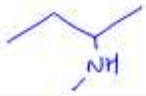
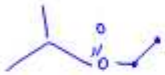
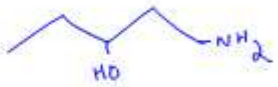
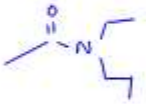
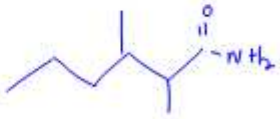
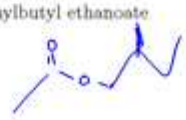
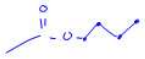
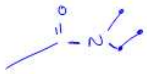
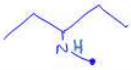
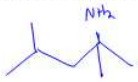
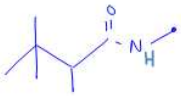
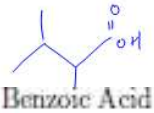
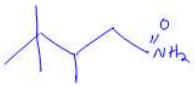
1. 3,3,4-trimethylpentanoic acid
2. 2,3-dimethyl-1-hexanamine
3. 2-ethyl-3,3-dimethylbutanamide
4. 2-butyl butanoate
5. N,N-dimethyl-2-methylpropanamide
6. Propyl 2,2-dimethylpropanoate
7. benzoic_acid
8. N-methyl-3,4-dimethyl-2-pentanamine
9. 3-hexeneoic acid
10. N-butyl-N-methylethanamide

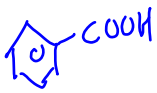
1. 2,2-dimethylbutanoic acid
2. N-ethyl-2-pentanamine
3. N-ethylethanamide
4. 2,2-dimethylbutyl ethanoate
5. 2-methyl-4-hexenoic acid
6. N-ethyl-N-methyl-2-methyl-1-propanamine
7. N-ethyl-N-methyl-3-methylbutanamide
8. 3-methyl-4-heptanamine
9. Ethyl 2-methylbutanoate
10. 3-ethylpentanamide

1. 2-heptanamine
2. 3-methylbutanamide
3. 4-methylpentanoic acid
4. 1,3-butanediamine
5. Ethyl butanoate
6. Hexanoic acid
7. N,N-dimethyl-3-heptanamine
8. N-ethylpentanamide
9. N-methyl-2-ethyl-1-pentanamine
10. Pentyl propanoate

(a) pentanedioic acid 	(b) N-methyl-2-butanamine 
(c) ethyl 2-methylpropanoate 	(d) 3-hydroxy-1-pentanamine 
(e) N-ethyl-N-propylethanamide 	(f) Aniline 
(g) 2,3,4-trimethylpentanoic acid 	(h) 2,3-dimethylhexanamide 
(i) N,N-dimethyl-2-methyl-1-pentanamine 	(j) 2-methylbutyl ethanoate 

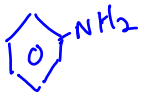
(a) N,N-dimethyl-1-propanamine 	(b) butyl ethanoate 
(c) N-ethyl-N-methylethanamide 	(d) propyl 2,2-dimethylpropanoate 
(e) N-methyl-3-pentanamine 	(f) 2,4-dimethyl-2-pentanamine 
(g) N-methyl-2,3,3-trimethylbutanamide 	(h) 6-methylheptanoic acid 
(i) 2,3-dimethylbutanoic acid 	(j) 3,4,4-trimethylpentanamide 

(a) Benzoic Acid

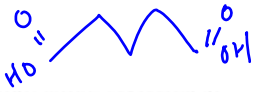


(b) Diethyldimethylammonium chloride

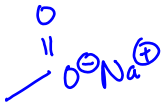
(c) Aniline



(d) Pentanedioc acid

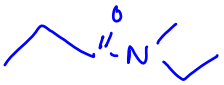


(e) Sodium ethanoate

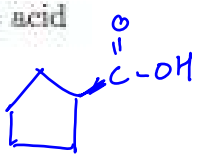


(f) N-methyl-2-butanamine

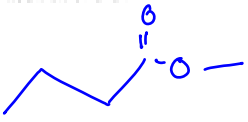
(g) N-ethyl-N-methylpropanamide



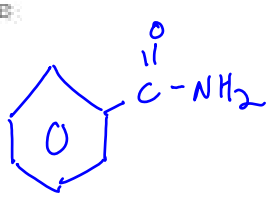
(h) Cyclopentanoic acid



(i) Methyl butanoate



(j) Benzamide



Fill in the class of compound for each missing product(s) or reactant(s). If no reaction occurs place a NR in the blank.

(a) Amide $\xrightarrow[H_2O]{Acid}$ C.A. + Amine (or salt)

(b) Carboxylic Acid + Thionyl Chloride ($SOCl_2$) $\longrightarrow$ Acid Chloride + HCl + SO_2

(c) Primary Alcohol $\xrightarrow{[O]}$ Ald $\xrightarrow{[O]}$ C.A.

