Which of the following statements is true?

BF₃ + NH₃ → product

1. NH3 is the Lewis base and BF3 is the Lewis acid.

2. NH3 is the Lewis acid and BF3 is the Lewis base.

3. A Lewis base donates lone-pair electrons.

4. A Lewis acid donates lone-pair electrons.

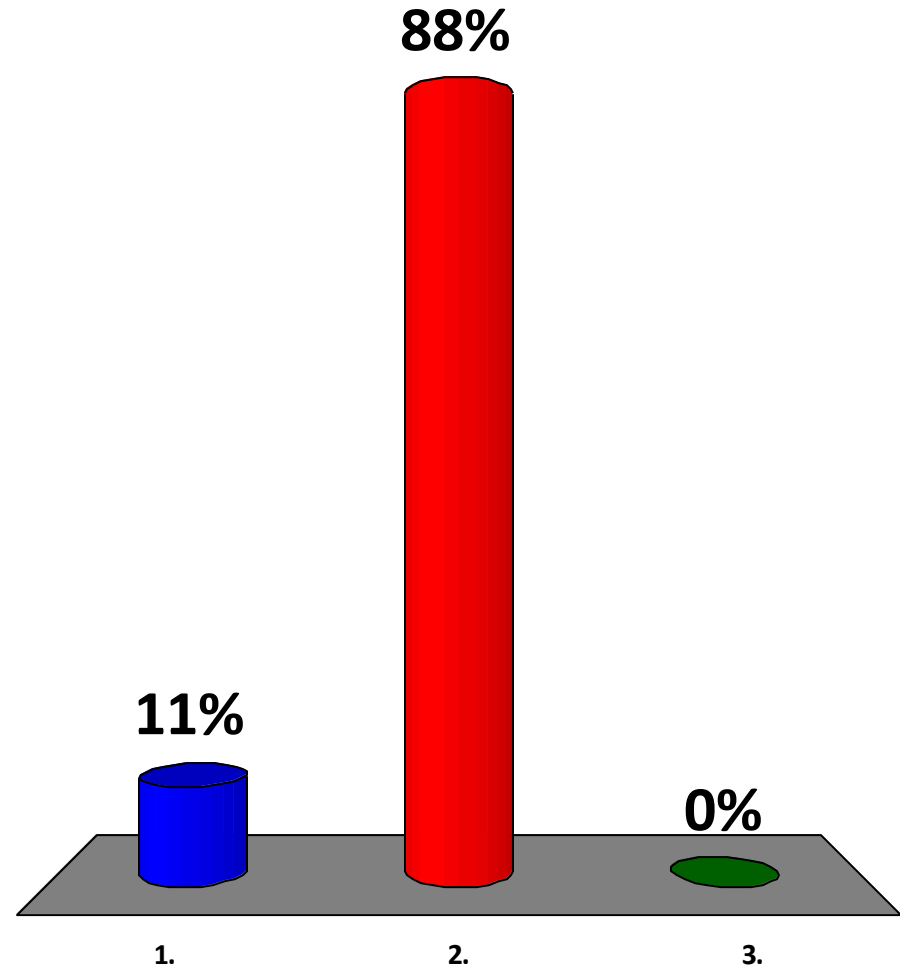5. 1 and 3 are true.

6. 1 and 4 are true.

7. 2 and 3 are true.

8. 2 and 4 are true.

