

亞洲大學

113 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)	113.04.27	10:30-12:00

- Order the four metric prefixes from smallest to largest.
A) nano- < milli- < centi- < kilo- B) milli- < nano- < centi- < kilo-
C) kilo- < centi- < nano- < milli- D) kilo- < centi- < milli- < nano-
- How many significant figures are there in the number 0.04560700?
A) 4 B) 5 C) 7 D) 8
- A method of separation that employs a system with two phases of matter, a mobile phase and a stationary phase, is called
A) filtration B) chromatography C) distillation D) vaporization
- Which of the following statements from Dalton's atomic theory is no longer true, according to modern atomic theory?
A) Elements are made up of tiny particles called atoms.
B) Atoms are not created or destroyed in chemical reactions.
C) All atoms of a given element are identical.
D) Atoms are indivisible in chemical reactions.
- Which of the following are incorrectly paired?
A) K, alkali metal B) Ba, alkaline earth metal C) O, halogen D) Ne, noble gas
- NaHCO_3 is the active ingredient in baking soda. How many grams of oxygen are in 0.52 g of NaHCO_3 ?
A) 0.099 g B) 0.019 g C) 6.19×10^3 g D) 0.30 g
- What volume of 18 M sulfuric acid must be used to prepare 2.30 L of 0.145 M H_2SO_4 ?
A) 19 mL B) 0.33 mL C) 1.1×10^3 mL D) 2.9 mL
- Which of the following salts is insoluble in water?
A) Na_2S B) K_2CO_3 C) $\text{Pb}(\text{NO}_3)_2$ D) All of these are soluble in water.
- In the reaction $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$, N_2 is
A) oxidized B) reduced C) the electron donor D) the reducing agent
- Boyle's law states that:
A) Equal amounts of gases occupy the same volume at constant temperature and pressure.
B) The volume of a fixed amount of gas is inversely proportional to its pressure at constant temperature.
C) The volume of a fixed amount of gas is directly proportional to its temperature in Kelvin at constant pressure.
D) The total pressure of a mixture of gases is the simple sum of the partial pressure of all of the gaseous compounds.
- Body temperature is about 309 K. On a cold day, what volume of air at 276 K must a person with a lung capacity of 2.2 L breathe in to fill the lungs?
A) 2.46 L B) 1.97 L C) 2.08 L D) 3.93 L

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12. The partial pressures of CH₄, N₂, and O₂ in a sample of gas were found to be 135 mmHg, 508 mmHg, and 571 mmHg, respectively. Calculate the mole fraction of nitrogen.
A) 20.4 B) 0.470 C) 0.418 D) 0.751
13. Calculate the work associated with the expansion of a gas from 42.0 L to 79.0 L at a constant pressure of 14.0 atm.
A) 518 L·atm B) -518 L·atm C) -1.11×10³ L·atm D) 588 L·atm
14. Which of the following properties is (are) intensive properties?
I.mass II.Temperature III.Volume IV.Concentration V.energy
A) I, III, and V B) II only C) II and IV D) III and IV
15. Fe has _____ that is (are) unpaired in its d orbitals.
A) one electron B) two electrons C) three electrons D) four electrons
16. An atom of fluorine contains nine electrons. How many of these electrons are in s orbitals?
A) 2 B) 4 C) 6 D) 8
17. 1s²2s²2p⁶3s²3p⁶4s²3d² is the correct electron configuration for which of the following atoms?
A) Ca B) Ti C) Ge D) Zr
18. For which of the following elements does the electron configuration for the lowest energy state show a partially filled d orbital?
A) Ti B) Rb C) Cu D) Ga
19. Choose the compound with the most ionic bond.
A) LiCl B) KF C) NaCl D) LiF
20. Which of the following bonds would be the most polar without being considered ionic?
A) Mg-O B) C-O C) O-O D) Si-O
21. Which of these is an isoelectronic series?
A) Na⁺, K⁺, Rb⁺, Cs⁺ B) K⁺, Ca²⁺, Ar, S²⁻ C) Na⁺, Mg²⁺, S²⁻, Cl⁻
D) Li, Be, B, C
22. The hybridization of the central atom in ClF₂⁺ is:
A) sp B) sp² C) sp³ D) dsp³
23. How many of the following: F₂, B₂, O₂, N₂, are paramagnetic?
A) 0 B) 1 C) 2 D) 3
24. Which of the following statements is false?
A) C₂ is paramagnetic. B) C₂ is diamagnetic.
C) The carbon-carbon bond in C₂²⁻ is stronger than the one in CH₃CH₃.
D) The carbon-carbon bond in C₂²⁻ is shorter than the one in CH₃CH₃.
25. In which of the following groups of substances would dispersion forces be the only significant factors in determining boiling points?
I.Cl₂ II.HF III.Ne IV.KNO₂ V.CCl₄
A)I, III, V B) I, II, III C) II, IV D) II, V

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26. Which of the following is the correct order of boiling points for KNO_3 , CH_3OH , C_2H_6 , Ne?

