

# 亞洲大學

## 109 學年度學士後獸醫學系招生考試試題紙

學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

- A student performs an experiment to determine the density of a sugar solution. She obtains the following results: 4.71 g/mL, 4.73 g/mL, 4.67 g/mL, 4.69 g/mL. If the actual value for the density of the sugar solution is 4.40 g/mL, which statement below best describes her results?  
A) Her results are precise, but not accurate. B) Her results are accurate, but not precise. C) Her results are both precise and accurate. D) Her results are neither precise nor accurate.
- What answer should be reported, with the correct number of significant figures, for the following calculation?  $(249.362 + 41) / 63.498$   
A) 4.6 B) 4.57 C) 4.573 D) 4.5728
- Write the name for  $\text{Ca}_3(\text{PO}_4)_2$ .  
A) calcium (III) phosphite B) calcium (II) phosphite C) calcium phosphate  
D) tricalcium phosphorustetraoxide
- Give the correct formula for aluminum sulfate.  
A)  $\text{Al}_2\text{SO}_4$  B)  $\text{Al}(\text{SO}_4)_3$  C)  $\text{Al}_3(\text{SO}_4)_2$  D)  $\text{Al}_2(\text{SO}_4)_3$
- Determine the empirical formula for a compound that contains C, H and O. It contains 51.59% C and 35.30% O by mass. (C: 12.0 g/mol; H: 1.00 g/mol; O: 16.0 g/mol)  
A)  $\text{C}_2\text{H}_6\text{O}$  B) CHO C)  $\text{C}_4\text{H}_{13}\text{O}_2$  D)  $\text{CH}_4\text{O}_3$
- Give the theoretical yield, in grams, of  $\text{CO}_2$  from the reaction of 4.000 moles of  $\text{C}_8\text{H}_{18}$  with 4.000 moles of  $\text{O}_2$ . (C: 12.0 g/mol; H: 1.00 g/mol; O: 16.0 g/mol)  
$$2 \text{C}_8\text{H}_{18} + 25 \text{O}_2 \rightarrow 16 \text{CO}_2 + 18 \text{H}_2\text{O}$$
  
A) 112.7 g B) 102.4 g C) 176.0 g D) 704.0 g

# 亞洲大學

## 109 學年度學士後獸醫學系招生考試試題紙

學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

7. The titration of 25.0 mL of an unknown concentration  $\text{H}_2\text{SO}_4$  solution requires 83.6 mL of 0.12 M LiOH solution. What is the concentration of the  $\text{H}_2\text{SO}_4$  solution (in M)?  
 A) 0.20 M B) 0.40 M C) 0.10 M D) 0.36 M

8. How many subshells are there in the shell with  $n = 4$ ?  
 A) 3 B) 4 C) 6 D) 18

9. How many valence electrons does an atom of C have?  
 A) 1 B) 4 C) 2 D) 3

10. Place the following in order of increasing radius.  
 $\text{Ca}^{2+}$      $\text{S}^{2-}$      $\text{Cl}^-$   
 A)  $\text{Ca}^{2+} < \text{Cl}^- < \text{S}^{2-}$     B)  $\text{Cl}^- < \text{Ca}^{2+} < \text{S}^{2-}$     C)  $\text{S}^{2-} < \text{Cl}^- < \text{Ca}^{2+}$   
 D)  $\text{Ca}^{2+} < \text{S}^{2-} < \text{Cl}^-$

11. Which of the elements listed below would most likely form a *polar covalent bond* when bonded to oxygen?  
 A) Mg B) H C) Al D) O

12. Assuming the octet rule is obeyed, how many covalent bonds will an oxygen atom form to give a formal charge of zero?  
 A) 0 B) 1 C) 2 D) 3

13. Which of the following Lewis structures is incorrect?  
 A)  $\begin{array}{c} \text{H} - \overset{\cdot\cdot}{\text{N}} - \text{H} \\ | \\ \text{H} \end{array}$     B)  $\begin{array}{c} \cdot\cdot \quad \cdot\cdot \\ \text{:F} - \text{F:} \\ \cdot\cdot \quad \cdot\cdot \end{array}$     C)  $\begin{array}{c} \cdot\cdot \quad \cdot\cdot \\ \text{N} = \text{N} \\ \cdot\cdot \quad \cdot\cdot \end{array}$     D)  $\begin{array}{c} \cdot\cdot \quad \cdot\cdot \quad + \\ \text{H} - \text{O} - \text{H} \\ | \\ \text{H} \end{array}$

