Faculty Submitting: _Grinias_____

Specify here whether "Pre" or "End" of Unit and the Unit #: ____End Unit 12_____

Unit 12_ Question 1	**Canvas Question Type:** Multiple Choice
	Question Text: Carbonates are generally considered insoluble in water (Table 4.1) Write the expression for the equilibrium constant for the reaction represented by the equation $CaCO_3(s) \rightleftharpoons Ca^{2+}(aq) + CO_3^{2-}(aq)$. Is $K_c > 1$, < 1, or ≈ 1?
	Correct Answer: $K_c < 1$ **Wrong Answers:** $K_c > 1$, $K_c \approx 1$
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Unit 12_ Question 2	**Canvas Question Type:** Multiple Choice
	Question Text: Benzene is one of the compounds used as octane enhancers in unleaded gasoline. It is manufactured by the catalytic conversion of acetylene to benzene: $3C_2H_2(g) \rightleftharpoons C_6H_6(g)$. Is this reaction most useful if $K_c > 1$, < 1, or ≈ 1?
	Correct Answer: $K_c > 1$ **Wrong Answers:** $K_c < 1$, $K_c \approx 1$
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Unit 12_ Question 3	**Canvas Question Type:** Multiple Choice or Drop Down **Question GROUP, choose 2**
3a	**Question Text:** The initial concentrations or pressures of reactants and products are given for the following system. Calculate the reaction quotient, Q, and use it to determine the direction in which each system will proceed to reach equilibrium. $2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$ $K_c = 17$ $[NH_3] = 0.50\ M$, $[N_2] = 0.15\ M$, $[H_2] = 0.12\ M$
	Correct Answer: Shifts Right **Wrong Answers:** Shifts Left, Reaction already at equilibrium
3b	**Question Text:** The initial concentrations or pressures of reactants and products are given for the following system. Calculate the reaction quotient, Q, and use it to determine the direction in which each system will proceed to reach equilibrium.

Commented [1]: I changed this to > because I'm pretty sure you need a synthesis reaction to favor the products

	$2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$ $K_P = 6.8 \times 10^4$ NH_3 = 2.00 atm, N_2 = 10.00 atm, H_2 = 10.00 atm
	Correct Answer: Shifts Right **Wrong Answers:** Shifts Left, Reaction already at equilibrium
3c	**Question Text:** The initial concentrations or pressures of reactants and products are given for the following system. Calculate the reaction quotient, Q, and use it to determine the direction in which each system will proceed to reach equilibrium. $2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$ $K_C = 0.230$ [SO_3] = 2.00 *M*, [SO_2] = 2.00 *M*, [O_2] = 2.00 *M*
	Correct Answer: Shifts L*eft* **Wrong Answers:** Shifts R*ight*, Reaction already at equilibrium
3d	**Question Text:** The initial concentrations or pressures of reactants and products are given for the following system. Calculate the reaction quotient, Q, and use it to determine the direction in which each system will proceed to reach equilibrium. $2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$ $K_P = 6.5 atm$ SO_2 = 1.00 atm, O_2 = 1.130 atm, SO_3 = 0 atm
	Correct Answer: Shifts L*eft* **Wrong Answers:** Shifts R*ight*, Reaction already at equilibrium
3e	**Question Text:** The initial concentrations or pressures of reactants and products are given for the following system. Calculate the reaction quotient, Q, and use it to determine the direction in which each system will proceed to reach equilibrium. $2NO(g) + Cl_2(g) \rightleftharpoons 2NOCl(g)$ $K_P = 2.5 \times 10^3$ NO = 1.00 atm, Cl_2 = 1.00 atm, NOCl = 0 atm
	Correct Answer: Shifts R*ight* **Wrong Answers:** Shifts L*eft*, Reaction already at equilibrium

3f	**Question Text:** The initial concentrations or pressures of reactants and products are given for the following system. Calculate the reaction quotient, Q, and use it to determine the direction in which each system will proceed to reach equilibrium. $N_2(g)+O_2(g) \rightleftharpoons 2NO(g) K_c=0.050$ $[N_2] = 0.100\ M$, $[O_2] = 0.200\ M$, $[NO] = 1.00\ M$
	Correct Answer: Shifts Left **Wrong Answers:** Shifts Right, Reaction already at equilibrium
Unit 12_ Question 4	**Canvas Question Type:** Multiple Choice or Drop Down
	Question Text: When writing the reaction quotient for the ionization of NH_3 in water, is the hydronium ion (H_3O^+) found in the numerator, denominator, or neither?
	Correct Answer: Neither **Wrong Answers:** Numerator, Denominator
Unit 12_ Question 5	**Canvas Question Type:** Multiple Choice or Drop Down
	Question Text: For an exothermic reaction, would adding heat to the system shift the equilibrium to the right or to the left?
	Correct Answer: Left **Wrong Answers:** Right
Unit 12_ Question 6	**Canvas Question Type:** Multiple Choice or Drop Down
	Question Text: For an endothermic reaction, would adding heat to the system shift the equilibrium to the right or to the left?
	Correct Answer: Right **Wrong Answers:** Left
Unit 12_ Question 7	**Canvas Question Type:** Multiple Choice or Drop Down
	Question Text: Will an increase in temperature shift the equilibrium of the following reaction to the right or to the left? $2O_3(g) \rightleftharpoons 3O_2(g) \quad \Delta H=-285kJ$
	Correct Answer: Left **Wrong Answers:** Right
Unit 12_ Question 8	**Canvas Question Type:** Multiple Choice or Drop Down

