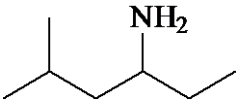
ACS Review Amines

1. What is an acceptable name of the following compound?

   $CH_3CH_2CH_2CH_2NHCH_3$

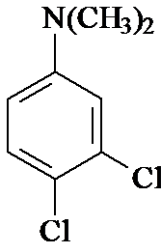
   A. *N*-methylbutylamine
   B. 1-methyl-1-butylamine
   C. *N*-butylmethylamine
   D. 2-pentylamine

2. What is the IUPAC name of the following compound?



   A. 2-methyl-4-hexanamine
   B. 2-methyl-4-aminohexane
   C. 5-methyl-3-hexanamine
   D. 5-methyl-3-aminohexane

3. Which of the following is the correct IUPAC name of the compound shown below?



   A. 1,2-dichloro-4-(*N*,*N*-dimethyl)aniline
   B. dimethyl-(3,4-dichlorophenyl)amine
   C. 3,4-dichloro-*N*,*N*-dimethylaniline
   D. *N*,*N*-dimethylamino-3,4-dichlorobenzene

4. Which one of the following is ethyl 4-(dimethylamino) butanoate?

   A) $(CH_3NH)_2CHCH_2CH_2CO_2CH_2CH_3$

   B) $H_2NCH_2\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}CH_2CO_2CH_2CH_3$

   C) $(CH_3)_2\underset{\displaystyle NH_2}{\overset{}{\overset{|}{\underset{|}{C}}}}CH_2CH_2CO_2CH_2CH_3$

   D) $(CH_3)_2NCH_2CH_2CH_2CO_2CH_2CH_3$

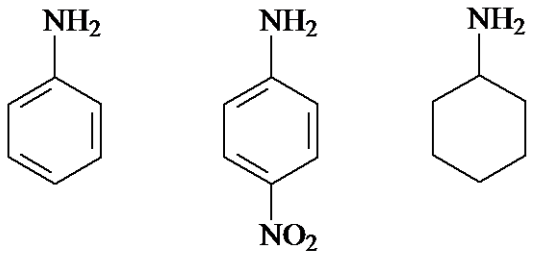
   A. A
   B. B
   C. C

D. D

5. Among the isomeric $C_4H_{11}N$ amines below, the one with the lowest boiling point is:

A. $CH_3CH_2CH_2CH_2NH_2$
B. $(CH_3CH_{2)2}NH$
C. $(CH_3)_2CHNHCH_3$
D. $(CH_3)_2NCH_2CH_3$

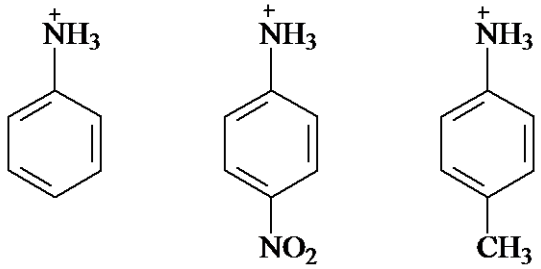
6. Rank the following three compounds in order of decreasing basicity.



I **II** **III**

A. I > II > III
B. II > I > III
C. III > II > I
D. III > I > II

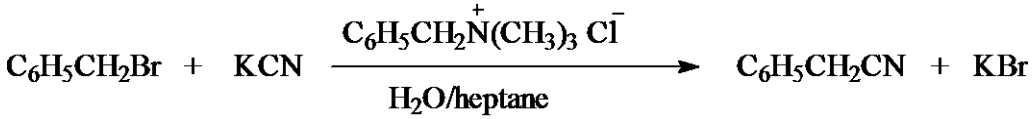
7. Rank the following three compounds in order of decreasing acidity.



I **II** **III**

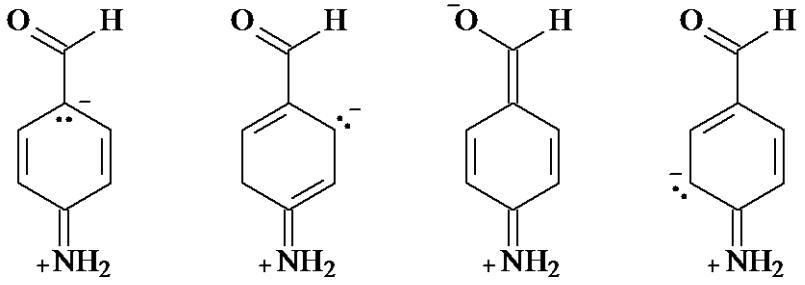
A. II > III > I
B. II > I > III
C. III > I > II
D. III > II > I

8. In the following two-phase reaction, the catalyst works by:



A. transferring CN^- from the aqueous phase to the organic phase containing $C_6H_5CH_2Br$.
B. transferring $C_6H_5CH_2Br$ from the organic phase to the aqueous phase containing CN^-.
C. removing Br^- from the organic phase to the aqueous phase.
D. removing K^+ from the organic phase to make cyanide ion more nucleophilic.

