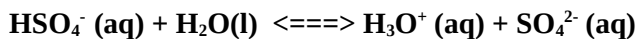


Year 12 Acid and Bases

Question 1

(1 mark)



In the equilibrium represented above, the species that act as bases include which of the following?

- I. HSO_4^-
- II. H_2O
- III. SO_4^{2-}

- (A) II only
- (B) III only
- (C) I and II
- (D) I and III
- (E) II and III

Question 2

(1 mark)

Which of the following is NOT a conjugate acid/base pair?

- (A) $\text{H}_3\text{PO}_4 / \text{HPO}_4^{2-}$
- (B) $\text{H}_2\text{SO}_4 / \text{HSO}_4^-$
- (C) $\text{H}_2\text{CO}_3 / \text{HCO}_3^-$
- (D) $\text{NH}_3 / \text{NH}_2^-$

Question 3

(1 mark)

The Brønsted–Lowry theory applies in both aqueous and non-aqueous systems.

The following reactions may take place in solvents other than water.

Which is NOT a Brønsted–Lowry reaction?

- (A) $\text{NH}_4^+ + \text{NH}_2^- \rightleftharpoons 2\text{NH}_3$
- (B) $\text{CO}_2 + \text{OH}^- \rightleftharpoons \text{HCO}_3^-$
- (C) $\text{HClO}_4 + \text{CH}_3\text{COOH} \rightleftharpoons \text{CH}_3\text{COOH}_2^+ + \text{ClO}_4^-$
- (D) $\text{CH}_3\text{CH}_2\text{O}^- + \text{CH}_3\text{NH}_3^+ \rightleftharpoons \text{CH}_3\text{CH}_2\text{OH} + \text{CH}_3\text{NH}_2$

Question 4

Define each of the following giving a *real* chemical equation to illustrate your definition.

(a) An Arrhenius base.

(2 marks)

(b) A Brønsted-Lowry base.

(2 marks)

Question 5

(a) Is acetic acid a non-electrolyte, a weak electrolyte or a strong electrolyte? Why?

(2 marks)

(b) Is water a non-electrolyte, a weak electrolyte or a strong electrolyte? Why?

(2 marks)

Question 6

It is suggested that SO_2 which contributes to acid rain, could be removed from a stream of waste gases by bubbling the gases through 0.25 M KOH, thereby producing K_2SO_3 . Calculate the maximum mass of SO_2 that could be removed by 1000 L of the KOH solution?

(5 marks)

Question 7

24.0 mL of 0.150 mol L^{-1} NaOH is added to 25.0 mL of 0.150 mol L^{-1} HCl.

Calculate the pH of the final solution.

(7 marks)

Question 8

0.300 g of solid NaOH was added to 1.00 L of 5.00×10^{-3} mol L^{-1} HNO_3 .

(a) Which reactant was in excess? Explain your answer.

(5 marks)

(b) Assuming no volume change, what is the pH of the final solution?

(3 marks)