14. In the best Lewis structure for  $\text{NO}^+$ , what is the formal charge on the N atom?  
 A) -1 B) 0 C) +1 D) +2

# 亞洲大學

## 109 學年度學士後獸醫學系招生考試試題紙

學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

15. Which of the elements listed below is most likely to exhibit an expanded octet in its compounds?  
A) O B) S C) Na D) C
  
16. Give the number of lone pairs around the central atom and the molecular geometry of  $\text{SCl}_2$ .  
A) 0 lone pairs, linear B) 1 lone pair, bent C) 2 lone pairs, bent  
D) 3 lone pairs, bent
  
17. Use VSEPR theory to predict the geometry of the  $\text{BF}_3$  molecule.  
A) linear B) bent C) trigonal planar D) trigonal pyramidal
  
18. Which one of the following molecules has tetrahedral geometry?  
A)  $\text{XeF}_4$  B)  $\text{BF}_3$  C)  $\text{AsF}_5$  D)  $\text{CF}_4$
  
19. Which one of the following molecules has a non-zero dipole moment?  
A)  $\text{BeCl}_2$  B)  $\text{Br}_2$  C)  $\text{BF}_3$  D)  $\text{IBr}$
  
20. Which one of the following molecules is polar?  
A)  $\text{PBr}_5$  B)  $\text{CCl}_4$  C)  $\text{BrF}_5$  D)  $\text{XeF}_2$
  
21. What is the strongest type of intermolecular force present in  $\text{NH}_2\text{CH}_3$ ?  
A) dispersion B) dipole-dipole C) hydrogen bonding D) ion-dipole
  
22. Identify the compound that does not have hydrogen bonding.  
A)  $(\text{CH}_3)_3\text{N}$  B)  $\text{H}_2\text{O}$  C)  $\text{CH}_3\text{OH}$  D)  $\text{HF}$
  
23. What is the type of intermolecular force for dissolving  $\text{NaCl}$  in  $\text{H}_2\text{O}$ ?  
A) dispersion B) dipole-dipole C) hydrogen bonding D) ion-dipole
  
24. What is the type of intermolecular force for dissolving  $\text{Br}_2$  in  $\text{H}_2\text{O}$ ?  
A) dispersion B) dipole-dipole C) hydrogen bonding D) induced dipole
  
25. Which of the following acids will have the strongest conjugate base?  
A)  $\text{HCl}$  B)  $\text{HClO}_4$  C)  $\text{HNO}_3$  D)  $\text{HCN}$

學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

26. Which one of the following salts, when dissolved in water, produces the solution with the lowest pH?

- A) NaCl   B) KCl   C) MgCl<sub>2</sub>   D) AlCl<sub>3</sub>

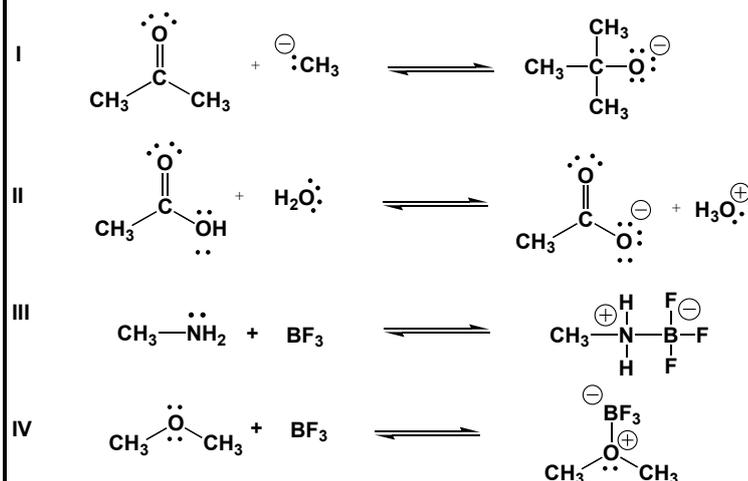
27. Which of the following is a Lewis acid?

