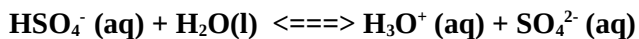


## Year 12 Acid and Bases

### Question 1

(1 mark)



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

- I.  $\text{HSO}_4^-$
- II.  $\text{H}_2\text{O}$
- III.  $\text{SO}_4^{2-}$

- (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)

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(b) A Brønsted-Lowry base.

(2 marks)

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**Question 5**

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

(2 marks)

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

(2 marks)

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### Question 6

It is suggested that  $\text{SO}_2$  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  $\text{K}_2\text{SO}_3$ . Calculate the maximum mass of  $\text{SO}_2$  that could be removed by 1000 L of the KOH solution?

(5 marks)

### Question 7

24.0 mL of 0.150 mol  $\text{L}^{-1}$  NaOH is added to 25.0 mL of 0.150 mol  $\text{L}^{-1}$  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  $5.00 \times 10^{-3}$  mol  $\text{L}^{-1}$   $\text{HNO}_3$ .

(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)