Chemistry 115 Name

Dr. Cary Willard

Exam 1a February 21, 2013

 Multiple Choice (30 points)

 Page 5 (22 points)

 Page 6 (20 points)

 Page 7 (16 points)

 Page 8 (14 points)

 Total (102 points)

All work must be shown to receive credit. Give all answers to the correct number of significant figures

$$℉=\left(℃×\frac{180℉}{100℃}\right)+32℉$$

$$℃=\left(℉-32℉\right)\frac{100℃}{180℉}$$

$$K=℃+273$$

454 g = 1 lb

2.54 cm = 1 in

946 mL = 1 qt

Grossmont College

Periodic Table

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  IA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | VIIA | NOBLE GASES |
| 1**H**1.008 | IIA |  |  |  |  |  |  |  |  |  |  | IIIA | IVA | VA | VIA | 1**H**1.008 | 2**He**4.002 |
| 3**Li**6.941 | 4**Be**9.012 |  |  |  |  |  |  |  |  |  |  | 5**B**10.81 | 6**C**12.01 | 7**N**14.01 | 8**O**16.00 | 9**F**19.00 | 10**Ne**20.18 |
| 11**Na**23.00 | 12**Mg**24.30 | IIIB | IVB | VB | VIB | VIIB |  VIII VIII VIII | IB | IIB | 13**Al**27.00 | 14**Si**28.09 | 15**P**30.97 | 16**S**32.06 | 17**Cl**35.45 | 18**Ar**39.95 |
| 19**K**39.10 | 20**Ca**40.08 | 21**Sc**44.96 | 22**Ti**47.90 | 23**V**50.94 | 24**Cr**52.00 | 25**Mn**54.94 | 26**Fe**55.85 | 27**Co**58.93 | 28**Ni**58.70 | 29**Cu**63.55 | 30**Zn**65.38 | 31**Ga**69.72 | 32**Ge**72.59 | 33**As**74.92 | 34**Se**78.96 | 35**Br**79.90 | 36**Kr**83.80 |
| 37**Rb**85.47 | 38**Sr**87.62 | 39**Y**88.91 | 40**Zr**91.22 | 41**Nb**92.91 | 42**Mo**95.94 | 43**Tc**(99) | 44**Ru**101.1 | 45**Rh**102.9 | 46**Pd**106.4 | 47**Ag**107.9 | 48**Cd**112.4 | 49**In**114.8 | 50**Sn**118.7 | 51**Sb**121.8 | 52**Te**127.6 | 53**I**126.9 | 54**Xe**131.3 |
| 55**Cs**132.9 | 56**Ba**137.3 | 57**La**138.9 | 72**Hf**178.5 | 73**Ta**180.9 | 74**W**183.9 | 75**Re**186.2 | 76**Os**190.2 | 77**Ir**192.2 | 78**Pt**195.1 | 79**Au**197.0 | 80**Hg**200.6 | 81**Tl**204.4 | 82**Pb**207.2 | 83**Bi**209.0 | 84**Po**(209) | 85**At**(210) | 86**Rn**(222) |
| 87**Fr**(223) | 88**Ra**226.0 | 89**Ac**227.0 | 104**Rf**(261) | 105**Db**(262) | 106**Sg**(263) | 107**Bh**(262) | 108**Hs**(265) | 109**Mt**(266) | 110**??**(269) |  |  |  |  |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 58**Ce**140.1 | 59**Pr**140.9 | 60**Nd**144.2 | 61**Pm**(147) | 62**Sm**150.4 | 63**Eu**152.0 | 64**Gd**157.3 | 65**Tb**158.9 | 66**Dy**162.5 | 67**Ho**164.9 | 68**Er**167.3 | 69**Tm**168.9 | 70**Yb**173.0 | 71**Lu**175.0 |
| 90**Th**232.0 | 91**Pa**231.0 | 92**U**238.0 | 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**(260) |

Lanthanide series

Actinide series

Part 1 – Multiple Choice (30 points)