- A) BBr<sub>3</sub>   B) CCl<sub>4</sub>   C) NH<sub>3</sub>   D) CHBr<sub>3</sub>

28. Which of the following is a Lewis base?

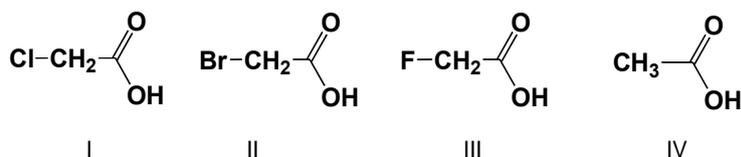
- A) AlF<sub>3</sub>   B) H<sub>2</sub>O   C) SiF<sub>4</sub>   D) C<sub>5</sub>H<sub>12</sub>

29. Which are acid-base reactions according to Lewis theory but not according to the Brønsted-Lowry theory?



- A) I, II   B) III, IV   C) I, III, IV   D) I, II, III, IV

30. Which acid is the most acidic?



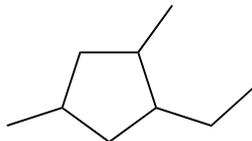
- A) I   B) II   C) III   D) IV

# 亞洲大學

## 109 學年度學士後獸醫學系招生考試試題紙

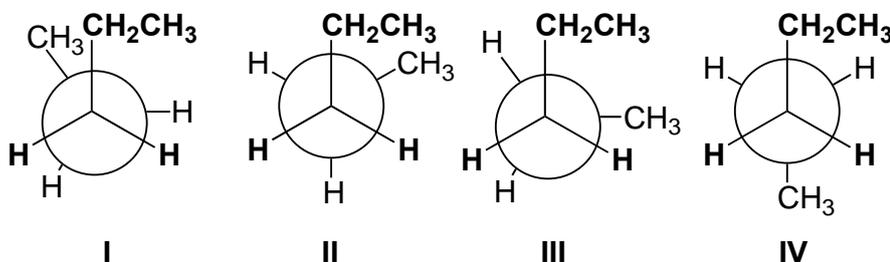
學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

31. Which is the IUPAC name for the following cycloalkane?



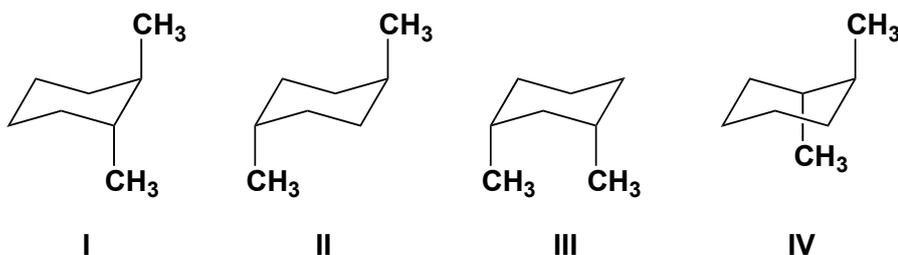
- A) 2,4-dimethyl-1-ethylcyclopentane    B) 1,3-dimethyl-5-ethylcyclopentane  
 C) 1-ethyl-2,4-dimethylcyclopentane    D) 1-ethyl-3,5-dimethylcyclopentane

32. Which conformation of pentane is most stable?



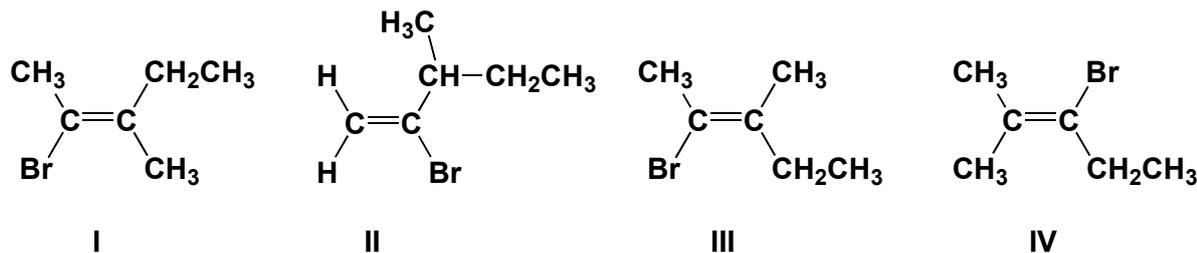
- A) I    B) II    C) III    D) IV

33. Which of these diaxial conformations has the highest energy?



- A) I    B) II    C) III    D) IV

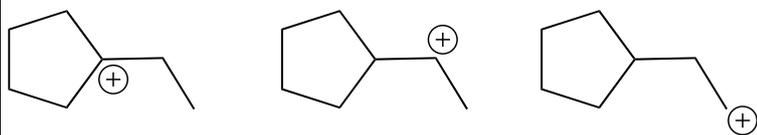
34. Which structure is Z-2-bromo-3-methyl-2-pentene?