Which of the following statements is true?
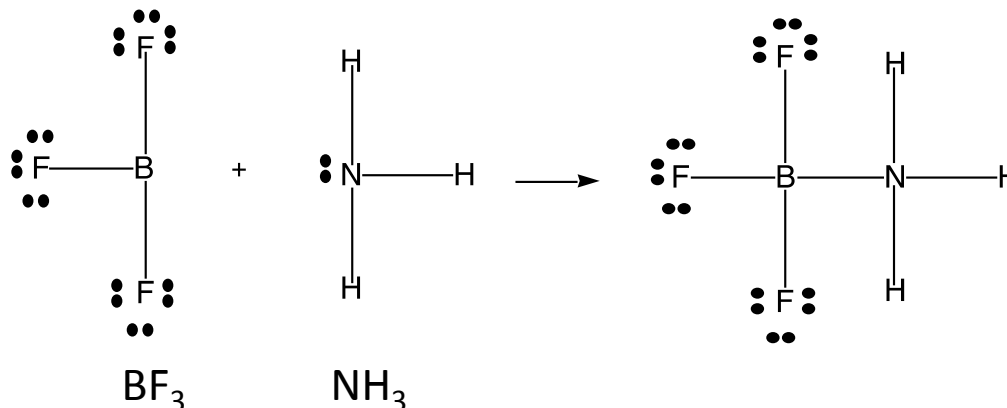
7%	1.	NH3 is the Lewis base and BF3 is the Lewis acid.
5%	2.	NH3 is the Lewis acid and BF3 is the Lewis base.
3%	3.	A Lewis base donates lone-pair electrons.
2%	4.	A Lewis acid donates lone-pair electrons.
57% ⭐	5.	1 and 3 are true.
5%	6.	1 and 4 are true.
9%	7.	2 and 3 are true.
13%	8.	2 and 4 are true.

2

Do you expect a large or small value for K if $\Delta G°$ is +79.89 kJ/mol?
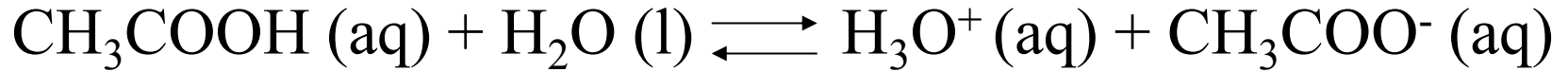
1. K will be large (greater than 1).

2. K will be small (less than 1)

3. K will be zero.

Do you expect a large or small value for K if ΔG° is +79.89 kJ/mol?

1. K will be large (greater than 1).
2. K will be small (less than 1)
3. K will be zero.

88%

11%

0%

1.   2.   3.

Identify the reason that the follow expression for K_a is wrong:

$$CH_3COOH\ (aq) + H_2O\ (l) \rightleftharpoons H_3O^+\ (aq) + CH_3COO^-\ (aq)$$

$$K_a = \frac{[H_3O^+][CH_3COO^-]}{[CH_3COOH][H_2O]}$$

1. The expression should be K= reactions/products
2. $[H_2O]$ should not be in the equation
3. $[CH_3COOH]$ should not be in the equation
4. Neither $[H_2O]$ nor $[CH_3COOH]$ should be in the equation
5. Not enough information is given
6. The expression is correct

Identify the reason that the follow expression for K_a is wrong:

$$CH_3COOH \text{ (aq)} + H_2O \text{ (l)} \rightleftharpoons H_3O^+ \text{ (aq)} + CH_3COO^- \text{ (aq)}$$
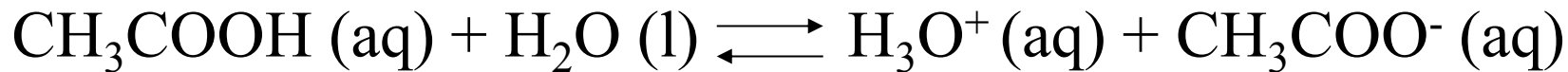
$$K_a = \frac{[H_3O^+][CH_3COO^-]}{[CH_3COOH][H_2O]}$$