A) $\text{Ne} < \text{CH}_3\text{OH} < \text{C}_2\text{H}_6 < \text{KNO}_3$
 B) $\text{KNO}_3 < \text{CH}_3\text{OH} < \text{C}_2\text{H}_6 < \text{Ne}$
 C) $\text{Ne} < \text{C}_2\text{H}_6 < \text{KNO}_3 < \text{CH}_3\text{OH}$
 D) $\text{Ne} < \text{C}_2\text{H}_6 < \text{CH}_3\text{OH} < \text{KNO}_3$

27. Cubic closest packing is another name for _____.

A) simple cubic packing B) body-centered cubic packing C) face-centered cubic packing
 D) hexagonal closest packing

28. Steel is considered to be a(n) _____.

A) interstitial alloy B) ionic solid C) molecular solid D) substitutional alloy

29. How many milliliters of 15.7 M H_2SO_4 are needed to prepare 600.0 mL of 0.10 M H_2SO_4 ?

A) 0.26 mL B) 94 mL C) 3.8 mL D) 1.9 mL

30. How many of the following help determine whether or not a solution forms?

I. the polarities of the solute and solvent
 II. the densities of the solute and solvent
 III. the probability of the mixed state (of the solution)
 IV. the energies needed for the solution formation to occur
 V. the state of matter of the solute (solid, liquid, gas)

A) 1 B) 2 C) 3 D) 4

31. Consider the reaction $\text{X} \rightarrow \text{Y} + \text{Z}$
 Which of the following is a possible rate law?

A) $\text{Rate} = k[\text{X}]$ B) $\text{Rate} = k[\text{Y}]$ C) $\text{Rate} = k[\text{Y}][\text{Z}]$ D) $\text{Rate} = k[\text{X}][\text{Y}]$

32. If the reaction $2\text{HI} \rightarrow \text{H}_2 + \text{I}_2$ is second order, which of the following will yield a linear plot?

A) $\log [\text{HI}]$ vs time B) $1/[\text{HI}]$ vs time C) $[\text{HI}]$ vs time D) $\ln [\text{HI}]$ vs time

33. Given the equation $2\text{A}(\text{g}) \rightleftharpoons 2\text{B}(\text{g}) + \text{C}(\text{g})$. At a particular temperature, $K = 1.6 \times 10^4$.
 If you mixed 5.0 mol B, 0.10 mol C, and 0.0010 mol A in a one-liter container, which direction would the reaction initially proceed?

A) To the left. B) To the right. C) The above mixture is the equilibrium mixture.
 D) Cannot tell from the information given.

34. Calculate the $[\text{H}^+]$ in a solution that is 0.16 M in NaF and 0.25 M in HF. ($K_a = 7.2 \times 10^{-4}$)
 (HF: 20.01 g/mol)

A) 7.2×10^{-4} M B) 1.6 M C) 1.1×10^{-3} M D) 0.20 M

35. Which of the following is true for a buffered solution?

A) The solution resists change in its $[\text{H}^+]$.
 B) The solution will not change its pH very much even if a concentrated acid is added.
 C) The solution will not change its pH very much even if a strong base is added.
 D) All of these.

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36. Which of the following compounds has the lowest solubility in mol/L in water?

A) $\text{Al}(\text{OH})_3$ $K_{\text{sp}} = 2 \times 10^{-32}$
 B) CdS $K_{\text{sp}} = 1.0 \times 10^{-28}$
 C) PbSO_4 $K_{\text{sp}} = 1.3 \times 10^{-8}$
 D) $\text{Sn}(\text{OH})_2$ $K_{\text{sp}} = 3 \times 10^{-27}$

37. When the equation $\text{Cl}_2 \rightarrow \text{Cl}^- + \text{ClO}_3^-$ (basic solution) is balanced using the smallest whole-number coefficients, the coefficient of OH^- is:

A) 1 B) 12 C) 3 D) 6

38. Which oxide of a Group 2A element is not highly ionic?

A) Be B) Mg C) Ca D) Sr

39. What is the maximum oxidation state expected for manganese?

A) +2 B) +8 C) +6 D) +7

40. Which of the following coordination compounds will form a precipitate when treated with an aqueous solution of AgNO_3 ?

