Unrelated - totally wrong answer -all pts off

Exam IV General Chemistry II Lecture Fall 2018 12/3/18 M 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. (2 pts print and sign exam)

BA = bad attempt

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (3 pts per question, 21 pts pts total)

NA = not attempted

1) If the reaction $2HI \rightarrow H_2 + I_2$ is second order, which of the following will yield a linear plot? 1) D

A) log [HI] vs time
B) ln [HI] vs time
C) [HI] vs time
D) 1/[HI] vs time

2) Consider the following equilibrium: $2H_2(g) + X_2(g) \rightleftharpoons 2H_2X(g)$ + energy 2) D

Addition of X_2 to a system described by the above equilibrium

A) will have no effect
B) will cause $[X_2]$ to decrease
C) will cause $[H_2X]$ to decrease
D) will cause $[H_2]$ to decrease

3) Consider the following rate law: Rate = $k[A]^n[B]^m$ How are the exponents *n* and *m* determined? 3) C

A) by using subscripts for the chemical formulas
B) by using the coefficients of the chemical formulas
C) by experiment
D) by using the balanced chemical equation of the overall reaction

4) For each of the following pairs of substances, select the one expected to have the higher melting point: 4) A

I. H_2O, H_2S II. HCl, NaCl III. CH_4, C_3H_8

A) H_2O, NaCl, C_3H_8
B) H_2S, NaCl, CH_4
C) H_2O, NaCl, CH_4
D) H_2O, HCl, C_3H_8

5) Consider the reaction $2H_2 + O_2 \rightarrow 2H_2O$ 5) A

What is the ratio of the initial rate of the appearance of water to the initial rate of disappea oxygen?

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

6) In which of the following groups of substances would dispersion forces be the only *significant* factors in determining boiling points? 6) A

I. Cl_2 II. HF III. Ne IV. KNO_2 V. CCl_4

A) I, III, V
B) II, V
C) I, II, III
D) III, IV, V

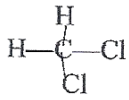
7) Order the intermolecular forces (dipole-dipole, London dispersion, ionic, and hydrogen-bonding) from weakest to strongest

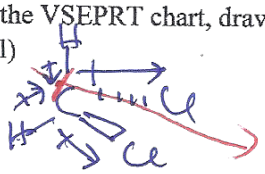
7) B

A) London dispersion, ionic, dipole-dipole, and hydrogen-bonding
B) London dispersion, dipole-dipole, hydrogen-bonding, and ionic
C) hydrogen-bonding, dipole-dipole, London dispersion, and ionic
D) dipole-dipole, London dispersion, ionic, and hydrogen-bonding

Part II: Short Answers (53 pts) Show work on all questions for partial and full credit.

1. a. Given the following Lewis Dot Structure and the VSEPRT chart, draw the 3 D structure using the wedge dash wedge drawings. (3 pts) (10 pts total)





bad drawing -1

b. Does the molecule have vector sum which is [(zero dipole moment) or (non zero dipole moment)] (circle one) Draw the individual dipoles in your figure above. (4 pts) -2pt

c. The primary intermolecular force for the molecule is [(hydrogen bonding) or (dipolar interaction) or (London or VDW forces)] (circle one) (3 pts)

2. If $K_f = 1.86$ °C kg/mol and the freezing point of water is 0.0 °C, if I dissolve 1.55 moles of sugar in 1.02 kilograms of water, what would be the freezing point depression ? ($\Delta T = K_b\, m_{solute}$) (8 pts)

$\Delta T = (1.86\ ^\circ C\ kg/mol)\left(\frac{1.55\ mol\ sugar}{1.02\ kg}\right) = 2.83\ ^\circ C$ BA-4

3. a. If the reaction of 2 HI → H_2 + I_2 results in a straight line for ln [HI] vs time, write out the rate equation for the reaction. (5 pts) (10 pts total)

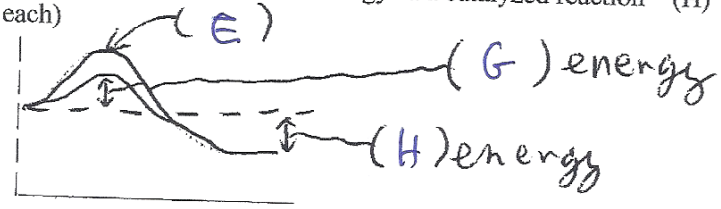
attempt-2

rate = $k[HI]$

b. Give the expression of the half life (5 pts)

$t_{1/2} = \frac{0.693}{k}$

4. Given the following reaction energy diagram, fill in the blanks with the letters to match:
(A) Energy (B) progress of reaction or time (C) reactant (D) product (E) transition state (F) activation energy (G) activation energy of a catalyzed reaction (H) overall energy of the reaction (12 pts, 4 pts each)



5. a. Given the following reaction, write out the equilibrium expression. (12 pts, 7 pts)

$N_2(g) + O_2(g) \rightleftharpoons 2\,NO(g) + heat$

attempt-1

$K = \frac{[NO]^2}{[N_2][O_2]}$

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b. According to leChatelier's Principle, (6 pts, 3 pts each)

If you remove NO will the reaction go [(to product) or (to reactants)]

If you raise the temperature will the reaction go [(to product) or (to reactants)]

Part III: Long Answers (24 pts) Show work on all questions for partial and full credit even on questions which do not specify.

1. If the reaction mechanism steps are the following: (assume none of the reaction mechanism steps are reversible) (12 pts)

$A_2 + B_2 \rightarrow C + D$ (slow, rate determining step)

$A_2 + C \rightarrow D$

a. What is the overall reaction (experimentally observed reaction)? (8 pts)

$2A_2 + B_2 \rightarrow 2D$

b. Write out the overall rate law expression. (4 pts)

$rate = k[A_2][B_2]$

2. You have a solution of 287.89 grams of Na_3PO_4 (FW = 163.97 g/mol) in 897.2 grams of water to make up 902.3 mL of the solution. (12 pts)

a. Show your calculation mass % of Na_3PO_4 in solution. (% mass = mass solute/mass solution) (6 pts)

$$\%\ Na_3PO_4 = \left[\frac{287.89\text{ g } Na_3PO_4}{897.2\text{ g } H_2O + 287.89\text{ g}}\right] * 100 = 24.29\%$$

BA-3 attempt-1

b. Molality of Na_3PO_4 (m = moles solute / kilogram solvent) (6 pts)

$$\#\text{moles} = 287.89\text{ g } Na_3PO_4 \times \frac{1\text{ mol } Na_3PO_4}{163.97\text{ g } Na_3PO_4} = 1.7557\text{ mol}$$

BA-3 attempt-1

$$897.2\text{ g } H_2O \times \frac{1\text{ kg}}{1000\text{ g } H_2O} = 0.8972\text{ kg } H_2O$$

$$m = \frac{1.7557\text{ mol } Na_3PO_4}{0.8972\text{ kg } H_2O}$$

$$m = 1.957$$