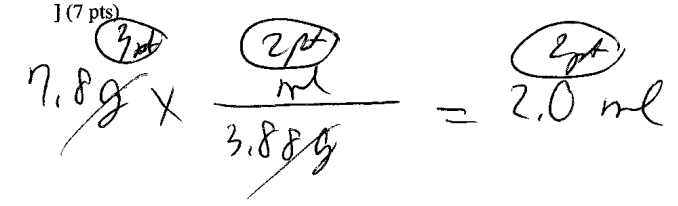
(A) transition metal elements (B) lanthanide, actinide elements (C) main group elements (D) alkali metal elements (E) alkaline earth elements (F) halogens (G) noble gases (L) a period (M) a group

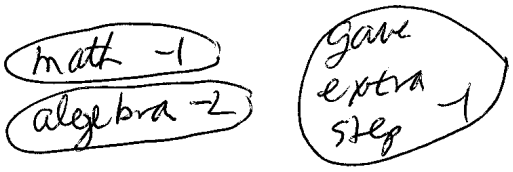


Part III: Long Answers (31 pts) Show work on all questions for partial and full credit even on questions which do not specify.

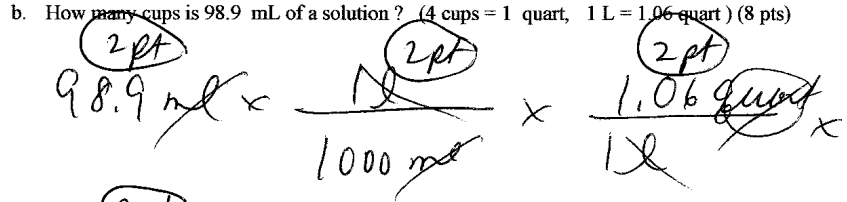
1. Dimensional Analysis Problem: (15 pts)

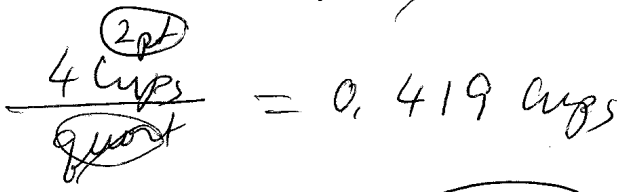
a. The **density** of a liquid pharmaceutical is **3.88 g / mL**. You need **7.8 grams** of the liquid pharmaceutical. How many mL of the pharmaceutical do you need to get 7.8 grams ? [density = mass (grams) / volume (mL)] (7 pts)

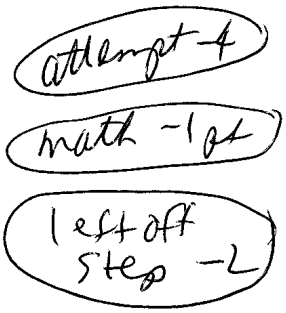




b. How ~~many~~ cups is 98.9 mL of a solution ? (4 cups = 1 quart, 1 L = ~~1.06 quart~~) (8 pts)







2. Mole Dimensional Analysis Question: (16 pts)

molar mass	=	1 mole	=	6.022×10^{23}
atomic mass or molecular weight		of atoms of molecules		atoms molecules

a. What is the molar mass (in grams) for a molecule with the formula H_2O ? (8 pts)

molar mass = $2(1.01)$ + (16.00) = $18.02 \frac{g}{mol}$

H: 3 pt; O: 3 pt; 2 pt

attempt, −4 pt

b. If I have ~~11.2~~ 48.5 grams of the compound, how many **moles** of H_2O do I have ? (5 pts)

$48.5\ g\ H_2O \times \frac{mol\ H_2O}{18.02\ g\ H_2O} = 2.69\ mol\ H_2O$

2 pt; 2 pt; 1 pt

Consistent w above no pts off

math −½ pt

c. If you are told that for 1 mole of H_2O, you have 2 moles of hydrogen, how many atoms of hydrogen do I have in the 48.5 grams of water ? (3 pts)

1 pt; 1 pt; ½ pt; ½ pt

$48.5\ g\ H_2O \times \frac{mol\ H_2O}{18.02\ g\ H_2O} \times \frac{2\ mol\ H}{1\ mol\ H_2O} \times \frac{6.022 \times 10^{23}\ atoms}{1\ mol\ H}$