- A) I    B) II    C) III    D) IV

學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

35. Arrange these carbocations in order of increasing stability (least to most).



- A) I, II, III    B) I, III, II    C) II, I, III    D) III, II, I

36. Which of the following alkenes is the major product when 2-bromo-2-methylpentane is treated with sodium ethoxide in ethanol?

- A) 2-methylpent-1-ene    B) 2-methylpent-2-ene    C) (*E*)-4-methylpent-2-ene  
D) (*Z*)-4-methylpent-2-ene

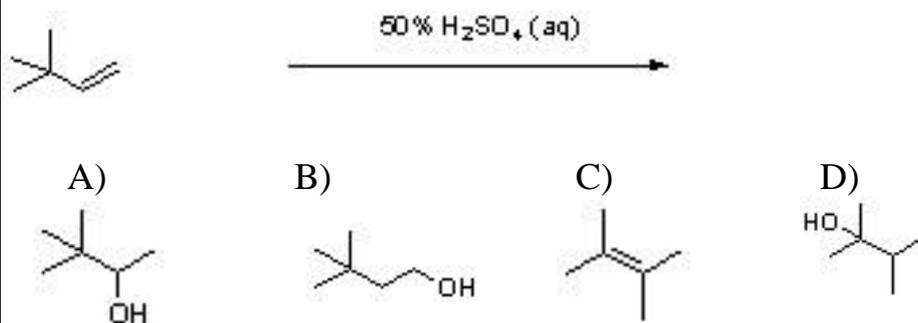
37. Which of the following alkenes is the major product when 2-bromo-2-methylpentane is treated with potassium *tert*-butoxide in *tert*-butanol?

- A) 2-methylpent-1-ene    B) 2-methylpent-2-ene    C) (*E*)-4-methylpent-2-ene  
D) (*Z*)-4-methylpent-2-ene

38. Which of the following statements applies to the E2 mechanism?

- A) It occurs with inversion of stereochemistry.  
B) It occurs with racemization of stereochemistry.  
C) It proceeds through the more stable carbocation intermediate.  
D) The C-H and C-X bonds that break must be anti.

39. What is the major product of the following reaction?



# 亞洲大學

## 109 學年度學士後獸醫學系招生考試試題紙

學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

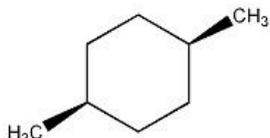
40. Provide the reagents necessary to complete the following transformation.



- A) 1.  $\text{BH}_3 \cdot \text{THF}$  2.  $\text{H}_2\text{O}_2, \text{HO}^-$     B)  $\text{H}_2\text{O}, \text{H}_2\text{SO}_4$     C)  $\text{OsO}_4, \text{H}_2\text{O}_2$   
 D)  $\text{CH}_3\text{CO}_3\text{H}$
41. Which of the following reagents will convert 1 mole of 3-methylpent-1-yne into 3-methylpentane?
- A) 1 mole of  $\text{Br}_2$  in  $\text{CCl}_4$     B) 2 moles of  $\text{Cl}_2$  in  $\text{CCl}_4$     C) 2 moles of  $\text{HCl}$   
 D) 2 moles  $\text{H}_2$ , Ni and heat
42. Which of the following reagents should be used to convert hex-3-yne to (Z)-hex-3-ene?
- A)  $\text{H}_2, \text{Pt}$     B)  $\text{Na}, \text{NH}_3$     C)  $\text{H}_2$ , Lindlar's catalyst    D)  $\text{H}_2\text{SO}_4, \text{H}_2\text{O}$
43. Which of the following statements correctly pertains to a pair of enantiomers?
- A) They rotate the plane of polarized light by exactly the same amount and in opposite directions.  
 B) They rotate the plane of polarized light by differing amounts and in opposite directions.  
 C) They rotate the plane of polarized light by differing amounts and in the same direction.  
 D) They have different melting points.

