亞洲大學

110 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)	110.05.01	10:30-12:00

1. Gasoline is an example of
   (A) a compound.
   (B) an element.
   (C) a heterogeneous mixture.
   (D) a homogeneous mixture.

2. How many significant figures are in the measurement, 0.0005890 g?
   (A) 4　(B) 5　(C) 6　(D) 7

3. Which of the following elements is a metalloid?
   (A) Al　(B) Ge　(C) C　(D) Sn

4. Which of the following does NOT describe a nonmetal?
   (A) Tend to gain electrons
   (B) Found in the upper right hand corner of the periodic table
   (C) Poor conductor of electricity
   (D) Nonmetals are generally unreactive.

5. Determine the name for H_2CO_3.

   (A) carbonous acid　(B)　dihydrogen carbonate　(C) carbonic acid
   (D) hydrocarbonic acid

6. The chemical formula for calcium nitride is

   (A) $Ca(NO_3)_2$.　(B) $Ca(NO_2)_2$.　(C) Ca_3N_2.　(D) CaN_2

7. How many of the following compounds are **<u>insoluble</u>** in water?

   $KC_2H_3O_2$　　$CaSO_4$　　SrS　　$AlPO_4$

   (A) 0　(B) 1　(C) 2　(D) 3

8. The mixing of which pair of reactants will result in a precipitation reaction?

   (A) $CsI(aq) + NaOH(aq)$　　(B) $HCl(aq) + Ca(OH)_2(aq)$

   (C) $K_2SO_4(aq) + Hg_2(NO_3)_2(aq)$　(D) $NaNO_3(aq) + NH_4Cl(aq)$

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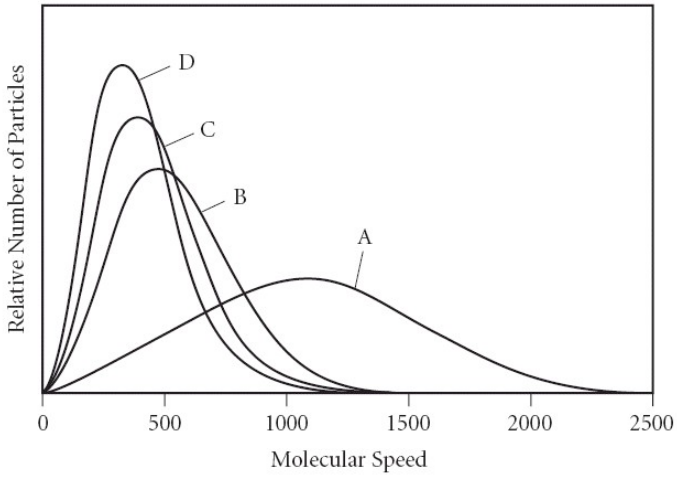
9. Which of the gases in the graph below has the largest molar mass?



(A) A (B) B (C) C (D) D

10. Which of the following gases has the **highest** average speed at 400K?

(A) N_2 (B) O_2 (C) F_2 (D) Cl_2

11. Which of the following processes is endothermic?

(A) The freezing of water.
(B) The vaporization of rubbing alcohol.
(C) A hot cup of coffee (system) cools on a countertop
(D) The chemical reaction in a "hot pack" often used to treat sore muscles.

12. An exothermic reaction has

(A)has a negative ΔH and absorbs heat from the surroundings. An exothermic reaction feels warm to the touch .
(B)has a positive ΔH and absorbs heat from the surroundings. An exothermic reaction feels warm to the touch .
(C)has a positive ΔH and gives off heat to the surroundings. An exothermic reaction feels warm to the touch.
(D)has a negative ΔH and gives off heat to the surroundings. An exothermic reaction feels warm to the touch.

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13. Place the following types of electromagnetic radiation in order of increasing frequency.
    (A) microwaves < visible light < X-rays
    (B) X-rays < visible light < microwaves
    (C) microwaves < X-rays < visible light
    (D) X-rays < microwaves < visible light

14. Describe the shape of one of the d orbitals.
    (A) four lobes in one plane　(B) three lobes in one plane
    (C) two lobes in one plane　(D) one sphere

15. Give the ground state electron configuration for I.

    (A) $[Kr]5s^24d^{10}5p^6$　(B) $[Kr]5s^24d^{10}5p^5$

    (C) $[Kr]4d^{10}5p^6$　　(D) $[Kr]5s^25p^6$

16. Of the following, which atom has the largest atomic radius?
    (A) Rb　(B) I　(C) Cs　(D) At

17. Choose the compound below that should have the **lowest** melting point according to the ionic bonding model.
    (A) LiF　(B) NaCl　(C) CsI　(D) KBr

18. Using periodic trends, place the following bonds in order of **increasing** ionic character.
    (A) Si-P < Si-Cl < Si-S
    (B) Si-P < Si-S < Si-Cl
    (C) Si-S < Si-Cl < Si-P
    (D) Si-Cl < Si-P < Si-S

19. How many of the following molecules are polar?

    PCl_5　COS　XeO_3　$SeBr_2$

    (A) 2　(B) 0　(C) 1　(D) 3

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20. Using the VSEPR model, the molecular geometry of the central atom in SO_2 is _____.

