

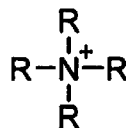
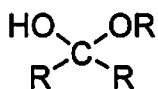
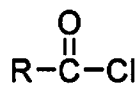
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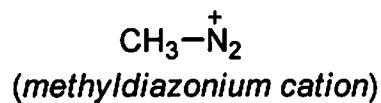
1-10) are True or False (10pts)

- 1) Aldehydes and ketones both contain a C=O double bond.
- 2) Nitration of Benzene, followed by reduction, produces Aniline.
- 3) An *ylide* is an overall neutral molecule which contains two formal charges of the same sign on adjacent atoms.
- 4) Wittig reactions generate alkanes.
- 5) Tollen's reagent (Silver Mirror test) is used to distinguish between ketones and amines.
- 6) The cyanide anion contains three nitrogens and is a good nucleophile.
- 7) Cyclic acetals are formed when aldehydes (or ketones) react via condensation with a diol under acidic conditions.
- 8) Sandmeyer chemistry involves the reactions of arene diazonium salts with copper (I) salts.
- 9) Hofmann eliminations involve a sterically demanding leaving group.
- 10) *Nitrogen inversion* (of stereocenters) involves the rehybridization of the Nitrogen between sp^3 and sp^2 .

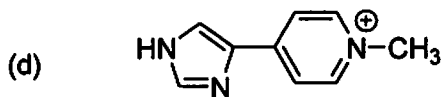
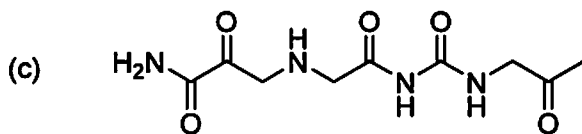
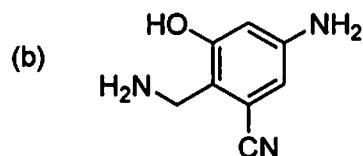
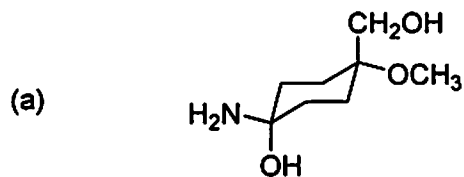
11) (3pts) Name the general class of organic compound (functional group) that each of these molecules belong to.



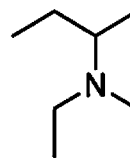
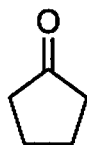
12) Draw a Lewis structure (*including lone pairs / formal charges*) for the following two species. (4pts)



13) Circle the *most basic atom* in each of the following species. (4pts)



14) Name the following compounds in IUPAC acceptable terms. (2+3=5pts)

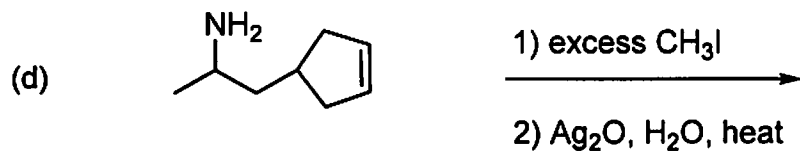
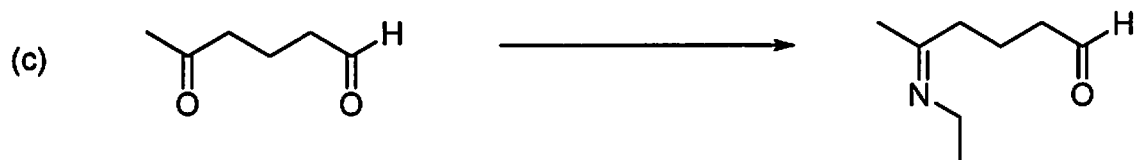
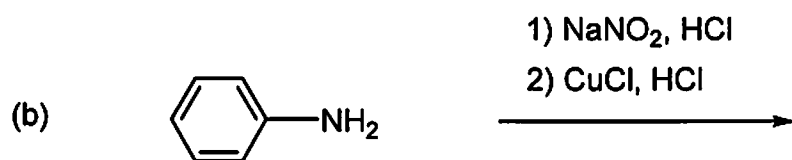
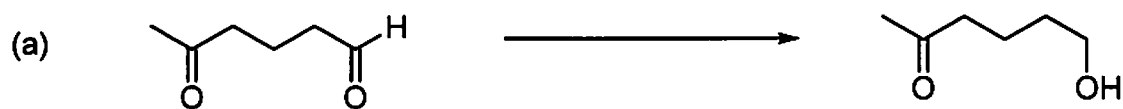