學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

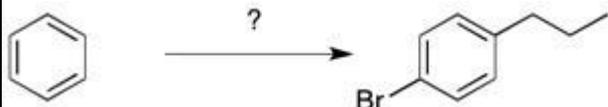
44. Predict the specific rotation of the compound shown.



- A) It is impossible to predict; it must be determined experimentally.  
 B) Because both asymmetric centers are R, the compound is dextrorotatory.  
 C) Because both asymmetric centers are S, the compound is levorotatory.  
 D) Zero; the compound is achiral.
45. What is the major difference between an antiaromatic and aromatic compound?  
 A) Only aromatic compounds follow Huckle's rule.  
 B) Antiaromatic compounds have at least one  $sp^3$  hybridized atom in the ring.  
 C) Antiaromatic compounds can assume a chair-like structure while aromatic compounds are nearly flat.  
 D) Aromatic compounds cannot have a charged atom in the structure.
46. Which of the following is an incorrect statement about the bromination of benzene by  $Br_2$  and  $FeBr_3$ ?  
 A)  $FeBr_3$  functions to increase the electrophilicity of  $Br_2$ .  
 B) Formation of the sigma complex is the rate-determining step of the mechanism.  
 C) The carbanionic intermediate is resonance stabilized.  
 D) There is one carbon-containing intermediates in the mechanism.
47. Which of the following species is attacked by benzene in the electrophilic nitration reaction?  
 A)  $HNO_3$    B)  $NO_2^+$    C)  $NO_2$    D)  $NO^+$
48. Which of the following compounds will not undergo Friedel-Crafts acylation when treated with  $CH_3CH_2COCl$ ,  $AlCl_3$ ?  
 A) toluene   B) *p*-xylene   C) benzophenone   D) ethoxybenzene

學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

49. Which series of reagents would be required to perform the following synthesis?



- A) 1.  $\text{ClCH}_2\text{CH}_2\text{CH}_3$ ,  $\text{AlCl}_3$       2.  $\text{FeBr}_3$ ,  $\text{Br}_2$   
 B) 1.  $\text{ClCOCH}_2\text{CH}_3$ ,  $\text{AlCl}_3$       2.  $\text{FeBr}_3$ ,  $\text{Br}_2$   
 C) 1.  $\text{ClCOCH}_2\text{CH}_3$ ,  $\text{AlCl}_3$       2.  $\text{FeBr}_3$ ,  $\text{Br}_2$       3.  $\text{Zn(Hg)}$ ,  $\text{HCl}$   
 D) 1.  $\text{ClCOCH}_2\text{CH}_3$ ,  $\text{AlCl}_3$       2.  $\text{Zn(Hg)}$ ,  $\text{HCl}$       3.  $\text{FeBr}_3$ ,  $\text{Br}_2$

50. What are the expected products of the reaction of  $\text{PhOCH}_3$  with concentrated  $\text{HI}$ ?

- A) phenol and methanol                      B) phenol and iodomethane  
 C) iodobenzene and methanol              D) iodobenzene and iodomethane

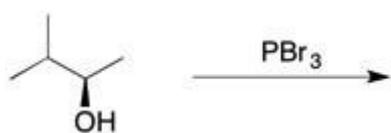
51. Which of the following is produced by the reaction of  $(\text{CH}_3\text{CH}_2)_2\text{S}$  with  $\text{CH}_3\text{CH}_2\text{I}$ ?

- A)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{I}$       B)  $(\text{CH}_3\text{CH}_2)_3\text{S}^+ \text{I}^-$   
 C)  $(\text{CH}_3\text{CH}_2)_3\text{S}$                       D)  $\text{CH}_3\text{SCH}_2\text{CH}_2\text{CH}_3$

52. Through what basic mechanism is 1-methylcyclohexanol converted to 1-bromo-1-methylcyclohexane upon treatment with  $\text{HBr}$ ?