A) $[\text{Cr}(\text{NH}_3)_3\text{Cl}_3]$ B) $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$ C) $[\text{Cr}(\text{NH}_3)\text{Cl}]\text{NO}_3$ D) $\text{Na}_3[\text{Cr}(\text{CN})_6]$

41. Using the VSEPR model, predict which atoms have bond angles of about 120° .

$\begin{array}{c} \text{O} \\ || \\ \text{CH}_3 - \text{C} - \text{H} \\ \uparrow \\ \text{I} \end{array}$

$\begin{array}{c} \text{CH}_3\text{OH} \\ \uparrow \\ \text{II} \end{array}$

$\begin{array}{c} \text{CH}_2=\text{CH}_2 \\ \uparrow \\ \text{III} \end{array}$

$\begin{array}{c} \text{NH}_4\text{Cl} \\ \uparrow \\ \text{IV} \end{array}$

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

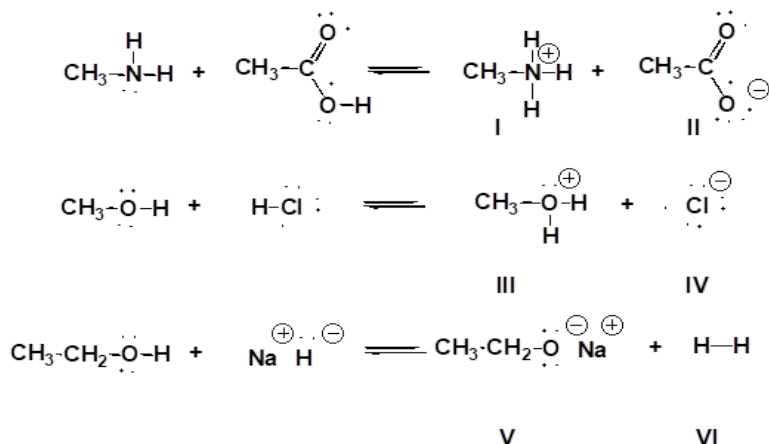
42. The carbon has the correct orbital hybridization in which structures?

$\text{CH}_2=\text{O}$	$\text{CH}_2=\text{CH}_2$	CH_4	$\text{CH}\equiv\text{N}$	$\text{O}=\text{C}=\text{O}$
sp	sp^2	sp^2	sp	sp
I	II	III	IV	V

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

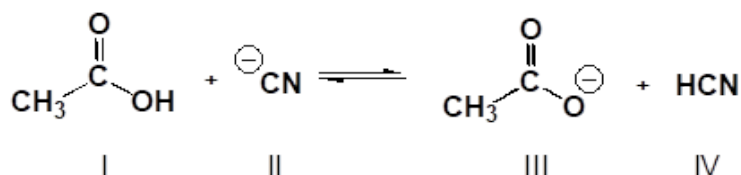
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43. Identify the conjugate acids in the following reactions.



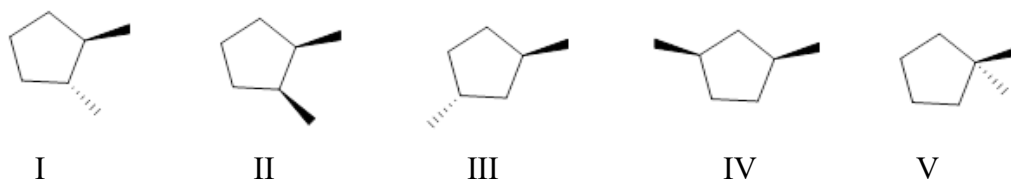
A) I, IV, VI B) I, III, VI C) II, IV, V D) I, III, V

44. Which is the stronger base if the equilibrium lies considerably to the right?



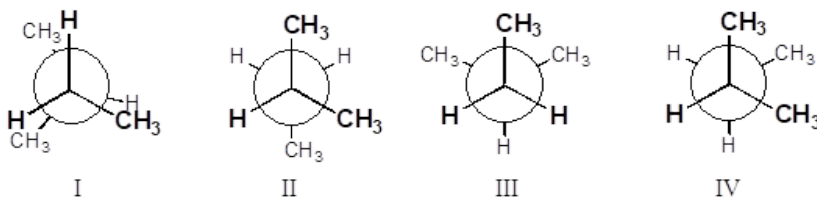
A) I B) II C) III D) IV

45. Which of the following are constitutional isomers of trans-1,2-dimethylcyclopentane?



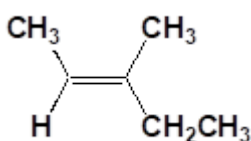
A) I, III, IV B) II, IV, V C) II, III, V D) III, IV, V