(15) (2+2+2 = 6pts) a) What is the definition of a *condensation* reaction?

b) List the three desirable properties of a *protecting group*.

c) Many odorous (smelly) compounds produced by the human body when we sweat contain amines and other basic functional groups. Some people believe that adding vinegar (acetic acid/ethanoic acid) to their washing machine rinse cycle helps to remove these smelly molecules from their clothing. Briefly state whether there is any scientific or chemical explanation for this laundry practice.

16) Provide the products (2+2pts) and the reagents (3+3+3pts) for these reactions. (13pts)



17) Write the mechanism (*i.e. curly arrows*) for the **acid catalyzed nucleophilic addition of water to acetone (propanone)**, producing the ketone hydrate. (5pts)

****Bonus question (up to 2pts)****

Explain why the conversion of aldehydes and ketones into their corresponding (solid or crystalline) hydrazone and carbazone derivatives was so important to synthetic chemists back in “the olden days” (meaning before modern instrumentation like HPLC-MS or NMR were widely available).

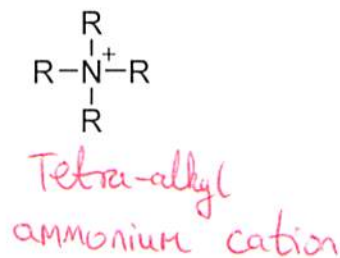
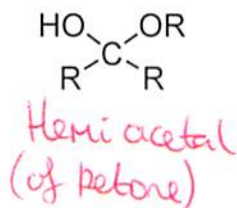
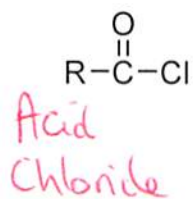
NAME: AMINES → ANEND

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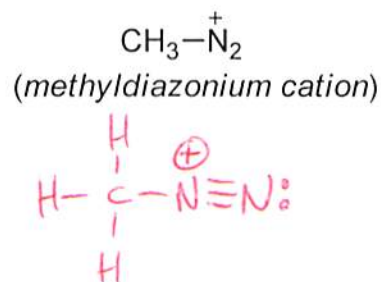
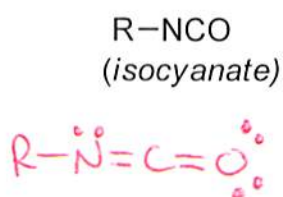
1-10) are True or False (10pts)

- 1) Aldehydes and ketones both contain a C=O double bond. T
- 2) Nitration of Benzene, followed by reduction, produces Aniline. T
- 3) An *ylide* is an overall neutral molecule which contains two formal charges of the same sign on adjacent atoms. false
- 4) Wittig reactions generate alkanes. false
- 5) Tollen's reagent (Silver Mirror test) is used to distinguish between ketones and amines. false
- 6) The cyanide anion contains three nitrogens and is a good nucleophile. false
- 7) Cyclic acetals are formed when aldehydes (or ketones) react via condensation with a diol under acidic conditions. T
- 8) Sandmeyer chemistry involves the reactions of arene diazonium salts with copper (I) salts. T
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- 10) *Nitrogen inversion* (of stereocenters) involves the rehybridization of the Nitrogen between sp^3 and sp^2 . T

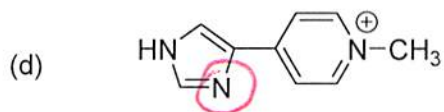
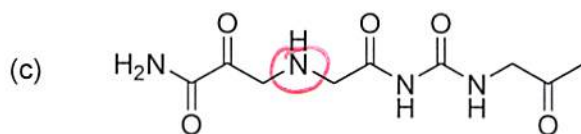
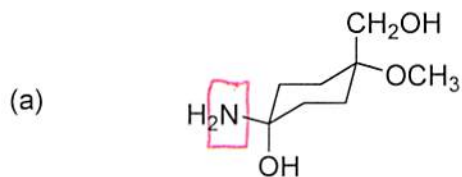
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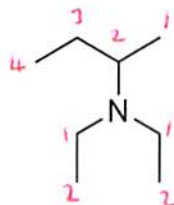
13) Circle the *most basic atom* in each of the following species. (4pts)



14) Name the following compounds in IUPAC acceptable terms. (2+3=5pts)



CYCLOPENTANONE



N,N-DIETHYLBUTAN-2-AMINE

(15) (2+2+2 = 6pts) a) What is the definition of a *condensation* reaction?