1. Why study chemistry?
	1. to help inform us about our world
	2. to be better able to make informed decisions
	3. to help us learn a technique for identifying and solving problems
	4. all of these choices
2. Which is a pure substance?
	1. solution
	2. compound
	3. mixture
	4. both mixture and solution
3. One kilometer is equal to \_\_\_.
	1. 1000 m
	2. 0.001 m
	3. 0.01 m
	4. 100 m
4. How many zeroes are significant in the number 0.030030?
	1. 1
	2. 2
	3. 3
	4. 4
5. The elements on the current periodic table are placed in order of increasing \_\_\_.
	1. density
	2. boiling point
	3. atomic mass
	4. atomic number
6. Which of the following is the correct symbol for iron?
	1. I
	2. I2
	3. Fe
	4. FE
7. Which of the following is an alkaline earth metal?
	1. magnesium
	2. hydrogen
	3. manganese
	4. iodine
8. What is the name of the element with an atomic number of 24?
	1. carbon
	2. cerium
	3. chromium
	4. californium
9. Which of the following is a physical change?
	1. a piece of wood is burned
	2. a nail rusts
	3. a rubber band is stretched
	4. a firecracker explodes
10. Which of the following is a chemical property of chlorine?
	1. It has a sharp suffocating odor.
	2. It combines with sodium to form sodium chloride.
	3. It is a yellowish-green gas.
	4. It boils at –34.6ºC.
11. What is the charge associated with a neutron?
	1. +1
	2. –1
	3. 0
	4. none of these choices
12. Which of the following pairs of subatomic particles have similar masses?
	1. protons and neutrons
	2. electrons and protons
	3. electrons and neutrons
	4. none of these choices
13. Mass number refers to
	1. number of protons and electrons in an atom
	2. number of neutrons and electrons in an atom
	3. number of protons in an atom
	4. number of protons and neutrons in an atom
14. Which of the following is not accounted for by Dalton’s theory?
	1. Elements are composed of atoms.
	2. Atoms combine to form compounds.
	3. Atoms are composed of electrons, neutrons, and protons.
	4. Atoms of a given element are alike in mass and size.
15. The concept that most of the atom’s mass is concentrated in a small nucleus surrounded by electrons was the contribution of \_\_\_.
	1. Rutherford
	2. Dalton
	3. Thomson
	4. Chadwick

Part 2 – 70 points Give all answers to the correct number of significant figures and include units where appropriate. Show clear set-up for each problem to receive credit.

1. (10 points) Perform the following actions on each of the following

|  |  |
| --- | --- |
| Round 7.29764 mL to 3 significant figures. | 7.30 mL |
| How many significant figures are in 0.00860 g? | 3 |
| Write 70350000 cm in scientific notation. | 7.035 x 107 cm |
| What is the log of 8.24 x 106? | 6.916 |
| $$6.5741g BeCO\_{3}×\frac{1 mol BeCO\_{3}}{69.02 g BeCO\_{3} }×\frac{6.022×10^{23}units BeCO\_{3}}{1 mol BeCO\_{3}}×\overset{exact conversion}{\overbrace{\frac{3 atoms O}{1 unit BeCO\_{3}}}}=$$ | 1.721 x 1023 atoms O |

1. (8 points) The radius of an atom of copper is 1.28 x 10-10 m.
	1. Calculate the radius of this atom in centimeters.

$$?cm=1.28 x 10^{-10}m×\frac{100 cm}{1 m}=1.28 x 10^{-8}cm$$

* 1. Calculate the radius of this atom in inches.

$$?in=1.28 x 10^{-10}m×\frac{100 cm}{1 m}×\frac{1 in}{2.54 cm}=5.04 x 10^{-9}in$$

1. (4 points) Blue whale calves can grow at a rate of 260. pounds/day. What is the rate of growth in grams/second?

$$?\frac{g}{sec}=\frac{260 lb}{day}×\frac{454 g}{1 lb}×\frac{1 day}{24 hr}×\frac{1 hr}{60 min}×\frac{1 min}{60 sec}=\frac{1.37 g}{sec}$$