9. Which one of the following is not a resonance form of *para*-aminobenzaldehyde?



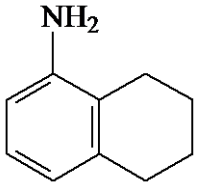
I II III IV

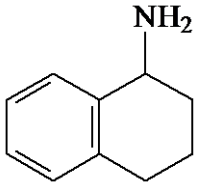
A. I
B. II
C. III
D. IV

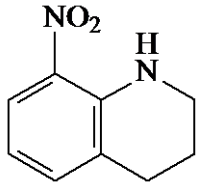
10. To convert a nitrile to a primary amine you must:

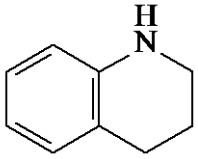
A. hydrolyze it with water
B. oxidize it with chromic acid
C. reduce it with hydrogen or lithium aluminum hydride
D. substitute it with an alkyl halide

11. Which one of the following is the strongest base?

A)


B)


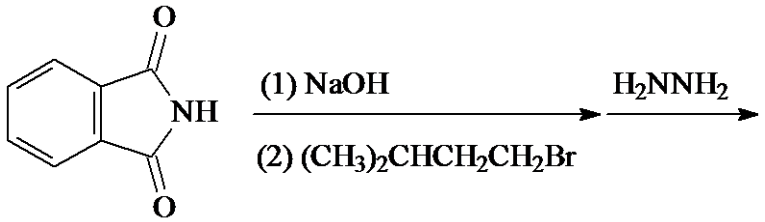
C)


D)


A. A
B. B
C. C

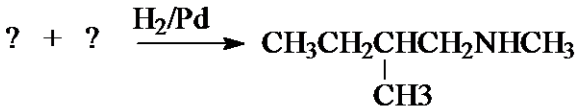
D. D

12. Which of the following is the product of the reaction shown below?



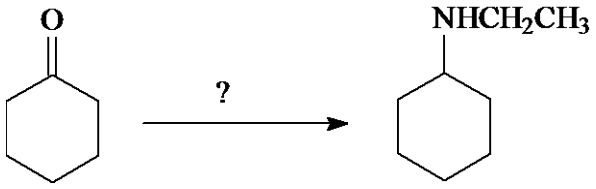
A. $(CH_3)_2CHCH_2CH_2NHNH_2$
B. $(CH_3)_2CHCH_2CH_2NH_2$
C. $[(CH_3)_2CHCH_2CH_2]_2NH$
D. $(CH_3)_2CHCH_2CH_2CONH_2$

13. Which pair of reagents would be used to make the following amine by reductive amination?



A. methylamine and 2-methylbutanoic acid
B. methylamine and 2-methylbutanal
C. ammonia and 3-methyl-2-pentanone
D. dimethylamine and 2-butanone

14. Which of the following reagents can convert cyclohexanone to *N*-ethylcyclohexylamine as shown below?



A. $CH_3CH_2NH_2$ and H_2/Pt
B. $LiAlH_4$ followed by H_2O and then CH_3CH_2Br
C. CH_3CH_2Br and NH_3
D. $CH_3CH{=}O$ and NH_3