(A) linear (B) trigonal planar (C) tetrahedral (D) bent

21. What is the strongest type of intermolecular force present in CHF_3?

(A) ion-dipole (B) dispersion (C) hydrogen bonding (D) dipole-dipole

22. Which of the following compounds exhibits only dispersion and dipole-dipole intermolecular interactions?

(A) H_2 (B) HI (C) CO_2 (D) CH_3NH_2

23. Which of the following compounds will be most soluble in ethanol (CH_3CH_2OH)?

(A) trimethylamine ($N(CH_3)_3$)

(B) acetone (CH_3COCH_3)

(C) ethylene glycol ($HOCH_2CH_2OH$)

(D) hexane ($CH_3CH_2CH_2CH_2CH_2CH_3$)

24. Which of the following ions should have the most exothermic $\Delta H_{hydration}$?

(A) Na^+ (B) Mg^{2+} (C) Al^{3+} (D) Ca^{2+}

25. Given the following proposed mechanism, predict the rate law for the overall reaction.

$2NO_2 + Cl_2 \rightarrow 2NO_2Cl$ (overall reaction)

Mechanism

$NO_2 + Cl_2 \rightarrow NO_2Cl + Cl$ slow

$NO_2 + Cl \rightarrow NO_2Cl$ fast

(A) Rate = $k[NO_2][Cl_2]$ (B) Rate = $k[NO_2]^2[Cl_2]$

(C) Rate = $k[NO_2][Cl]$ (D) Rate = $k[NO_2Cl][Cl]$

26. Identify an homogeneous catalyst.

(A) SO_2 over vanadium (V) oxide (B) Pd in H_2 gas

(C) Pt with methane (D) H_2SO_4 with concentrated HCl

27. Consider the following reaction and its equilibrium constant:

$I_2(g) \rightleftharpoons 2I(g)$ $K_p = 0.209$

A reaction mixture contains 0.89 atm I_2 and 1.77 atm I. Which of the following statements is TRUE concerning this system?

(A) The reaction will shift in the direction of reactants.
(B) The reaction quotient will increase.
(C) The reaction will shift in the direction of products.
(D) The equilibrium constant will decrease.

28. Consider the following reaction at equilibrium. What effect will increasing the temperature have on the system?

$C_3H_8(g) + 5\ O_2(g) \rightleftharpoons 3\ CO_2(g) + 4\ H_2O(l)$ $\Delta H° = -2220$ kJ

(A) The reaction will shift to the right in the direction of products.
(B) The reaction will shift to the left in the direction of reactants.
(C) The equilibrium constant will increase.
(D) The equilibrium constant will decrease.

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29. Which of the following is a STRONG base?

(A) Cl^- (B) NH_3 (C) CH_3OH (D) KOH

30. Which one of the following salts, when dissolved in water, produces the solution with the most *acidic* pH?

(A) NaCl (B) KCl (C) $MgCl_2$ (D) $AlCl_3$

31. If the pKa of $HCHO_2$ is 3.74 and the pH of an $HCHO_2/NaCHO_2$ solution is 3.89, which of the following is TRUE?

(A) $[HCHO_2] < [NaCHO_2]$ (B) $[HCHO_2] = [NaCHO_2]$

(C) $[HCHO_2] > [NaCHO_2]$ (D) $[HCHO_2] >> [NaCHO_2]$

32. When titrating a strong monoprotic acid and KOH at 25°C, the
(A) pH will be less than 7 at the equivalence point.
(B) pH will be greater than 7 at the equivalence point.
(C) titration will require more moles of base than acid to reach the equivalence point.
(D) pH will be equal to 7 at the equivalence point.

33. Consider a reaction that has a positive ΔH and a negative ΔS. Which of the following statements is TRUE?
(A) This reaction will be spontaneous only at high temperatures.
(B) This reaction will be spontaneous at all temperatures.
(C) This reaction will be nonspontaneous at all temperatures.
(D) This reaction will be nonspontaneous only at high temperatures.

34. Which of the following statements is TRUE?
(A) Entropy is an extensive property.
(B) Entropy is not temperature dependent.
(C) Exothermic processes decrease the entropy of the surroundings.
(D) ΔSuniverse is always greater than zero for a nonspontaneous process.

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35. Balance the following redox reaction if it occurs in acidic solution. What are the coefficients in front of H^+ and Fe^{3+} in the balanced reaction?

$$Fe^{2+}(aq) + MnO_4^-(aq) \rightarrow Fe^{3+}(aq) + Mn^{2+}(aq)$$

(A) $H^+ = 2$, $Fe^{3+} = 3$ (B) $H^+ = 8$, $Fe^{3+} = 5$

(C) $H^+ = 3$, $Fe^{3+} = 2$ (D) $H^+ = 5$, $Fe^{3+} = 1$

36. What element is being oxidized in the following redox reaction?

$$Cr(OH)_4^-(aq) + ClO^-(aq) \rightarrow CrO_4^{2-}(aq) + Cl^-(aq)$$

(A) Cr (B) O (C) H (D) Cl

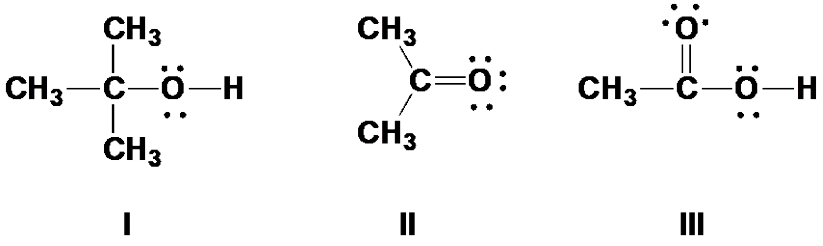
37. Which particle has the highest penetrating power?
(A) Alpha particle. (B) Beta particle.
(C) Gamma particle. (D) Positron emission.

