Exam II General Chemistry II Lecture Fall 2018 10/3/18 W 10 am MWF Dr. Hahn Exam # _____

Name Key (print) Name _____ (sign)

Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multip questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) Avogadro's number = 6.022×10^{23}

NA = not attempted BA = bad attempt

NW = no work

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (3 pts per question, 24 pts pts total)

1) Which of the following is the highest energy orbital for a silicon atom ? (outermost electron goes where) 1) D

A) 1s B) 3s C) 2p (D) 3p

2) In which group do all the elements have the same number of valence electrons? 2) D

A) P, S, Cl B) P, As, Se C) Ag, Cd, Ar (D) Ca, Ba, Be

3) Of the following elements, which has occupied *d* orbitals in its ground-state neutral atoms? 3) C

A) Ca B) P (C) Ba D) Si

4) An element with the electron configuration [Ar] $4s^2 3d^7$ would belong to which class on the periodic table? 4) B

A) halogens (B) transition metal elements
C) lanthanide/actinide D) alkaline earth elements

5) All halogens have the following number of valence electrons: 5) D

A) 0 B) 2 C) 3 (D) 7

6) Which of the following has a $\Delta H°_f = 0$ kJ/mol? 6) D

A) $Fe^{2+}(aq)$ B) $CS_2(l)$ C) $H_2O(l)$ (D) $N_2(g)$ E) NO(g)

7) Calculate the standard enthalpy change for the reaction 7) B

$2A + 2A_2 + 4AB + B \rightarrow 5A_2B$

Given:

$2A + B \rightarrow A_2B$ $\Delta H° = -25.0$ kJ/mol

$(2A_2B \rightarrow 2AB + A_2) \times 2$ $\Delta H° = 35.0$ kJ/mol $(-35) 2$

A) – 60.0 kJ/mol
(B) – 95.0 kJ/mol
C) 45.0 kJ/mol
D) – 15.0 kJ/mol
E) 10.0 kJ/mol

$2A_2 + 4AB \rightarrow 4A_2B$

8) A given set of *p* orbitals consists of _____ orbitals. 8) C

A) 2 B) 4 C) 3 D) 1

Part II: Short Answers (37 pts) Show work on all questions for partial and full credit even on questions which do not specify.

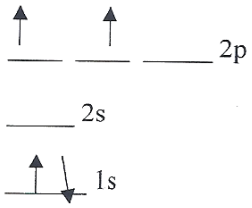
1. Given n = 4, what are the possible values of ℓ (12 pts)

$\ell = 0, \ldots (n-1)$ $\quad n-1 = 4-1 = 3$

$\ell = 0, 1, 2, 3$ (3A -6)

2. Given the following is it a violation of (7 pts)

[(a) Aufbau (b) Pauli Exclusion or (c) Hund's Rule] (circle one)



3. What ℓ value goes with the following letters ? Fill in the blank with the angular momentum quantum number. (8 pts, 2 pts each)

s 0 p 1 d 2 f 3

4. Give the electron configuration of **Ru** in the format 1 s^2, $2s^2$ ….. (10 pts)

$1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $4s^2$, $3d^{10}$, $4p^6$, $5s^2$, $4d^6$ (-1 each)

Part III: Long Answers (37 pts) Show work on all questions for partial and full credit even on questions which do not specify.

1. Given PV = nRT, for 1.5 moles of a gas at T= 298.1 K at 1.15 atmospheres, what is the volume ? [R = 0.08206 (Liter Atmosphere)/(mole Kelvin)] (12 pts)

$P = 1.15$ atm (−1) $V = ?$, $n = 1.5$ mole (−1)

$T = 298.15$ K (BA = −6)

$(1.15\ atm)V = (1.5\ mol)\left(0.08206 \frac{L\ atm}{mol\ K}\right)(298.15\ K)$

$V = \frac{(1.5\ mol)\left(0.08206 \frac{L\ atm}{mol\ K}\right)(298.15\ K)}{(1.15\ atm)} = 31.9\ L$

2. a. For the element **Se**, give the electron configuration in the format $1s^2, 2s^2$ ..... (10 pts)

$1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^4$

attempt −2 (−1 each)

b. For the element **Se**, give the electron configuration of the valence electrons. (5 pts)

$4s^2, 4p^4$

c. How many **valence electrons** is in the element **Se**? (5 pts) 6

d. For the above element **Se** give the electron configuration diagram using a line to represent orbitals and up and down arrows to represent electrons in the format for the **valence electrons**

..... (5 pts)

attempt −1