F_MT1

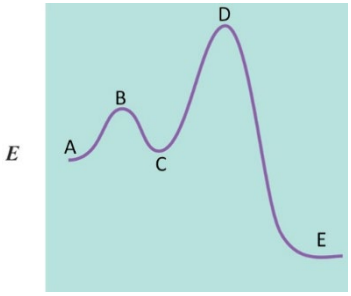
1. Determine the mass in grams of cycloheptane (C_7H_{14}, 98.2 g/mol) that must be added to 60.3 g of benzene (C_6H_6, 78.1 g/mol) to make a 0.599 *m* solution. [**3.55E0**]
2. Calculate the vapor pressure (in torr) at 310 K in a solution prepared by dissolving 37.63 g of the non-volatile non-electrolyte 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. 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. 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. 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. 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. KBr does not dissolve well in nonpolar solvents because [**solute-solute interactions are much stronger than solvent-solvent or solute-solvent interactions**.]
8. 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 *M*	H_2 *M*	Initial Rate, *M*/s
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. 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. The reaction A → 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. 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. Which of the following would be a reasonable unit for the rate constant of a second order reaction? [**L/mol.sec**]
13. Which letter(s) correspond to transition state(s) for the mechanism of the reaction depicted in the figure? [**B and D**]



14. 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. 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. 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. 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. 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. 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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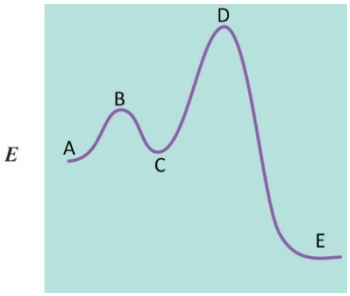

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