Chemistry 115 Name key

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Exam 4a May 23, 2013

Multiple Choice (30 points)

Page 4 (10 points)

Page 5 (16 points)

Page 6 (14 points)

Page 7 (14 points)

Page 8 (6 points)

Total (100 points)

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

Avogadros number = 6.022 x 1023 /mol

Grossmont College

Periodic Table

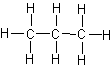
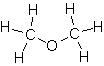
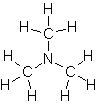
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| IA |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  | VIIA | NOBLE GASES |
| 1  **H**  1.008 | IIA |  |  |  |  |  |  |  |  |  | |  | IIIA | IVA | VA | VIA | 1  **H**  1.008 | 2  **He**  4.002 |
| 3  **Li**  6.941 | 4  **Be**  9.012 |  |  |  |  |  |  |  |  |  | |  | 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 I – Multiple Choice (30 points)

1. Which phase change corresponds to sublimation?
   1. liquid to gas
   2. solid to gas
   3. gas to liquid
   4. solid to liquid
2. Which has the highest vapor pressure?
   1. 125 mL of water at 283 K
   2. 10 mL of water at 288 K
   3. 5 mL of water at 299 K
   4. 50 mL of water at 293 K
3. Which of the following properties of water is not affected by hydrogen bonding?
   1. boiling point
   2. molar mass
   3. freezing point
   4. vapor pressure
4. Which of the following substances would exhibit hydrogen bonding?
   1. 
   2. 
   3. 
   4. 
5. At which temperature would CO2 gas be most soluble?
   1. 40. °C
   2. 30. °C
   3. 20. °C
   4. 10. °C
6. The addition of a crystal of sodium chlorate to a sodium chlorate solution causes additional crystals of sodium chlorate to precipitate. The original solution was
   1. supersaturated.
   2. saturated.
   3. unsaturated.
7. Which of the following is the hydroxide ion?
   1. H +
   2. H3O+
   3. OH –
   4. a proton
8. Which pH listed below is most alkaline (basic)?
   1. 12
   2. 7
   3. 5
   4. 1
9. Which is true about ionizing radiation?
   1. It dislocates bonding electrons and creates ions.
   2. It can damage DNA molecules.
   3. Both large acute doses and small chronic doses are harmful.
   4. All the above are true.
10. Gamma rays have
    1. a mass of 4 amu.
    2. a charge of +2.
    3. a charge of –1.
    4. neither mass nor charge.
11. An alpha particle consists of
    1. one proton and one neutron.
    2. two protons and two neutrons.
    3. one proton and two neutrons.
    4. two protons and one neutron.
12. In a nuclear reaction
    1. mass is lost.
    2. mass is gained.
    3. energy is converted into mass.
    4. mass is converted into energy.
13. What type of compound is composed of only carbon and hydrogen atoms?
    1. carbohydrate
    2. hydrocarbon
    3. ester
    4. carboxylic acid
14. Which hydrocarbon series is saturated?
    1. alkenes
    2. alkynes
    3. alkanes
    4. aromatics
15. Two or more different compounds with the same molecular formula are
    1. isomers
    2. isotopes
    3. hypermeres
    4. hypertopes

Problems (61 points)

1. (6 points) Define the term viscosity. How does the viscosity of a liquid change as intermolecular forces become stronger? Explain using kinetic molecular theory (KMT) how differences in intermolecular forces affect viscosity.

Viscosity is a measure of resistance to flow.

As intermolecular forces become stronger, the viscosity of a liquid increases.

This is because stronger intermolecular forces cause the molecules to be more strongly attracted to each other resulting in a liquid that pours more slowly because the molecules do not want to roll past one another but rather stick.

1. (4 points) How does the solubility vary with pressure? Compare the effect of pressure change on gases, liquids, and solids.

The solubility of liquids and gases is generally not affected by pressure. Gases are always more soluble at high pressures.

1. (8 points) A cup of coffee has a volume of 250. mL, a mass of 250. g, and contains 175 mg of caffeine, C8H10N4O2.
   1. What is the molarity of the caffeine in the coffee?
   2. What is the mass percent of the caffeine in the coffee?
2. (4 points) If 6.04 mL of a 2.75 M solution of calcium acetate is added to enough orange juice to make 1.50 L of orange juice, what will the molarity of calcium acetate be in the calcium fortified orange juice?
3. (4 points) You love the smell of jasmine and have bought a solution of methyl jasmonate, one of the compounds responsible for the characteristic odor of jasmine. If the solution is composed of a 0.5298 molar solution of methyl jasmonate in acetone, how many molecules of methyl jasmonate will you spread around the room if you spritz 0.414 mL of the solution into the air?
4. (8 points) Given the reaction

2 K3PO4(aq) + 3 Ni(NO3)2(aq) 🡪 Ni3(PO4)2(s) + 6 KNO3(aq)

* 1. How many mL of a 3.416 M solution of nickel(II) nitrate are required to react with 0.1800 mol of potassium phosphate?
  2. How many grams of nickel(II) phosphate (366.0 g/mol) will be produced by the reaction of 38.95 mL of 3.416 M nickel(II) nitrate with excess potassium nitrate?

1. (6 points) Write an equation to illustrate the acid-base reactions that will take place between HBr and NH3. Identify the acids, bases, and conjugate acid base pairs.
2. (8 points) Fill in the chart below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| [H3O+] | [OH-1] | pH | pOH | Acidic or basic |
| 1.56 x 10-11 M | 6.41 x 10-4 M | 10.807 | 3.193 | basic |
| 1.90 x 10-10 M | 5.26 x 10-5 M | 9.721 | 4.279 | basic |

1. (3 points) The formula for lactic acid is preferable written as HC3H5O3 rather than C3H6O3. Explain why.

Writing one H in front indicates that there is one acidic hydrogen in this acid.

1. (3 points) What is the correct name for the compound below?



3,4-dimethyl octane

1. (6 points) A 25.00 mL aliquot of an oxalic acid solution is titrated with 31.66 mL of a 0.5377 M solution of sodium hydroxide (40.00 g/mol). What is the concentration of oxalic acid(H2C2O4, 90.03 g/mol) in the solution?

|  |  |
| --- | --- |
| Moles NaOH used to titrate sample | 0.01702 mol |
| Moles oxalic acid in the sample | 0.008510 mol |
| Molarity oxalic acid | 0.3404 M |