46. Which conformation of 2-methylbutane is least stable?



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

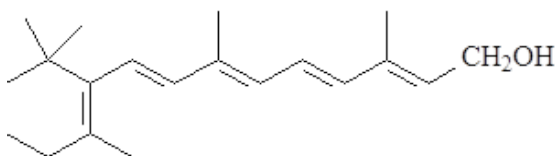
47. What is the IUPAC name for the following compound?



A) E-2-ethyl-2-butene B) Z-3-methyl-3-pentene C) E-3-methyl-2-pentene
D) Z-3-ethyl-2-butene

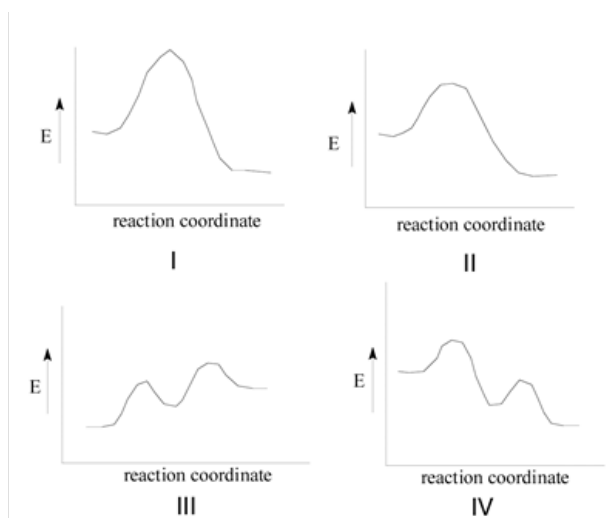
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48. How many isoprene units are there in vitamin A?



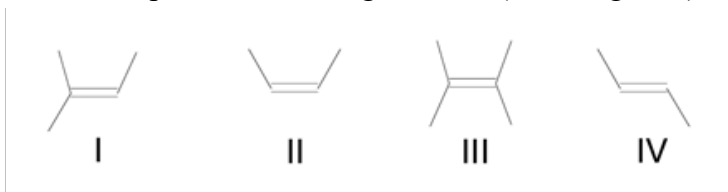
A) 2 B) 3 C) 4 D) 8

49. Which diagram represents the slowest reaction?



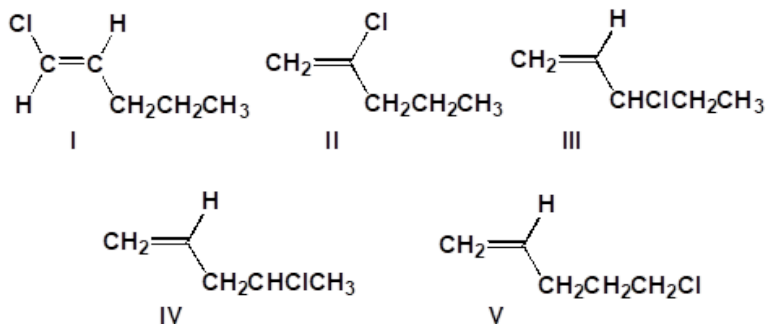
A) I B) II C) III D) IV

50. Which compound has the highest heat (most negative) of hydrogenation?



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

51. Which structures are chiral?



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

52. How many stereoisomers are possible for 2,3-butanediol?

A) 1 B) 2 C) 3 D) 4

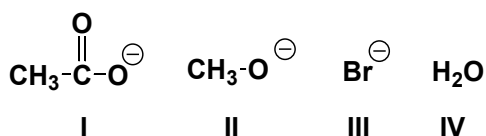
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53. Which of the following compounds are secondary haloalkanes?

