系所組別：生物化學暨分子生物學研究所

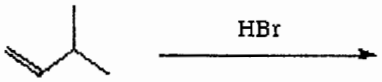
考試科目：有機化學 考試日期：0223，節次：2

※ 考生請注意：本試題不可使用計算機 。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1-35 (2 points for each); 36-38 (10 points for each)

1-7. In each reaction gives the major product. If there is no reaction, indicate that with N.R. Remember stereochemistry where it is appropriate.

1.



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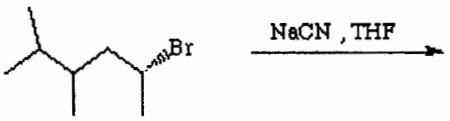

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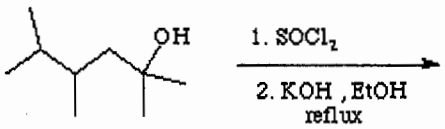

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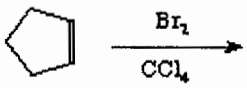

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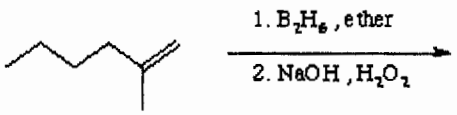

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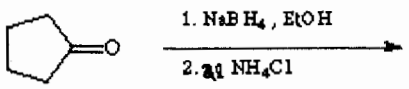

（背面仍有題目，請繼續作答）

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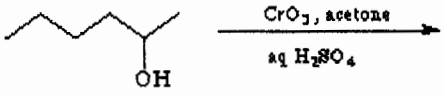
7.



8-10. The following substances can act as Bronsted acids with the corresponding pKa's shown.

	pKa
Ammonium ion NH^{4+}	9.3
Water H_2O	15.7
Hydrogen sulfide H_2S	7.0
Acetone CH_3COCH_3	19.0
Propene C_3H_6	43.0

8. Which of these acids is the strongest?

9. Which acid of these would have the strongest conjugate base?

10. Write a balanced chemical equation for a reaction between hydrogen sulfide and the conjugate base of propene. Tell whether this reaction will proceed as written, or not.

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11-20. For each of the following, provide a structural formula (2% for each; 20%).

11. Tyrosinate

12. Tyrosine

13. Mercaptoethanol

14. Acetonitrile

15. Pyruvate

16. Chloroform

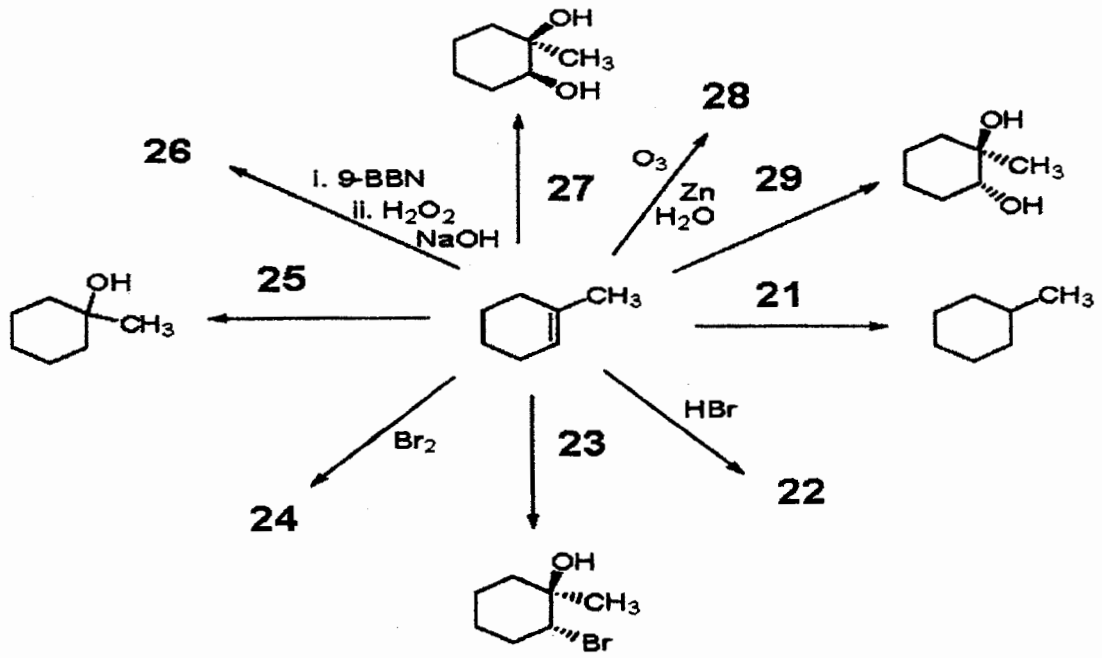
17. Acetic Acid

18. Glucose

19. Citric Acid

20. Adenosine

21.-29. Fill up the missing products and reagents for each of the following transformations. Be sure to indicate stereochemistry when appropriate.