38. The following reaction represents what nuclear process?

$$^{214}_{82}Pb \rightarrow {}^{0}_{-1}e + {}^{214}_{83}Bi$$

(A) beta emission (B) gamma emission
(C) electron capture (D) neutron bombardment

39. Which functional groups have correct Lewis structures?



I II III

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

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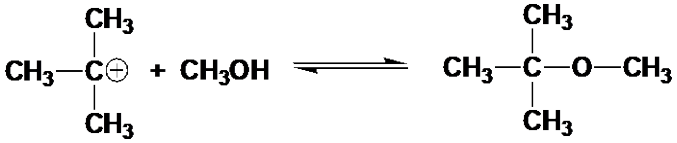
40. What are the correct orbital hybridizations for carbon in the following species?

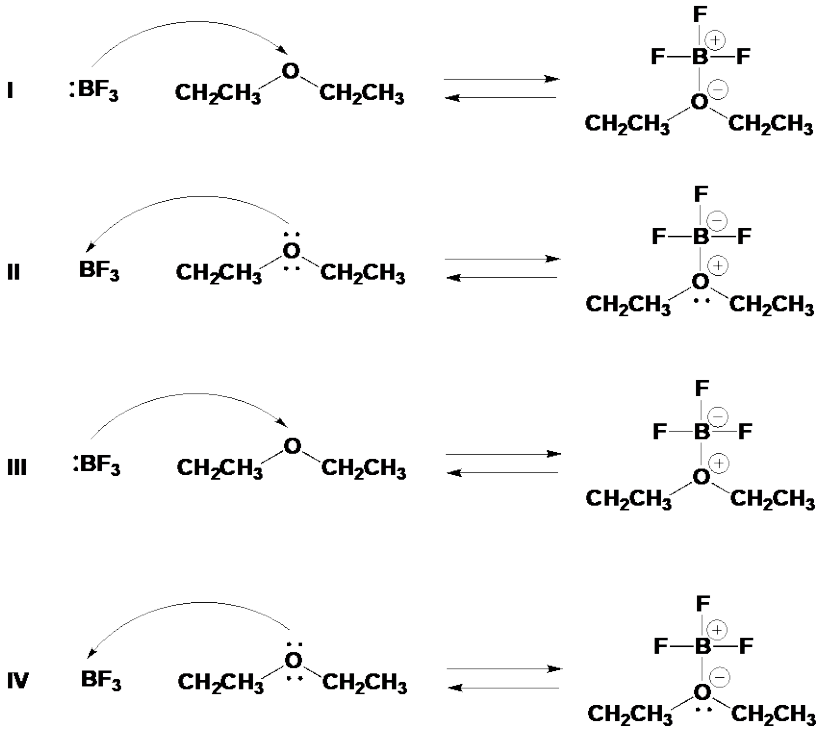
(A) CH_3^+ is sp-hybridized (B) CH_3^- is sp^2-hybridized
(C) CH_4 is sp^2-hybridized (D) CH_3^- is sp^3-hybridized

41. What is the role of methanol (CH_3OH) in the following reaction?



(A) Lewis acid (B) Lewis base (C) Brønsted acid (D) Brønsted base

42. Which is the proper reaction mechanism for the reaction of boron trifluoride and diethyl ether?



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

43. Which of the following are constitutional isomers of 4-isopropyloctane?

I. 3-ethyl-2,4,5-trimethyloctane II. isobutylcyclohexane
III. 4-ethyl-2,2-dimethylheptane IV. 4-ethyl-2-methyloctane

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

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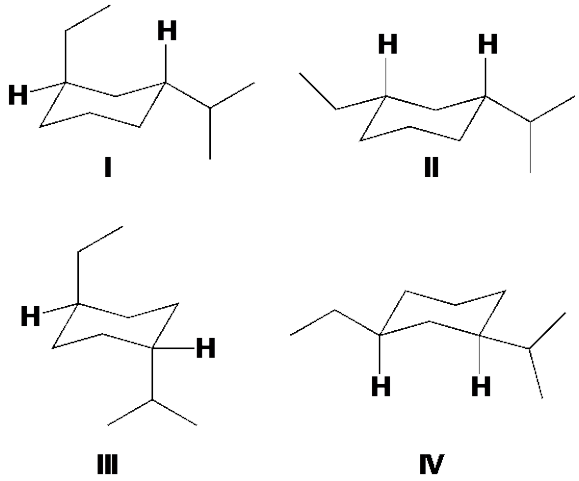
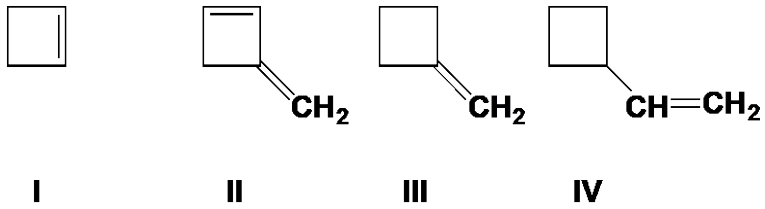
44. Which is the structure for *trans*-1-ethyl-3-isopropylcyclohexane?



