Quiz IV General Chemistry II Lecture I Summer 13 Dr. Hahn 25 pts 6/12 W quiz # _____

Name Key (print name) Name _____ (sign name) Please **show all work** for full credit.

1. using Molarity as a conversion factor: If you have 255 mL of a 0.125 M solution of a $FeCl_3$ solution, how many moles of $FeCl_3$ do you have. (8 pts)

$$255 \text{ ml soln.} \times \frac{0.125 \text{ mol } FeCl_3}{1000 \text{ ml soln.}} = 0.0319 \text{ mol}$$

math -1

attempt -5

extra incorrect no pts off

2. a. For a 0.55 molal aqueous $CaCl_2$ solution, what is the freezing point depression ? ($\Delta T_f = i \times m \times K_f$ $K_f = 1.86\ ^\circ C/m$, You should assume complete dissociation of the $CaCl_2$ in water.(6 pts)

$m = 0.55$ molal, $i = 3$ ($CaCl_2 \rightarrow Ca^{+2} + 2Cl^-$)

$$\Delta T_f = (3)(0.55\ \cancel{m})\left(\frac{1.86\ ^\circ C}{\cancel{m}}\right) = 3.1\ ^\circ C$$

3 particles

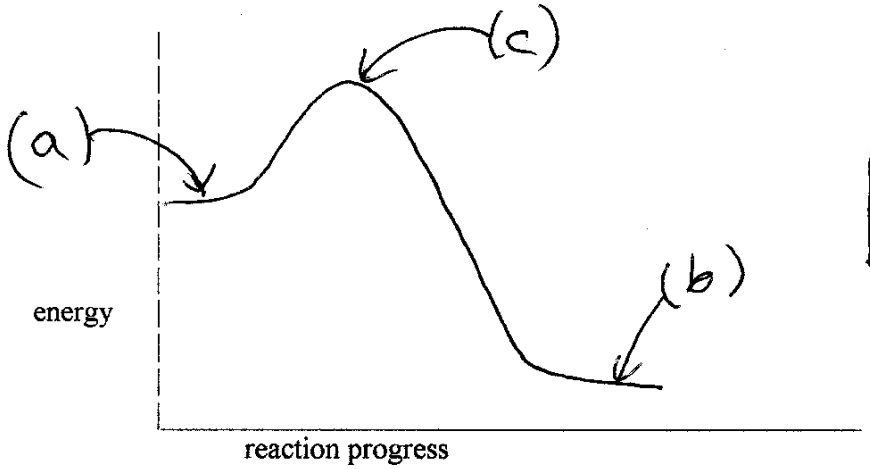
2pt

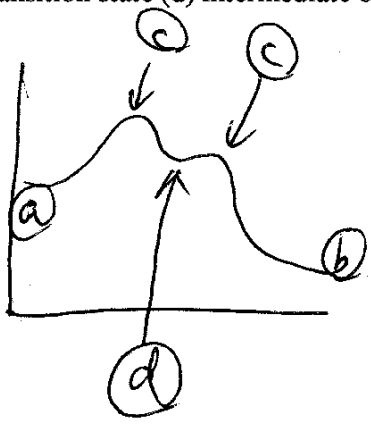
4pts

b, What is the freezing point of the solution in part (a). (freezing point of water is 0.0 °C) (2 pts)

F.P. depression $T = 0.0^\circ C - 3.1^\circ C = -3.1^\circ C$

3. For a reaction illustrated below, label (a) reactant (b) product (c) transition state (d) intermediate by filling in the blank with the appropriate letters. (9 pts)





Extra Credit on material covered immediately before quiz (which may show up on Exam II)

1. For the following reaction mechanism and the overall reaction, give the expression for the rate law. You do not need to have the expression in only reagents given in the overall reaction. Assume all reactions including the overall reactions are irreversible. (1 pt)

left off (1) in k_1 — did not cover — I changed the problem which I went over in class by changing which is slow step.

$2\,NO \xrightarrow{k_1} N_2O_2$ elementary reaction mechanism step (1) slow

no pts off — in class

$H_2 + N_2O_2 \xrightarrow{k_2} H_2O + N_2O$ elementary reaction mechanism step (2) fast

said rate law determined by slow

$N_2O + H_2 \xrightarrow{k_3} N_2 + H_2O$ elementary reaction mechanism step (3) fast

step = 2

gave $k_1[2NO](-2)$

$2H_2 + 2\,NO \rightarrow 2\,H_2O + N_2$ overall reaction

Rate = $k_1[NO]^2$

rate law goes for elementary reaction mechanism step & only for the slow step

2. For the overall reaction given, show the rate expression using Δ [NO (g)] and change in time. (1 pt)

$2H_2(g) + 2\,NO(g) \rightarrow 2\,H_2O(g) + N_2(g)$

left off bracket no pt off

$\text{rate} = -\frac{1}{2}\frac{\Delta[NO(g)]}{\Delta t}$

sign -1 pt

also

$\text{rate} = -\frac{1}{2}\frac{\Delta[H_2]}{\Delta t} = +\frac{1}{2}\frac{\Delta[H_2O]}{\Delta t} = +\frac{\Delta[N_2]}{\Delta t}$

sign negative for reactant positive for product

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b, What is the freezing point of the solution in part (a). (freezing point of water is 0.0 °C) (2 pts)

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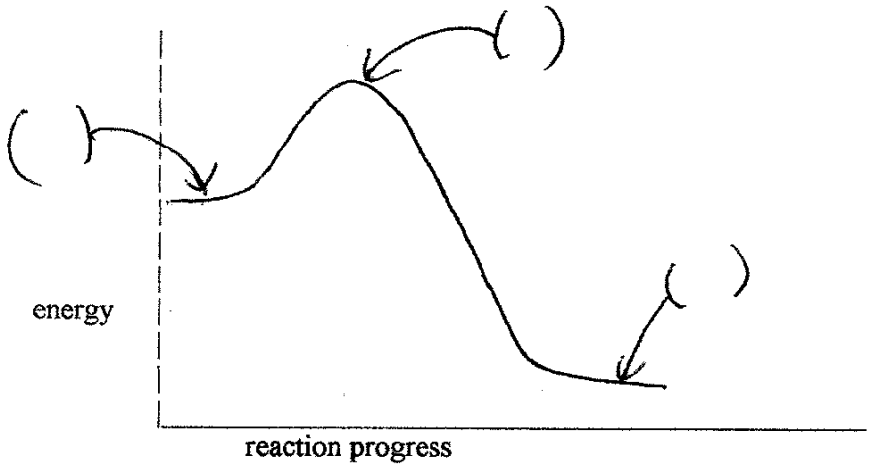

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$2\ NO \xrightarrow{k_1} N_2O_2$ elementary reaction mechanism step (1) slow

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$N_2O + H_2 \xrightarrow{k_3} N_2 + H_2O$ elementary reaction mechanism step (3) fast

$2H_2 + 2\ NO \rightarrow 2\ H_2O + N_2$ overall reaction

Rate = _____

2. For the overall reaction given, show the rate expression using Δ [NO (g)] and change in time. (1 pt)

$2H_2\ (g) + 2\ NO\ (g) \rightarrow 2\ H_2O\ (g) + N_2\ (g)$