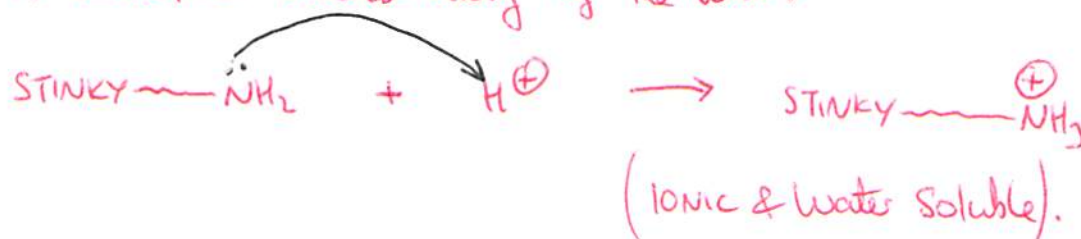
A condensation reaction is where two (or more) molecules add together, along with the expulsion of a small molecule (usually water).

b) List the three desirable properties of a *protecting group*.

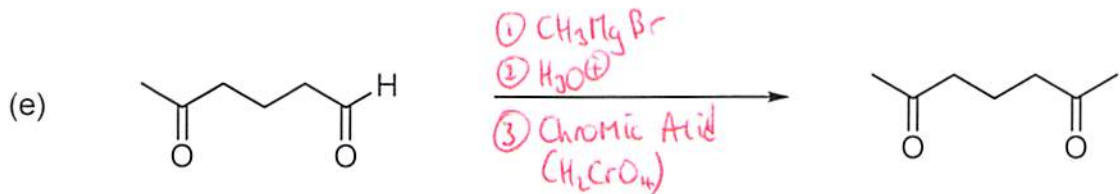
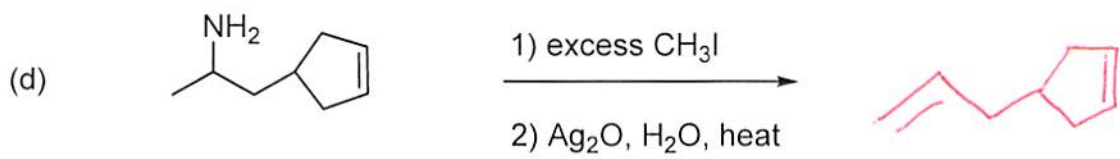
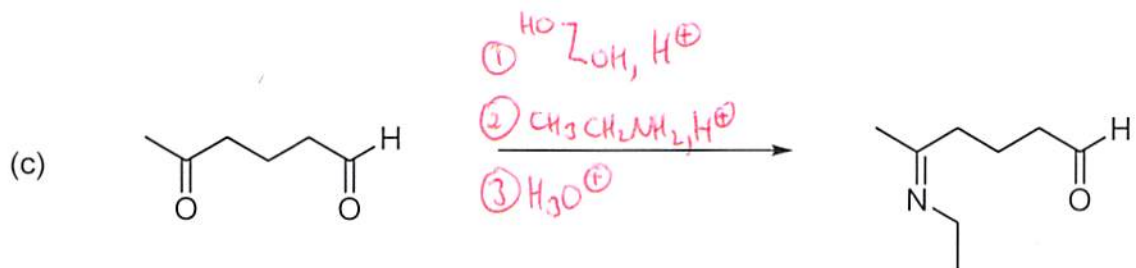
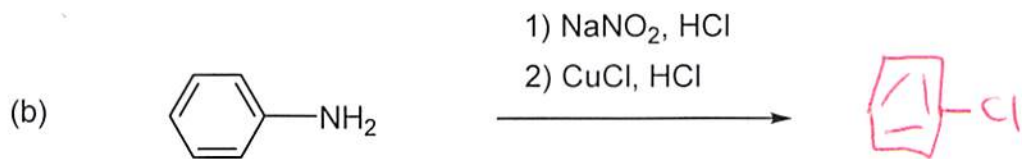
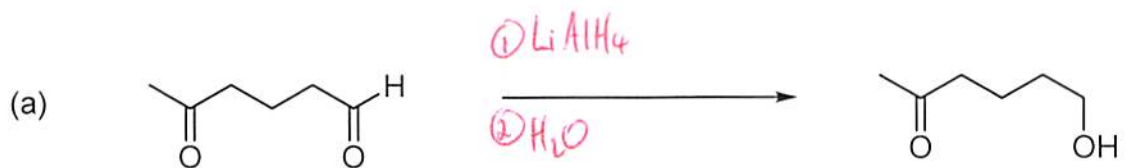
- Easy to put on
- Inert to the performed chemistry
- Easy to remove.