15. Which one of the following compounds gives propylamine, $CH_3CH_2CH_2NH_2$, upon hydrolysis?

A) $CH_3CH_2C{\equiv}N$

B) $CH_3\overset{\overset{O}{\|}}{C}NHCH_2CH_2CH_3$

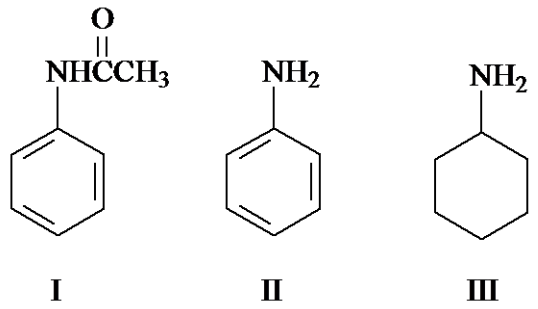
C) $(CH_3CH_2CH_2)_2NH$

D) $CH_3CH_2\overset{\overset{NH}{\|}}{C}H$

A. A

B. B
C. C
D. D

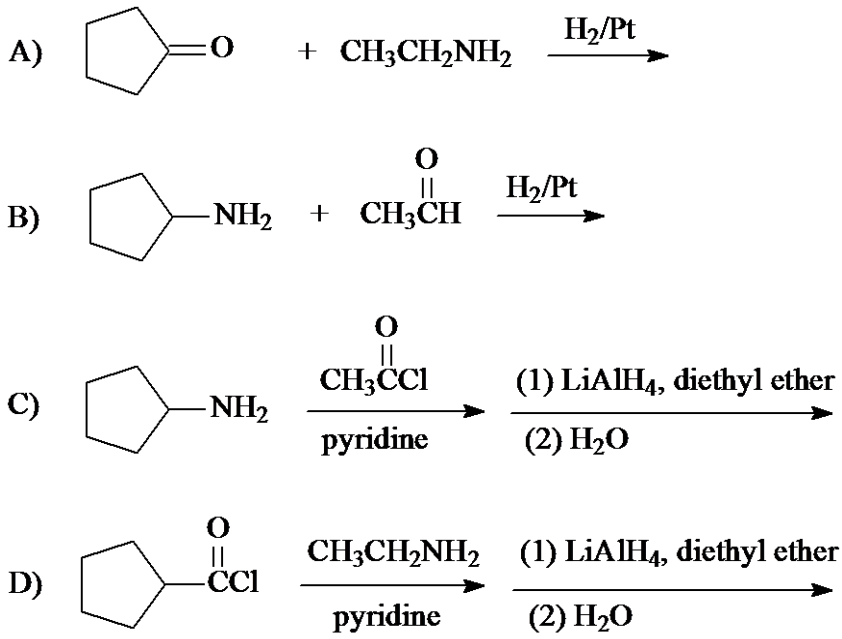
16. Rank the following three compounds in decreasing order of basicity.



I II III

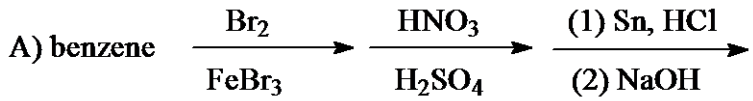
A. III > I > II
B. III > II > I
C. II > I > III
D. II > III > I

17. Which one of the following does <u>not</u> give *N*-ethylcyclopentylamine as the major product?



A. A
B. B
C. C
D. D

18. Which one of the following synthetic routes gives the best yield of *meta*-bromoaniline starting with benzene?



B) benzene $\xrightarrow[H_2SO_4]{HNO_3}$ $\xrightarrow[(2)\ NaOH]{(1)\ Sn,\ HCl}$ $\xrightarrow[FeBr_3]{Br_2}$

C) benzene $\xrightarrow[H_2SO_4]{HNO_3}$ $\xrightarrow[FeBr_3]{Br_2}$ $\xrightarrow[(2)\ NaOH]{(1)\ Sn,\ HCl}$

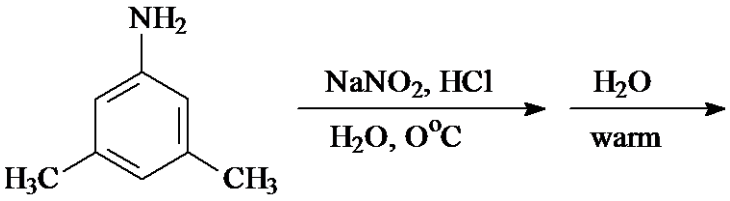
D) benzene $\xrightarrow[(2)\ NaOH]{(1)\ Sn,\ HCl}$ $\xrightarrow[H_2SO_4]{HNO_3}$ $\xrightarrow[FeBr_3]{Br_2}$

A. A
B. B
C. C
D. D

19. Which one of the following amines gives an *N*-nitrosoamine on treatment with nitrous acid, HNO_2?

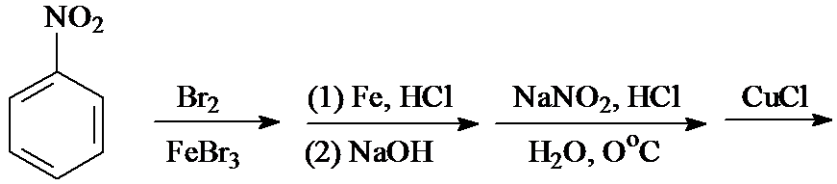
A. 2,4-dimethylaniline
B. 3,5-dimethyaniline
C. *N*,4-dimethylaniline
D. *N*,*N*-dimethylaniline

20. What is the product of the following reaction?



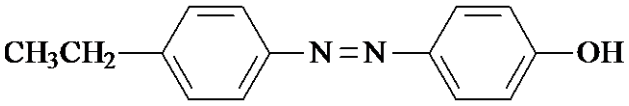
A. 3,5-dimethyl-4-nitrophenol
B. 1,3-dimethyl-5-nitrobenzene
C. *meta*-xylene (*meta*-dimethybenzene)
D. 3,5-dimethylphenol

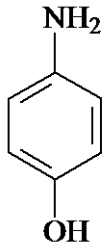
21. Which of the following is the product of the reaction sequence shown below?

