

Exercise 7.22 – Lewis theory of acids

Q722-01 Which equation represents an acid-base reaction according to the Lewis theory, but not according to the Brønsted-Lowry theory?

- A. $\text{CO}_3^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightleftharpoons \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- B. $\text{Cu}^{2+}(\text{aq}) + 4\text{NH}_3(\text{aq}) \rightleftharpoons [\text{Cu}(\text{NH}_3)_4]^{2+}(\text{aq})$
- C. $\text{BaO}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{Ba}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq})$
- D. $\text{NH}_3(\text{g}) + \text{HCl}(\text{g}) \rightleftharpoons \text{NH}_4\text{Cl}(\text{s})$

Q722-02 In which reaction below does the first species listed react as a Lewis acid?

- A. $\text{H}_2\text{O} + \text{HPO}_4^{2-} \rightleftharpoons \text{H}_2\text{PO}_4^- + \text{OH}^-$
- B. $\text{H}^+ + \text{NH}_3 \rightleftharpoons \text{NH}_4^+$
- C. $\text{NO}_2^- + \text{H}_3\text{O}^+ \rightleftharpoons \text{HNO}_2 + \text{H}_2\text{O}$
- D. $\text{NH}_4^+ + \text{HS}^- \rightleftharpoons \text{H}_2\text{S} + \text{NH}_3$

Q722-03 Which equation represents an acid-base reaction according to the Lewis theory but not the Brønsted Lowry theory?

- A. $\text{NaOH}(\text{aq}) + \text{HCl}(\text{aq}) \rightleftharpoons \text{H}_2\text{O}(\text{l}) + \text{NaCl}(\text{aq})$
- B. $\text{CrCl}_3(\text{aq}) + 6\text{NH}_3(\text{aq}) \rightleftharpoons [\text{Cr}(\text{NH}_3)_6]^{3+}(\text{aq}) + 3\text{Cl}^-(\text{aq})$
- C. $2\text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq})$
- D. $\text{NH}_3(\text{g}) + \text{HCl}(\text{g}) \rightleftharpoons \text{NH}_4\text{Cl}(\text{s})$

Q722-04 Which pair of species consists of a Lewis acid followed by a Lewis base?

- A. $\text{Cl}^-(\text{aq}), \text{Ag}^+(\text{aq})$
- B. $\text{NH}_3(\text{g}), \text{BF}_3(\text{g})$
- C. $\text{SO}_4^{2-}(\text{aq}), \text{HSO}_4^-(\text{aq})$
- D. $\text{H}^+(\text{aq}), \text{OH}^-(\text{aq})$

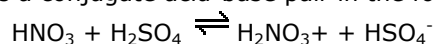
Q722-05 When H_2PO_4^- behaves as a Brønsted base it becomes

- A. H_3PO_4
- B. HPO_4^{2-}
- C. HPO_3
- D. PO_4^{3-}

Q722-06 Ethanol is $\text{CH}_3\text{CH}_2\text{OH}$. Which species is formed when ethanol acts as a Brønsted base?

- A. $\text{CH}_3\text{CH}_2\text{O}^-$
- B. CH_3CH_2^+
- C. $\text{CH}_3\text{CH}_2\text{OH}_2^+$
- D. H_3O^+

Q722-07 Which of the pairs below is a conjugate acid-base pair in the following reaction?



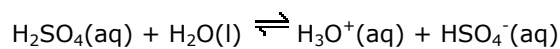
- A. HNO_3 and H_2SO_4
- B. HNO_3 and H_2NO_3^+
- C. HNO_3 and HSO_4^-
- D. H_2NO_3^+ and HSO_4^-

Q722-08 Which statement describes the Brønsted-Lowry behaviour of H_2O molecules in aqueous solutions?

- A. They cannot act as either acids or bases
- B. They can act as acids but not bases
- C. They can act as acids or bases when reacting with each other
- D. They can act as acids when reacting with HCl molecules

Exercise 7.22 – Lewis theory of acids

Q722-09 The ionisation (dissociation) of sulphuric acid is represented by the equations below:



Which of the following is the conjugate base of HSO_4^- ?

- A. $\text{H}_2\text{O}(\text{l})$
 - B. H_3O^+
 - C. H_2SO_4
 - D. SO_4^{2-}
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Q722-10 In which reaction is H_2PO_4^- acting as a Brønsted-Lowry base?

- A. $\text{H}_2\text{PO}_4^-(\text{aq}) + \text{NH}_3(\text{aq}) \rightleftharpoons \text{HPO}_4^{2-}(\text{aq}) + \text{NH}_4^+(\text{aq})$
 - B. $\text{H}_2\text{PO}_4^-(\text{aq}) + \text{OH}^-(\text{aq}) \rightleftharpoons \text{HPO}_4^{2-}(\text{aq}) + \text{H}_2\text{O}(\text{l})$
 - C. $\text{H}_2\text{PO}_4^-(\text{aq}) + \text{C}_2\text{H}_5\text{NH}_2(\text{aq}) \rightleftharpoons \text{HPO}_4^{2-}(\text{aq}) + \text{C}_2\text{H}_5\text{NH}_3^+(\text{aq})$
 - D. $\text{H}_2\text{PO}_4^-(\text{aq}) + \text{CH}_3\text{COOH}(\text{aq}) \rightleftharpoons \text{H}_3\text{PO}_4(\text{aq}) + \text{CH}_3\text{COO}^-(\text{aq})$
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