$= 2.24 \times 10^{24}$

attempt −1½

math −½ pt

General Chemistry I Lecture Fall 2017 8/28/17 Monday 9 am class Dr. Hahn Exam # 6-2

Name_____ (print) Name _____(sign)

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   A) 108 mg
   B) None of the above
   C) 112 mg
   D) 102 mg
   E) 115 mg

2) What are the three states of matter? 2) _____
   A) Compound, solid, liquid
   B) Solid, liquid, compound
   C) Solid, liquid, element
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3) How many electrons, protons, and neutrons are in a neutral atom of the following isotope of krypton? 3) _____

$^{84}_{36}Kr$

   A) 36 electrons, 36 protons, and 48 neutrons
   B) 84 electrons, 24 protons, and 36 neutrons
   C) 36 electrons, 48 protons, and 36 neutrons
   D) 36 electrons, 36 protons, and 84 neutrons
   E) None of the above are correct

4) What is the formula for dinitrogen monoxide? 4) _____
   A) N_2O_2 B) NO_2 C) N_2O D) 2NO E) NO

5) The number 1.050×10^9 has how many significant figures? 5) _____

A) 2 B) 9 C) 13 D) 3 E) 4

6) A magnesium ion, Mg^{2+}, has 6) _____

A) 12 protons and 10 electrons.
B) 24 protons and 26 electrons.
C) 12 protons and 13 electrons.
D) 12 protons and 14 electrons.
E) 24 protons and 22 electrons.

7) The SI prefixes *kilo* and *milli* represent, respectively: 7) _____

A) 10^9 and 10^{-6}
B) 10^{-9} and 10^{-6}
C) 10^6 and 10^{-3}
D) 10^{-9} and 10^{-1}
E) 10^3 and 10^{-3}

8) Liquid nitrogen boils at –195.8°C. Express the boiling point of liquid nitrogen in kelvin. 8) _____

A) –469.0 K
B) all temperatures are 0 K on the Kelvin scale (K = °C + 273.15)
C) 469.0 K
D) –77.4 K
E) 77.4 K

9) Express the number 0.000053 in scientific notation. 9) _____

A) 5.3×10^{-4}
B) 5.3×10^{-6}
C) 5.3×10^{-2}
D) 5.3×10^{-5}
E) 5.3×10^{-3}

10) Which one of the following elements is most likely to form a 2+ ion? 10) _____

A) fluorine B) carbon C) oxygen D) sodium E) calcium

11) What are the two different ions present in the compound CaS? 11) _____

A) Ca^+, S^- B) Ca, S C) Ca^-, S^+ D) Ca^{2-}, S^{2+} E) Ca^{2+}, S^{2-}

12) Which of the following is true of an element? 12) _____

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D) An element must be a solid at room temperature
E) An element must be heterogeneous

13) Which of the following are isotopes? 13) _____

A) ^{12}C and ^{12}CO
B) ^{14}N and $^{14}N^{3-}$
C) ^{14}N and $^{14}N_2$
D) ^{14}C and ^{13}C
E) ^{14}C and ^{14}N

14) Name the following binary compound: FeS.(Fe ion is usually charged +2 or +3) 14) _____

A) Iron (I) sulfide
B) Iron sulfite
C) Iron sulfide
D) Iron (II) sulfide
E) Iron (I) sulfite

15) There are the seven elements that naturally occur as diatomic molecules. This list contains four of those plus one that does not fit this distinction. Which one of the following does not occur naturally as a diatomic molecule? 15) _____

A) Nitrogen
B) Chlorine
C) Neon
D) Fluorine
E) Hydrogen

16) An *anion* is defined as 16) _____

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C) a stable atom.
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Part II: Short Answers (39 pts) Show work on all questions for partial and full credit even on questions which do not specify.

1. Periodic Table and atom symbols: (1 pts each blank, 9 pts total)

(a) Give the symbol for the element **chlorine**

(b) How many protons _____

(c) How many electrons for the neutral atom _____

(d) Give the symbol in the format ${}^{A}_{Z}X$ for the same element _____

(e) What group is the element in _____ e) What period is the element in _____

(f) What is the likely charge on the element _____ Explain or show work.

