

What are Amines and Amides?

Worksheet

Amines are organic derivatives of ammonia with the N bonded to carbon(s). Amides contain the C(=O)-N group and are stabilized by resonance. Amines are basic and nucleophilic; amides are weakly basic and more stable.

Questions

- (CH)₃NH is what class of amine?
 - Primary
 - Secondary
 - Tertiary
 - Not an amine
- Amides are formed by reacting
 - Alcohols + ammonia
 - Acyl halides + amines
 - Ketones + water
 - Alkenes + HCN
- Which is more basic, an amine or an amide?
 - Amide
 - Amine
 - Equally basic
 - Neither
- The N in an amide is stabilized by
 - Hydrogen bonding
 - Resonance with C=O
 - Ionic bonding
 - Steric effects
- Classify CH₃NH₂ as a primary, secondary, or tertiary amine.
- How is acetamide (CH₃CONH₂) formed from acetic acid?
- Why are amides less basic than amines?
- Define: What is an amine?
- Define: What is an amide?
- Define: Are amines basic or acidic?

Answer Key

1. B) Secondary - Two carbons bonded to N secondary (2).
2. B) Acyl halides + amines - Acyl halides (or anhydrides) + amines/ammonia amides.
3. B) Amine - Amines are much more basic; amides are stabilized by resonance.
4. B) Resonance with C=O - Resonance delocalizes the N lone pair, stabilizing the amide.
5. Look at the nitrogen and count carbon atoms attached CHNH: only 1 carbon bonded to N This is a PRIMARY (1) amine Primary amines have the most basic lone pair (most reactive)
6. Start with acetic acid CHCOOH Convert to acyl halide: CHCOCl React acyl halide with ammonia: CHCOCl + NH₃ → CHCONH₂ + HCl Amides are easily formed from acyl halides and amines/ammonia
7. In amides, the N lone pair resonates with the C=O Resonance delocalizes the N lone pair (forms partial C-N double bond) The lone pair is less available for protonation Result: amides are very weak bases (pK_b >> 9)
8. An organic compound with N bonded to carbon (or carbons): RNH₂, RNH, RN.
9. A compound with N bonded to a carbonyl carbon: RCONH₂, RCONHR, RCONR₂.
10. Basic - the lone pair on N accepts protons to form RNH₃⁺.

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