	Question Text: Will a decrease in temperature shift the equilibrium of the following reaction to the right or to the left? $2O_3(g) \rightleftharpoons 3O_2(g) \quad \Delta H = -285kJ$
	Correct Answer: Right **Wrong Answers:** Left
Unit 12_ Question 9	**Canvas Question Type:** Multiple Choice or Drop Down
	Question Text: Will an increase in volume shift the equilibrium of the following reaction to the right or to the left? $2O_3(g) \rightleftharpoons 3O_2(g) \quad \Delta H = -285kJ$
	Correct Answer: Right **Wrong Answers:** Left
Unit 12_ Question 10	**Canvas Question Type:** Multiple Choice or Drop Down
	Question Text: Will a decrease in volume shift the equilibrium of the following reaction to the right or to the left? $2O_3(g) \rightleftharpoons 3O_2(g) \quad \Delta H = -285kJ$
	Correct Answer: Left **Wrong Answers:** Right
Unit 12_ Question 11	**Canvas Question Type:** Formula Question
	Question Text: What is the value of the equilibrium constant at [d] °C for the formation of NH_3 according to the following equation? $N_2(g)+3H_2(g) \rightleftharpoons 2NH_3(g)$ An equilibrium mixture of $NH_3(g)$, $H_2(g)$, and $N_2(g)$ at [d] °C was found to contain [a] *M* H_2, [b] *M* N_2, and [c] *M* NH_3.
	Formula: $c^2/(a^3*b)$ **Parameters:** Let [a] = 1.25-1.45 (vary by 0.01), let [b] = 1.05-1.25 (vary by 0.01), let [c] = 0.390-0.430 (vary by 0.001), and let [d] = 480-520 (vary by 1).
Unit 12_ Question 12	**Canvas Question Type:** Formula Question
	Question Text: A [a] mol sample of PCl_5 is put into a 1.00-L vessel and heated. At equilibrium, the vessel contains [b] mol of $PCl_3(g)$ and [b] mol of $Cl_2(g)$. Calculate the value

	of the equilibrium constant for the decomposition of PCl_5 to PCl_3 and Cl_2 at this temperature.
	Formula: $b^2/(a-b)$ **Parameters:** Let [a] = 0.600-0.800 (vary by 0.001) and let [b] = 0.350-0.450 (vary by 0.001).
Unit 12_ Question 13	**Canvas Question Type:** Formula Question
	Question Text: Analysis of the gases in a sealed reaction vessel containing NH_3, N_2, and H_2 at equilibrium at [t] °C established the concentration of N_2 to be 1.2 *M* and the concentration of H_2 to be 0.24 *M*. $N_2(g)+3H_2(g)\rightleftharpoons 2NH_3(g)$ K_c= [c] at [t]°C Calculate the equilibrium molar concentration (in M) of NH_3.
	Formula: $(c*a*b^3)^{1/2}$ **Parameters:** Let [t] = 390 – 410 (vary by 1), let [a] = 1.10-1.40 (vary by 0.01), let [b] = 0.230-0.270 (vary by 0.001), and let [c] = 0.450-0.550 (vary by 0.001).
Unit 12_ Question 14	**Canvas Question Type:** Formula Question
	Question Text: Cobalt metal can be prepared by reducing cobalt(II) oxide with carbon monoxide. $CoO(s)+CO(g)\rightleftharpoons Co(s)+CO_2(g)$ K_c= [k] at [t]°C What concentration of CO (in M) remains in an equilibrium mixture with $[CO_2]$ = [a] *M*?
	Formula: a/k **Parameters:** Let [t] = 150-250 (vary by 1), let [k] = 100-200 (vary by 1), and let [a] = 1.01-1.99 (vary by 0.01).
Unit 12_ Question 15	**Canvas Question Type:** Formula Question
	Question Text: For the following reaction, K_c = [k] at [t]°C: $A_2 + B_2 \rightleftharpoons 2\ AB$ What is K_c at the same temperature for this reaction?: $2\ AB \rightleftharpoons A_2 + B_2$

	Formula: $1/k$ (or k^{-1}) **Parameters:** Let [k] = 50-250 (vary by 1), let [t]=80-380 (vary by 1).
Unit 12_ Question 16	**Canvas Question Type:** Formula Question
	Question Text: For the following reaction, K_c = [k] at [t]°C: $A_2 + B_2 \rightleftharpoons 2\,AB$ What is K_c at the same temperature for this reaction?: $2\,A_2 + 2\,B_2 \rightleftharpoons 4\,AB$
	Formula: k^2 **Parameters:** Let [k] = 5.0-25.0 (vary by 0.1), let [t]=80-380 (vary by 1).
Unit 12_ Question 17	**Canvas Question Type:** Formula Question
	Question Text: For the following reaction, K_c = [k] at [t]°C: $A_2 + B_2 \rightleftharpoons 2\,AB$ What is K_c at the same temperature for this reaction?: $6\,AB \rightleftharpoons 3\,A_2 + 3\,B_2$
	Formula: $1/k^3$ (or k^{-3}) **Parameters:** Let [k] = 0.50-9.50 (vary by 0.01), let [t]=80-380 (vary by 1).
Unit 12_ Question 18	**Canvas Question Type:** Formula Question
	Question Text: What is the minimum mass (in g) of $CaCO_3$ required to establish equilibrium at a certain temperature in a [a]-L container if the equilibrium constant (K_c) is [b] for the decomposition reaction of $CaCO_3$ at that temperature? $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$
	Formula: 100.1*a*b **Parameters:** Let [a]=5.50-7.50 (vary by 0.01) and let [b]=0.400-0.600 (vary by 0.001).