

考生注意事項：所有考題務必在答案卷上作答。凡在問題卷上作答者無效。

一. 是非題 (每題 1 分, T = TRUE or F = FALSE, 選擇正確答案, 答錯倒扣 0.5 分)

- T F (1) Electron-releasing groups bonded to an amine nitrogen increase its basicity.
- T F (2) An N-alkyl sulfonamide is insoluble in sodium hydroxide because it has no acidic hydrogen.
- T F (3) In the uv-vis region, the intensity of absorption is independent of the number of absorbing molecules in the light path.
- T F (4) The most useful transition in the uv-vis regions are  $n \rightarrow \pi^*$  and  $\pi \rightarrow \pi^*$  transitions.
- T F (5) The D-series of aldohexoses is related, from a configurational standpoint, to D-glyceraldehyde.
- T F (6) Acid halides are extremely reactive compounds.
- T F (7) A sodium lamp generates plane-polarized light.
- T F (8) The specific rotation of a compound depends on the number of molecules of the optically active materials that are in the path of the plane-polarized light.
- T F (9) All molecules that contains only one asymmetric carbon are chiral, but all chiral molecules do not contain an asymmetric carbon atom.
- T F (10) The coupling constant J is dependent on the spectrometer frequency.

二. 填充題 (每題 1 分, 答錯倒扣 0.25 分)

Fill in the blank with the correct word(s) provided at the end of each question.

- (11) Electromagnetic radiation in the ultraviolet region is of \_\_\_\_\_ energy than electromagnetic radiation in the infrared region. (higher, lower, similar, unknown).
- (12) The  $\sigma \rightarrow \sigma^*$  electronic transitions are at \_\_\_\_\_ wavelengths than  $n \rightarrow \sigma^*$  transitions. (longer, similar, unknown, shorter)
- (13) An increase in shielding leads to a \_\_\_\_\_ shift in the nmr spectrum. (upfield, downfield, unchanged, unpredictable)
- (14) Stereoisomers which are mirror images are called \_\_\_\_\_. (diastereomers, enantiomorphs, anomers, epimers, chiral centers)
- (15) The only aldehyde that can be prepared by hydration of alkynes is \_\_\_\_\_. (formaldehyde, acetaldehyde, propaldehyde, glyceraldehyde, butyraldehyde)
- (16) Optically inactive mixture of equal amounts of enantiomorphs is called \_\_\_\_\_. (racemate, meso compound, conformers, structural isomers, solutes)
- (17) Stereoisomers which differ in the configuration of the hemiacetal carbon of the carbohydrate are called \_\_\_\_\_. (mutarotators, anomers, conformers, epimers, optical antipodes)
- (18) Separation of a racemic mixture into its optically active forms is called \_\_\_\_\_. (purification, resolution, racemization, elimination, identification)
- (19) The group least likely to be listed as an auxochrome is (a) -OH (b) -CH<sub>3</sub> (c) -OCH<sub>3</sub> (d) -NH<sub>2</sub> (e) -NH(CH<sub>3</sub>)
- (20) The group that has its stretching vibration occurred at the highest frequency is (a) C=C (b) C≡C (c) C=O (d) C-C (e) C-O

三. 寫出化學構造 (每題=分)

Write the correct structural formulas for each of the following compounds.

(21) N-Methylpropanamide

(22) 2-Mercaptoethanol

(23) Diisopropyl disulfide

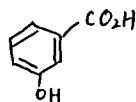
(24) Aspirin

(25) Tripeptide glycylphenylalanylalanine

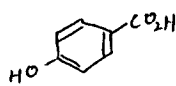
四. 簡答題及配合題

(26) Arrange in decreasing acidity. (3%)

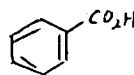
(a)



(b)

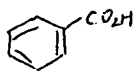


(c)

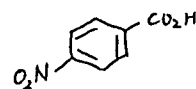


(27) Arrange in order of acidity (greatest to least): (3%)

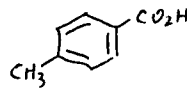
(a)



(b)

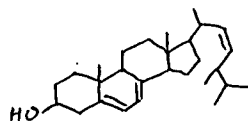


(c)

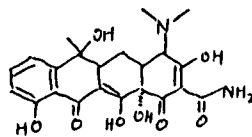


(28) (5%) of the following compounds,

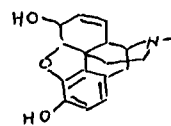
(a)



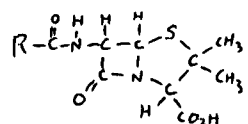
(b)



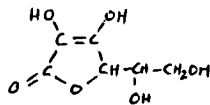
(c)



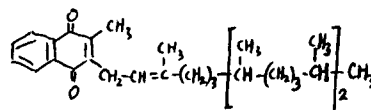
(d)



(e)

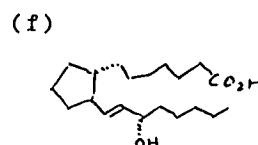
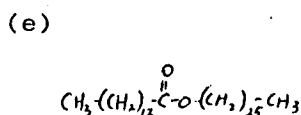
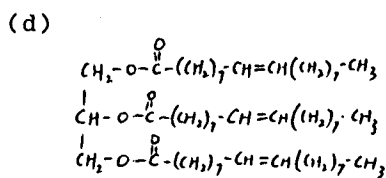
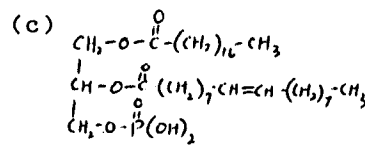
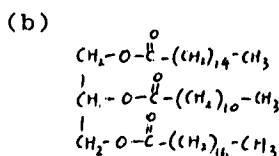
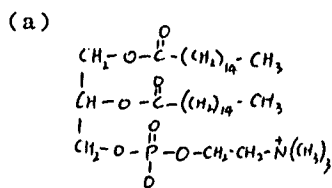


