Prince Sultan University

Deanship of Educational Services

Department of General Sciences

COURSE DETAILS:

GENERAL CHEMISTRY 101CHM101MAJOR EXAM II	
Semester:	Spring Term 182
Date:	Sunday /April 7th /2019
Time Allowed:	60 minutes

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

H[1] 1.000																	**He**[2] 4
Li[3] 6.941	**Be**[4] 9.012											**B**[5] 10.81	**C**[6] 12.01	**N**[7] 14.01	**O**[8] 16	**F**[9] 19	**Ne**[10] 20.18
Na[11] 22.99	**Mg**[12] 24.31											**Al**[13] 26.98	**Si**[14] 28.09	**P**[15] 30.97	**S**[16] 32.06	**Cl**[17] 35.45	**Ar**[18] 39.95
K[19] 39.10	**Ca**[20] 40.08	**Sc**[21] 44.96	**Ti**[22] 47.9	**V**[23] 50.94	**Cr**[24] 51.99	**Mn**[25] 54.94	**Fe**[26] 55.85	**Co**[27] 58.93	**Ni**[28] 58.71	**Cu**[29] 63.54	**Zn**[30] 65.37	**Ga**[31] 69.72	**Ge**[32] 72.59	**As**[33] 74.92	**Se**[34] 78.96	**Br**[35] 79.9	**Kr**[36] 83.8
Rb[37] 85.47	**Sr**[38] 87.62	**Y**[39] 88.91	**Zr**[40] 91.22	**Nb**[41] 92.91	**Mo**[42] 95.94	**Tc**[43] 99.91	**Ru**[44] 101.1	**Rh**[45] 102.91	**Pd**[46] 106.4	**Ag**[47] 107.87	**Cd**[48] 112.4	**In**[49] 114.8	**Sn**[50] 118.69	**Sb**[51] 121.75	**Te**[52] 127.6	**I**[53] 126.9	**Xe**[54] 131.3
Cs[55] 132.9	**Ba**[56] 137.3	**Lu**[71] 175.0	**Hf**[72] 178.5	**Ta**[73] 180.9	**W**[74] 183.85	**Re**[75] 186.2	**Os**[76] 190.2	**Ir**[77] 192.2	**Pt**[78] 195.1	**Au**[79] 196.97	**Hg**[80] 200.6	**Tl**[81] 204.37	**Pb**[82] 207.2	**Bi**[83] 208.98	**Po**[84] 210	**At**[85] 210	**Rn**[86] 222

Student's Mark
/15

1) ***(3 points)*** Barium hydroxide, $Ba(OH)_2$ solution, and acetic acid, CH_3COOH solution, react to yield two products; Answer the following reaction regarding this reaction:

A) *Complete* and *balance* the ***molecular equation*** that represents this reaction:

……..$Ba(OH)_2(aq)$ + …….CH_3COOH $(aq) \rightarrow$ …….. (aq) +…….(l)

B) Write the ***net ionic*** equation (Note: Acetic acid is **<u>weak acid</u>**):

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C) If 20 mL of 0.1 M $Ba(OH)_2$ solution were required to titrate 0.3M sample of CH_3COOH solution. Calculate the volume of acetic acid (CH_3COOH) sample?

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2) ***(1.5 points)*** You have 88.6 mL of a 2.50 M solution of Na_2CrO_4(aq). You also have 125 mL of a 2.50 M solution of $AgNO_3$(aq). After mixing the two solutions the following reaction takes place:

Na_2CrO_4 (aq) + 2 $AgNO_3$(aq) $\rightarrow$ Ag_2CrO_4 (s) + 2 $NaNO_3$ (aq)

A) Calculate the mass of **Ag_2CrO_4** that will precipitate at the end of the reaction?

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B) Calculate the concentration of Na^+ ions at the end of the reaction?

