Chemistry 115 Name

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Exam 1a February 20, 2014

 Multiple Choice (30 points)

 Page 5 (19 points)

 Page 6 (17 points)

 Page 7 (18 points)

 Page 8 (16 points)

 Total (100 points)

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

|  |  |
| --- | --- |
| Substance  | Density (g/mL) |
| Vegetable oil | 0.91 |
| Water | 1.00 |
| Sugar  | 1.59 |
| Glycerin | 1.26 |
| Magnesium  | 1.74 |
| Sulfuric acid  | 1.84 |
| Lead  | 11.34 |
| Mercury  | 13.55 |

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

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

$$K=℃+273$$

454 g = 1 lb

2.54 cm = 1 in

946 mL = 1 qt

1 mile = 5280 ft

1 ft = 12 in

|  |  |
| --- | --- |
| food type | Calories |
| carbohydrate | 4.0 |
| fat | 9.0 |
| protein | 4.0 |

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) |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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. A well established hypothesis is often called a(n) \_\_\_.
	1. observation
	2. fact
	3. theory
	4. law
2. How many significant figures are in the number 0.0015070?
	1. 5
	2. 4
	3. 7
	4. 8
3. Multiply (40.36) by (37.40). The product expressed to the proper number of significant figures is \_\_\_.
	1. 151
	2. 1509
	3. 1510.
	4. 1509.464
4. When expressed in proper scientific notation the number 4289 is \_\_\_.
	1. 4.289 × 10-4
	2. 4.289 × 10-3
	3. 4.289 × 103
	4. 4.289 ×104
5. The majority of the elements are \_\_\_.
	1. metals
	2. gases
	3. nonmetals
	4. metalloids
6. Based on the chemical formula Mg3(AsO4)2, choose the alternative that lists the number of atoms and the names of each of the elements present in the compound.
	1. 6 atoms of magnesium, 2 atoms of arsenic, 8 atoms of oxygen
	2. 3 atoms of magnesium, 1 atom of astatine, 8 atoms of oxygen
	3. 3 atoms of magnesium, 2 atoms of antimony, 8 atoms of oxygen
	4. 3 atoms of magnesium, 2 atoms of arsenic, 8 atoms of oxygen
7. What is the name of the element with an atomic number of 80?
	1. hafnium
	2. gold
	3. mercury
	4. silver
8. The law of multiple proportions states that
	1. atoms of one element may combine in different ratios to form more than one compound.
	2. atoms of one element may combine in different ratios to form the same compound.
	3. atoms of two or more elements may combine in different ratios to form more than one compound.
	4. atoms of two or more elements may combine in different ratios to produce the same compound.
9. Which of the following is a physical change?
	1. kerosene burning
	2. decomposition of water by electrolysis
	3. salt dissolving in water
	4. converting alcohol to vinegar
10. 3.17 g of sodium combines with chlorine to form 8.00 g of sodium chloride. What is the mass of chlorine in this sample of sodium chloride?
	1. 3.17 g
	2. 4.83 g
	3. 8.00 g
	4. 11.17 g
11. The specific heat of iron is 0.473 J/gºC and the specific heat of lead is 0.128 J/gºC. In order to raise the temperature of one gram of those metals by one degree Celsius,
	1. both metals require the same amount of energy.
	2. the iron requires more energy than the lead.
	3. the lead requires more energy than the iron.
	4. no correct answer is given
12. Which is not part of Dalton’s atomic model?
	1. Atoms of the same element can be different in size.
	2. Elements are composed of minute, indivisible particles called atoms.
	3. Atoms of the same element are alike in mass.
	4. Chemical compounds are composed of two or more atoms of different elements.
13. What is the charge associated with a neutron?
	1. 0
	2. +1
	3. –1
	4. none of these choices
14. Which of the following pairs of subatomic particles have similar masses?
	1. electrons and protons
	2. electrons and neutrons
	3. protons and neutrons
	4. none of these choices
15. Different isotopes of an element are atoms of that element which have
	1. different atomic number and the same mass number.
	2. different atomic number and different mass number.
	3. the same atomic number and the same mass number.
	4. the same atomic number and different mass number.

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. (4 points) Describe (using pictures if useful) the order of the following substances (top to bottom) if these three substances were placed in a 100 mL graduated cylinder: 25 mL glycerin, 25 mL mercury, and a cube of magnesium 2.0 cm on an edge.

The glycerin will float on top of the mercury and the cube of magnesium will sit at the interface between the mercury and the glycerin.

1. (3 points) How can the number 92000000 g be written to indicate there are 4 significant figures?