(f)



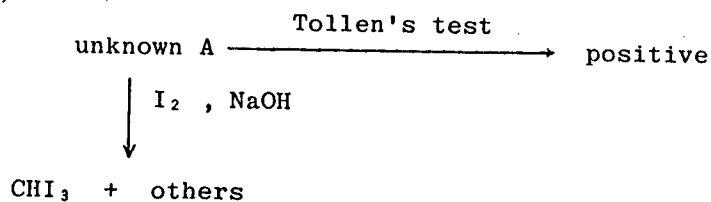
- \_\_\_\_\_ an alkaloid.  
 \_\_\_\_\_ a tetracycline.  
 \_\_\_\_\_ a fat-soluble vitamin.  
 \_\_\_\_\_ a steroid.  
 \_\_\_\_\_ a penicillin.

(29) (5%) of the following compounds:

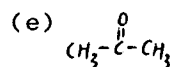
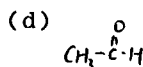
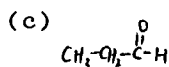
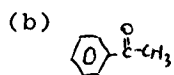
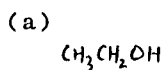


- \_\_\_\_\_ an oil.  
 \_\_\_\_\_ a wax.  
 \_\_\_\_\_ a lecithin.  
 \_\_\_\_\_ a prostaglandin.  
 \_\_\_\_\_ a phosphatidic acid.

(30) (2%)

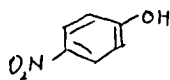


Which of the following could be the unknown A?

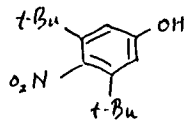


(31) (2%) Which is more acidic? Why?

(a)

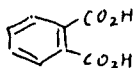


(b)

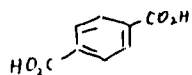


(32) (3%) Explain why the pKa for phthalic acid, as shown in formula (a), is smaller than the pKa for terephthalic acid, as shown in formula (b).

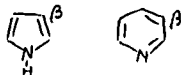
(a)



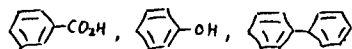
(b)



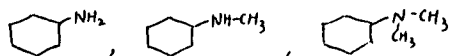
(33) (4%) Explain why pyrrole readily reacts with electrophiles at the beta position, whereas pyridine does not.



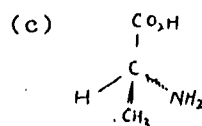
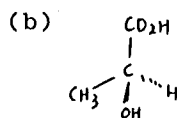
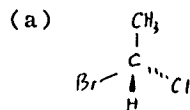
(34) (5%) How would you separate a mixture of the following? Assume that they are dissolved in diethylether.



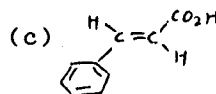
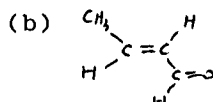
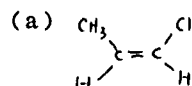
(35) (3%) Suggest chemical tests that would distinguish among the following:



(36) (3%) Identify the configuration of each of the following as R or S:



(37) (3%) Identify each of the following as E or Z:

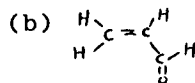
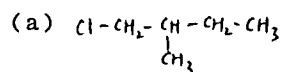


(38) (2%) of the following solvents: (a)  $\text{CCl}_4$ , (b)  $\text{D}_2\text{O}$  (c)  $\text{CH}_3\text{CH}_2\text{OH}$   
(d)  $\text{CDCl}_3$ , (e)  $\text{CD}_3\text{COCD}_3$ , the least desirable for use in nmr spectroscopy is \_\_\_\_\_.

(39) (1%) The longer the wavelength ( $\lambda$ ) of light the \_\_\_\_\_ the energy. (greater, less)

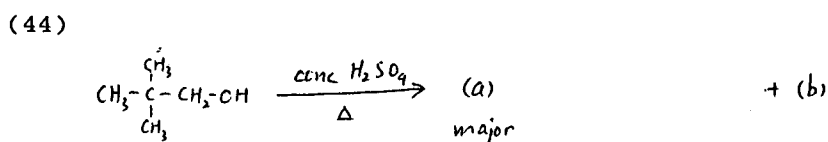
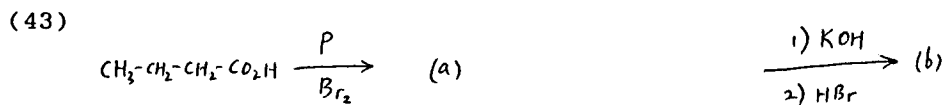
(40) (2%) Esters of long-chain, unbranched fatty acids and long-chain alcohols are called \_\_\_\_\_.

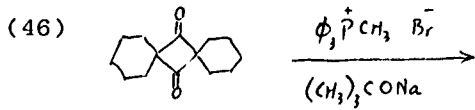
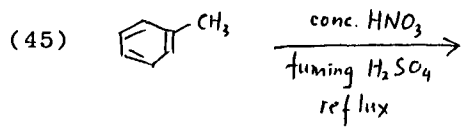
(41) (2%) How many sets of nonequivalent protons are there in



(42) (2%) Given the  $\text{pK}_b$  of  $\text{NH}_3 = 4.76$ , of  $\text{CH}_3\text{NH}_2 = 3.38$ . Which is the stronger base?

五. Complete the following reactions: (每題三分)





六. Propose plausible mechanism, (每題四分)

