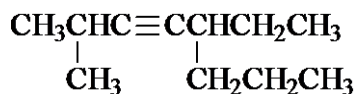
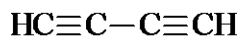


ACS Review Alkynes

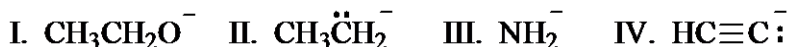
1. What is the IUPAC name of the following compound?



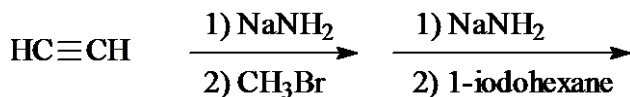
- A. 2-methyl-5-propyl-3-heptyne
 B. 1-isopropyl-3-propyl-1-pentyne
 C. 5-ethyl-2-methyl-3-octyne
 D. 4-ethyl-7-methyl-5-octyne
2. Which one of the following describes the C(2)-C(3) sigma bond in the structure below?



- A. sp-sp
 B. sp²-sp²
 C. sp³-sp³
 D. 2p-2p
3. Select the best base to quantitatively remove a proton from acetylene.
- A. NaNH₂
 B. NH₃
 C. NaOH
 D. NaOCH₂CH₃
4. Arrange the following in order of decreasing base strength (strongest base first).



- A. IV > III > II > I
 B. II > III > I > IV
 C. I > II > IV > III
 D. II > III > IV > I
5. Predict the major product(s) in the reactions below.

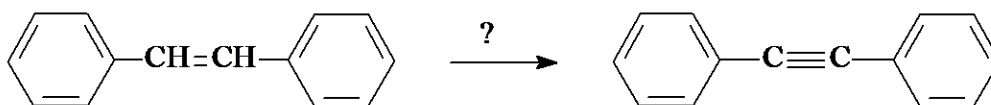


- A. 1-nonyne
 B. 2-nonyne
 C. *cis*-2-nonene
 D. *trans*-2-nonene
6. Which one of the following alkynes gives a single ketone in the acid-catalyzed hydration of each?
- A. 2-decyne
 B. 3-decyne
 C. 4-decyne
 D. 5-decyne
7. Which sequence of reactions works best in synthesizing *cis*-3-nonene?

- A) (1) 1-butyne, NaNH₂ (2) 1-bromopentane (3) Na, NH₃
 B) (1) 1-butyne, NaNH₂ (2) 1-bromopentane (3) H₂, Lindlar Pd
 C) (1) 1-pentyne, NaNH₂ (2) 1-bromobutane (3) H₂O, H₂SO₄/HgSO₄
 D) (1) 1-pentyne, NaNH₂ (2) 1-bromobutane (3) 2 HCl (4) NaNH₂

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

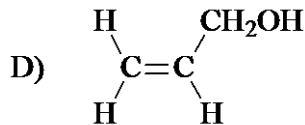
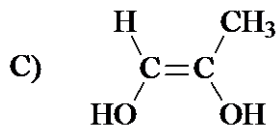
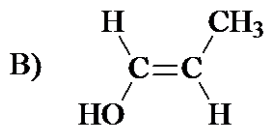
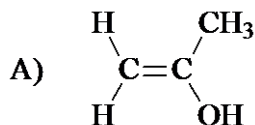
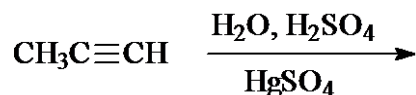
8. Which sequence of reactions below works best in carrying out the following conversion?