- I) Isobutyl bromide II) 2-iodobutane III) isopropyl fluoride IV) neopentyl chloride
 A) I, II B) III, IV C) II, III D) I, IV

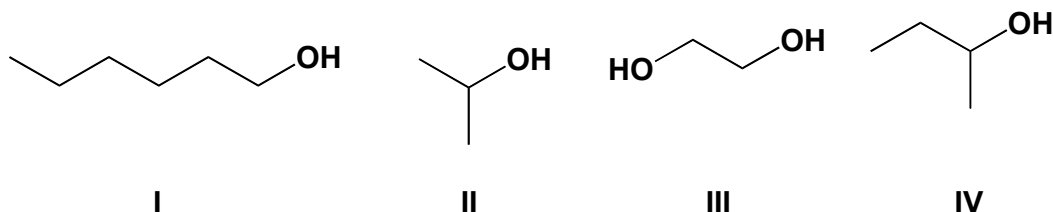
54. Arrange the nucleophiles in order of increasing reactivity (least reactive first).

HINT: Draw the lone pair(s) first.



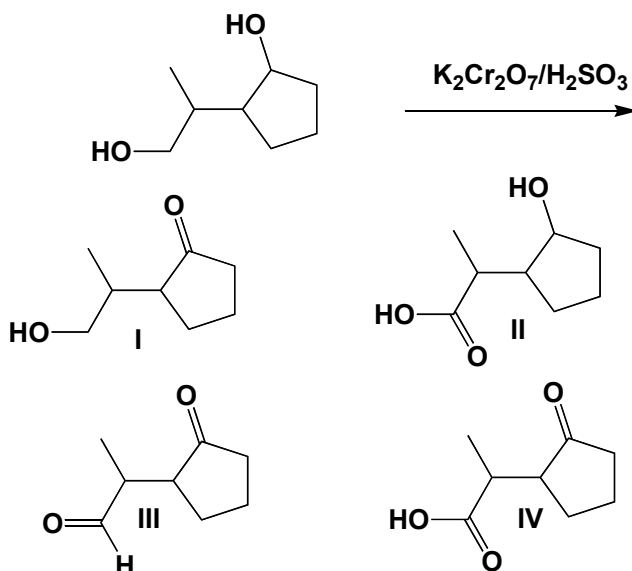
- A) III, II, I, IV B) IV, I, II, III C) I, III, II, IV D) III, I, IV, II

55. Arrange the compounds in the order of increasing solubility in water (least soluble first). (help: add the lone pairs to the oxygen atoms and look for the possibility of hydrogen bonding between the molecules and water)



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

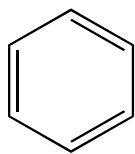
56. 2-(1-hydroxypropan-2-yl)cyclopentanol reacts with a mixture of potassium dichromate in concentrated sulfuric acid at room temperature. What product is formed? (help: assume that you have sufficient quantities of oxidizer to perform all possible reactions.)



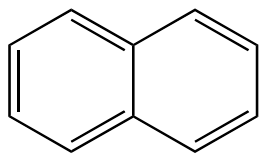
- A) I B) II C) III D) IV

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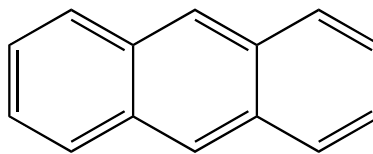
57. How many Kekule structures are possible for benzene, naphthalene, and anthracene ?



I



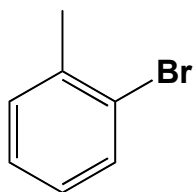
II



III

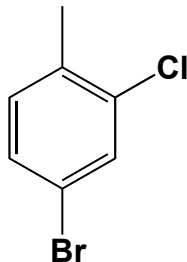
- A) I: 3, II: 4, III: 4
 B) I: 2, II: 3, III: 4
 C) I: 2, II: 4, III: 4
 D) I: 3, II: 3, III: 4

58. Which structures have the correct IUPAC names?



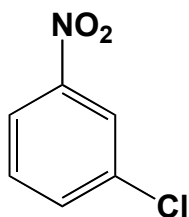
ortho-bromotoluene

I



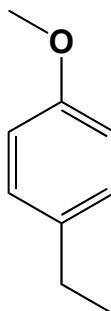
para-bromo-meta-chlorotoluene

II



meta-chloroaniline

III



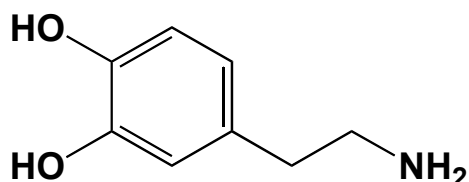
para-ethylanisole

IV

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

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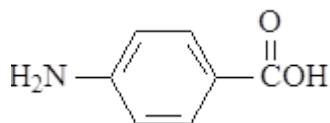
59. Dopamine is a neurotransmitter occurring in a wide variety of animals, including both vertebrates and invertebrates. What is the classification of the amine?