c) Many odorous (smelly) compounds produced by the human body when we sweat contain amines and other basic functional groups. Some people believe that adding vinegar (acetic acid/ethanoic acid) to their washing machine rinse cycle helps to remove these smelly molecules from their clothing. Briefly state whether there is any scientific or chemical explanation for this laundry practice.

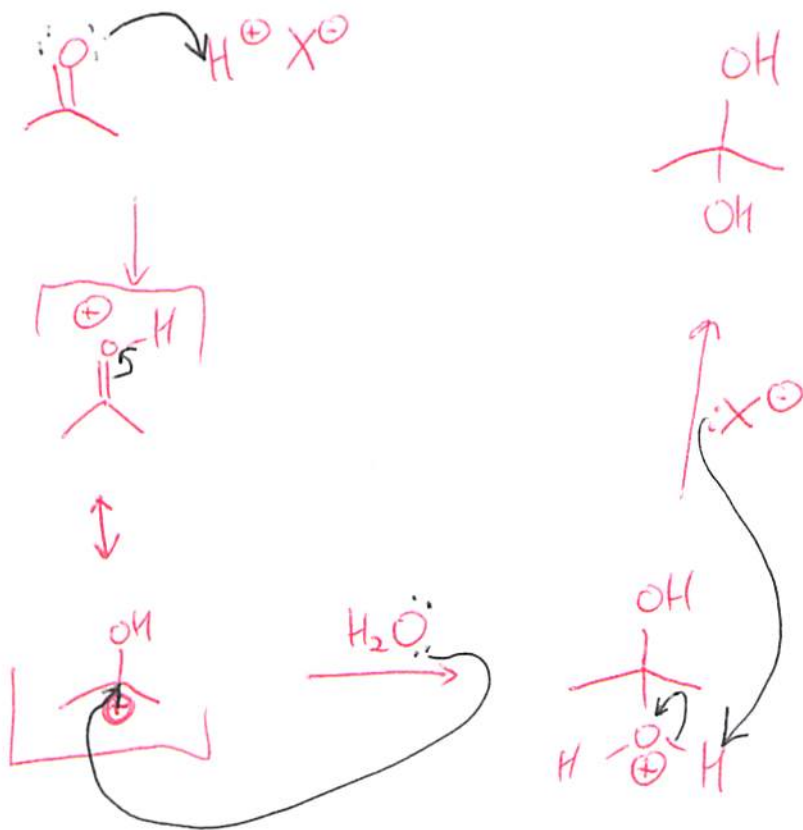
Yes, the addition of an acid can help protonate the amine which produces a more water soluble ammonium salt, that is therefore washed away by the water.



16) Provide the products (2+2pts) and the reagents (3+3+3pts) for these reactions. (13pts)



17) Write the mechanism (*i.e. curly arrows*) for the **acid catalyzed** nucleophilic addition of water to acetone (propanone), producing the ketone hydrate. (5pts)



****Bonus question (up to 2pts)****

Explain why the conversion of aldehydes and ketones into their corresponding (solid or crystalline) hydrazone and carbazone derivatives was so important to synthetic chemists back in “the olden days” (meaning before modern instrumentation like HPLC-MS or NMR were widely available).

This allowed chemists to convert their liquid samples into solids, which enabled the easy purification, and determination of melting points. The melting points were used for characterization and identification purposes.