- A) (1) HBr (2) excess NaNH₂
 B) (1) Br₂ (2) excess NaNH₂
 C) (1) Br₂, H₂O (2) excess NaNH₂
 D) (1) H₂O, H₂SO₄(cat.) (2) excess NaNH₂

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

9. Which of the following is the enol intermediate in the acid-catalyzed addition of water to propyne?



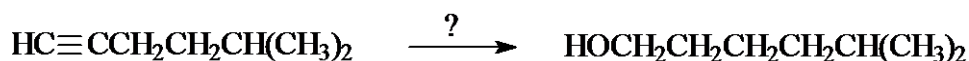
- A. A

- B. B
- C. C
- D. D

10. Which reagent below would be used to convert 2-pentyne to *trans*-2-pentene?

- A. NaNH₂, NH₃
- B. Na, NH₃
- C. H₂, Lindlar Pd
- D. H₂O, HgSO₄/H₂SO₄

11. Select the best method to carry out the following conversion.



- | | | |
|--|--------------------------|--|
| A) (1) H ₂ O, H ₂ SO ₄ /HgSO ₄ | (2) H ₂ /Pt | |
| B) (1) HBr | (2) H ₂ /Pt | (3) NaOH |
| C) (1) H ₂ , Lindlar Pd | (2) BH ₃ /THF | (3) H ₂ O ₂ , NaOH |
| D) (1) HBr, peroxides | (2) NaOH | (3) H ₂ , Pt |

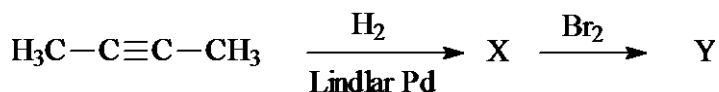
- A. A
- B. B
- C. C
- D. D

12. Which of the following is the correct IUPAC name of the product for the reaction shown below?



- A. *cis*-2-methyl-5-heptene
- B. *trans*-2-methyl-5-heptene
- C. *cis*-6-methyl-2-heptene
- D. *trans*-6-methyl-2-heptene

13. Identify compound Y.



- A. 2-bromobutane
- B. *meso*-2,3-dibromobutane
- C. racemic (2R,3R) and (2S,3S)-2,3-dibromobutane
- D. 2,3-dibromo-2-butene

14. When a terminal alkyne is treated with sodium amide, NaNH₂, in liquid ammonia, sodium amide acts as a:

- A. Bronsted acid
- B. Bronsted base
- C. reducing agent
- D. catalyst

15. When alkynes are treated with sodium metal, Na, in liquid ammonia, sodium acts as a:

- A. Bronsted acid
- B. Bronsted base
- C. reducing agent

D. catalyst

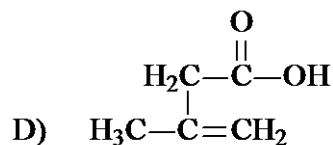
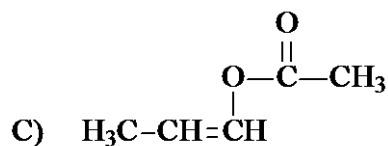
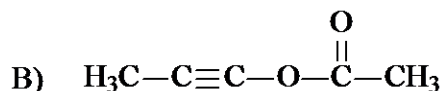
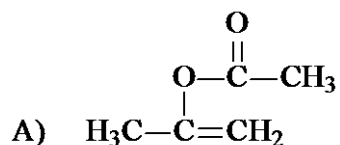
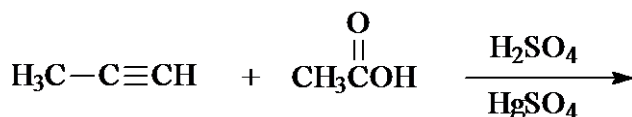
16. Select the best reaction sequence to make the following ketone.