dopamine

- A) primary aromatic
- B) primary aliphatic
- C) secondary aromatic
- D) tertiary aliphatic

60. Which is the name for the following compound?



- A) 4-carboxy aniline
- B) 1-amino-4-carboxybenzene
- C) benzylamine carboxylic acid
- D) 4-aminobenzoic acid

61. Which is the wave number for an infrared band at 5 microns (μm)?

- A) 500 cm^{-1} B) 2000 cm^{-1} C) 5000 cm^{-1} D) $10,000\text{ cm}^{-1}$

62. Which regions in the IR spectrum could be used to distinguish between benzene and cyclohexane?

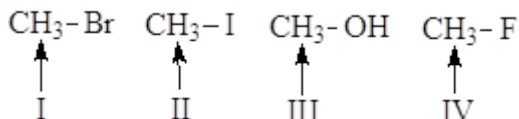
- A) $1360\text{-}1380\text{ cm}^{-1}$
- B) $2900\text{-}3100\text{ cm}^{-1}$
- C) $1680\text{-}1750\text{ cm}^{-1}$
- D) $3200\text{-}3600\text{ cm}^{-1}$

63. The chemical shift in NMR spectroscopy is observed, because_____.

- A) the magnetic field is not constant during the measurement
- B) of the interfering magnetic field caused by the electrons in the molecule
- C) many elements have more than one isotope
- D) the interference of neighboring nuclei

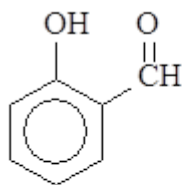
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64. Which is the order of increasing δ values downfield from TMS for the methyl groups shown (lowest first)?

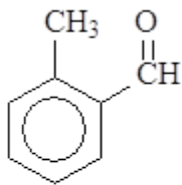


- A) I, III, IV, II
 B) II, I, III, IV
 C) IV, II, III, I
 D) III, IV, II, I

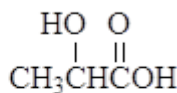
65. Which compounds are named correctly?



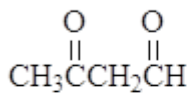
o-hydroxybenzaldehyde
I



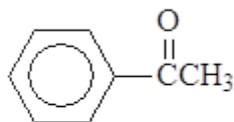
2-methylbenzaldehyde
II



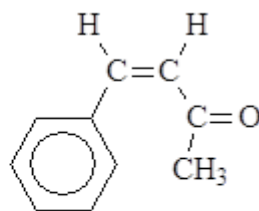
2-hydroxypropanoic acid
III



1,3-butanedione
IV



benzophenone
V



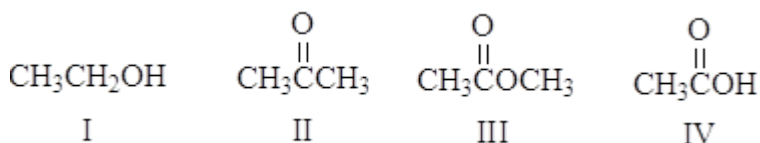
cinnamaldehyde
VI

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

66. Which reaction does not lead to 3-methyl-3-hexanol?

- A) 2-butanone + propylmagnesium bromide
 B) 3-hexanone + methyl magnesium bromide
 C) 2-pentanone + ethylmagnesium bromide
 D) 3-pentanone + ethylmagnesium bromide

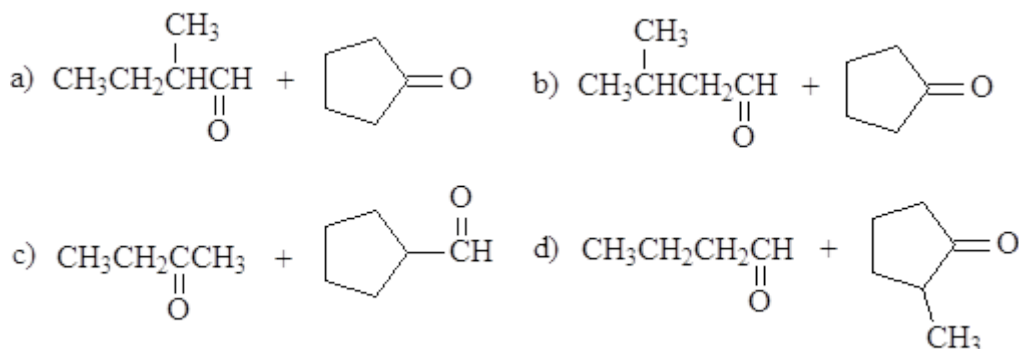
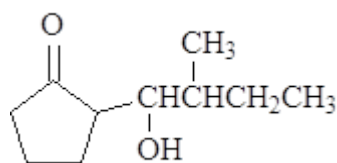
67. What is the order of increasing acidity for these compounds (least acidic first)?



