

國立臺北科技大學 101 學年度碩士班招生考試

系所組別：3711、3712、3713 有機高分子研究所甲組

第一節 有機化學 試題

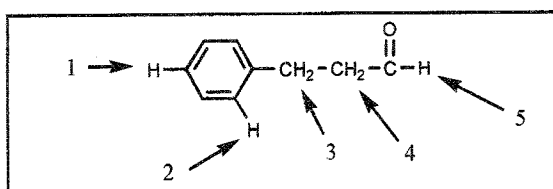
第一頁 共二頁

注意事項：

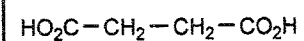
1. 本試題共二大題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一、單選題 (20 題，共 60 分，每題 3 分，答錯一題倒扣 3 分，不答不扣分)

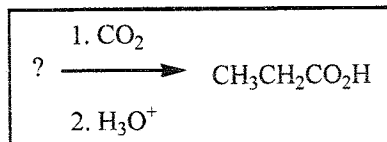
1. Which of the following is a typical ^{13}C -NMR shift value for a carbonyl carbon?
A) 200 ppm B) 30 ppm C) 10 ppm D) 120 ppm E) 80 ppm
2. What is the name of the reaction by which aldehydes and ketones are converted directly to alkenes?
A) Friedel-Crafts B) Williamson C) Wittig D) Hofmann E) Gilman
3. In which electrophilic aromatic substitution reaction can unintended poly-substitution (i.e., disubstitution, trisubstitution, etc.) be a problem?
A) Nitration B) Friedel-Crafts acylation C) Bromination D) Friedel-Crafts alkylation E) Sulfonation
4. Which proton in the following molecule is the most acidic?



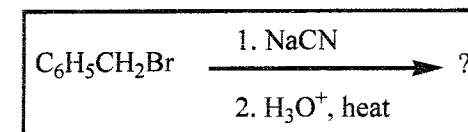
- A) 1 B) 2 C) 3 D) 4 E) 5
5. What would the common name of the following di-acid be?



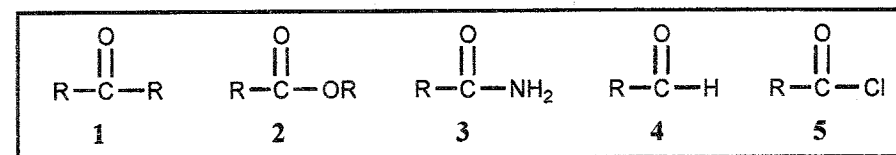
- A) Malonic acid B) Oxalic acid C) Succinic acid D) Adipic acid E) Glutaric acid
6. What reagent(s) is (are) needed to complete the reaction shown?



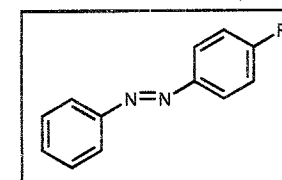
- A) $\text{CH}_3\text{CH}_2\text{Br}$ B) $\text{KMnO}_4/\text{OH}^-$ C) $\text{CH}_3\text{CH}_2\text{MgBr}$ D) CH_3Li E) CH_3COCl
7. What would be the product of the following reaction?



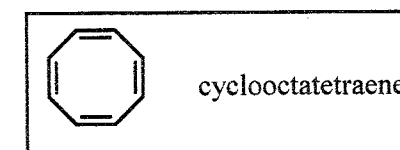
- A) $\text{C}_6\text{H}_5\text{CO}_2\text{H}$ B) $\text{C}_6\text{H}_5\text{CH}_2\text{CO}_2\text{H}$ C) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ D) $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{NH}_2$ E) $\text{C}_6\text{H}_5\text{CH}_3$
8. What is the relative reactivity of carboxylic acid derivatives toward hydrolysis (left = least reactive)?
A) ester < amide < acid chloride < anhydride
B) amide < ester < acid chloride < anhydride
C) ester < amide < anhydride < acid chloride
D) amide < ester < anhydride < acid chloride
E) The relative reactivities really cannot be compared.
 9. Which of the following has the highest IR absorption frequency for the C=O group?



- A) 1 B) 2 C) 3 D) 4 E) 5
10. What is the main use of azo compounds in general?