(g) Is the element a [(metal) or (nonmetal)]

2. Metric Measurements: (6 pts, 3 pts each)

meter equals _____ centimeters or 10 raised to what power _____ (don't forget sign) (6 pt)

3. Given the following list of chemical formulas, circle all which are covalent (your book calls this molecular) (4 pts total, ½ pts each)

K Cl CO_2 Sr_3P_2 MgF_2 SO_2 Li_2O CCl_4 $CaCl_2$

4. If you have a compound made up of the elements **Mg and N** (6 pts total)

a) What are the charges on the ions made from those elements (show work) (2 pts)

b) Write the formula for the compound made from those elements. Showing work on how you arrived at the formula. (4 pts)

5. Name the compound (4 pts)

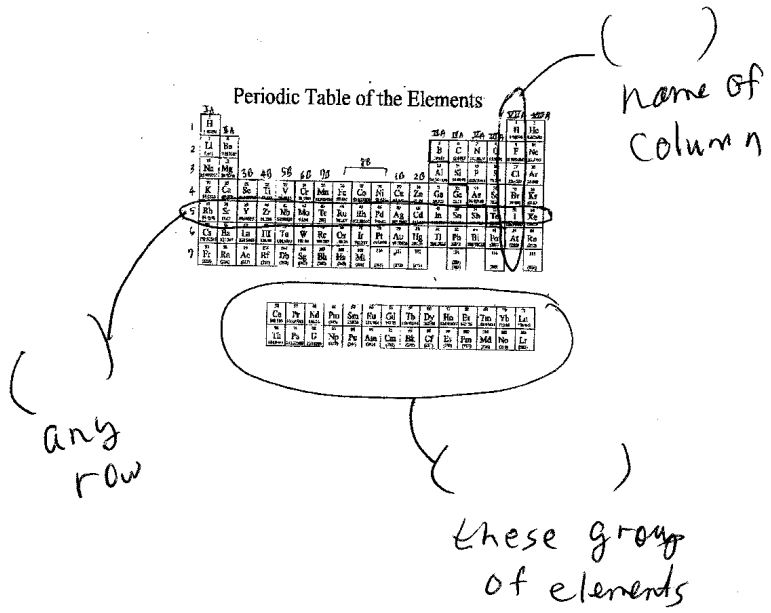
Na_2CO_3

6. Given the following name, give the formula (4 pts)

Carbon tetrachloride

5. Match the following to the letters shown. The letters may only be used one time or not at all. (6 pts total, 2 pts each)

(A) transition metal elements (B) lanthanide, actinide elements (C) main group elements (D) alkali metal elements (E) alkaline earth elements (F) halogens (G) noble gases (L) a period (M) a group



Part III: Long Answers (31 pts) Show work on all questions for partial and full credit even on questions which do not specify.

1. Dimensional Analysis Problem: (15 pts)

   a. The **density** of a liquid pharmaceutical is **8.77 g / mL**. You need **2.3 grams** of the liquid pharmaceutical. How many mL of the pharmaceutical do you need to get 2.3 grams ? [density = mass (grams) / volume (mL)] (7 pts)

   b. How many cups is 78.2 mL of a solution ? (4 cups = 1 quart, 1 L = 1.06 quart) (8 pts)

2. Mole Dimensional Analysis Question: (16 pts)

molar mass	=	1 mole	=	6.022×10^{23}
atomic mass or molecular weight		of atoms of molecules		atoms molecules

a. What is the molar mass (in grams) for a molecule with the formula $C_6H_{12}O_6$? (8 pts)

b. If I have 72.3 grams of the compound, how many **moles** of $C_6H_{12}O_6$ do I have ? (5 pts)

c. If you are told that for 1 mole of $C_6H_{12}O_6$ you have 6 moles of oxygens, how many atoms of oxygen do I have in the 72.3 grams of the compound ? (3 pts)

General Chemistry I Lecture Fall 2017 8/28/17 Monday 10 am class Dr. Hahn Exam # _____

Name_____ (print) Name _____(sign)

Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If you run out of space, continue on the empty back pages but clearly label where the remaining answer can be found. (If I can't find your answer or cannot read it, I obviously cannot grade it). Return your entire exam including the periodic table. (Please count your exam pages and make sure there are 8 real pages + periodic table assembly)

It is your responsibility **to return the entire exam package** (with periodic table assembly inside the rest of the exam) **directly into Dr. Hahn's hands.** If you do not and the exam disappears or sits around for days NOT in Dr. Hahn's possession, t exam will count as an UNEXCUSED missed exam.

