Questions 1-28 (84 pts): Please mark the appropriate box on the front of the Scantron form (3 pts each).

1. What is the **IUPAC name** for the compound shown in the box?

   ![Compound](image)

   A) (E)-2-methyl-5-pentyn-1-ene  
   B) 2-methyl-1-penten-4-yne  
   C) 2-methyl-1-hexen-4-yne  
   D) 4-methyl-1-hexyn-4-ene

2. What is the **IUPAC name** for the compound shown in the box?

   ![Compound](image)

   A) 3-pentyn-2-ol  
   B) 2-pentyn-4-ol  
   C) 2-methyl-3-butynol  
   D) 1-methyl-3-butyn-2-ol

3. What is the **IUPAC name** of the major product for the reaction shown in the box?

   ![Reaction](image)

   A) 4,4-dimethyl-2-pentyne  
   B) 3,3-dimethyl-1-butyne  
   C) 4,4-dimethyl-1-pentyne  
   D) 3,3-dimethyl-1-pentyne

4. A terminal alkyne, 1-butyne is **NOT deprotonated** by the ethoxide ion. What does this indicate?

   A) Alkynyl anion is a weaker base than the hydroxide ion  
   B) 1-Butyne is stronger base than ethanol  
   C) Ethanol is a stronger acid than 1-butyne  
   D) 1-Butyne is the conjugate base of ethanol
5. What is the IUPAC name of the major product for the reaction shown in the box?

\[
\text{\text{CH}_3\text{CC} = \text{CNa}} \quad \text{H}_2\text{CC} = \text{CNa} \quad ?
\]

A) 2-methyl-1-hepten-5-yne  
B) (E)-3-methyl-2-hepten-5-yne  
C) 2-methyl-2-heptyne  
D) (Z)-3-methyl-2-hepten-5-yne

6. What is a main product of the reaction shown in the box?

\[
\text{\text{H}_2, \text{Lindlar cat.}} \quad ?
\]

A)  
B)  
C)  
D)

7. What is the IUPAC name of the major product for the reaction sequence shown in the box?

\[
\text{\text{CH}_3\text{CC} \rightarrow \text{NaNH}_2 \rightarrow \text{CH}_3\text{CH}_2\text{Br}} \quad 1\text{ mol Br}_2 \quad \text{CH}_2\text{Cl}_2 \quad ?
\]

A) (E)-2,3-dibromo-2-pentene  
B) 2,3-dibromopentane  
C) (Z)-2,3-dibromo-2-pentene  
D) 3,3-dibromopentane

8. What is the main product of the reaction shown in the box?

\[
\text{\text{Br}_2} \quad \text{NaNH}_2 \quad 2\text{ Na} \quad \text{NH}_3 (\text{liq.}) \quad ?
\]

A)  
B)  
C)  
D)

9. What is the main product of the reaction sequence shown in the box?

\[
\text{\text{Br}} \quad \text{HC\equiv\text{CNa}} \quad \text{NaNH}_2 \quad \text{CH}_3\text{Br} \quad 2\text{ Na} \quad \text{NH}_3 (\text{liq}) \quad ?
\]

A)  
B)  
C)  
D)

10. What is the main product of the reaction shown in the box?

\[
\text{\text{CH}_3\text{CC} \rightarrow \text{H}_2\text{O}\quad \text{H}_2\text{SO}_4 (\text{cat})} \quad ?
\]

A) CH₃CH₂CH₂OH  
B) CH₃CH(OH)CH₃  
C) CH₃CH₂CHO  
D) CH₃COCH₃
11. What is the main **product** of the reaction shown in the box?