（背面仍有題目，請繼續作答）

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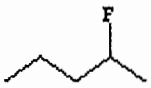
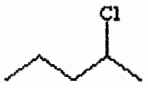
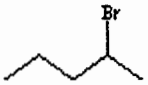
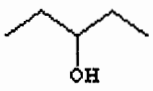
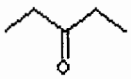
30. Which structure has a mass spectrum with P-35 peak?

a. 

b. 

c. 

d. 

e. 

31. Which structure has a zero point in the proton NMR?

a. CH_3CH_2OH

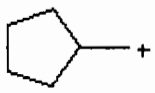
b. KBr

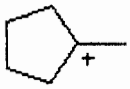
c. $(CH_3)_4Si$

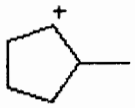
d. THF

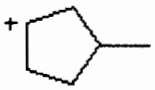
e. $CH_3CH_2OCH_2CH_3$

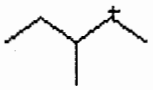
32. Which structure has the most stable carbocation?

a. 

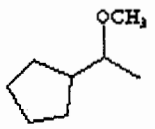
b. 

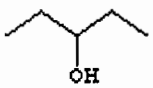
c. 

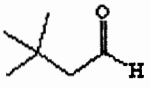
d. 

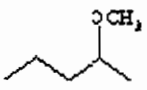
e. 

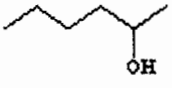
33. A molecule with a formula $C_6H_{12}O$ shows a strong peak at 1725 cm^{-1} and no peak at 3300-3600 cm^{-1}. Which structure is consistent with this data?

a. 

b. 

c. 

d. 

e. 

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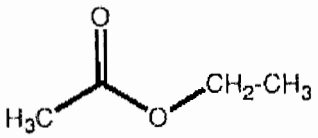
34. HOW MANY ^{1}H NMR peaks would the molecule below show and how many of the peaks would be triplets?



a. 2 peaks and 1 triplet b. 2 peaks and 2 triplets c. 3 peaks and 2 triplets

d. 3 peaks and 1 triplet e. None of them

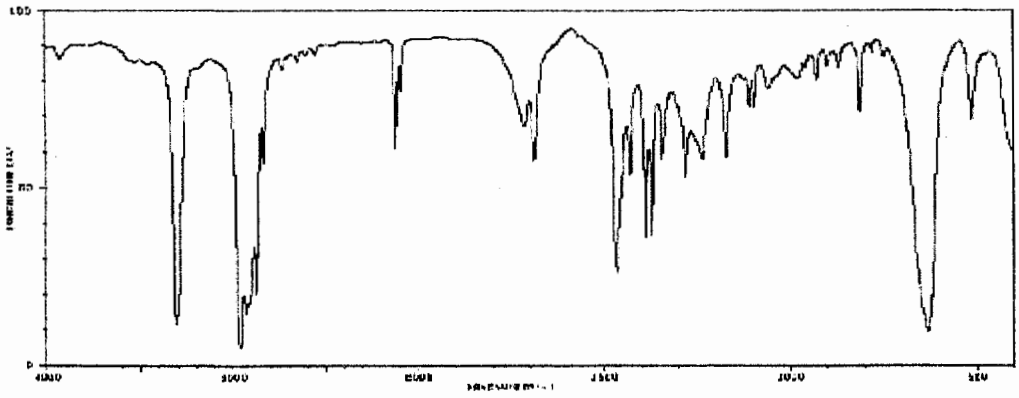
35. In proton NMR, which compound or groups will show a characteristic peak near 10 ppm?