1. ( 4 points) The density of corn oil is 0.814 g/mL. If a recipe calls for 3.58 kg of corn oil, how many quarts of corn oil should you measure out?

$$?qt oil=3.58 kg oil×\frac{1000 g oil}{1 kg oil}×\frac{1 mL oil}{0.814 g oil}×\frac{1 qt oil}{946 mL oil}=4.65 qt oil$$

1. (8 points) A solution is prepared by dissolving 95.4 grams of sodium nitrate in 753 g of water.
	1. What is the percent sodium nitrate in the solution.

$$\%=\left(\frac{mass part}{mass whole}\right)×100=\left(\frac{95.4 g sodium nitrate}{95.4 g sodium nitrate+753 g water}\right)×100=\left(\frac{95.4 g sodium nitrate}{848 g soln}\right)×100=11.3\% sodium nitrate$$

* 1. How many grams of the solution are required to obtain 50.0 grams of sodium nitrate?

$$?g soln=50.0 g sodium nitrate×\frac{100 g soln}{11.3 g sodium nitrate}=442 g soln$$

1. (8 points) The boiling temperature of ethyl alcohol is 78oC.
	1. What is the boiling temperature in oF?

$$℉=\left(℃×\frac{180℉}{100℃}\right)+32=\left(78℃×\frac{180℉}{100℃}\right)+32=140+32=172℉$$

* 1. What is the boiling temperature in K?

$$K=℃+273=78+273=351 K$$

1. (4 points)How are the different isotopes of an element alike; how are they different?

All isotopes of an element always have the same number of protons or atomic number. The difference between various isotopes of an element is that they have different numbers of neutrons and different mass numbers.

1. (4 points) How does Dalton’s atomic theory explain why chemical formulas are always written with whole number values?

Dalton’s theory states that all matter is composed of fundamental particles called atoms. Since atoms cannot be broken down into more fundamental units, when a compound forms it must contain a whole number of atoms as reflected by the whole number values for the number of each type of atom within a compound.

1. (4 points) Would a bowl of cream of broccoli soup be a homogeneous or a heterogeneous mixture? Justify your choice.

Two possible answers

* 1. Heterogenous because there are small pieces of broccoli floating in the soup so some bites you will get a chunk of broccoli and in others nothing but cream.
	2. Homogeneous because the pieces of broccoli are chopped up into such small bits that every bite will be a smooth mixture of all of the soup components.
1. (4 points) Explain how an ocean of water and a cup of the same ocean water can have the same temperature but contain different amounts of heat.

Temperature is the average kinetic energy of the molecules in a sample. If both samples have the same temperature they consist of molecules with the same average kinetic energy. The sample with more molecules, the ocean, must have the greater total amount of energy.

1. (6 points) You buy an ingot of gold off of the internet. Given the current price of gold you want to make sure that it is real. You decide to determine the density of the ingot and compare it to the density of gold. The density of some metals are given at the right. Calculate the density of the ingot and predict its identity.

|  |  |
| --- | --- |
| metal | density (g/mL) |
| gold | 19.3 |
| silver | 10.5 |
| copper | 8.96 |
| lead | 11.3 |

Data: Mass ingot 466.3 g

 Initial volume water 45.0 mL

 Volume water and ingot 89.4 mL

$$volume ingot=89.4 mL-45.0 mL=44.4 mL$$

$$density=\frac{mass}{volume}=\frac{466.3 g}{44.4 mL}=10.5 {g}/{mL}$$

The density is low and the ingot appears to be composed of silver.

1. (8 points) You are given a sample of manganese-57.
	1. How many protons does this isotope contain? 25 protons
	2. How many neutrons does this isotope contain? 32 neutrons
	3. What is the mass number of this isotope? 57
	4. Write the correct atomic symbol $\left(\right)$for this atom including information regarding the mass number and the atomic number.

$$ or $$