3% 1. The expression should be K= reactions/products

83% ✓ 2. [H$_2$O] should not be in the equation

0% 3. [CH$_3$COOH] should not be in the equation

10% 4. Neither [H$_2$O] nor [CH$_3$COOH] should be in the equation

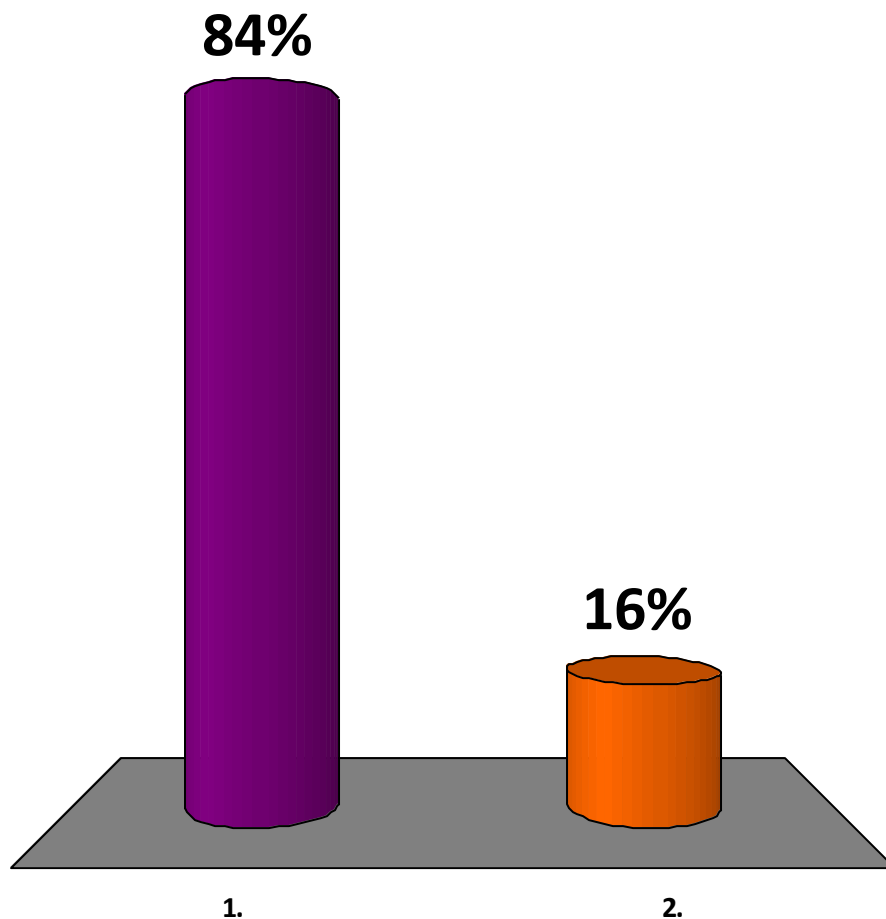1% 5. Not enough information is given

3% 6. The expression is correct

The higher the pK$_a$, the

1. weaker the acid.
2. stronger the acid.

The higher the pK$_a$, the

1. **weaker** the acid.
2. **stronger** the acid.

84%

16%

1.

2.

For pH = -log [1.$\underline{4}$7 x 10^{-3}], which is correct?

1. pH = 2.8
2. pH = 2.83
3. pH = 2.833

For pH = -log [1.47 x 10^{-3}], which is correct?
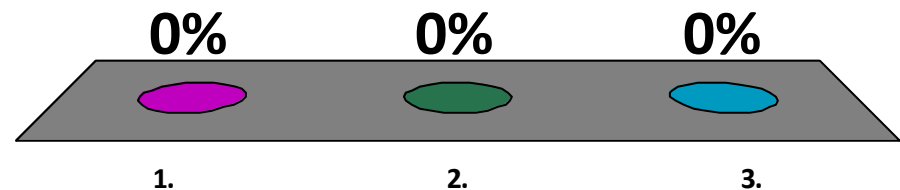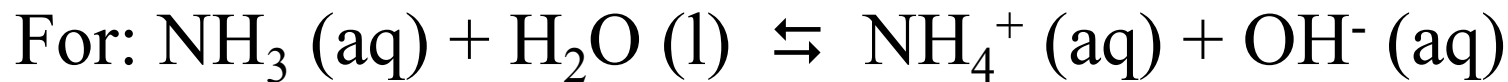
1. pH = 2.8
2. pH = 2.83
3. pH = 2.833

0%   0%   0%

1.   2.   3.

