The compound shown below is polyketide called vittatalactone. It is the aggregation pheromone of the striped cucumber beetle, *Acalymma vittatum*.

The biosynthetic polyketide synthase (PKS) pathway for vittatalactone is similar to the normal FAS fatty acid synthase pathway discussed in class, but a different primer compound is used and a different compound is used as the extenders. The final step of its biosynthetic pathway is shown above.

1. Which of the above compounds is used as the primer compound in the biosynthesis of vittatalactone? **B**

2. Which of the above compounds is used as the extender compound for biosynthesis of vittatalactone?

3. How many moles of NADPH would be needed for the biosynthesis of vittatalactone? **D**

```
A. 4  B. 5  C. 6  D. 7  E. 8  F. 10
```

Which of the above compounds would be the major product of the following reaction sequences?

4. **A**

5. **C**
A student had a mixture of benzoic acid, benzyl alcohol and benzylamine. The compounds were subjected to the following separation scheme.

6. Which flask contains the acid? D
7. Which flask contains the alcohol? E
8. Which flask contains the amine? B

Which of the above compounds would be the major product of the following reaction sequences?

9. F
10. A
11. The compound 6-methyl salicylic acid is a polyketide formed in many fungii and plants. Which compound shown below is most likely its acyclic precursor?

![Diagram showing biochemical reactions and structures](image)

A. OH O O O S-ACP  
B. O H O O S-ACP  
C. O H O OH O S-ACP  
D. O OH O O S-ACP  
E. OH O O O S-ACP

12. Compound X undergoes the following reaction sequence. What is the structure of compound X?

![Diagram showing reaction sequence and structures](image)

A. OH  
B. OH  
C. O  
D. O  
E. O  
F. O

X \xrightarrow{\text{NaOH}} \xrightarrow{\text{heat}} \xrightarrow{\text{H}_2/\text{Pd}} \xrightarrow{1. \text{LiAlH}_4 \ 2. \text{H}_2\text{O}} \text{HO-\text{alkyl chain}}
13. Choose the product of the following reaction.

\[
\text{HOEt} + \text{CH}_3\text{OEt} \xrightarrow{\text{Na}_2\text{CO}_3} \text{A} \quad \text{B} \quad \text{C}
\]

\[
\text{D} \quad \text{E} \quad \text{F}
\]

14. Choose the product of the following reaction sequence.

\[
\text{A} \quad \text{B} \quad \text{C} \quad \text{D} \quad \text{E} \quad \text{F}
\]
15. Give a curved arrow mechanism for the following reaction. (8 pts)

16. Give a synthesis of the compound shown below starting with toluene. (8 pts)

17. Complete the following reaction sequence by drawing structures for compounds A and B. (8 pts)
18. Pyrrobutamine is a antihistamine drug. It is synthesized by a Mannich reaction followed by a Grignard and a dehydration as shown in the following reaction sequence. (8 pts)

\[ \text{C} \xrightarrow{\text{1. } \text{Cl} \text{-Ph-MgBr}} \text{D} \]
\[ \text{C}_20\text{H}_{22}\text{ClN} \]

Draw structures for the intermediate C and the final product D.

Chemical Formula: \( \text{C}_{20}\text{H}_{22}\text{ClN} \)
19. An industrial synthesis of Vitamin A starts with the following reaction sequence. The reaction occurs in two steps as shown below. First identify intermediate E. Then draw a curved arrow mechanism for the second step of the reaction sequence converting intermediate E to the final product. (10 pts)

20. Propose a good synthesis of the drug Selegiline which is used to treat Parkinson’s disease. Your carbon starting materials may include benzene and any other carbon containing compounds of four carbons or less. (8 pts)