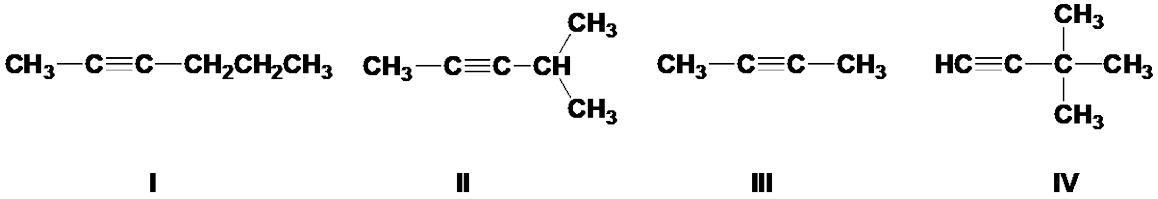
(A)I　(B) II　(C) III　(D) IV

45. Which is the correct structure for vinylcyclobutane?



(A) I　(B) II　(C) III　(D) IV

46. Arrange the following compounds in decreasing order of boiling point (highest first).



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

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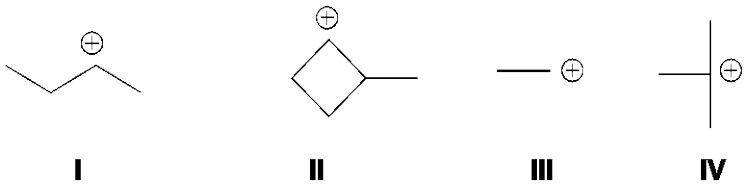
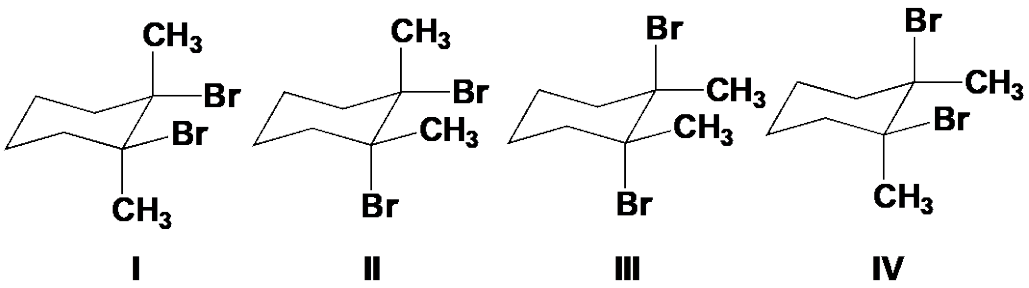
47. Arrange these carbocations in order of increasing stability (least to most).



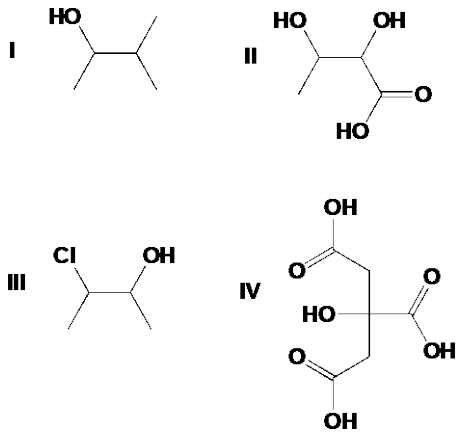
(A) I, II, III, IV　(B) III, II, I, IV　(C) II, IV, I, III　(D) III, I, II, IV

48. Which is the major product from the reaction of 1,2-dimethylcyclohexene with Br_2?



(A) I and III　(B) II and IV　(C) II and III　(D) III and IV

49. Which compounds have multiple stereocenters?



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

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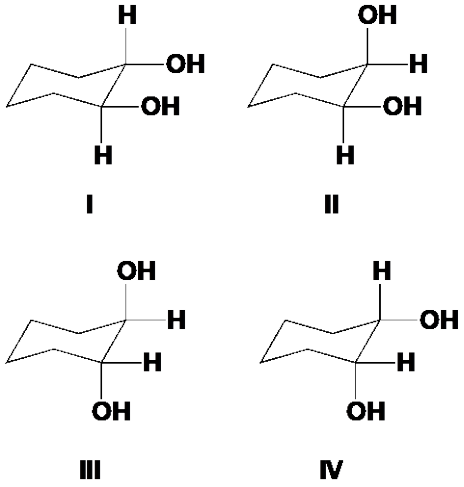
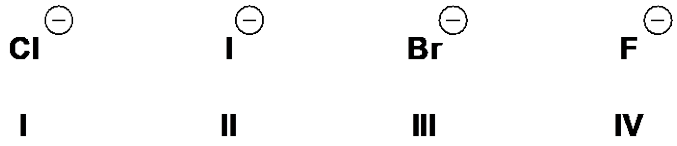
50. Which compound is a meso compound?



