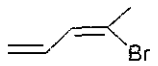
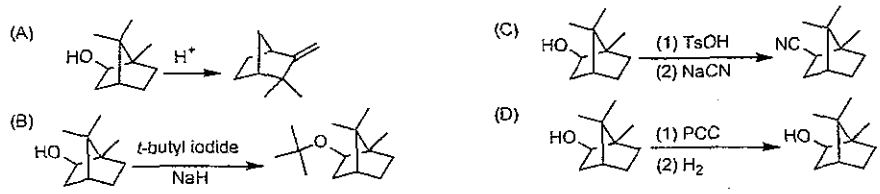
單選題 (60 %)(請作答於答案卷首頁之「選擇題作答區」。)

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

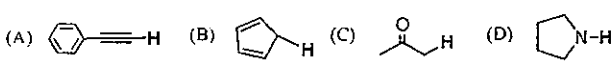


(A) (Z)-4-bromo-1,3-pentadiene (C) *cis*-4-bromo-1,3-pentadiene
(B) *trans*-2-bromo-2,4-pentadiene (D) (E)-2-bromo-2,4-pentadiene

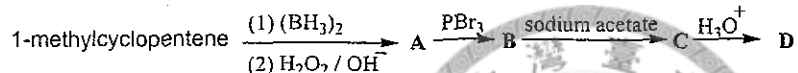
2. Which of the following reaction can occur?



3. Which of the following indicated hydrogen has the lowest pK_a?



4. Which is the right description of the following reaction products?

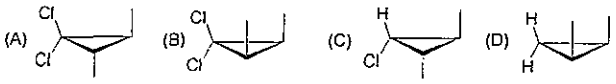


(A) **A** is a tertiary alcohol (C) the bromo and methyl groups are *anti* in **B.**
(B) **A** = **D** (D) the molecular weight of **C** is 144 dalton.

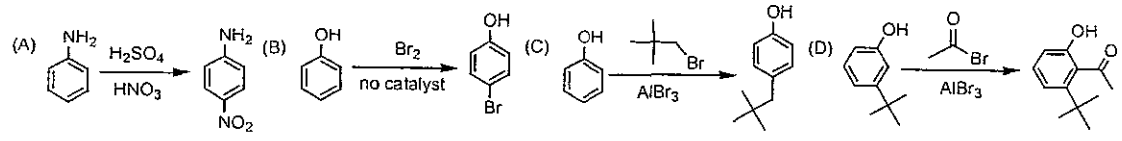
5. Which one of the following compounds would have the largest value of λ_{max} (in nm) in its UV-Vis spectrum?
(A) 1,3,5-cycloheptatriene (B) β-carotene (C) *o*-methoxytoluene (D) bicyco[2.2.2]octa-2,5-diene

6. About Grignard reagent, which of the following description is inappropriate?
(A) tetrahydrofuran (THF) is a proper solvent for preparation
(B) can react with aldehyde to afford tertiary alcohol after acidic aqueous work up.
(C) can react with dry ice to afford carboxylic acid upon acidic aqueous work up.
(D) can react with nitrile to afford ketone after acidic aqueous work up.

7. What would be the product from the reaction of *trans*-2-butene with chloroform in the presence of potassium *t*-butoxide in *t*-BuOH?

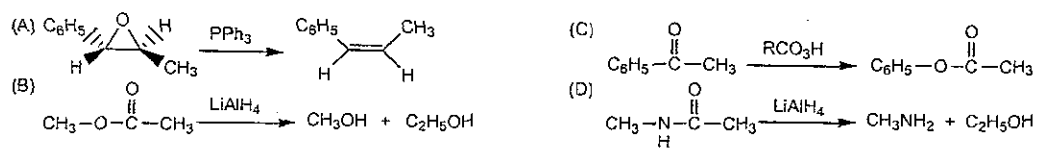


8. Which of the following reaction is more likely to happen?



9. What products would be formed from the oxidative cleavage of 1,4-hexadiene with $KMnO_4$ in acidic solution?
(A) $CH_3CHO + HCOOH + OHCCH_2CHO$ (C) $CH_3CHO + CO_2 + OHCCH_2CHO$
(B) $HO_2CCH_2CO_2H + CO_2 + CH_3COOH$ (D) $HO_2CCH_2CO_2H + HCOOH + CH_3COOH$

10. Which of the following reaction is unlikely to happen?



11. Which of the following amino acid contains a mercaptan group?
(A) Valine (B) Aspartic acid (C) Tyrosine (D) Cystenine

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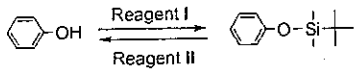
12. In the reaction below, which of the following description about the reagent(s) **I** and **II**, is less appropriate?



