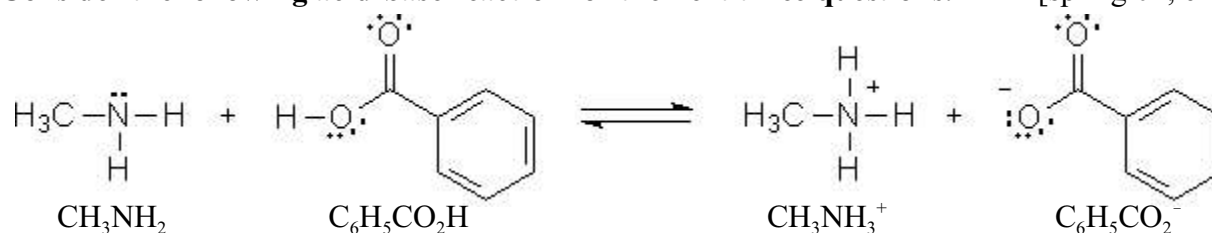


Consider the following acid-base reaction for the next three questions:

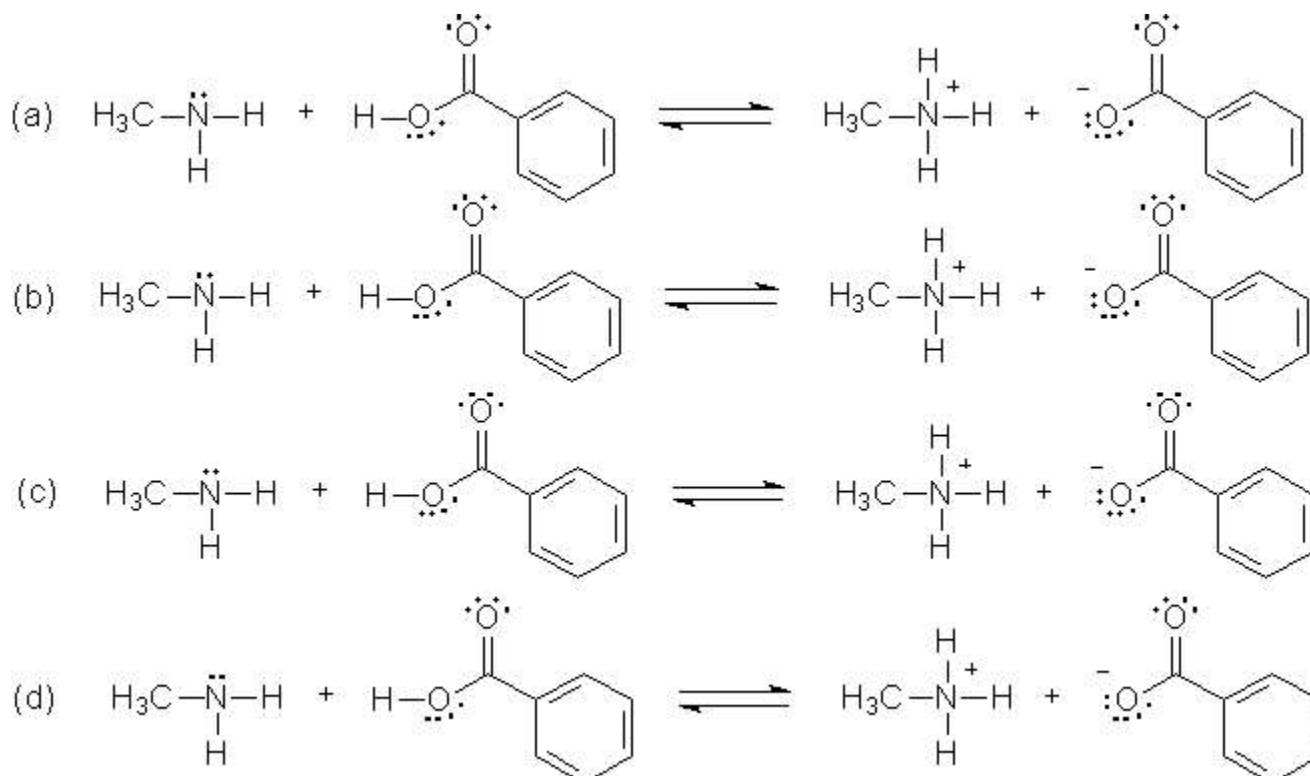
[spring 01, ex1]