![Reactions](image)

A) B) C) D)

12. Which **sequence of reagents** can be used for the reaction shown in the box?

HC≡CNa → 1. [Reagent (1)] → 2. [Reagent (2)] → THF

A) (1) CH₃Br, (2) BH₃
B) (1) CH₂CH₂Br, (2) BH₃
C) (1) CH₃Br, (2) H₂SO₄
D) (1) CH₂CH₂Br, (2) HgSO₄

13. Which **sequence of reagents** can be used for the reaction shown in the box?

![Reactions](image)

A) (1) NaH, (2) C₃H₅Br, (3) H₂SO₄
B) (1) NaNH₂, (2) CH₃Br, (3) H₂SO₄
C) (1) Br₂, (2) NaNH₂, (3) BH₃
D) (1) NaNH₂, (2) CH₃Br, (3) BH₃

14. Which **sequence of reagents** can be used for the reaction shown in the box?

Ph → 1. [Reagent (1)] → 2. [Reagent (2)] → 3. [Reagent (3)]

A) (1) NaNH₂, (2) CH₃Br, (3) H₂
B) (1) CH₃Br, (2) NH₃, (3) Na
C) (1) CH₃CH₂Br, (2) NaNH₂, (3) H₂
D) (1) Br₂, (2) NaNH₂, (3) H₂

15. Which one of the following compounds has **high solubility in water**?

A) CHBr₃  B) Br⁻  C) Br⁻  D) Br⁻

16. What is the main **product** of the reaction shown in the box?

CH₃OH → Na → ?

A) B) C) D)
17. What is the main **product** of the reaction shown in the box?

![Reaction Scheme](image)

A) B) C) D)

18. What is the **IUPAC name** of the major product for the reaction sequence shown in the box?

![Reaction Scheme](image)

A) cis-1,2-dimethoxycyclohexane  B) *cis*-1,2-dimethylcyclohexane  
C) *trans*-1,2-dimethoxycyclohexane  D) *trans*-1,2-dimethylcyclohexane

19. What is the **IUPAC name** of the major product for the reaction shown in the box?

![Reaction Scheme](image)

A) (E)-1-bromo-1,3-dichloro-1-butene  B) (Z)-1-bromo-1,3-dichloro-1-butene  
C) (E)-1-bromo-1,3-dichloro-2-butene  D) (Z)-1-bromo-1,3-dichloro-2-butene

20. What is the **IUPAC name** of the major product for the reaction shown in the box?

![Reaction Scheme](image)

A) (2S,3S)-2,3-dibromobutane  B) (2R,3S)-2,3-dibromobutane  
C) (R)-1,2-dibromobutane  D) (S)-1,2-dibromobutane

21. What is the main **product** of the reaction shown in the box?

![Reaction Scheme](image)

A) PhCH$_2$CH$_2$CN  B) PhCH$_2$CN  
C)  D) Ph

22. What is the **IUPAC name** of the major product for the reaction shown in the box?

![Reaction Scheme](image)

A) 1-methylcyclohexene  B) 3-methylcyclohexene  
C) 4-methylcyclohexene  D) methylenecyclohexene
23. What is the main **product** of the reaction shown in the box?

![Chemical reaction](image1)

A)  
B)  
C)  
D)  

24. What is the main **product** of the reaction shown in the box?

![Chemical reaction](image2)

A)  
B)  
C)  
D)  

25. Which **sequence of reagents** can be used for the reaction shown in the box?

![Chemical reaction](image3)

A) (1) NaN₃, (2) IBX  
B) (1) IBX, (2) NaN₃  
C) (1) TsCl, (2) NaN₃  
D) (1) NaN₃, (2) TsCl

26. What is the main **product** of the reaction sequence shown in the box?

![Chemical reaction](image4)

A)  
B)  
C)  
D)  

27. Which **reagent** can be used for the reaction shown in the box?

![Chemical reaction](image5)

A) IBX  
B) H₂CrO₄  
C) PCC  
D) NBS
28. Which sequence of reagents can be used for the reaction shown in the box?

A) (1) NaOH, (2) IBX  
B) (1) CH₃ONa, (2) PCC  
C) (1) NBS, (2) PCC  
D) (1) NaOH, (2) H₂CrO₄

Question 29: Provide the reagents that give the indicated products in high yield. Please write your answers in boxes 66-69 on the back of the Scantron form (4 pts each).