- A)  $\text{S}_\text{N}1$     B)  $\text{S}_\text{N}2$     C)  $\text{E}1$     D)  $\text{E}2$

53. What is the major organic product of the following reaction?



- A)                      B)                      C)                      D) Both A and B





學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

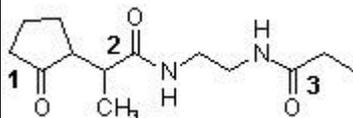
59. The positively polarized carbon atom of a carbonyl group acts as \_\_\_\_\_.

- A) an electrophile and a Lewis base
- B) a nucleophile and a Lewis base
- C) an electrophile and a Lewis acid
- D) a nucleophile and a Lewis acid

60. What reagent can be used to convert 2-methylbutan-1-ol into 2-methylbutanal?

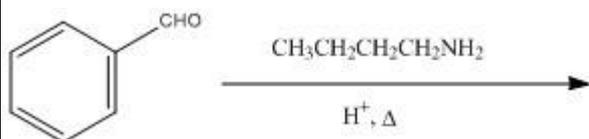
- A)  $\text{LiAlH}_4$     B)  $\text{Na}_2\text{Cr}_2\text{O}_7$     C) PCC    D)  $\text{KMnO}_4$

61. Which sequence ranks the following carbonyl compounds in order of increasing rate of nucleophilic addition?



- A)  $2 < 3 < 1$     B)  $3 < 2 < 1$     C)  $2 < 1 < 3$     D)  $1 < 3 < 2$

62. What product will result from the reaction shown?



- A) imine
- B) amino acid
- C) amino alcohol
- D) hydrazine

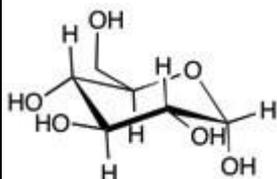
63. What product will result from the reaction shown?



- A) acetal    B) hydrazine    C) ester    D) ylide

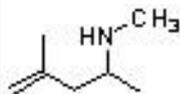
學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

64. The cyclic structure of glucose is shown below. What functional groups are present in this molecule?



- A) acetal    B) hemiacetal    C) oxime    D) hydrate

65. Provide the correct IUPAC name for the following amine.



- A) 4-(methylamino)-2-methyl-1-pentene  
 B) 2,*N*-dimethyl-1-penten-4-amine  
 C) 4,*N*-dimethyl-4-penten-2-amine  
 D) 1,3,*N*-trimethyl-3-buten-1-amine

66. What compound results from the reaction below?



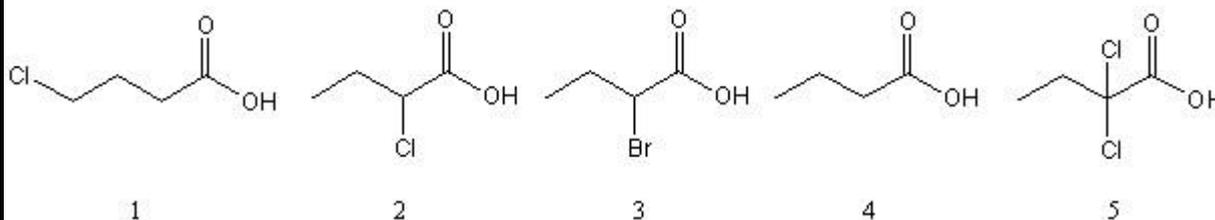
- A) imine  
 B) amide  
 C) primary amine  
 D) quaternary ammonium salt

# 亞洲大學

## 109 學年度學士後獸醫學系招生考試試題紙

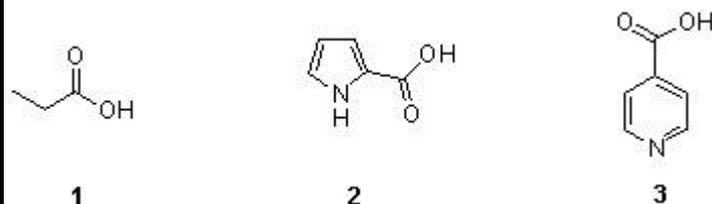
學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

67. List the following weak acids in order of increasing acidity (from lowest to highest.).



- A)  $4 < 3 < 2 < 1 < 5$     B)  $4 < 1 < 3 < 2 < 5$     C)  $5 < 2 < 3 < 1 < 4$   
 D)  $4 < 1 < 2 < 5 < 3$

68. Which of the following sequences ranks the structures below in order of increasing acidity?



- A)  $1 < 2 < 3$     B)  $2 < 3 < 1$     C)  $3 < 1 < 2$     D)  $2 < 1 < 3$

69. What compound is produced when  $(\text{CH}_3)_2\text{CHCH}_2\text{Br}$  is subjected to the following sequence of steps?