4. The equilibrium constant, K , for this reaction is 2.4×10^6 at 25°C . Given that, which one of the following statements is **TRUE**?

At equilibrium, the reaction mixture contains...

- (a) almost all CH_3NH_3^+ and $\text{C}_6\text{H}_5\text{CO}_2^-$
 (b) almost all CH_3NH_2 and $\text{C}_6\text{H}_5\text{CO}_2\text{H}$
 (c) significant amounts of CH_3NH_2 , $\text{C}_6\text{H}_5\text{CO}_2\text{H}$, CH_3NH_3^+ and $\text{C}_6\text{H}_5\text{CO}_2^-$
5. Based on the value of K given in question 9, what can be said about relative acid strengths?
- (a) $\text{C}_6\text{H}_5\text{CO}_2^-$ is a stronger acid than CH_3NH_2
 (b) CH_3NH_3^+ is a stronger acid than $\text{C}_6\text{H}_5\text{CO}_2\text{H}$.
 (c) CH_3NH_2 is a stronger acid than $\text{C}_6\text{H}_5\text{CO}_2^-$
 (d) $\text{C}_6\text{H}_5\text{CO}_2\text{H}$ is a stronger acid than CH_3NH_3^+
6. Which of the following diagrams best represents the flow of electrons that occurs as the reaction goes from left to right?



Consider the following acid-base reaction for the next three questions:

[fall 01, ex1]



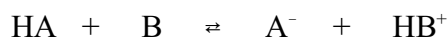
7. What are the conjugate acid-base pairs involved in this reaction? [The answer format is **(conjugate acid / conjugate base)**, in other words, the acid in the conjugate pair is listed first, followed by its conjugate base.]

- (a) ($\text{H}_2\text{PO}_4^- / \text{H}_3\text{PO}_4$) and (F^- / HF) (b) ($\text{H}_3\text{PO}_4 / \text{H}_2\text{PO}_4^-$) and (HF / F^-)
 (c) ($\text{H}_3\text{PO}_4 / \text{HF}$) and ($\text{H}_2\text{PO}_4^- / \text{F}^-$) (d) ($\text{HF} / \text{H}_3\text{PO}_4$) and ($\text{F}^- / \text{H}_2\text{PO}_4^-$)
 (e) ($\text{H}_3\text{PO}_4 / \text{F}^-$) and ($\text{H}_2\text{PO}_4^- / \text{HF}$)

8. Which of the following statements regarding the equilibrium constant, K , for this reaction is correct? (HINT: There's a table of K_a 's and K_b 's in the back.... K_a of $\text{H}_3\text{PO}_4 = 7.5 \times 10^{-3}$; K_a of $\text{HF} = 3.5 \times 10^{-4}$)

- (a) $K = 1$ (b) $K > 1$ (c) $0 < K < 1$ (d) $K < 0$ (e) $K = 0$

9. Consider the following generic acid-base equilibria and four statements regarding acid-base strength: [spring 02, ex1]



1. HA is a stronger acid than HB^+
2. HB^+ is a stronger acid than HA
3. B is a stronger base than A^-
4. A^- is a stronger base than B

If $K < 1$, which of the above statements are true?

- (a) 1 only (b) 2 only (c) 1 and 3 (d) 2 and 4 (e) 1 and 4
 (ab) 2 and 3

Answers: 1 c, 2 c, 3 d, 4 a, 5 d, 6 d, 7 b, 8 b, 9 d.