1 mole = molar mass of atom or molecule (in grams) = 6.022×10^{-23} atoms or molecules

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts each, 32 pts total)

1) What is the formula for dinitrogen monoxide? 1) _____

A) N_2O_2 B) NO_2 C) N_2O D) NO E) 2NO

2) How many electrons, protons, and neutrons are in a neutral atom of the following isotope of krypton? 2) _____

$^{84}_{36}Kr$

A) 36 electrons, 36 protons, and 48 neutrons
B) 84 electrons, 24 protons, and 36 neutrons
C) 36 electrons, 36 protons, and 84 neutrons
D) None of the above are correct
E) 36 electrons, 48 protons, and 36 neutrons

3) Which of the following is true of an element? 3) _____

A) An element must be heterogeneous
B) An element must be a solid at room temperature
C) An element is a substance composed of atoms of two or more elements
D) An element is combination of two or more substances in which the substances retain their distinct identities.
E) An element is a substance that cannot be separated into simpler substances by chemical means.

4) Liquid nitrogen boils at –195.8°C. Express the boiling point of liquid nitrogen in kelvin. 4) _____

A) all temperatures are 0 K on the Kelvin scale (K = ^{o}C + 273.15)
B) 77.4 K
C) 469.0 K
D) –77.4 K
E) –469.0 K

5) A person weighs 68.04 kg (150.0 lb), and the correct dosage of a drug is given as 1.50 mg per kilogram of body weight. How many milligrams of the drug should be given? 5) _____

A) 112 mg
B) 108 mg
C) None of the above
D) 102 mg
E) 115 mg

6) The number 1.050×10^9 has how many significant figures? 6) _____

A) 13 B) 3 C) 9 D) 2 E) 4

7) Express the number 0.000053 in scientific notation. 7) _____

A) 5.3×10^{-5}
B) 5.3×10^{-6}
C) 5.3×10^{-2}
D) 5.3×10^{-3}
E) 5.3×10^{-4}

8) What are the three states of matter? 8) _____

A) Solid, liquid, element
B) Compound, solid, liquid
C) Compound, element, mixture
D) Solid, liquid, gas
E) Solid, liquid, compound

9) An *anion* is defined as 9) _____

A) a charged atom or group of atoms with a net negative charge.
B) a stable atom.
C) a group of stable atoms.
D) an atom or group of atoms with a net positive charge.

10) The SI prefixes *kilo* and *milli* represent, respectively: 10) _____

A) 10^{-9} and 10^{-1}
B) 10^{3} and 10^{-3}
C) 10^{9} and 10^{-6}
D) 10^{-9} and 10^{-6}
E) 10^{6} and 10^{-3}

11) A magnesium ion, Mg^{2+}, has 11) _____

A) 12 protons and 13 electrons.
B) 24 protons and 22 electrons.
C) 24 protons and 26 electrons.
D) 12 protons and 14 electrons.
E) 12 protons and 10 electrons.

12) Name the following binary compound: FeS.(Fe ion is usually charged +2 or +3) 12) _____

A) Iron sulfite
B) Iron (I) sulfide
C) Iron sulfide
D) Iron (I) sulfite
E) Iron (II) sulfide

13) Which one of the following elements is most likely to form a 2+ ion? 13) _____

A) oxygen B) fluorine C) carbon D) calcium E) sodium

14) Which of the following are isotopes? 14) _____

A) ^{14}C and ^{13}C
B) ^{14}N and $^{14}N^{3-}$
C) ^{12}C and ^{12}CO
D) ^{14}C and ^{14}N
E) ^{14}N and $^{14}N_2$

15) There are the seven elements that naturally occur as diatomic molecules. This list contains four of those plus one that does not fit this distinction. Which one of the following does not occur naturally as a diatomic molecule? 15) _____

A) Nitrogen
B) Neon
C) Chlorine
D) Fluorine
E) Hydrogen

16) What are the two different ions present in the compound CaS? 16) _____

A) Ca^{2-}, S^{2+} B) Ca^{2+}, S^{2-} C) Ca, S D) Ca^{-}, S^{+} E) Ca^{+}, S^{-}

Part II: Short Answers (39 pts) Show work on all questions for partial and full credit even on questions which do not specify.

