Imines & Enamines — Instructor Answer Key

Worked solutions and reasoning • For instructor review before publication

1. **A primary amine plus propanone under suitable mildly acidic conditions yields:**

   Answer: An imine

   Reasoning: Primary amines commonly give imines after addition and dehydration.

2. **A secondary amine and ketone with an alpha H commonly form:**

   Answer: An enamine

   Reasoning: Secondary amines often give enamine products when alpha H is available.

3. **A characteristic imine bond is:**

   Answer: C=N

   Reasoning: Imines contain a carbon–nitrogen double bond.

4. **An enamine has a prominent structural motif:**

   Answer: C=C–N

   Reasoning: The nitrogen is bonded to an alkene carbon in an enamine.

5. **What is lost during net formation of a simple imine?**

   Answer: Water

   Reasoning: Addition and dehydration convert carbonyl and amine into C=N and H_2O.

6. **Why are very strongly acidic solutions potentially unfavorable for imine formation?**

   Answer: They protonate the amine and decrease nucleophilicity

   Reasoning: Most fully protonated amine is unavailable for nucleophilic attack.

7. **Which additional requirement applies to enamine formation?**

   Answer: An alpha hydrogen

   Reasoning: An alpha hydrogen is needed for formation of C=C adjacent to nitrogen.

8. **A primary amine RNH_2 has how many N–H bonds before reaction?**

   Answer: Two

   Reasoning: A primary amine RNH_2 has two bonds to H on nitrogen.

9. **What type of amine typically forms an imine?**

   Answer: A primary amine (or ammonia, forming an unsubstituted imine).

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10. **What structural feature is necessary for enamine formation?**

    Answer: An alpha hydrogen on the carbonyl substrate, in addition to appropriate secondary amine conditions.

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