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

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68. Which are the reactants for the aldol product shown?

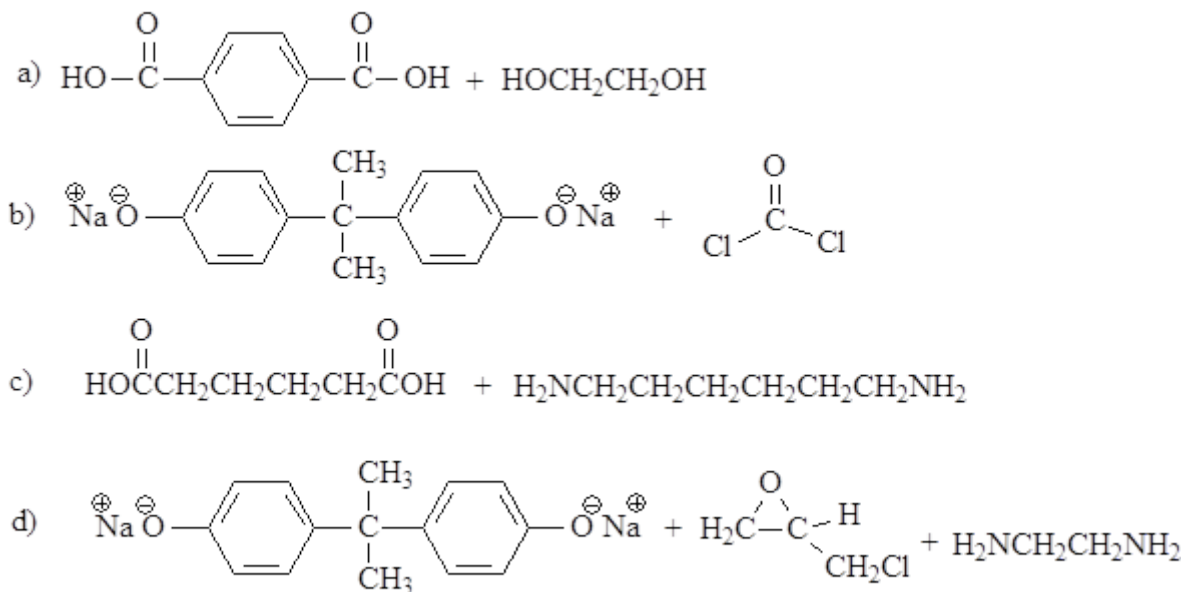
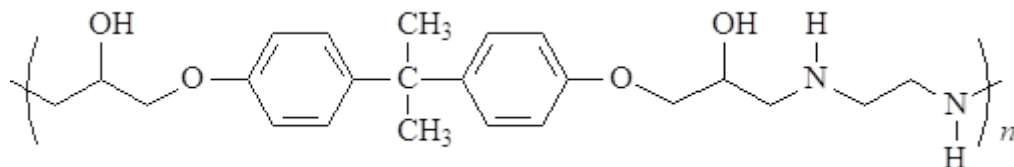


A) a B) b C) c D) d

69. Which classification best describes the mechanism of the synthesis of polyamides via step growth polymerization?

A) nucleophilic acyl addition B) nucleophilic acyl substitution
C) electrophilic addition D) radical substitution

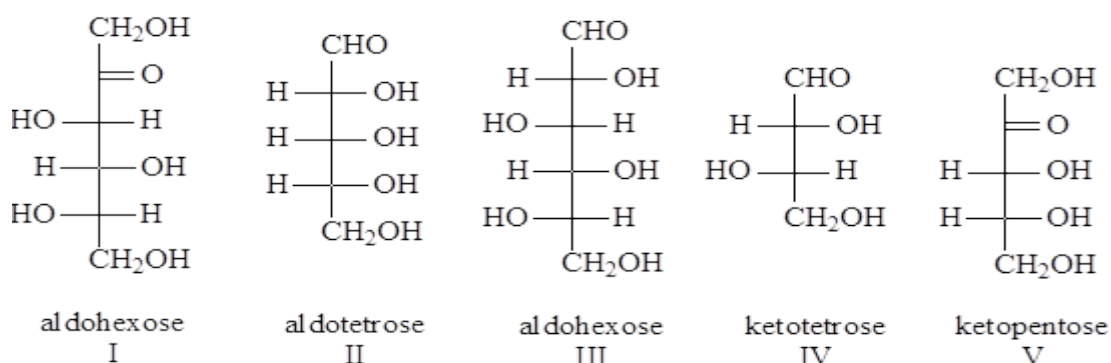
70. Which pair of compounds would react to form the polymer shown?



