

## Chem12 Acids : Exam Questions-110

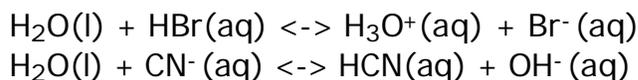
1) In the following equation,  $\text{HF} + \text{NO}_2^- \rightleftharpoons \text{HNO}_2 + \text{F}^-$ , the HF is a Bronsted :

- a) acid accepting protons                      b) base accepting protons  
c) acid donating protons                      d) base donating protons

2) The conjugate base of  $\text{HSO}_3^-$  (aq) is :

- a)  $\text{H}_2\text{SO}_3$ (aq)      b)  $\text{HSO}_3\text{OH}$ (l)      c)  $\text{SO}_3$ (g)      d)  $\text{SO}_3^{2-}$ (aq)

3) Note the following reactions involving water.



Because of this behavior, water is classified as :

- a) neutral              b) a salt              c) amphiprotic      d) a solvent

4) 0.200 mole of hydrogen chloride gas (HCl) is dissolved in water and made up to a volume of 4.00 L of solution. What is the molarity of the  $\text{H}_3\text{O}^+$  ion ?

- a) 0.200 M              b) 20.0 M              c)  $5.00 \times 10^{-2}$  M      d)  $1.37 \times 10^{-3}$  M

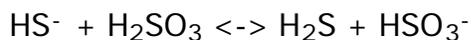
5) The  $[\text{H}_3\text{O}^+]$  in an aqueous solution of  $2.0 \times 10^{-3}$  M NaOH (strong base) is :

- a)  $5.0 \times 10^{-12}$  M      b)  $5.0 \times 10^{-3}$  M      c)  $2.0 \times 10^{-3}$               d)  $2.0 \times 10^{-3}$

6) Which one of the following is a conjugate base of  $\text{HPO}_4^{2-}$  ?

- a)  $\text{HPO}_4^-$               b)  $\text{H}_2\text{PO}_4^-$               c)  $\text{H}_3\text{PO}_4$               d)  $\text{PO}_4^{3-}$

7) In the following equation



What is the correct order for Bronsted acids and bases ?

- a) base + acid  $\leftrightarrow$  acid + base      b) base + acid  $\leftrightarrow$  base + acid  
c) acid + base  $\leftrightarrow$  acid + base      d) acid + base  $\leftrightarrow$  base + acid

8) Which one of the following statements is true about the stronger of two acids ?

- a) it more readily accepts protons  
b) it less readily accepts protons  
c) it more readily donates protons  
d) it less readily donates protons

9) The following acids are all 1.0 M concentration. Which acid has the smallest hydronium ion ( $\text{H}_3\text{O}^+$ ) concentration ?

- a) HCl                      b)  $\text{HNO}_2$                       c)  $\text{HNO}_3$                       d)  $\text{H}_2\text{SO}_4$

10) Calculate  $K_b$  for  $\text{H}_2\text{BO}_3^-$ , the conjugate base of boric acid,  $\text{H}_3\text{BO}_3$ .

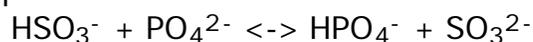
11) In the equation  $\text{NH}_4^+ + \text{H}_2\text{O} \leftrightarrow \text{H}_3\text{O}^+ + \text{NH}_3$ , how does the  $\text{H}_2\text{O}$  act ?

- a) as an acid donating protons      b) as an acid accepting protons  
c) as a base donating protons      d) as a base accepting protons

12) Which one of the following is the conjugate base of  $\text{H}_2\text{PO}_4^-$  ?

- a)  $\text{HPO}_4^{2-}$                       b)  $\text{H}_3\text{PO}_4$                       c)  $\text{PO}_4^{3-}$                       d)  $\text{H}_3\text{PO}_3$

13) Which one of the following is the correct order for Bronsted acids or bases in the equation :



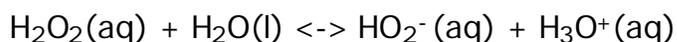
- a) acid + base  $\leftrightarrow$  acid + base      b) acid + base  $\leftrightarrow$  base + acid  
c) base + acid  $\leftrightarrow$  acid + base      d) base + acid  $\leftrightarrow$  base + acid

14) Which one of the following is the weakest acid ?

- a) 0.02 M HCl      b) 0.10 M HBr      c) 0.10 M HI      d) 0.10 M HF

15) Calculate the actual number of  $\text{H}_3\text{O}^+$  ions in 500.0 mL of pure water at 25°C.