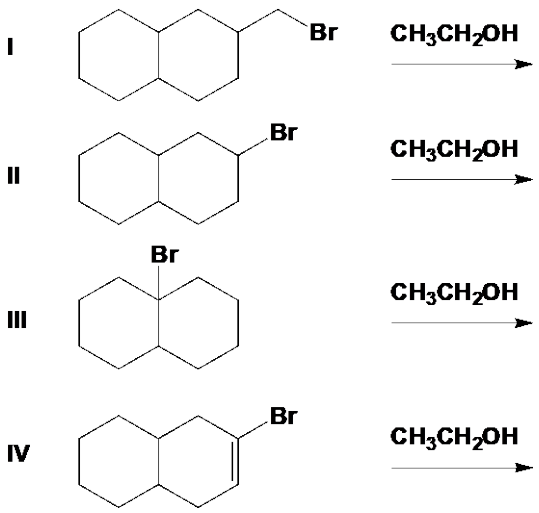
(A) I　(B) II　(C) III　(D) IV

51. Arrange the leaving groups in order of increasing leaving group ability (least first).



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

52. Which of the reactions below are most likely to be S_N1 reactions?



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

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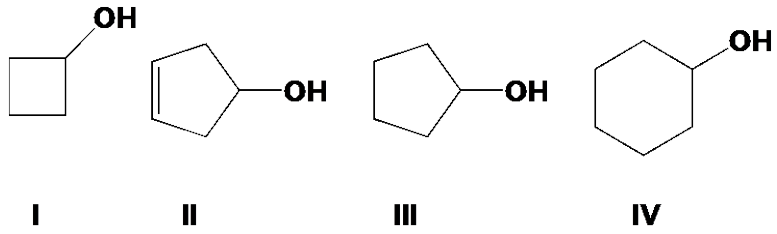
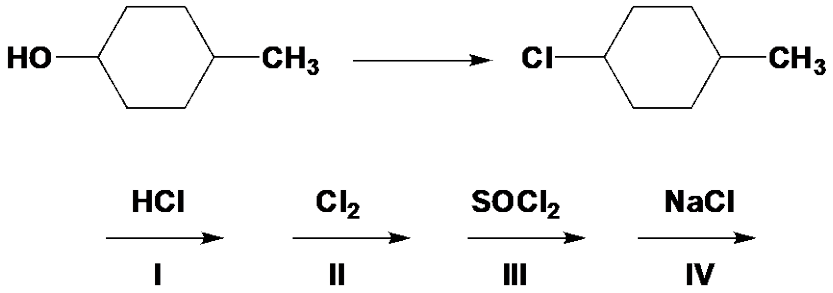
53. Arrange the compounds in the order of increasing solubility in water (least soluble first). (help: estimate the hydrophobic surface of the non-polar part of the molecules)



I　　II　　III　　IV

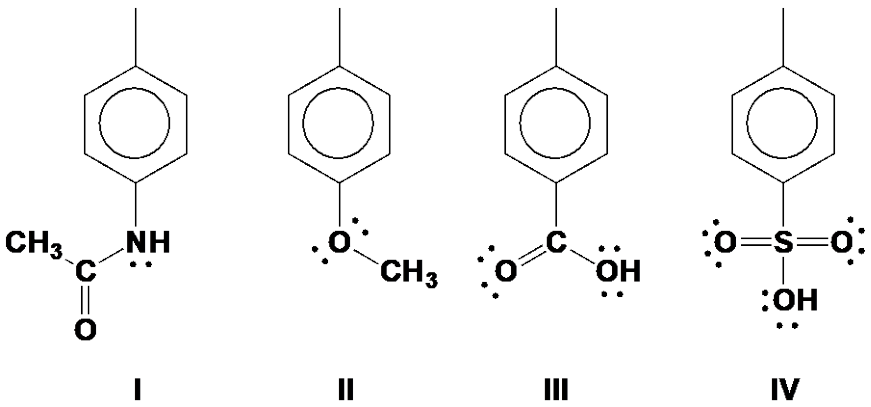
(A) III, IV, II, I　(B) II, III, IV, I　(C) IV, III, II, I　(D) III, IV, I, II

54. Which reagents do not perform the following conversion?



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

55. Arrange the compounds in order of decreasing reactivity towards the aromatic nitration reaction.



I　　II　　III　　IV

(A) II > III > IV > I　(B) III > II > I > IV
(C) II > I > III > IV　(D) IV > II > III > I

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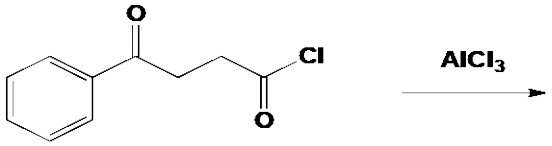
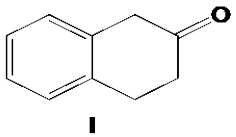
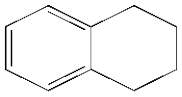
56. Which is the major product of the following reaction?

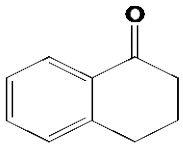




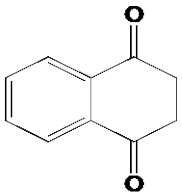
I



II



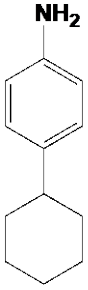
III



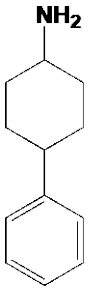
IV

(A) I　(B)　II　(C) III　(D)IV

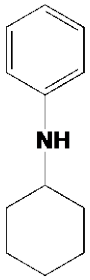
57. Arrange the basicities of the four amines in decreasing order (highest first).



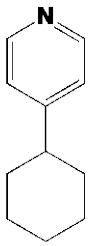
I



II



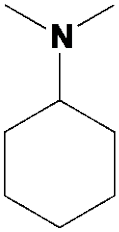
III



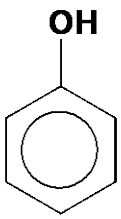
IV

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

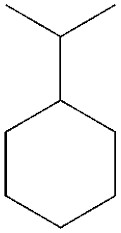
58. The following mixture was extracted with 1 M HCl, followed by 1 M NaOH, followed by ether.　Which compound is recovered from the acid solution?



I



II



III

(A) I　(B) II　(C) III　(D) None of the above

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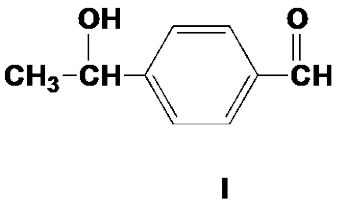
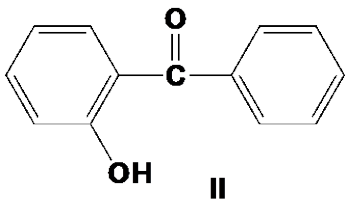
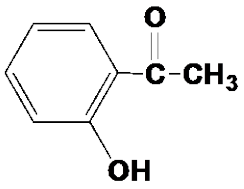
59. Which is the correct structure for 2-hydroxybenzophenone?



