

- 1)
 - (a) What is the Brønsted-Lowry theory definition for
 - (i) an acid?
 - (ii) a base?
 - (b) How is the Brønsted-Lowry theory about acids and bases different from the Arrhenius theory? (Include at least TWO difference.)

- 2) Write the balanced equation for each of the following reactions:
 - (a) the dissociation of perchloric acid in water

 - (b) the dissociation of propanoic acid ($\text{CH}_3\text{CH}_2\text{COOH}$) in water

 - (c) the dissociation of the ammonium ion (NH_4^+) in water

- 3) Write the dissociation reaction and the corresponding K_a equilibrium expression for each of the following acids in water:
 - (a) HCN

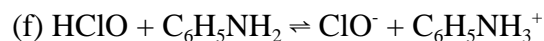
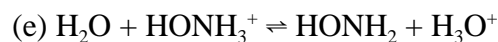
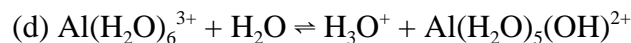
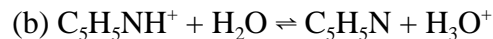
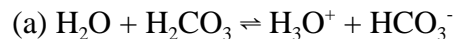
 - (b) $\text{C}_6\text{H}_5\text{OH}$

 - (c) $\text{C}_6\text{H}_5\text{NH}_3^+$

- 4)
 - (a) What is the difference between a conjugate acid and a conjugate base?

 - (b) How can you decide what the conjugate base is in a given chemical reaction?

- 5) For each of the following aqueous reactions, identify the acid (A), the base (B), the conjugate acid (CA), and the conjugate base (CB):



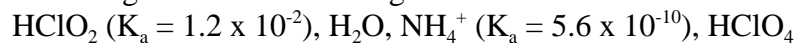
- 6) List four strong acids.

- 7) Draw a picture illustrating the particles present in aqueous solutions of the following:



- 8) Explain which would have a higher K_a , a weak acid or a strong acid.

- 9) Put the following in order from strongest to weakest acid:



- 10) Calculate the $[\text{OH}^-]$ of each of the following solutions at 25 °C:

(a) $[H^+] = 1.0 \times 10^{-7} \text{ M}$

(b) $[H^+] = 8.3 \times 10^{-16} \text{ M}$

(c) $[H^+] = 12 \text{ M}$

(d) $[H^+] = 5.4 \times 10^{-5} \text{ M}$

11) Values of K_w as a function of temperature are as follows:

Temperature ($^{\circ}\text{C}$)	K_w
0	1.14×10^{-15}
25	1.00×10^{-14}
35	2.09×10^{-14}
40.	2.92×10^{-14}
50.	5.47×10^{-14}

(a) Is the autoionization of water exothermic or endothermic? Explain your choice.

(b) Calculate the $[H^+]$ and $[OH^-]$ in a neutral solution at 50. $^{\circ}\text{C}$.

12) Calculate the pH and pOH of the solutions in question 10.

13) Calculate the $[H^+]$ and $[OH^-]$ for each of the following solutions at 25 $^{\circ}\text{C}$. Also identify each solution as neutral, basic, or acidic.

(a) pH = 7.40 (the normal pH of blood)

(b) pH = 15.3

(c) pH = -1.0

(d) pH = 3.20

(e) pOH = 5.0

(f) pOH = 9.60

14) Fill in the missing information in the following table:

Solution	pH	pOH	[H ⁺]	[OH ⁻]	acid? base? neutral?
A	6.88				
B				$8.4 \times 10^{-14} \text{ M}$	
C		3.11			
D			$1.0 \times 10^{-7} \text{ M}$		

15) The pH of a sample of gastric juice in a person's stomach is 2.1. Calculate the pOH, [H⁺], and [OH⁻] for this sample. Is gastric juice acidic or basic?