# ACID & BASE Multiple Choice Review Questions

1. Which one would be possible for both acids and bases?

1) has a [H+] of 10-7  3) turns litmus red

2) tastes sour 4) reacts with Mg to free H2 5) is a good conductor

2. An acid reacts with the base, carbonate ion, according to the equation**:**

2H3O+(aq) **+** CO3-2(aq) **⇄** 3H2O **+** CO2(g). If 0.4 mole of H3O+ is consumed,  
 the amount of CO2 released will be**:**  
 1) 0.2 mole; 2) 0.40 mole; 3) 0.10 mole; 4) 0.15 mole; 5) 2.0 moles.

3. Given the reaction H2S **+** H2O **⇄** H3O+ **+** HS-, what are the Bronsted acids?

1) H2S and H2O 2) H2S and H3O+ 3) HS- and H2O 4) HS- and H3O+

4. Consider the reaction H2SO4 *+* H2O **⇄** HSO4- ***+*** H3O+. Identify the two

Bronsted-Lowry acids.

1) H2SO4 and H2O 2) H2SO4 and H3O+ 3) H2O and H3O+ 4) HSO4-and H3O+

5. In the reaction, NH3(aq) ***+*** H2PO4-(aq) **⇄** NH4+(aq) ***+*** HPO4-2(aq), the

dihydrogen phosphate ion, H2PO4-(aq), acts as 1) a proton donor;

2) a proton acceptor; 3) a base; 4) an electron donor.

6. As NH3(g) is dissolved in water, ionization occurs.

NH3(g) ***+*** H2O **⇄** NH4+(aq) ***+*** OH-(aq). A proton is donated to

1) NH4+ by NH3 .3) NH2 -by NH3.

2) NH4+by H2O. 4) OH-  by H2O.

7. Consider the reaction H2SO4 + H2O **⇄** HSO4- + H3O+. Identify the two

Bronsted-Lowry bases.

1) H2SO4 and H2O 2) H2SO4 and H3O+ 3) H2O and H3O+ 4) HSO4- and H2O

8. Given the reaction H2S + H2O **⇄** H3O+ + HS-, what are the Bronsted bases?

1) H2S and H2O 2) H2S and H3O+ 3) HS- and H2O 4) HS- and H3O+

9. What role does the water play in this reaction?

H2O(l) + HNO3(g) **⇄** H3O+(aq) + NO3-(aq)  
 1) electron acceptor 2) proton donor 3) acid 4) base

10. Which particle can act only as a base?

1) H3PO4 2) HPO4-2  3) PO4-3 4) HPO3  5) none of these

11. The net equation H3O+ ***+*** OH- **⇄** 2 H2O could represent the reaction of

1) hydrochloric acid and any salt; 2) sulfuric acid with any salt;

3) sulfuric acid with water; 4) hydrochloric acid with sodium hydroxide.

12. Which could act as either a Bronsted base or a Bronsted acid?

1) HC1 2) CO3-2 3) HPO4-2 4) H2SO4 5) NO3-1

13. HCO3-may, in a water solution, act as either an acid or base. An equation for a reaction in which it is acting as an acid is**:**

1) HCO3-(aq) **+** CH3COOH(aq) **⇄** CO2(aq) **+** H2O(1) **+** CH3COO-(aq).  
 2) HCO3-(aq) **+** OH-(aq) **⇄** H2CO3(aq) **+** O-2(aq).  
 3) HCO3-(aq) **+** H3O+(aq) **⇄** CO2(g) **+** 2 H2O(1).   
 4) HCO3-(aq) **+** H2O(l) **⇄** CO3-2(aq) **+** H3O+(aq).  
 5) HCO3-(aq) **+** H2O(1) **⇄** H2CO3(aq) **+** OH-(aq).

14. Which of the following is **not** a conjugate acid - base pair?

1) NH3 and NH4+ 2) water and OH- 3) PH3 and PH4+ 4) H2O and 2 H2O

15. Which is the conjugate base of the HSO3- ion?

1) H2SO3 2) OH- 3) SO3-2  4) S-2 5) none of these

16. What is the conjugate acid of HSO4-?

1) H2SO4 2) OH- 3) H3O+ 4) SO4-2 5) none of these

17. The members of an acid-base conjugate pair differ by

1) a proton; 2) an electron; 3) a hydroxide ion; 4) a hydronium ion.

18. Which of the following is **not** a conjugate acid-base pair?

1) SO4-2 and SO3-2 3) HCl and Cl-

2) H2O and OH- 4) H2SO4 and HSO4- 5) HCO3- and CO3-2

19. Which of the following bases has the weakest conjugate acid?

1) NH3 2) H2O 3) NaOH 4) HCO3- 5) HPO4-2

20. Which ionization constant, KA, indicates the strongest acid?

1) 1 x 10*-7* 3) 1.7 x 10-4  
 2) 4 x 10-7 4) 6.7 x 10-4 5) 7.1 x 10-3

\*21. In an acid-base equilibrium reaction, the shift of equilibrium is in the direction in which the

1) weaker acid donates a proton to the weaker base.

2) weaker acid donates an electron to the stronger base.

3) stronger acid donates a proton to the weaker base.

4) stronger acid donates a proton to the stronger base.

22. What is the hydroxide-ion concentration in an aqueous solution of pH 3?

1) 11 M 2) 3 M 3) 10+3 M 4) 10-3 M 5) none of these

23. What is the pH of a 0.0010 M NaOH solution?

1) 1 2) 11 3) 3 4) 4 5) 8

**CHE 40S UNIT 4 – ACIDS AND BASES Review**

1. List the characteristics or properties of acids and bases.

2. What is the concentration of H3O+ ions in a solution if the [OH-] = 2.2 x 10-5? Remember Kw = 1 x 10-14. Is it acidic, basic or neutral?

4.54 x 10-10

Basic

3. Given that the pH of shampoo is 10.6, calculate the following.

1. [H+] = 2.5 x 10-11
2. [OH-] = 3.98 x 10-4
3. pOH = 3.4

4. If you had a 0.33 M HA solution. Its Ka = 4.5 x 10-2

a) calculate [H+], [A-], [OH-], pH, pOH, and percent dissociation

x = 0.1219 M = [H+] = [A-]

pH = 0.914

pOH = 13.086

[OH-] = 8.2 x 10-13 M

1. The pOH of a solution of acetic acid (CH3COOH) is 10.5. The initial concentration of the acid is 0.3 M. Calculate the Ka. (Type 1)

CH3COOH + H2O ↔ CH3COO- + H3O+

I 0.2 M 0 ~0

C *- x*  *+x +x*

E 0.3 M-*x x x*

14 = pOH + pH

14 = 10.5 + pH

pH = 3.5

[H3O+] = 10-pH

[H3O+] = 10-3.5

[H3O+] = 3.2 x 10-4 M

Ka = [CH3COO-][H3O+]

[CH3COOH-]

Ka = (3.2 x 10-4)2

0.29968 M

Ka = 3.42 x 10-7

5. Consider the reaction of hydrochloric acid with NaOH.

a) Write the balanced equation for this neutralization.

HCl + NaOH 🡪 NaCl + H2O

b) How many moles of HCl are needed to neutralize 2.2 moles of sodium hydroxide?

2.2 moles

~~6. A volume of 22 ml of 0.30 M H~~~~2~~~~SO~~~~4~~ ~~neutralizes a 45 ml sample of NaOH solution. What is the concentration of NaOH?~~

Be sure you practice titrations/dilutions questions