Chemistry 115 Name

Dr. Cary Willard

Exam 1a September 11, 2013

 Multiple Choice (30 points)

 Page 5 (16 points)

 Page 6 (16 points)

 Page 7 (20 points)

 Page 8 (19 points)

 Total (100 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

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. Which is a scientific observation?
	1. Freezing and boiling are called physical changes.
	2. Water freezes at 0 °C.
	3. If a substance has a density of 1.00 g/mL it must be water.
	4. When a substance freezes its molecules lose potential energy.
2. Which state of matter consists of particles held together firmly but not rigidly? These particles are held together by strong attractive forces, are in close contact with one another, but are able to flow by one another.
	1. solid
	2. vapor
	3. gas
	4. liquid
3. The number, 14.74999, when rounded to three digits is \_\_\_.
	1. 14.7
	2. 15.0
	3. 14.8
	4. 10.0
4. How many zeroes are significant in the number 0.0040?
	1. 4
	2. 3
	3. 2
	4. 1
5. If the Celsius temperature of a sample changes twenty degrees, how many degrees does its Kelvin temperature change?
	1. 20
	2. 257
	3. 273
	4. 293
6. When expressed in proper scientific notation the number 0.00364 is \_\_\_.
	1. 3.64 × 103
	2. 3.64 × 102
	3. 3.64 × 10–2
	4. 3.64 × 10–3
7. The elements on the current periodic table are placed in order of increasing \_\_\_.
	1. density
	2. boiling point
	3. atomic number
	4. atomic mass
8. Which of the following is the correct symbol for iron?
	1. I
	2. I2
	3. Fe
	4. FE
9. Which of the following is an alkali metal?
	1. sodium
	2. calcium
	3. silicon
	4. fluorine
10. A 20. g sample of solid carbon and 127 g of oxygen gas burn to form 73 g of pure carbon dioxide. If no other products are formed and all of the carbon is reacted, what is the mass of the unreacted oxygen?
	1. 54 g
	2. 49 g
	3. 74 g
	4. 99 g
11. The change of liquid water into ice is a
	1. chemical change.
	2. physical change.
	3. heterogeneous change.
	4. homogeneous change.
12. 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.
13. The number of protons in an atom is known as its \_\_\_.
	1. atomic mass
	2. mass number
	3. molecular mass
	4. atomic number
14. Which of the following is not accounted for by Dalton’s theory?
	1. Elements are composed of atoms.
	2. Atoms are composed of electrons, neutrons, and protons.
	3. Atoms combine to form compounds.
	4. Atoms of a given element are alike in mass and size.
15. Ions can be formed from atoms by losing or gaining electrons. Select the alternative that states the correct number of protons, neutrons, and electrons in .
	1. 13 protons, 14 neutrons, and 10 electrons
	2. 13 protons, 14 neutrons, and 16 electrons
	3. 10 protons, 17 neutrons, 13 electrons
	4. 13 protons, 27 neutrons, 10 electrons

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) When the stopper is removed from a partly filled bottle containing solid and liquid acetic acid at 16.7oC, a strong vinegar-like odor is noticeable immediately. How many acetic acid phases must be present in the bottle? Identify the phases and explain your reasoning.

The bottle must contain at least 3 phases. The solid and liquid phases are visible in the bottle and the fact that a strong vinegar odor emanates from the bottle indicates that a gas phase must also be present.

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

9.200 x 107

1. (4 points) In what ways are isotopes of an element alike? In what ways are they different?

Isotopes of an element are alike because they must all have the same number of protons (and electrons for the neutral atom) or they would be different elements. Different isotopes of an element are different because they have different numbers of neutrons and thus different masses.