For: NH_3 (aq) + H_2O (l) $\leftrightarrows$ NH_4^+ (aq) + OH^- (aq)

Fill in the chart below:
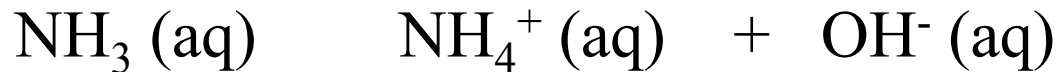
	NH_3 (aq)	NH_4^+ (aq)	+	OH^- (aq)
1.				
initial molarity	0.15	0		0
change in molarity	+x	+x		+x
equilibrium molarity	**0.15+x**	+x		+x
2.				
initial molarity	0.15	0		0
change in molarity	0	+x		+x
equilibrium molarity	**0.15**	+x		+x
3.				
initial molarity	0.15	0		0
change in molarity	-x	+x		+x
equilibrium molarity	**0.15-x**	+x		+x

10

For: NH_3 (aq) + H_2O (l) $\leftrightarrows$ NH_4^+ (aq) + OH^- (aq)
Fill in the chart below:
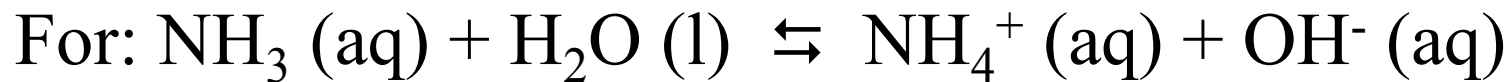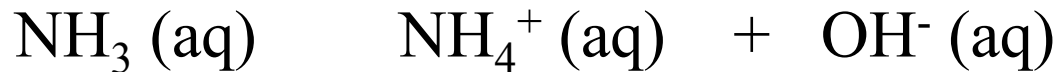
|	NH_3 (aq)	NH_4^+ (aq)	+ OH^- (aq)
1.			
initial molarity	0.15	0	0
33% change in molarity	+x	+x	+x
equilibrium molarity	**0.15**+x	+x	+x
2.			
33% initial molarity	0.15	0	0
change in molarity	0	+x	+x
equilibrium molarity	**0.15**	+x	+x
🙂 **3.**			
33% initial molarity	0.15	0	0
change in molarity	-x	+x	+x
equilibrium molarity	**0.15-x**	+x	+x

10

12

When asked to "check assumption," what do you do?

1. 0.00164/0.15 x 100 % = 1.1 % (1.1% is less then 5%, assumption is okay)

2. 0.15 - 0.00164 = 0.14836 (within sig figs, 0.00164 is small compared to 0.15)

3. 0.00164 x 0.15 x 100 % = 0.0246 % (0.0246 % is less then 5%, assumption is okay)

4. (0.15 – 0.00164) x 100 % = 14.8 % (14.8 is greater than 5%, assumption is not okay)

10
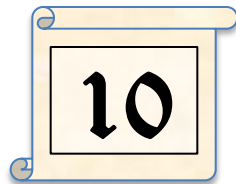
When asked to "check assumption," what do you do?

25% ⭐ 1. 0.00164/0.15 x 100 % = 1.1 % (1.1% is less then 5%, assumption is okay)

25% 2. 0.15 - 0.00164 = 0.14836 (within sig figs, 0.00164 is small compared to 0.15)

25% 3. 0.00164 x 0.15 x 100 % = 0.0246 % (0.0246 % is less then 5%, assumption is okay)

25% 4. (0.15 – 0.00164) x 100 % = 14.8 % (14.8 is greater than 5%, assumption is not okay)

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5.111 Principles of Chemical Science
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