

國立臺北科技大學
九十九學年度研究所碩士在職專班入學考試

有機高分子研究所
甲組：有機化學（含光譜分析）試題

填准考證號碼

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第一頁 共二頁

注意事項：

1. 本試題共二大題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。

Organic exam

Two Parts: Part A (80 points; 4 pt each), Part B (20 points; 10 pt each)

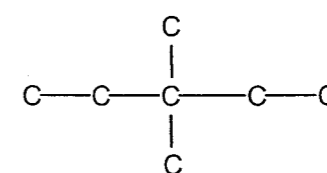
Please write your answer on the answer sheet(s).

Part A (80 points; 4 pt each; only one answer)

1. The rating of the ability of a gasoline to burn smoothly in an internal combustion is its
a. boiling point. b. energy value. c. fuel density. d. molar mass. e. octane rating.
2. The method used to rearrange straight-chain hydrocarbons into branched or aromatic hydrocarbons which burn better in internal combustion engines is called
a. simple distillation. b. pyrolysis. c. fractional distillation.
d. catalytic reforming. e. catalytic cracking.
3. Which of these is unlikely to help alleviate global warming?
a. reducing combustion of fossil fuels b. reducing forest clearing for agriculture
c. using only unleaded gasoline d. increasing the use of nuclear power generation
e. planting more trees
4. Which of the following processes remove carbon dioxide from the atmosphere?
I Combustion II Dissolving in water III Photosynthesis IV Respiration
a. I and II. b. III and IV. c. I and IV. d. II and III. e. all four

5. Greenhouse gases in the atmosphere contribute to global warming mainly by
a. absorbing ultraviolet light energy from the sun and emitting it as infrared radiation.
b. absorbing ultraviolet light energy from the sun and storing it as molecular vibrations.
c. absorbing infrared light energy from the sun and storing it as molecular vibrations.
d. absorbing ultraviolet light energy from the earth and storing it as molecular vibrations.
e. absorbing infrared light energy from the earth and storing it as molecular vibrations.

6. The major alcohol produced by fermentation of carbohydrates is
a. 1-butanol. b. ethanol. c. ethylene glycol. d. glycerol. e. methanol.
7. How many *different* secondary alcohols can be made from the carbon skeleton shown below?



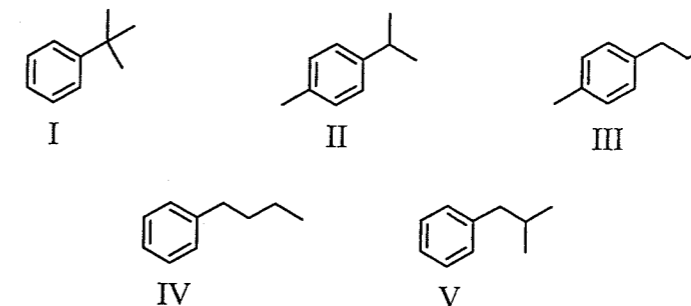
- a. 0
b. 1
c. 2
d. 3
e. 4
8. The most abundant organic compound in living systems on earth is
a. protein b. cellulose c. fat d. DNA e. starch
9. Which of these functional groups contains a carbon atom doubly bonded to an oxygen atom?
a. aldehyde b. ketone c. alcohol d. both a and b e. both b and c
10. Consider three molecules of similar molecular weight, one a hydrocarbon, another a primary alcohol, and the third a carboxylic acid. In *decreasing* order, their boiling points are
a. acid, alcohol, hydrocarbon b. acid, hydrocarbon, alcohol c. alcohol, acid, hydrocarbon
d. hydrocarbon, acid, alcohol e. hydrocarbon, alcohol, acid
11. Which description is *not* a property of carboxylic acids?
a. easily form hydrogen bonds b. react with bases to form salts
c. can be produced from ketones d. are polar at the carboxyl group
e. are produced by complete oxidation of primary alcohols
12. In high density polyethylene, the polymer chains are _____; in low density polyethylene, the polymer chains are _____.
a. unbranched; cross-linked b. branched; cross-linked c. unbranched; branched
d. branched; unbranched e. cross-linked; branched

注意：背面尚有試題

13. The polymer used to make food and drink coolers and building insulation material is
 a. polyethylene b. polypropylene c. polystyrene d. polytetrafluoroethylene
 e. poly(vinyl acetate)
14. The secondary structure of a protein is defined as
 a. the degree of interaction among separate protein subunits.
 b. interactions such as ionic bonding and sulfide linkages.
 c. the identity and order of its amino acids.
 d. hydrogen bonding between C=O groups and H atoms on amine groups, forming alpha helices or beta-pleated sheets.
 e. the overall shape of the protein resulting from complex turns and folds.
15. Which group contains only examples of addition polymers?
 a. polystyrene, polypropylene, polyvinylchloride b. polypropylene, polyamide, polysaccharide
 c. polyamide, polyester, polyvinylchloride d. polyester, polystyrene, polyisoprene
 e. polyamide, polyester
16. Which group contains *no* examples of condensation polymers?
 a. polyester, polystyrene, polyisoprene b. polyamide, polystyrene, polyvinylchloride
 c. polystyrene, polypropylene, polyvinylchloride
 d. polypropylene, polyamide, polysaccharide
 e. polyamide, polyester, nylon
17. The most common example of a biopolymer that is an addition polymer is
 a. starch. b. rubber. c. protein. d. cellulose. e. glycogen.
18. In terms of how its monomers are bonded together, to which synthetic polymer does a protein most closely correspond?
 a. polyethylene b. poly(ethylene terephthalate) c. poly(vinyl acetate)
 d. polyamide e. poly(methyl methacrylate)
19. The peptide linkage found in proteins is chemically the same as a(an)
 a. ionic bond. b. double bond. c. ester linkage. d. amide linkage. e. hydrogen bond.
20. The primary structure of a protein is determined by
 a. hydrogen bonding between C=O groups and H atoms on amine groups, forming alpha helices or beta-pleated sheets.
 b. the overall shape of the protein resulting from complex turns and folds.
 c. the degree of interaction among separate protein subunits.
 d. interactions such as ionic bonding and sulfide linkages.
 e. the identity and order of its amino acids.

Part B (20 points; 10 pt each)

- I. A compound with the molecular formula $C_{10}H_{14}$ gave the following 1H NMR spectrum:
 doublet, δ 1.2; singlet, δ 2.3; septet, δ 2.8; multiplet, δ 7.1
 A possible structure for the compound is: (please give the procedures)?



- II. An aliphatic compound with the molecular formula $C_3H_6Cl_2$ gave a 1H NMR spectrum consisting only of a triplet centered at δ 3.7 and a quintet centered at δ 2.2. What is a reasonable structure for the compound? (please give the procedures and draw the structure)