1. Periodic Table and atom symbols: (1 pts each blank, 9 pts total)

(a) Give the symbol for the element **oxygen**

(b) How many protons _____

(c) How many electrons for the neutral atom _____

(d) Give the symbol in the format ${}^{A}_{Z}X$ for the same element _____

(e) What group is the element in _____ e) What period is the element in _____

(f) What is the likely charge on the element _____ Explain or show work.

(g) Is the element a [(metal) or (nonmetal)]

2. Metric Measurements: (6 pts, 3 pts each)

liter equals _____ milliliter or 10 raised to what power _____ (don't forget sign) (6 pt)

3. Given the following list of chemical formulas, circle all which are ionic (4 pts total, ½ pts each)

K Cl CO_2 Sr_3P_2 MgF_2 SO_2 Li_2O CCl_4 $CaCl_2$

3. If you have a compound made up of the elements **In and Se** (6 pts total)

a) What are the charges on the ions made from those elements (show work) (2 pts)

b) Write the formula for the compound made from those elements. Showing work on how you arrived at the formula. (4 pts)

4. Name the compound (4 pts)

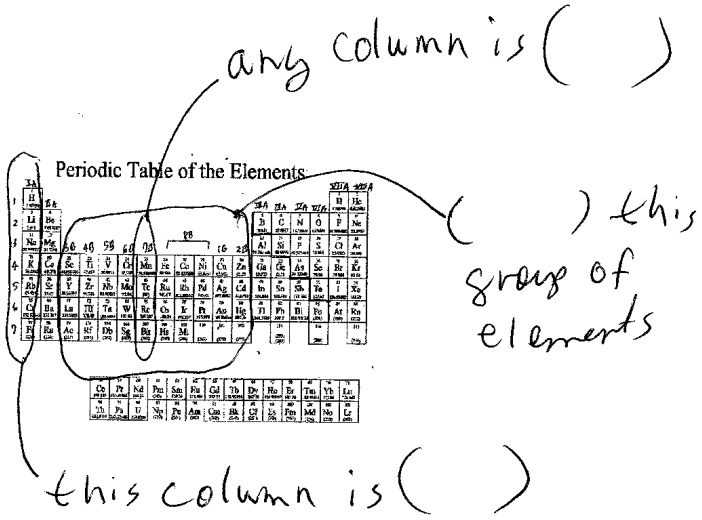
K_3PO_4

5. Given the following name, give the formula (4 pts)

carbon dioxide

5. Match the following to the letters shown. The letters may only be used one time or not at all. (6 pts total, 2 pts each)

(A) transition metal elements (B) lanthanide, actinide elements (C) main group elements (D) alkali metal elements (E) alkaline earth elements (F) halogens (G) noble gases (L) a period (M) a group



Part III: **Long Answers** (31 pts) Show work on all questions for partial and full credit even on questions which do not specify.

1. Dimensional Analysis Problem: (15 pts)

a. The **density** of a liquid pharmaceutical is **3.88 g / mL**. You need **7.8 grams** of the liquid pharmaceutical. How many mL of the pharmaceutical do you need to get 7.8 grams ? [density = mass (grams) / volume (mL)] (7 pts)

b. How many cups is 98.9 mL of a solution ? (4 cups = 1 quart, 1 L = 1.06 quart) (8 pts)

2. Mole Dimensional Analysis Question: (16 pts)

molar mass	=	1 mole	=	6.022×10^{23}
atomic mass or molecular weight		of atoms of molecules		atoms molecules

a. What is the molar mass (in grams) for a molecule with the formula H_2O ? (8 pts)

b. If I have ~~72.9~~ 48.5 grams of the compound, how many **moles** of H_2O do I have ? (5 pts)

c. If you are told that for 1 mole of H_2O, you have 2 moles of hydrogen, how many atoms of hydrogen do I have in the 48.5 grams of water ? (3 pts)