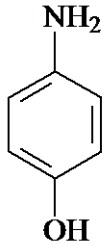


A. *meta*-bromochlorobenzene
B. 1,3,5-tribromobenzene
C. 1,3-dibromo-5-chlorobenzene
D. mixture of *ortho* and *para*-bromochlorobenzene

22. Which of the following would be the starting reagents needed to make the azo compound shown below?



A)  + *p*-ethylaniline

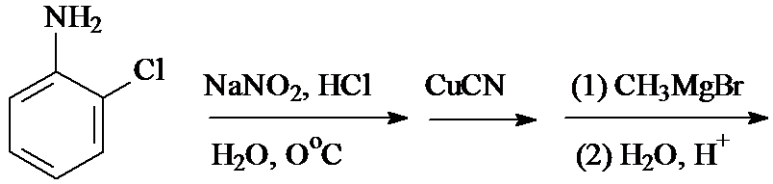
B)  + *p*-ethylphenol

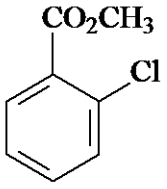
A. A
B. B
C. *p*-ethylaniline + phenol
D. aniline + *p*-ethylphenol

23. Reaction of an *N*,*N*-dialkylaniline with nitrous acid yields:

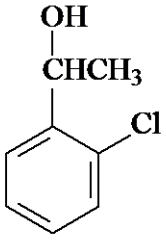
A. a diazonium salt
B. a *para*-nitroso compound
C. an *N*-nitroso compound
D. an azo compound

24. What is the product of the reaction series shown below?

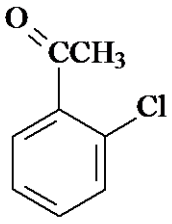




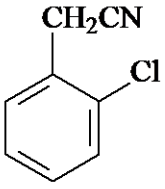
I



II



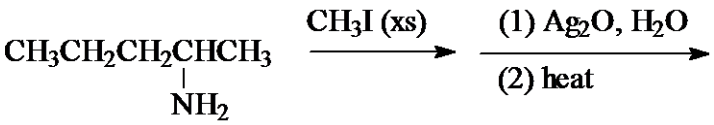
III



IV

A. I
B. II
C. III
D. IV

25. What is the major product of the reaction sequence below?



A) $CH_3CH_2CH_2CH{=}CH_2$

B) $CH_3CH_2CH{=}CHCH_3$

C) $CH_3CH_2CH_2CHCH_3$ (OH)

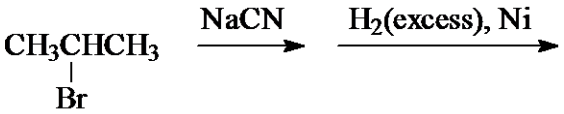
D) $CH_3CH_2CH{=}CCH_3$ (NH_2)

A. A
B. B
C. C
D. D

26. Which one of the following forms a diazonium ion on being treated with $NaNO_2$ in aqueous HCl?

A. *para*-nitrotoluene
B. ethylamine
C. *N*,*N*-dimethylaniline
D. triethylamine

27. What is the product of the following reaction?

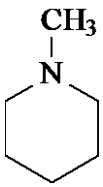


A. 1-amino-2-methylpropane
B. 2-amino-2-methylpropane
C. isopropylamine
D. *tert*-butylamine

28. Which of the following is a tertiary amine?

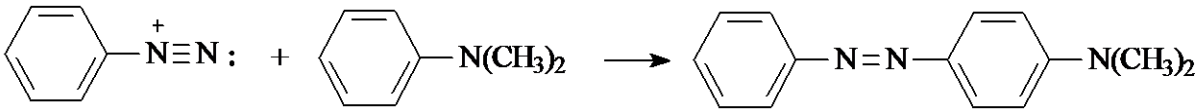
A. $CH_3CH_2CH_2NH_2$
B. $CH_3CH_2NHCH_3$
C. $(CH_3)_3N$
D. $(CH_3)_3CNH_2$

29. The following compound is classified as a(n):



A. amide
B. primary amine
C. secondary amine
D. tertiary amine

30. What is the mechanism of the following reaction?



A. S_N1
B. S_N2
C. free radical
D. electrophilic aromatic substitution

ACS Review Amines KEY

1. A
2. C
3. C
4. D
5. D
6. D
7. B
8. A
9. B
10. C
11. B
12. B
13. B
14. A
15. B
16. B
17. D
18. C
19. C
20. D
21. A
22. C
23. B
24. C
25. A
26. B
27. A
28. C
29. D
30. D