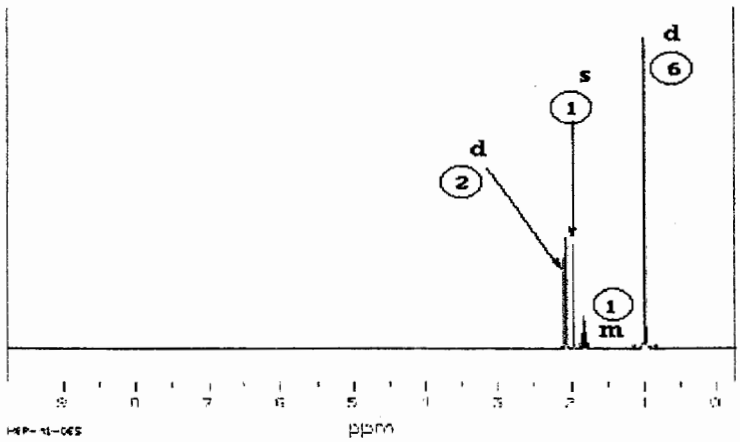
a. Alcohols b. Aldehydes c. Ketones d. C=O

e. Methyl on a carbonyl

36. Given the following spectral data, what is the structure (C_6H_{10}) of this molecule? SHOW YOUR WORK (10%).

P (82) (100); P^{+1} (83) (6.66); P^{+2} (84) (0.22)





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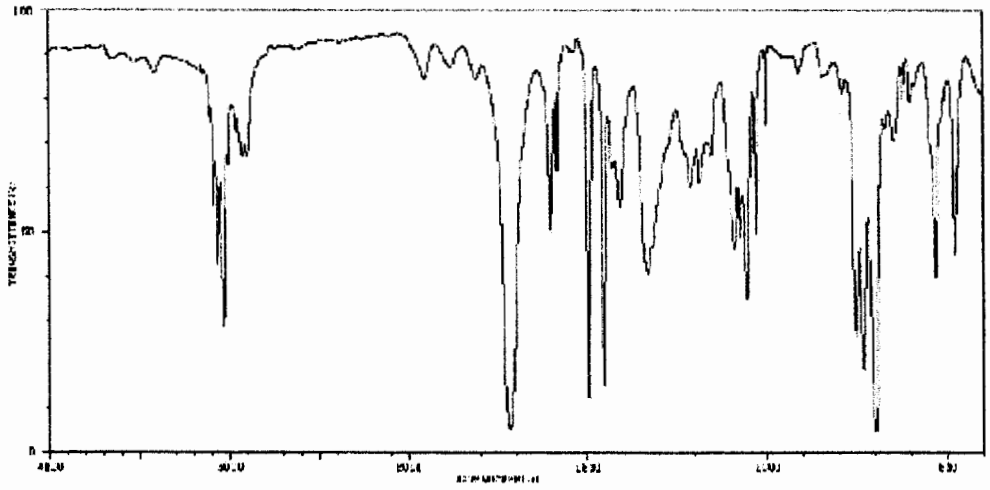
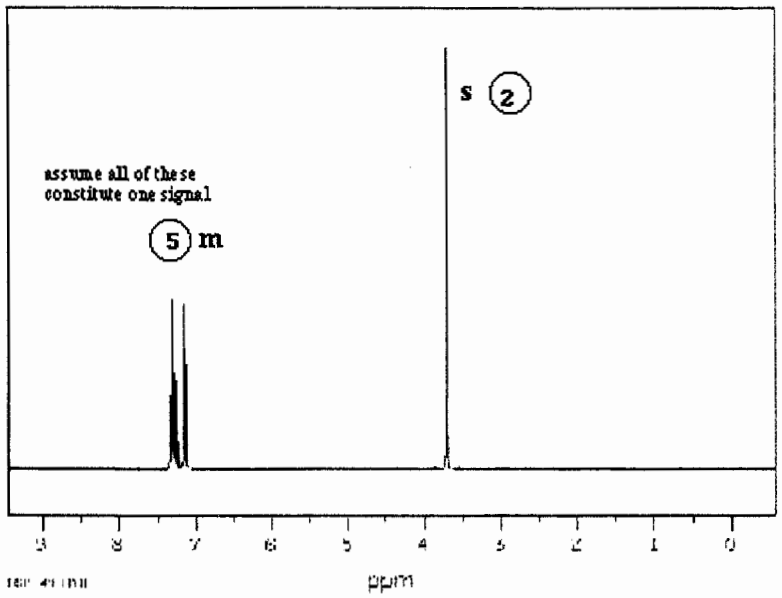
37. Given the following spectral data, what is the structure ($C_{14}H_{14}O$) of this molecule? SHOW YOUR WORK (10%).

P (210) (100); P^{+1} (211) (16.65); P^{+2} (212) (1.59)





38. Reaction of Br_2 with 4-pentenol does not lead to the expected dibromide. Instead, a product with molecular formula C_5H_9BrO is formed. Give the structure of this product and provide a detailed mechanism to account for its formation. (10%)