(d) Ester + H_2O $\xrightarrow{[H^+ \text{ or Enzyme}]}$ Carboxylic Acid + Alcohol

(e) 2° Amine + Alkyl Halide (RX) $\longrightarrow$ 3° Amine + HX

(f) Carboxylic Acid + Amine $\xrightarrow{[-H_2O]}$ Amide + H_2O

(g) Ester + Strong Base $\xrightarrow{[H_2O]}$ C.A Salt + Alcohol

(h) Nitrile + 2 H_2O $\xrightarrow{[H^+]}$ C.A. + (NH_3) opps

(i) Carboxylic Acid + Alcohol $\xrightarrow{[-H_2O]}$ Ester + H_2O

(j) Amide $\xrightarrow{LiAlH_4}$ 1° Amine + H_2O

(a) Ester + Strong Base $\xrightarrow{[H_2O]}$ C.A. Salt + Alcohol
(will accept C.A.)

(b) Carboxylic Acid + Carboxylic Acid $\xrightarrow{[-H_2O]}$ Acid Anhydride + H_2O

(c) Nitrile $\xrightarrow[\Delta]{H_2/N_2}$ Amine

(d) C.A. + $SOCl_2$ (Thionyl Chloride or) $\longrightarrow$ Acid Chloride + HCl + SO_2

(e) Carboxylic Acid $\xrightarrow{red}$ Ald $\xrightarrow{red}$ 1° Alc

(f) 2° Amine + Alkyl Halide $\longrightarrow$ 3° Amine + HX

(g) Amide $\xrightarrow[H_2O]{Acid}$ C.A ~~+ salt~~ + Amine (or Ammonia) Salt

(h) Carboxylic Acid + Alcohol $\xrightarrow{[-H_2O]}$ Ester + H_2O

(i) 2 1°/2° Amines + Acid Chloride $\rightarrow$ Amide + Ammonium Salt or Amine Salt.

(j) Amide $\xrightarrow{LiAlH_4}$ 1° Amine

(a) 1° Alc $\xrightarrow{[O]}$ Aldehyde $\xrightarrow{[O]}$ C.A

(b) Amide $\xrightarrow[H_2O]{Acid}$ C.A + Amine Salt

(c) Carboxylic Acid + Thionyl Chloride ($SOCl_2$) $\longrightarrow$ Acid Chloride + SO_2 + HCl

(d) Nitrile $\xrightarrow[\Delta]{H_2/N_2}$ 1° Amine

(e) Ester + H_2O $\xrightarrow{[H^+ \text{ or Enzyme}]}$ C.A. + Alc

(f) 2° Amine + Alkyl Halide (RX) $\longrightarrow$ 3° Amine + HX

(g) Amide $\xrightarrow{LiAlH_4}$ Amine + H_2O

(h) Carboxylic Acid + Amine $\xrightarrow{[-H_2O]}$ Amide + H_2O

(i) 1° Amine + Alkyl Halide (RX) $\longrightarrow$ 2° Amine

(j) Ammonia + Alkyl Halide (RX) $\longrightarrow$ 1° Amine

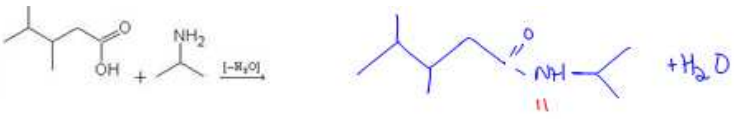
(k) 3° Amine + Alkyl Halide (RX) $\longrightarrow$ Quat. Ammonium Salt

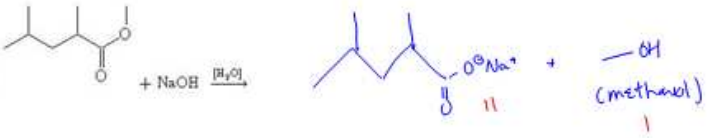
(l) Carboxylic Acid + Carboxylic Acid $\xrightarrow{[-H_2O]}$ Acid Anhydride + H_2O

(m) Ester + Strong Base $\xrightarrow{[H_2O]}$ C.A. Salt + Alcohol

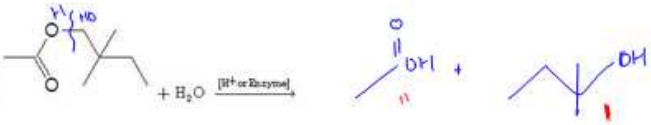
(n) C.A. + Alcohol $\xrightarrow{[-H_2O]}$ Ester + H_2O

(o) 2 1°/2° Amines + Acid Chloride $\longrightarrow$ Amide + Amine Salt / Ammonium Salt

(a) 

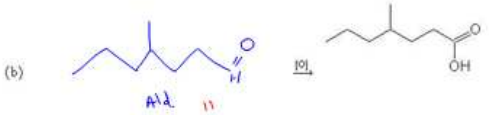
(b) 

(c) 

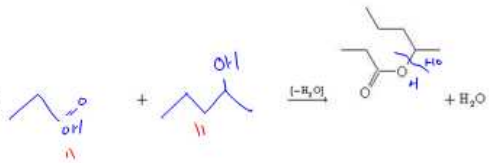
(d) 

(e) 