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) The mass of a prize-winning pumpkin at the Oregon state fair is 915 kg.
	1. Calculate the mass of this pumpkin in milligrams.

$$?mg=915 kg×\frac{1000 g}{1 kg}×\frac{1000 mg}{1 g}=9.15 × 10^{8}mg$$

* 1. Calculate the mass of this pumpkin in lbs.

$$?lb=915 kg×\frac{1000 g}{1 kg}×\frac{1 lb}{454 g}=2020 lb$$

1. (4 points)The 2013 Rolls Royce Ghost Alpine has a top speed of 185 miles per hour. Calculate the speed in centimeters per second.

$$?\frac{cm}{sec}=\frac{185 mi}{hr}×\frac{5280 ft}{1 mi}×\frac{12 in}{1 ft}×\frac{2.54 cm}{1 in}×\frac{1 hr}{60 min}×\frac{1 min}{60 sec}=\frac{8270 cm}{sec}$$

1. ( 4 points) A cape is designed for Lady Gaga’s concert with 8340 sequins. If a sequin has a volume of 0.0347 mL and the sequins have a density of 38.5 g/mL, what is the mass in kg of sequins on Lady Gaga’s cape?

$$?g sequins=8340 sequins×\frac{0.0347 mL sequin}{1 sequin}×\frac{38.5 g sequins}{1 mL sequins}×\frac{1 kg sequins}{1000 g sequins}=11.1 kg sequins$$

1. (8 points) A sample of brine collected from the ocean has a density of 1.28 g/mL and contains 9.06% sodium chloride.
	1. What is the volume in L of a 6.55 kg sample of this brine?

$$?L=6.55 kg brine×\frac{1000 g brine}{1 kg brine}×\frac{1 mL brine}{1.28 g brine}×\frac{1 L brine}{1000 mL brine}=5.12 L brine$$

* 1. How many grams of brine are required to obtain 150.0 grams of sodium chloride?

$$?g brine=150.0 g NaCl×\frac{100 g brine}{9.06 g NaCl}=1660 g brine$$

1. (12 points) A package of corn nuts contains 8 g of fat, 34 g of carbohydrate, and 4 g of protein.
	1. How many calories will you consume if you eat the entire bag? (8 points) (See front page for calorie data.)

$$8.0 g fat×\frac{9.0 Cal}{1 g fat}=72 Cal$$

$$34.0 g carb×\frac{4.0 Cal}{1 g carb}=136 Cal$$

$$4.0 g protein×\frac{4.0 Cal}{1 g protein}=16 Cal$$

Total Calories = 72 Cal +140 Cal +16 Cal = 230 Cal

* 1. What percentage of the calories in the package of corn nuts comes from fat?

$$\%=\left(\frac{mass part}{mass whole}\right)×100=\left(\frac{72 fat Cal}{230 total Cal}\right)×100=31\% of the calories come from fat$$

* 1. If jumping rope for 1 hour uses up 844 Calories, how many minutes must you jump rope to burn the calories consumed by eating the bag of corn nuts?

$$?min=230 Cal×\frac{1 hr}{844 Cal}×\frac{60 min}{1 hr}=16 min$$

1. (6 points) The body temperature for a tortoise is 78oF.
	1. What is this temperature in oC?

$$℃=\left(℉-32℉\right)\frac{100℃}{180℉}=\left(78℉-32℉\right)\left(\frac{100℃}{180℉}\right)=26℃$$

* 1. What is this temperature in K?

$$K=℃+273=26℃+273=299 K$$

1. (8 points) You are given a sample of titanium−52.
	1. How many protons does this isotope contain? 22 protons
	2. How many neutrons does this isotope contain? 30 neutrons
	3. If an atom of this element had a charge of +2, how many electrons would the atom contain? 20
	4. Write the correct atomic symbol $\left(\right)$for this atom including information regarding the mass number and the atomic number.

$$ or $$

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

According to Dalton the smallest particle is an atom. Compounds are composed of atoms combining together. Since only whole atoms are allowed and since chemical formulas tell the number of each type of atom in a compound they must be whole numbers. A fractional number would indicate the presence of a partial atom in the compound.