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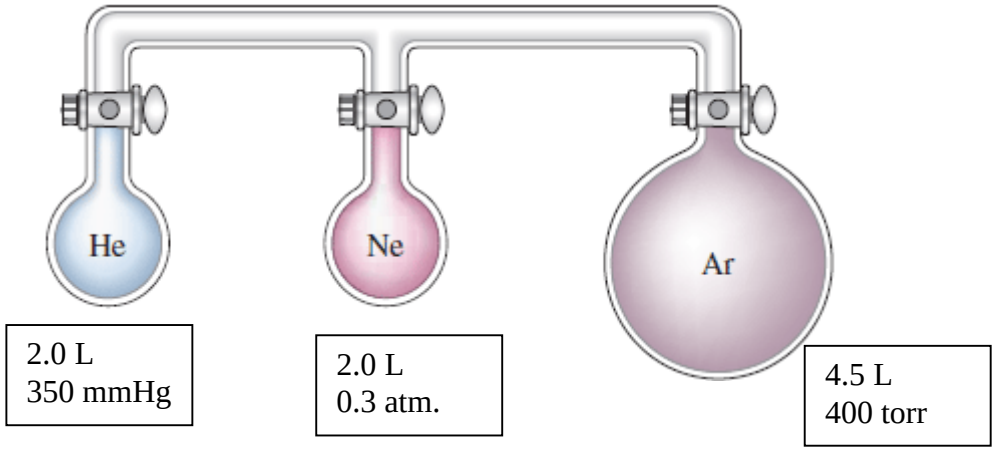
3) ***(2 points)*** consider the three flasks in the diagram below, , then



A) Calculate the ***total pressure*** after all valves are opened?

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B) Calculate the ***partial pressure of Ar*** gas in the mixture?

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4) ***(1.5 point)*** A 32.5 g piece of aluminum (which has a **molar specific heat** capacity of 24.03 J/°C•mol) is heated to 82.4°C and dropped into a calorimeter containing water (specific heat capacity of water is 4.18 J/g°C) initially at 22.3°C. The final temperature of the water is 24.2°C. Ignoring significant figures, calculate the mass of water in the calorimeter.

A) 212 g
B) 5.72kg
C) 6.42
D) 1.68kg
E) None of these

5) ***(1.0 point)*** A gas absorbs 188 J of heat and then performs 310 J of work. The change in internal energy of the gas is

A) 498J
B) - 122J
C) + 122J
D) – 498J
E) none of these

6) ***(1 point)*** At 1000°C and 10 torr, the density of a certain element in the gaseous state is 2.90×10^{-3} the element is:

A) Na
B) He
C) F
D) Zn
E) O

7) ***(1 point)*** A sample of gas is in a 50.0-mL container at a pressure of 645 torr and a temperature of 25°C. The entire sample is heated to a temperature of 35°C and transferred to a new container whose volume is 98.7 mL. The pressure of the gas in the second container is about:

A) 457 torr
B) 316 torr
C) 1.32×10^3 torr
D) 65 torr
E) 338 torr

8) ***(1 point)*** Given the following two reactions at 298 K and 1 atm, which of the statements is true?

1. $N_2(g) + O_2(g) \rightarrow 2NO(g)$ ΔH_1
2. $NO(g) + \frac{1}{2}O_2(g) \rightarrow NO_2(g)$ ΔH_2

A) $\Delta H_f°$ for $NO_2(g) = \Delta H_2$
B) $\Delta H_f°$ for $NO(g) = \Delta H_1$
C) $\Delta H_f° = \Delta H_2$
D) $\Delta H_f°$ for $NO_2(g) = \Delta H_2 + \frac{1}{2}\Delta H_1$
E) none of these

9) ***(1.5 point)*** Which of the following statements is true?

A) The exact location of an electron can be determined if we know its energy.
B) An electron in a 2s orbital can have the same ***n, l,* and m_l** quantum numbers as an electron in a 3s orbital.
C) 32 electrons is the maximum number of electrons that can be contained in all of the orbitals with $n = 4$
D) In the buildup of atoms, electrons occupy the 4f orbitals before the 6s orbitals.
E) Only three quantum numbers are needed to uniquely describe an electron.

10) ***(1 point)*** Gaseous ethane, C_2H_4 reacts with according to the following equation:

$$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2 + H_2O(g)$$

What volume of oxygen gas at STP is needed to react with 5.75 g of ethene, C_2H_4?

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11) ***(1.5 points)*** Consider the reaction:

$$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l),\ \Delta H = -1.37 \times 10^3\ \text{kJ}$$

When a 21.1-g sample of ethyl alcohol is burned, how much energy is released as heat?

A) 0.458 kJ

B) 0.627 kJ

C) 2.89 x 10^4 kJ

D) 6.27 x 10^2 kJ

E) 2.18 kJ

Scratch Paper