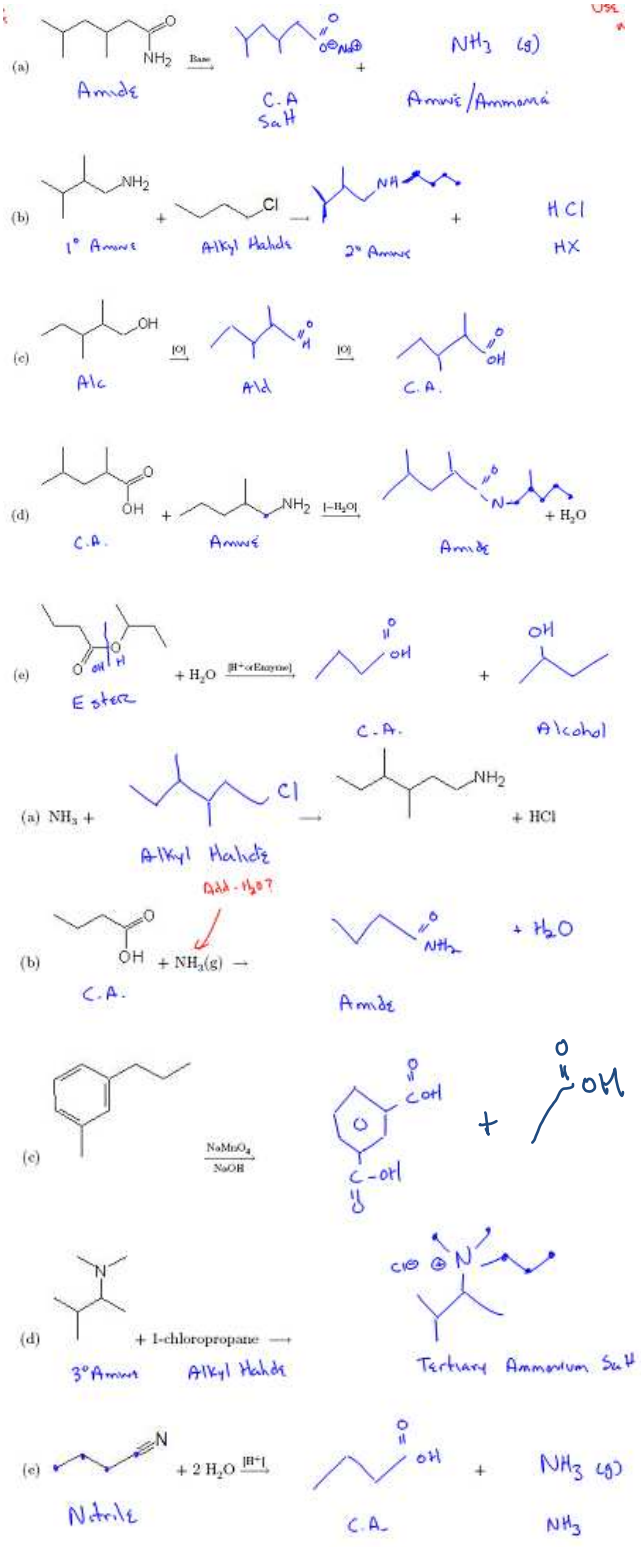
(a) 

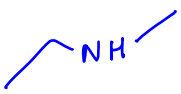
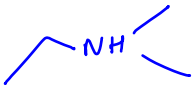
(b) 

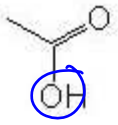
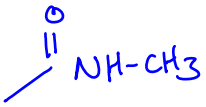
(c) 

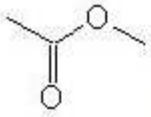
(d) 

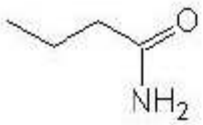
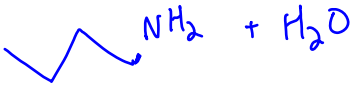
(e) 


(a)
Base
Amide
C.A Salt
NH_3 (g)
Amine/Ammonia
(b)
1° Amine
Alkyl Halide
2° Amine
HCl
HX
(c)
Alc
[O]
Ald
[O]
C.A.
(d)
C.A.
Amine
$[-H_2O]$
Amide
$+ H_2O$
(e)
Ester
$+ H_2O$ [H⁺ or Enzyme]
C.A.
Alcohol
(a) NH_3 +
Alkyl Halide
+ HCl
Add - H_2O?
(b)
C.A.
$+ NH_3(g) \rightarrow$
Amide
$+ H_2O$
(c)
$NaMnO_4$
NaOH
(d)
3° Amine
+ 1-chloropropane
Alkyl Halide
Tertiary Ammonium Salt
(e)
Nitrile
$+ 2 H_2O$ [H⁺]
C.A.
NH_3 (g)
NH_3

(a) $CH_3–CH_2–NH_2 \xrightarrow{CH_3Cl}$  $\xrightarrow{CH_3Cl}$ 

(b)  $+ CH_3–NH_2 \xrightarrow{[-H_2O]}$ 

(c)  $+ NaOH \xrightarrow{[H_2O]}$ 

(d)  $\xrightarrow{LiAlH_4}$ 

(e)  $\xrightarrow{[O]}$