- | | | |
|-------------------------------------|--------------------|---|
| A) (1) propyne, NaNH ₂ | (2) 1-bromobutane | (3) H ₂ O, Hg ²⁺ , H ₂ SO ₄ |
| B) (1) acetylene, NaNH ₂ | (2) 1-bromopentane | (3) H ₂ O, Hg ²⁺ , H ₂ SO ₄ |
| C) (1) 1-hexyne, NaNH ₂ | (2) bromomethane | (3) H ₂ O, Hg ²⁺ , H ₂ SO ₄ |
| D) (1) 1-pentyne, NaNH ₂ | (2) bromoethane | (3) H ₂ O, Hg ²⁺ , H ₂ SO ₄ |

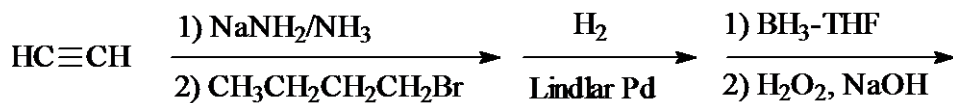
- A. A
B. B
C. C
D. D

17. Predict the major product of the following reaction.



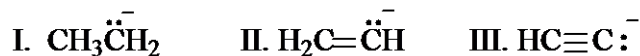
- A. A
B. B
C. C
D. D

18. What is the product of the following reaction sequence?



- A. 1-hexanol
- B. 2-hexanol
- C. 1,2-hexanediol
- D. 1-hexene

19. Rank the following anions in order of increasing base strength.

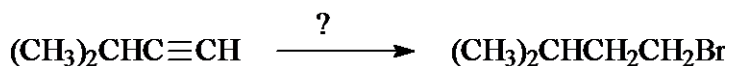


- A. I < II < III
- B. II < III < I
- C. III < II < I
- D. III < I < II

20. The larger acid dissociation constant, K_a , of acetylene as compared to ethylene is primarily attributed to the:

- A. greater electronegativity of a sp carbon as compared to a sp^2 carbon
- B. smaller electronegativity of a sp carbon as compared to a sp^2 carbon
- C. acetylide anion being resonance stabilized
- D. the 4 π electrons of the acetylide anion stabilizing the negative charge

21. How would you carry out the following conversion?



- A) (1) $\text{H}_2/\text{Lindlar Pd}$ (2) HBr
- B) (1) $\text{H}_2/\text{Lindlar Pd}$ (2) HBr , peroxides
- C) (1) HBr (1 eq) (2) H_2/Pd
- D) (1) Br_2 (1 eq) (2) H_2/Pd

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

22. What is the major product of the reaction shown below?



- A. 1,1-dichlorobutane
- B. 1,2-dichlorobutane
- C. 2,2-dichlorobutane
- D. 1,1,2,2-tetrachlorobutane

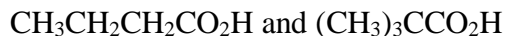
23. Why can't methanol, CH_3OH , be used as a solvent for sodium amide, NaNH_2 ?

- A. Sodium amide is nonpolar and methanol is polar.
- B. Sodium amide is polar and methanol is nonpolar.
- C. Sodium amide does an acid-base reaction with methanol.
- D. There would be no ion-dipole attractive forces between the two compounds.

24. Which of the following gives only one organic product on ozonolysis (O_3 followed by hydrolysis)?

- A. 2-hexyne
- B. 3-hexyne
- C. 2-heptyne
- D. 3-heptyne

25. Ozonolysis of an alkyne gave the two compounds shown below. What is the IUPAC name of the original alkyne?



- A. 2,2-dimethyl-3-octyne
- B. 3,3-dimethyl-4-octyne
- C. 2,2-dimethyl-3-heptyne
- D. 6,6-dimethyl-3-heptyne

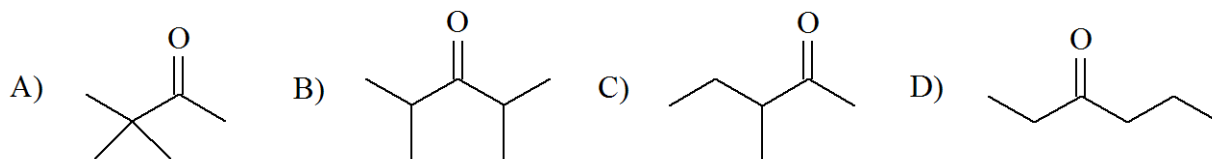
26. Which of the following reagents would be used to convert 2-pentyne to *cis*-2-pentene?