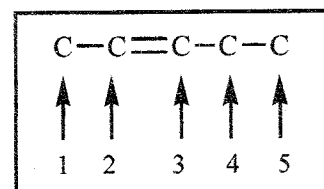


- A) Antibiotic properties B) Fragrances and flavorings C) Chemotherapy agents
D) Herbicides and/or pesticides E) Dyes and coloring agents
11. Which of the following reactions of aromatics is reversible?
A) Nitration B) Bromination C) Friedel-Crafts alkylation D) Sulfonation
E) Friedel-Crafts acylation
 12. Which of the following best describes the electronic nature of cyclooctatetraene?



注意：背面尚有試題

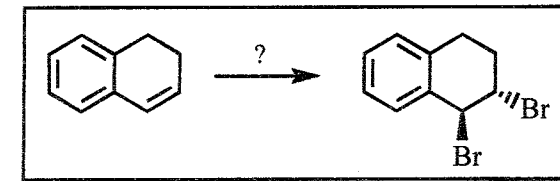
- A) This compound is predicted to be aromatic.
 B) This compound is anti-aromatic and very unstable.
 C) This compound is non-planar and non-aromatic.
 D) Not all of the carbon atoms possess the π -orbital required for conjugation.
 E) None of these are true.
13. UV-visible spectroscopy involves what type of phenomenon?
 A) Binding of chemical bonds
 B) Electron transitions between orbitals
 C) Molecular rotations
 D) Nuclear spin transitions
 E) Stretching of chemical bonds
14. The LUMO of 1,3,5-hexatriene is:
 A) Ψ_1 B) Ψ_2 C) Ψ_3 D) Ψ_4 E) Ψ_5
15. A typical Diels-Alder reaction involves
 A) an electron-rich diene and an electron-rich dienophile.
 B) an electron-poor diene and an electron-rich dienophile.
 C) an electron-rich diene and an electron-poor dienophile.
 D) an electron-poor diene and an electron-poor dienophile.
 E) a non-substituted diene and a non-substituted dienophile.
16. The presence of a bromine where in the following carbon chain would give the most reactive material for an S_N2 reaction with a nucleophile (all other bonds would be to hydrogen)?



- A) 1 B) 2 C) 3 D) 4 E) 5
17. Predict the product of the hydrolysis of (*S*)-4-bromo-2-pentene
 A) (*R*)-2-pentene-4-ol B) Racemic 3-pentene-2-ol C) (*R*)-2-hydroxy-3-pentene
 D) Racemic-3-hydroxy-3-pentene E) (*S*)-2-hydroxy-3-pentene
18. Which metal acts as a poison for hydrogenation catalysts?
 A) Pd B) Pt C) Ni D) Pb E) Hg
19. Polymerization of alkenes are thermodynamically favorable (exothermic) because
 A) large molecules are more stable than small ones.
 B) polymers precipitate, which shifts the equilibrium.
 C) a sigma bond is more stable than a π bond.

- D) crosslinking stabilizes the product.
 E) alkenes are too unstable to store.

20. What reagent(s) would accomplish the following reaction?



- A) Br_2 B) NBS C) $Br_2 + \text{light}$ D) $Br_2 + FeBr_3$ E) HBr

二、填空题 (請填寫英文, 共 10 格, 每格 4 分, 共 40 分)

- There are two methods to reduce ketone carbonyl groups to a methylene group. The ___(a)___ reduction uses an acidic solution of zinc dissolved in mercury as the reducing reagent. The ___(b)___ reduction employs hydrazine under basic conditions.
- The reaction of an arenediazonium salt with a copper(I) salt is known as a ___(c)___ reaction.
- Cyclic esters are called as ___(d)___; cyclic amides are called as ___(e)___.
- Treating a carboxylic acid with excess alcohol and an acid catalyst is called a ___(f)___ esterification.
- Nucleophilic addition to the carbonyl carbon of an α,β -unsaturated carbonyl compound is called direct addition; addition to the β -carbon is called ___(g)___ addition.
- The ___(h)___ postulate states that a transition state is more similar in structure to the species to which it is closer in energy; thus, the transition states of endergonic reactions resemble the products, and the transition states of exergonic reactions resemble the reactants.
- Oxidation of a primary or secondary alcohol to an aldehyde or ketone by using dimethyl sulfoxide, oxalyl chloride, and triethylamine is called as the ___(i)___ oxidation.
- A ___(j)___ annulations is a ring-forming reaction in which a Michael reaction and an intramolecular aldol addition occur sequentially.