16) Which one of the following species is the strongest acid in the reaction :



- a)  $\text{HO}_2^-(\text{aq})$       b)  $\text{H}_2\text{O}(\text{l})$       c)  $\text{H}_2\text{O}_2(\text{aq})$       d)  $\text{H}_3\text{O}^+(\text{aq})$

17) A Bronsted base is a substance which is

- a) a proton donor      b) a proton acceptor  
c) an electron donor      d) an electron acceptor

18) Which of the following species is a conjugate acid of  $\text{OH}^-$  ?

- a)  $\text{H}^+$       b)  $\text{O}^{2-}$       c)  $\text{OH}$       d)  $\text{H}_2\text{O}$

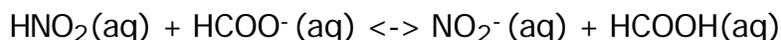
19) Which of the following species is the strongest acid ?

- a)  $\text{H}_3\text{BO}_3$       b)  $\text{NH}_4^+$       c)  $\text{H}_2\text{SO}_3$       d)  $\text{HS}^-$

20) Which of the following species is amphiprotic ?

- a)  $\text{H}^+$       b)  $\text{Mo}^-$       c)  $\text{HMo}$       d)  $\text{H}_2\text{Mo}^+$

21) Consider the following equilibrium :



Which of the following is an acid and conjugate base pair ?

- a)  $\text{HCOOH}(\text{aq})$  and  $\text{HCOO}^-(\text{aq})$       b)  $\text{HNO}_2(\text{aq})$  and  $\text{HCOO}^-(\text{aq})$   
c)  $\text{NO}_2^-(\text{aq})$  and  $\text{HCOO}^-(\text{aq})$       d)  $\text{HNO}_2(\text{aq})$  and  $\text{HCOOH}(\text{aq})$

22) In the reaction  $\text{NH}_3(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NH}_4^+(\text{aq}) + \text{OH}^-(\text{aq})$ , the water molecule serves as a

- a) weak base      b) strong acid  
c) proton donor      d) proton acceptor

23) To change a water molecule into a hydronium ion requires the

- a) addition of a proton      b) removal of a proton  
c) addition of an electron      d) removal of an electron



- a)  $S^{2-}$                       b)  $H_2S^-$                       c)  $H_2S$                       d)  $H_3S^+$

32) In the reaction,  $2H_2O \leftrightarrow H_3O^+ + OH^-$ , water is acting as

- a) a base only    b) an acid only  
c) both an acid and a base                              d) neither an acid nor a base

33) A substance in aqueous solution is classified as a weak base. This means that it :

- a) has a pH less than 7                      c) has a pH of exactly 7  
c) is less than 1 M in concentration  
d) is only partly ionized in solution

34) In the equation,  $HCO_3^- + HSO_3^- \leftrightarrow H_2CO_3 + SO_3^{2-}$ , the order of Bronsted acids and bases is :

- a) base, acid, acid, base    b) base, acid, base, acid  
c) acid, base, base, acid    d) acid, base, acid, base

35) The pH of a solution is 2.0 at 298°K. What is the pOH of this solution?

- a) 0.0                      b) 2.0                      c) 12                      d) 14

36) What is the total number of moles of  $H^+$  ions that will neutralize 2.0 moles of  $OH^-$  ions ?

- a) 1.0                      b) 2.0                      c) 17                      d) 34

37) Which particle is amphiprotic ?

- a)  $HNO_3$                       b)  $NO_3^-$                       c)  $NH_3$                       d)  $NH_4^+$

38) As 50.0 mL of 0.1 M HCl is added to 100. mL of 0.1 M NaOH, the pH of the NaOH solution :

- a) decreases                      b) increases                      c) remains the same

39) The hydroxide ion concentration is greater than the hydronium ion concentration in a 0.1 M solution of :

- a) NaOH                      b)  $CH_3OH$                       c)  $HNO_3$                       d)  $H_2SO_4$

Answers: 1) c, 2) d, 3) c, 4) c, 5) a, 6) d, 7) a, 8) c, 9) b, 10)  $1.4 \times 10^{-5}$ ,  
11) d, 12) a, 13) a, 14) d, 15)  $5.000 \times 10^{-8}$ , 16) b, 17) b, 18) d, 19) c,  
20) c, 21) a, 22) c, 23) a, 24) a, 25) d, 26) c, 27) a, 28) c, 29) d, 30)  
a, 31) c, 32) c, 33) d, 34) a, 35) c, 36) b, 37) c, 38) a, 39) a.