- A. $\text{NaNH}_2, \text{NH}_3$
- B. Na, NH_3
- C. $\text{H}_2, \text{Lindlar Pd}$
- D. $\text{H}_2\text{O}, \text{HgSO}_4/\text{H}_2\text{SO}_4$

27. Hydration of an alkyne, C_6H_{10} , gave two ketones in approximately equal amounts. Which of the following alkynes would be expected to give these results?

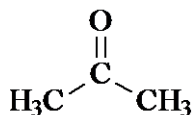
- A. 1-hexyne
- B. 2-hexyne
- C. 3-hexyne
- D. 3,3-dimethyl-1-butyne

28. Which of the following ketones cannot be made by the acid-catalyzed hydration of an alkyne?



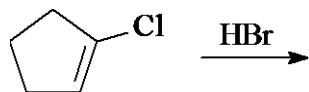
- A. A
- B. B
- C. C
- D. D

29. What is the relationship between the keto and enol forms of acetone?



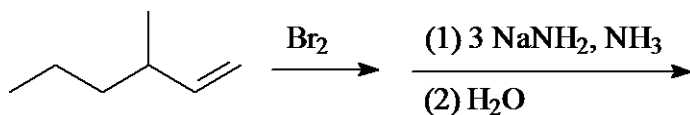
- A. resonance structure
- B. diastereomers
- C. conformations
- D. constitutional isomers

30. Predict the product of the following reaction.



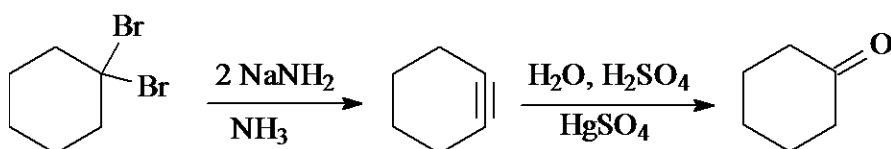
- A. 1-bromo-1-chlorocyclopentane
- B. 1-bromo-2-chlorocyclopentane
- C. 1-bromocyclopentene
- D. cyclopentene

31. What is the product of the following reaction?



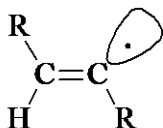
- A. 3-methylhexane
- B. 2-bromo-3-methylhexane
- C. 3-methyl-1-hexyne
- D. 1-bromo-3-methylhexane

32. Is the proposed synthesis of cyclohexanone below likely to work? If not, why not?



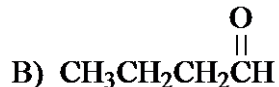
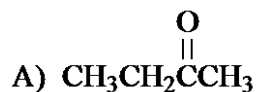
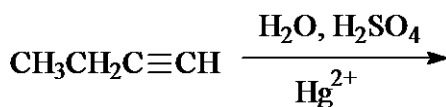
- A. Yes, it would work.
- B. No, you would need to start with 1,2-dibromocyclohexane.
- C. No, cyclohexyne will not form.
- D. No, the enol of cyclohexanone cannot be formed from cyclohexyne.

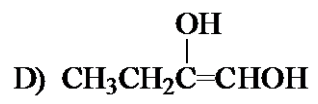
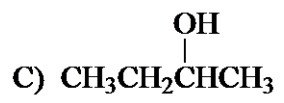
33. It is believed that the trans alkenyl radical, shown below, is an intermediate in the sodium metal reduction of an alkyne. Based on this information the unpaired electron would be located in which of the following orbitals?



- A. sp
- B. sp²
- C. sp³
- D. 2p

34. What is the major product of the reaction shown below?





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

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