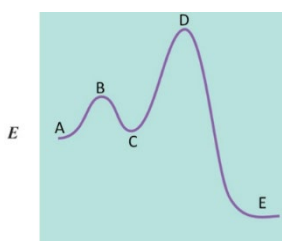


1. (L9_A) Determine the mass in grams of cycloheptane (C_7H_{14} , 98.2 g/mol) that must be added to 60.3 g of benzene (C_6H_6 , 78.1 g/mol) to make a 0.599 *m* solution. [3.55E0]
2. (L9_A) Calculate the vapor pressure (in torr) at 310 K in a solution prepared by dissolving 37.63 g of the non-volatile non-electrolyte sucrose (342.3 g/mol) in 129.7 g of water. The vapor pressure of water at 310 K is 47.08 torr. Enter your answer to 3 decimal places. [46.372]
3. (L9_C) Consider the solutions, 0.04 *m* urea [$(NH_2)_2C=O$], 0.04 *m* $AgNO_3$ and 0.04 *m* $CaCl_2$. Which has (i) the highest osmotic pressure, (ii) the lowest vapor pressure, (iii) the highest boiling point? [(a) $CaCl_2$ (b) $CaCl_2$ (c) $CaCl_2$]
4. (L9_C) Tin chloride dissolves in water according to: $SnCl_4(s) \rightarrow Sn^{4+}(aq) + 4 Cl^-(aq)$. What is the boiling point of the solution when 0.2605 g of $SnCl_4$ (molar mass 260.5 g/mol) is dissolved in 10.0 g of H_2O ? (K_b of water is 0.512 °C/m.) [100.256]
5. (L9_T) When 5.66 g of an unknown non-electrolyte is dissolved in 50.0 g of acetone, the boiling point increased by 3.8 degrees C. If the K_{bp} of the solvent is 1.71 K/m, calculate the molar mass of the unknown solute. [51]
6. (L9_A) Calculate the molarity of an aqueous solution that is 8.1% by mass calcium chloride. You might need to know that the density is 1.10 g/mL. [0.803]
7. (L9_C) KBr does not dissolve well in nonpolar solvents because [solute-solute interactions are much stronger than solvent-solvent or solute-solvent interactions.]
8. (L9_C) In experiments on the reaction $2 ICl(g) + H_2(g) \rightarrow I_2(g) + 2 HCl(g)$, the following initial rate data were obtained. What is overall order of the reaction? [Fourth]

Experiment	ICl <i>M</i>	H_2 <i>M</i>	Initial Rate, <i>M/s</i>
1	1.5	1.5	3.7×10^{-7}
2	3.0	1.5	15×10^{-7}
3	3.0	4.5	134×10^{-7}

9. (L10_C) What would be a rate law for the proposed mechanism for a reaction? [rate = $k[I_2]$]
 $I_2 \rightarrow 2 I$ Slow
 $I + H_2 \rightarrow H_2I$ Fast
 $H_2I + I \rightarrow 2 HI$ Fast
10. (L10_A) The reaction $A \rightarrow B + C$ is second order in A. When the initial $[A] = 0.100 M$, the reaction is 20.0% complete in 26.2 minutes. Calculate the value of the rate constant (in L/min·mol). [9.54 × 10⁻²]
11. (L10_A) Food spoils about 30 times more rapidly at 25°C then when it is held at 4 °C. What is the overall activation energy (kJ/mol) of the process responsible for food spoilage? Enter your answer as an integer. [111]
12. (L10_T) Which of the following would be a reasonable unit for the rate constant of a second order reaction? [L/mol·sec]
13. (L10_C) Which letter(s) correspond to transition state(s) for the mechanism of the reaction depicted in the figure? [B and D]



14. (L10_C) The water-gas shift reaction is an extremely important one in industry.
 $CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$
 At a given temperature, $K_p = 2.7$. If 0.13 moles of CO, 0.56 moles of H_2O , 0.62 moles of CO_2 and 0.43 moles of H_2 are placed in a 2.0 L flask, then [$Q_p = 3.7$, reaction will go to the left]
15. (L10_A) At a certain temperature, K_p for the reaction, $N_2(g) + 3 H_2(g) \rightleftharpoons 2 NH_3(g)$ is 784.8. Calculate the value of K_p for the reaction, $1/2 N_2(g) + 3/2 H_2(g) \rightleftharpoons NH_3(g)$. [2.8E1]
16. (L10_C) Phosphorus pentachloride decomposes to phosphorus trichloride and chlorine gas at elevated temperatures by the following reaction: $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$. If $K_c = 2.9$ at 300°C, what is the value of K_p at the same temperature? Enter your answer as the nearest whole number. [136]
17. (L10_A) At 700 K, the reaction below has a K_p value of 54. An equilibrium mixture at this temperature was found to contain 0.672 atm of H_2 and 2.99 atm of HI. Calculate the equilibrium pressure of I_2 . $H_2(g) + I_2(g) \rightleftharpoons 2 HI(g)$. [0.25]
18. (L10_C) At a given temperature, 4.86 atm of H_2 and 3.83 atm of Cl_2 are mixed and allowed to come to equilibrium. The equilibrium pressure of HCl is found to be 1.239 atm. Calculate K_p for the reaction at this temperature. [1.13E-1]
 $H_2(g) + Cl_2(g) \rightleftharpoons 2 HCl(g)$
19. (L10_T) Nitric oxide reacts with oxygen to form nitrogen dioxide: $2 NO(g) + O_2(g) \rightleftharpoons 2 NO_2(g)$. What is K_c for the forward reaction if the equilibrium concentration of NO is 0.200 *M*, O_2 is 0.100 *M*, and NO_2 is 0.250 *M* at 25°C? Write your answer with one decimal place. [15.6]

1. Determine the mass in grams of cycloheptane (C_7H_{14} , 98.2 g/mol) that must be added to 60.3 g of benzene (C_6H_6 , 78.1 g/mol) to make a 0.599 m solution. [3.55E0]

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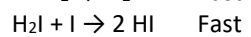
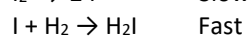
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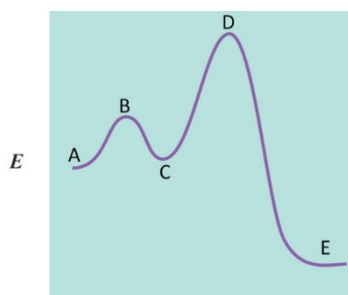


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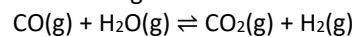
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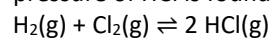
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