1. Mg, Et<sub>2</sub>O    2. CO<sub>2</sub>

- A) 2-methylpropanoic acid    B) 3-methylpropanoic acid  
 C) 2-methylbutanoic acid    D) 3-methylbutanoic acid

70. Acid chlorides can be prepared from carboxylic acids by treatment with \_\_\_\_\_.

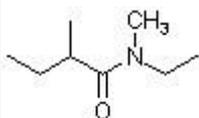
- A) (COCl)<sub>2</sub>  
 B) SOCl<sub>2</sub>  
 C) KCl  
 D) both A and B

學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

71. Cyclic amides are called \_\_\_\_\_.

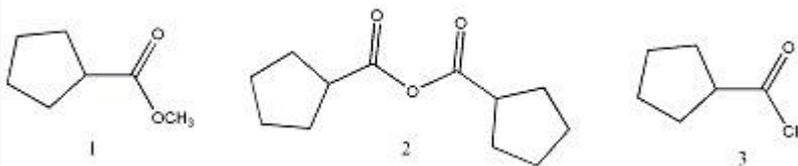
- A) lactones    B) lactams    C) aminals    D) animals

72. What is the correct IUPAC name for the following compound?



- A) N-ethyl-2,N-dimethylbutanamide  
 B) N-ethyl-N-methylisobutyramide  
 C) 2,N-dimethyl-N-ethylbutanamide  
 D) 1-(ethylmethylamino)-2-methylbutanamide

73. Arrange the carboxylic acid derivatives below in order of increasing reactivity towards nucleophilic acyl substitution.



- A) 1 < 2 < 3    B) 1 < 3 < 2    C) 2 < 1 < 3    D) 2 < 3 < 1

74. The hydrolysis of esters in base is called \_\_\_\_\_.

- A) the Fischer esterification  
 B) saponification  
 C) the Dieckmann condensation  
 D) transesterification

75. Lithium aluminum hydride reduces carboxylic acids, acid chlorides, and esters to \_\_\_\_\_.

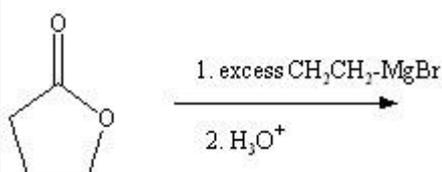
- A) aldehydes    B) primary alcohols    C) secondary alcohols  
 D) tertiary alcohols

學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

76. What compound is produced when *N,N*-dimethylpropanamide is treated with  $\text{LiAlH}_4$ ?

- A)  $\text{CH}_3\text{CH}_2\text{CONH}_2$
- B)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
- C)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- D)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{N}(\text{CH}_3)_2$

77. What is the predicted major product of the following reaction?

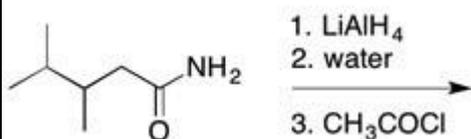


- A)

B)
- C)

D)

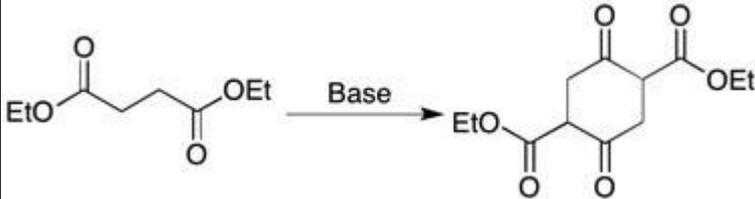
78. Predict the major organic product from the following reaction.



- A) carboxylic acid    B) ester    C) nitrile    D) 2° amide

學系別	考試科目	考試日期	時 間
學士後獸醫學系	化學(含普通化學、有機化學)	109.05.02	10:30-12:00

79. What type of reaction is shown below?



- A) Aldol condensation    B) Claisen Condensation    C) Michael Addition  
D) Alkylation

80. Which of the pairs shown below are tautomers?

A)



B)



C)



D)

