Sample exam 3 (Chapters 7, 8 and 9)
Closed book, open homework, open notes, calculators allowed; 50 minutes, no collaboration. Partial credit for problems can be awarded only with a clear setup of the problem.

Answer all questions.

1. How many grams of pure sodium chloride solid are required to prepare 700.0 mL of 1.2 M NaCl solution?

2. What is the percent by mass of a solution made by adding 35 g of KOH to 944 mL of water (density: 1.00g/mL)?

3. 14.0 mL of a 1.0 M NaC₂H₃O₂ solution is diluted to a final volume of 100.0 mL. What is the diluted solution’s molarity?

4. Using an energy diagram, demonstrate how the addition of a catalyst speeds up a reaction.
5. According to Le Chatelier’s principle, what would be the result of adding heat to the system at equilibrium:

\[ H_2 + Cl_2 \leftrightarrow 2 HCl + \text{heat} \]

6. Calculate the pH of the following solutions:
   a. 0.00300 M HCl

   b. \(4.2 \times 10^{-5}\) M Ca(OH)_2

7. a. What is \([H^+]\) when the pH of a solution is 6.4?

   b. Calculate the concentration of OH\(^-\) when the pH is 3.7.

8. Hydrocyanic acid, HCN, has a \(K_a = 6.2 \times 10^{-10}\).
   a. Calculate the \(K_b\) of CN\(^-\)

   b. Use the Henderson-Hasselbalch to determine the pH of a buffer that was made up to be 1.00 M in HCN and 0.100 M in CN\(^-\)