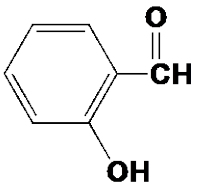
I



II



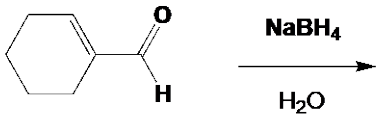
III

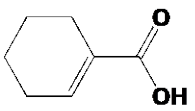


IV

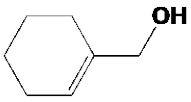
(A) I　(B) II　(C) III　(D) IV

60. Which is the major product of the following reaction?

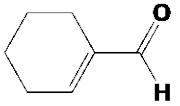




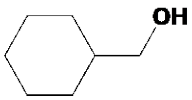
I



II



III



IV

(A) I　(B) II　(C) III　(D) IV

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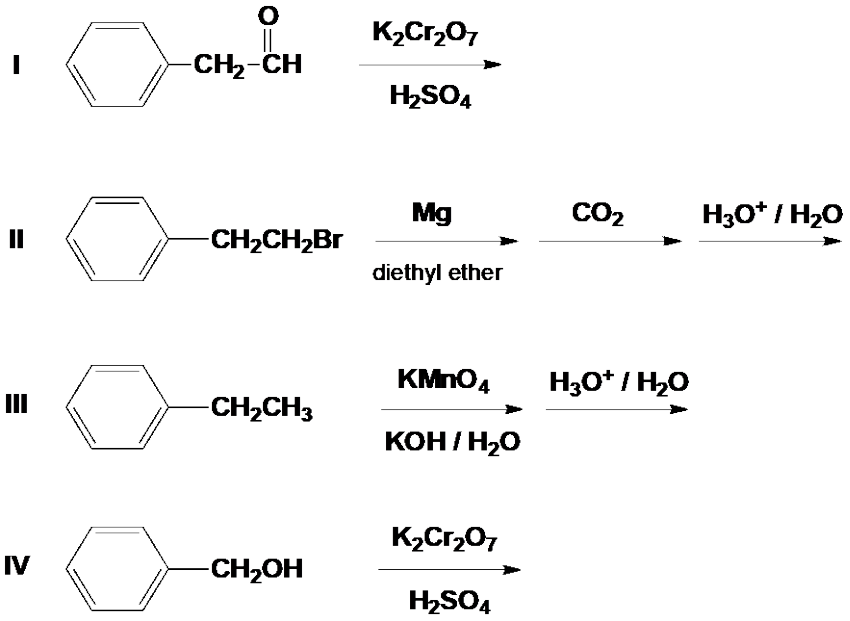
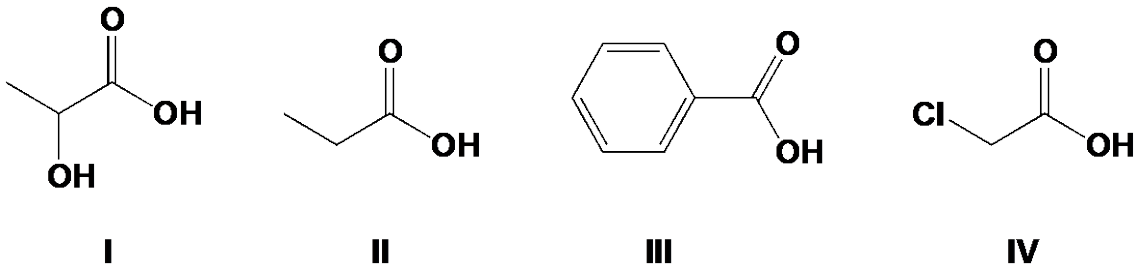
61. Which reactions yield the same carboxylic acid?



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

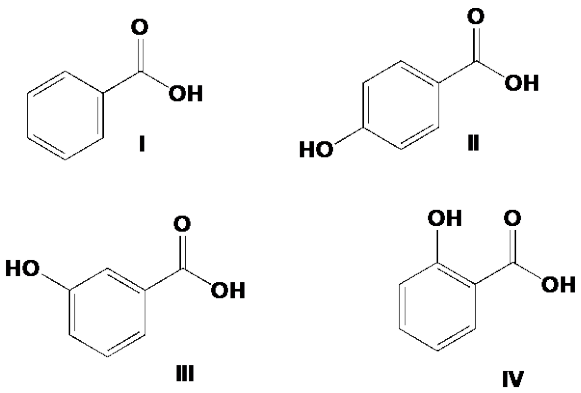
62. Arrange the compounds in order of increasing acidity (lowest first).



I　　II　　III　　IV

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

63. Which acid is strongest?



(A) I　(B) II　(C) III　(D) IV

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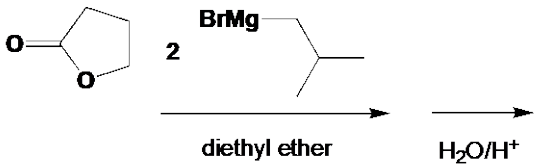
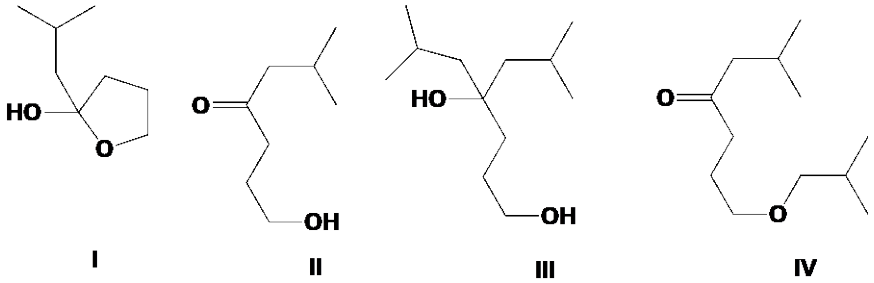
64. Butyrolactone reacts with isobutyl magnesium bromide. Which is the major product formed?