9.200 x 107 g

1. (4 points) Interpret the difference in meaning for each pair.
	1. NI and Ni

NI is a compound composed of nitrogen and iodine and Ni is the element nickel.

* 1. P4 and 4 P

P4 is a molecule containing 4 atoms of phosphorus and 4 P just means there are 4 atoms of P.

1. (4 points) How is a chemistry calorie (cal) different from a food calorie (Cal)?

A food calorie is equal to a kcal or 1000 chemistry calories.

1. (4 points) What is the volume of water (in mL) in the graduated cylinder shown to the right? Be sure to give your answer to the correct number of significant figures.

23.3 mL

1. (5 points) Identify an element that fits each of the descriptions below.

|  |  |
| --- | --- |
| An alkaline earth element |  |
| A semi-metal |  |
| An element found in the gas state in nature |  |
| A halogen |  |
| An element that is extremely unreactive |  |

1. (8 points) A hot dog stand goes through 793 kL of mustard every day.
	1. Calculate the cL of mustard used every day.

$$?cL=793 kL×\frac{1000 L}{1 kL}×\frac{100 cL}{1 L}=7.93 × 10^{7}cL$$

* 1. Calculate the number of gallons of mustard that must be delivered every day. (1 gal = 4 qt)

$$?lb=793 kL×\frac{1000 L}{1 kL}×\frac{1.06 qt}{1 L}×\frac{1 gal}{4 qt}=2.10 ×10^{5}gal$$

1. (4 points) A Mexican restaurant has the reputation of serving the hottest salsa in town. In order to maintain this standard, they must have a minimum of 8.41% by mass of cayenne pepper. If the restaurant just received a 3.26 kg shipment of cayenne pepper, how many pounds of salsa can they make?

$$?lb salsa=3.26 kg cayenne×\frac{100 kg salsa}{8.41 kg cayenne}×\frac{2.20 lb salsa}{1 kg salsa}=85.3 lb$$

1. ( 4 points) A giant anteater is able to eat 6.7 lbs of ants a day. If an ant has a mass of 85 mg, how many ants does the giant anteater eat in a day?

$$?ants=6.7 lb ant×\frac{454 g ant}{1 lb ant}×\frac{1000 mg ant}{1 g ant}×\frac{1 ant}{85 mg ant}=36000 ant$$

1. (8 points) A graduated cylinder is filled with 20.0 mL of salt water. A metal cylinder with a mass of 39.483 g is then submerged in the salt water increasing the volume to 34.1 mL.
	1. What is the density of the metal cylinder in g/mL?

$$mass cylinder=39.483 g$$

$$volume cylinder=34.1 mL-20.0 mL=14.1 mL$$

$$density= \frac{mass}{volume}=\frac{39.483 g}{14.1 mL}=2.80 {g}/{mL}$$

* 1. If the density of the salt water is 1.27 g/mL, what is the mass of salt water in the graduated cylinder?

$$?g salt water=20.0 mL×\frac{1.27 g}{1 mL}=25.4 g salt water$$

1. (6 points) The average high temperature in Sochi is 52oF.
	1. What is this temperature in oC?

$$℃=\left(℉-32℉\right)\frac{100℃}{180℉}=\left(52℉-32℉\right)\left(\frac{100℃}{180℉}\right)=11℃$$

* 1. What is this temperature in K?

$$K=℃+273=11℃+273=284 K$$

1. (8 points) A package of trail mix contains 9.2 g of fat, 13 g of carbohydrate, and 4.2 g of protein.
	1. How many calories will you consume if you eat the entire bag? (See front page for calorie data.)

$$9.2 g fat×\frac{9.0 Cal}{1 g fat}=83 Cal$$

$$13 g carb×\frac{4.0 Cal}{1 g carb}=52 Cal$$

$$4.2 g protein×\frac{4.0 Cal}{1 g protein}=17 Cal$$

Total Calories = 83 Cal +52 Cal +17 Cal = 152 Cal

* 1. What percentage of the calories in the package of trail mix comes from fat?

$$\%=\left(\frac{mass part}{mass whole}\right)×100=\left(\frac{83 fat Cal}{152 total Cal}\right)×100=55\% of the calories come from fat$$

1. (8 points) You are given a sample of mercury-207.
	1. How many protons does this isotope contain? 80 protons
	2. How many neutrons does this isotope contain? 127 neutrons
	3. If an atom of this element had a charge of +2, how many electrons would the atom contain? 78
	4. Write the correct atomic symbol $\left(\right)$for this atom including information regarding the mass number and the atomic number.

$$ or $$