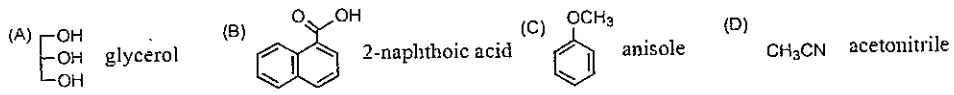
(A) **I** = *t*-butyldimethylsilyl chloride/Et_3N (C) **II** = HF/pyridine

(B) **II** = tetrabutylammonium fluoride (TBAF) (D) **II** = K_2CO_3/H_2O

13. Which of the species would be aromatic according to Hückel's rule?

(A) cyclopentadienyl cation (B) cycloheptatrienyl cation (C) cyclopentadienyl radical (D) cyclopropenyl anion

14. Which of the following nomenclature is <u>incorrect</u>?



15. Which of the following compound has the highest boiling point?

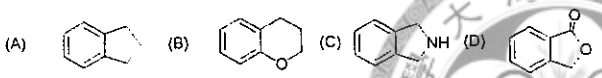
(A) benzene (B) ethanol (C) acetone (D) *N,N*-dimethylformamide

16. About naturally occurring α-amino acids, which of the following description is more appropriate?

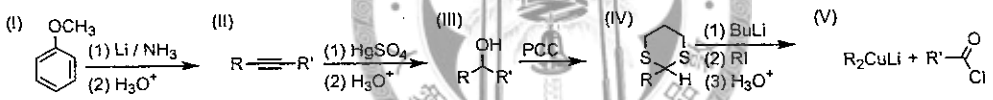
(A) proline contains an aromatic side-chain (C) can not be synthesized artificially

(B) most of them can easily dissolve in methylene chloride (D) L configuration is the naturally occurring form

17. Which one of the following compounds undergoes bromination of its aromatic ring at the fastest rate?



18. Which of the following reactions give ketone as the final product? (R and R' are simple alkyl groups)

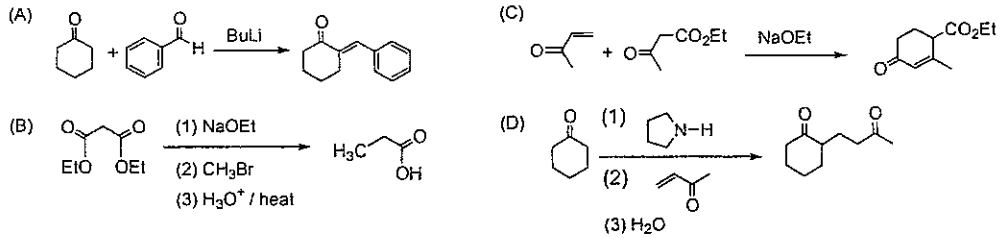


(A) I, II, III (B) I, III, IV (C) II, III, V (D) I, II, III, V

19. How would you carry out the conversion of *p*-$CH_3OC_6H_4CHO$ into *p*-$CH_3OC_6H_4CHDOH$?

(A) 1. $LiAlH_4$/ether, 2. D_2O (B) 1. $LiAlD_4$/ether, 2. H_2O (C) D_3O^+, NaOH (D) 1. $(i\text{-}Pr)_2NLi$, 2. D_3O^+

20. Which of the following reaction is <u>unlikely</u> to happen?



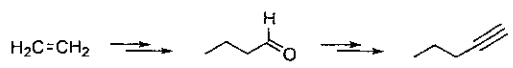
問答題 (不需抄題但請標明題號並依序作答)

一. Please describe how to prepare an orgaic solid sample for taking an infrared spectrum.(5%)

二. Treatment of *p*-$CH_3OC_6H_4OCH_3$ with D_2O in the presence of CF_3COOD resulted in the formation of *p*-$CH_3OC_6H_4OCH_3$-d_1. Please draw the structure of product(s) with deuterium labeled. Explain how the exchange process takes place. (8%)

三. Treatment of *trans*-2-bromocyclohexanol with NaOH yields 1,2-epoxycyclohexane, but the *cis*-isomer provides cyclohexanone under the similar reaction conditions. Rationalize this difference. (7%)

四. How would you carry out the following conversion? More than one step is necessary. (7%)



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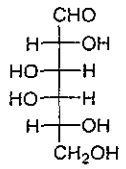
五. The structure of D-Galactose is shown below. Assign the R or S configuration of each asymmetric carbon center. The conversion of the primary hydroxyl group of D-Galactose into an aldehyde affords chiral product(s) or not? Why? (8%)



六. Determine the structure of the unknown compound based on the following spectroscopic data. (5%)
IR: 3080, 2960, 1641, 1428, 1267, 1211, 994, 921 cm^{-1}.

Isotope	Abundance
m/z	relative intensity
134 (M)	100.0 %
136 (M+2)	101.4 %