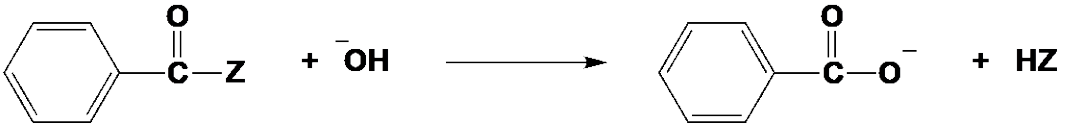




I　　II　　III　　IV

(A) I　(B) II　(C) III　(D) IV

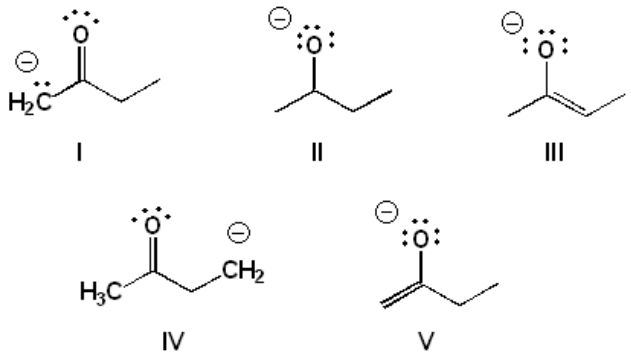
65. The following reaction is fastest when Z is which group?



I　　II　　III　　IV

(A)I　(B)　II　(C)　III　(D)　IV

66. Which are contributing structures of the enolates formed by the treatment of butanone with base?



I　　II　　III　　IV　　V

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

※ 試題請隨卷繳回

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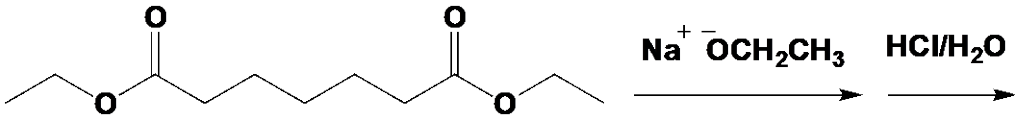
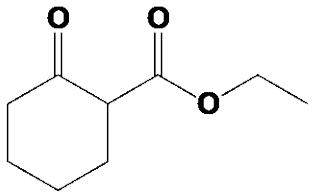
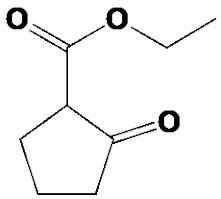
67. Which is the major product formed in the following reaction?

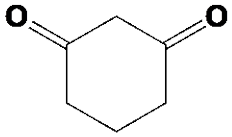




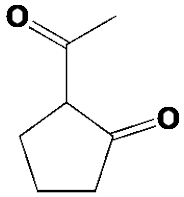
I



II



III



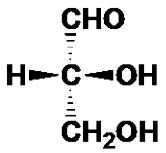
IV

(A) I　(B) II　(C) III　(D) IV

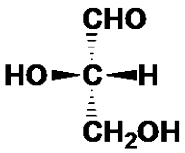
68. How many possible Claisen condensation products are formed when ethyl propanoate and ethyl methanoate are mixed with sodium ethoxide?

(A) 1　(B) 2　(C) 3　(D) 4

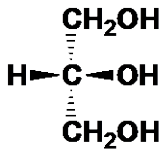
69. Which is the correct structure for D-glyceraldehyde?



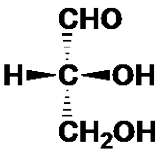
I



II



III



IV

(A) I　(B) II　(C) III　(D) IV

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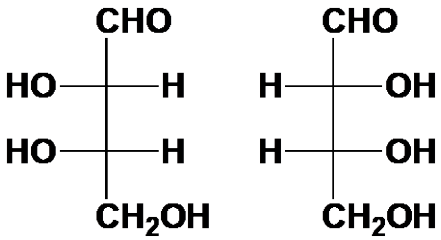
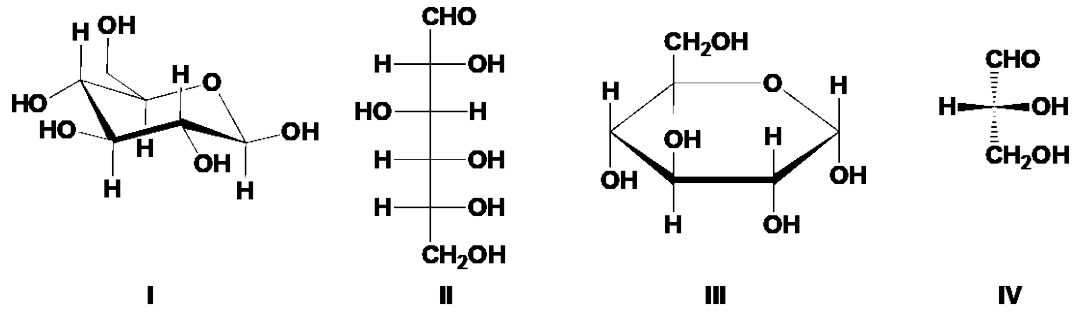
70. What is the relationship between the following compounds?