A) a B) b C) c D) d

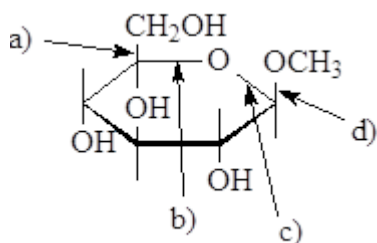
學系別	考試科目	考試日期	時 間
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71. Which sugars and classifications are correctly matched?



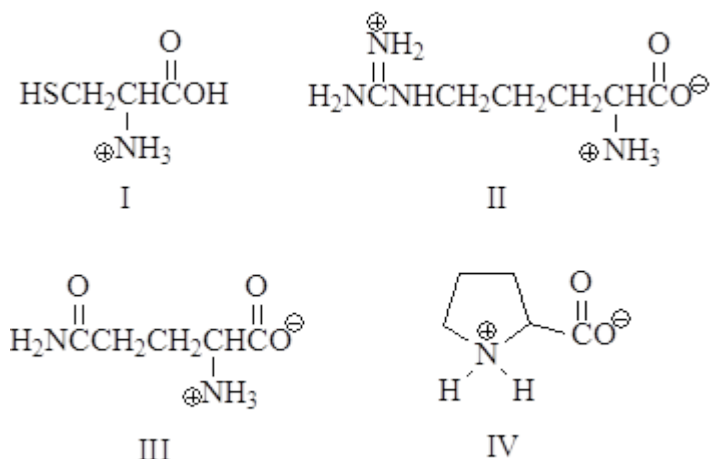
A) III, V B) II, III, IV C) I, III D) III, IV, V

72. Which of the labeled bonds is a glycosidic bond?



A) a B) b C) c D) d

73. Which molecules are zwitterions?



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

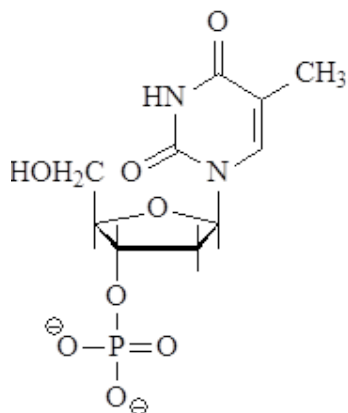
74. What are the differences between polyamides and proteins ?

- I) Polyamides are unable to undergo hydrogen bonding between individual polymer chains.
- II) Polyamides usually do not have hydroxyl- or thiol-groups as side chains.
- III) Proteins and polyamides can be partially crystalline.
- IV) Polyamides have a more stable bond between their monomers than proteins have between the individual amino acids.

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

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75. What is the correct name for this structure?



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

76. Which statements are true?

- a) A-DNA forms a right-handed helix
- b) B-DNA forms a left-handed helix
- c) Z-DNA forms a left-handed helix
- d) ribose is a hexose

- A) a and b B) b and c C) c and d D) a and c

77. Fats, oils, phospholipids, prostaglandins and steroids have which properties in common?

- I) oxygen functionality II) nonpolar groups III) rings IV) unsaturation

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

78. Which property of phospholipids accounts for their ability to form micelles?

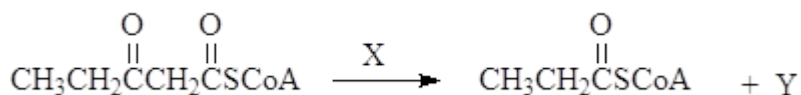
- A) nonpolarity B) unsaturation C) hydrophilicity and lipophilicity D) lipophilicity

79. Which statements about carbohydrate digestion and absorption are true?

- I) The main function of carbohydrates is as a carbon source.
- II) Hydrolysis begins in the mouth with α -amylase in saliva.
- III) Starch is hydrolyzed directly to glucose.
- IV) Hydrolysis is completed in the small intestine.

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

80. Which best describes this reaction?



- A) reverse aldol reaction
- B) aldol reaction
- C) reverse-Claisen condensation
- D) Claisen condensation