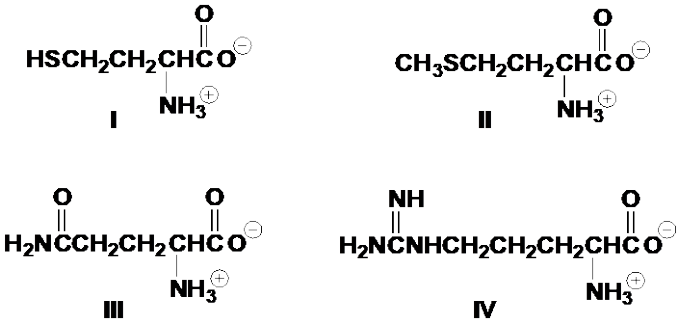
(A) anomers (B) diastereomers (C) enantiomers (D) identical structures

71. Which is the correct structure for □-D-glucopyranose?



(A) I and II (B) III and IV (C) III (D) I

72. Which amino acid has a basic side chain?



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

73. Which describes the isoelectric point of an amino acid?

(A) The degree of ionization of the amino acid at pH 7.

(B) The pH at which there is no net charge for the amino acid.

(C) The degree of ionization of the amino acid at pH 7 in an electric field.

(D) The pH at which the amino acid has a maximal charge

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74. Which saturated fatty acids have the correct name?

I) $CH_3(CH_2)_{10}COOH$ – stearic acid　　II) $CH_3(CH_2)_{14}COOH$ – palmitic acid

III) $CH_3(CH_2)_{16}COOH$ – lauric acid　　IV) $CH_3(CH_2)_{18}COOH$ – arachidic acid

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

75. Which is not a characteristic group in phospholipids?

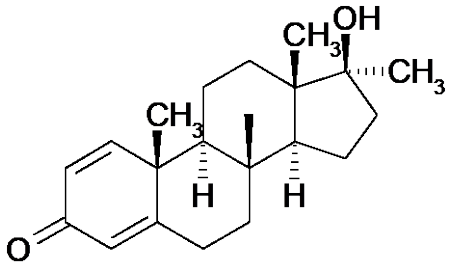
(A) phosphate esters

(B) fatty acid esters

(C) glycerides

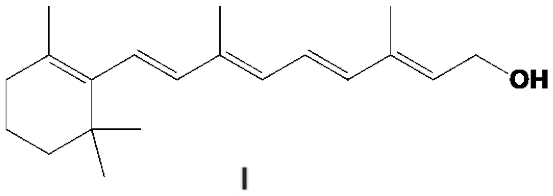
(D) polyamides

76. Which is the number of stereocenters in methandrostenolone?

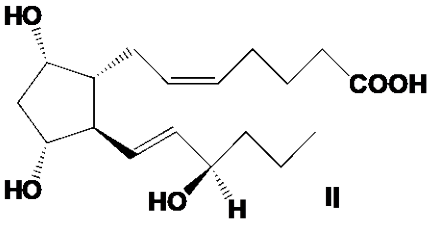


(A) 4　(B) 6　(C) 8　(D) 10

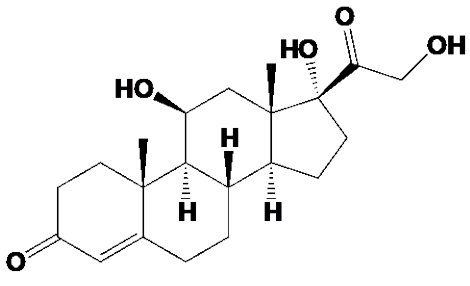
77. Which structure is vitamin A?



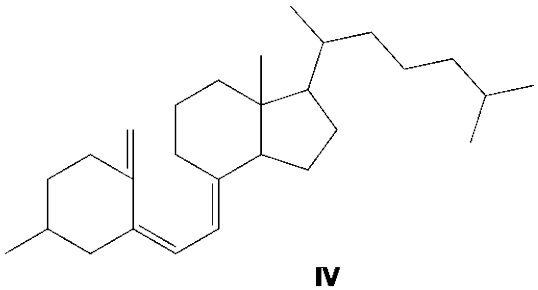
I



II



III



IV

(A) I　(B) II　(C) III　(D) IV

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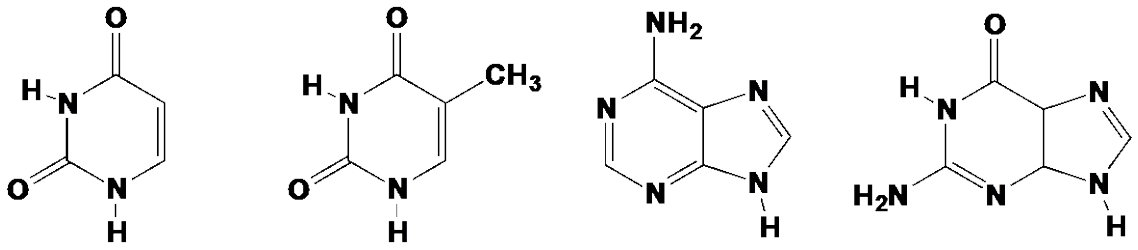
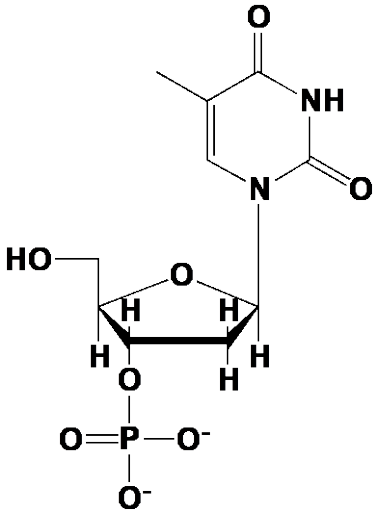
78. Which structures are named correctly?



I　　II　　III　　IV

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

79. What is the correct name for this structure?



(A) 5'-dAMP　(B) 5'-TMP　(C) 3'-AMP　(D) 3'-dTMP

80. Which is the oxidizing agent for the following reaction?

(A) FAD　(B) $FADH_2$　(C) NAD^+　(D) NADH

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