

22. A chemist wishes to separate benzoic acid from 4-hydroxybenzaldehyde. Which is the **best** method to achieve this separation?



- (A) Partitioning the mixture between diethyl ether and water.
- (B) Partitioning the mixture between diethyl ether and 1 M aqueous NaHCO_3 .
- (C) Partitioning the mixture between diethyl ether and 1 M aqueous NaOH .
- (D) Partitioning the mixture between diethyl ether and 1 M aqueous HCl .
- (E) Recrystallizing the mixture in diethyl ether.

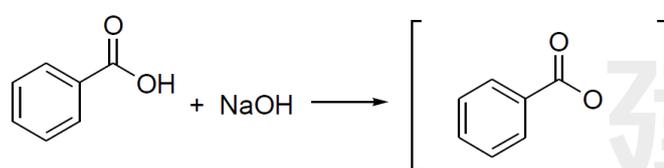
與普化講義 Page 9-73 觀念類似

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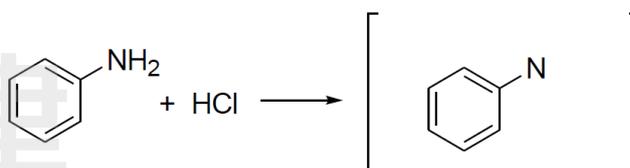
梁傑老師 編授

(3) 進行酸鹼反應可以改變物質對水溶解度

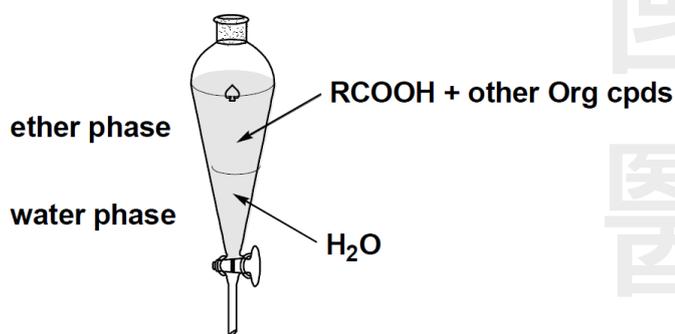
① 酸性物質



② 鹼性物質



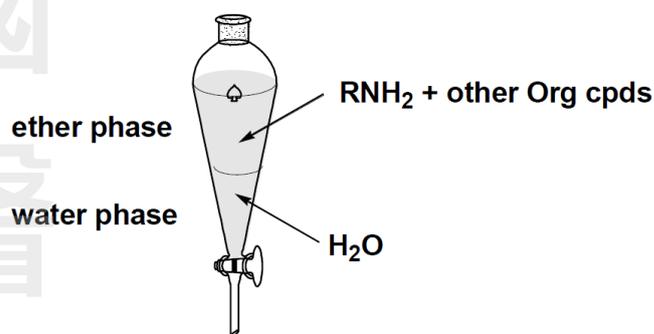
酸鹼萃取(Acid/Base Extraction)純化有機物



① RCO_2H 與其他有機物皆溶於有機層

② 無法藉由簡單萃取分離 RCO_2H

加入 $\text{NaHCO}_3(\text{aq})$



① RNH_2 與其他有機物皆溶於有機層

② 無法藉由簡單萃取分離 RNH_2

加入 $\text{HCl}(\text{aq})$

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24. Which elements are **most** similar in atomic size?

(A) Li ($Z = 3$) and Na ($Z = 11$)

(B) B ($Z = 5$) and Al ($Z = 13$)

(C) Co ($Z = 27$) and Rh ($Z = 45$)

(D) Zr ($Z = 40$) and Hf ($Z = 72$)

(E) Be ($Z = 4$) and F ($Z = 9$)

與普化講義 Page 5-107 觀念相同

● 注意：鑷收縮(lanthanide contraction)起因於 4f 軌域遮蔽不完全

在 La 和 Hf 之間有 15 個鑷系元素，其電子填入 4f 軌域，而 4f 軌域對原子核的遮蔽不像 4s、4p 等軌域那麼明顯，因此 4f 軌域對較外層電子($n=5$ 或 $n=6$)的遮蔽不強，造成較外層電子感受到相對明顯的核電荷，而使 5d 過渡金屬元素半徑並沒有比 4d 過渡金屬元素的半徑大多少。

這也使得同族的 4d 和 5d 過渡金屬的化學性質十分類似，例如：Hf 和 Zr 在自然界中總是一起出現，要把 Hf 和 Zr 分開十分困難。

版權所有 5-107 翻印必究

【版權所有，翻印必究】

62. Cisplatin $\text{cis-}[\text{PtCl}_2(\text{NH}_3)_2]$ has been applied as an anti-tumor drug. What is its main interaction *in vivo*?
- (A) Binding with DNA. (B) Binding with lipid. (C) Binding with protein.
 (D) Binding with sugar. (E) Blocking ion absorption.

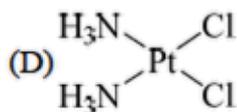
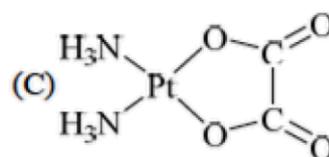
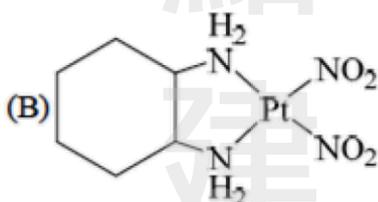
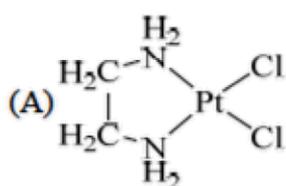
與普化講義 Page 6-116 觀念相同

● 注意：特殊的幾何形狀有應用的價值 \Rightarrow cisplatin

下列何者可當抗癌藥？

- (A) $\text{K}_2[\text{PtCl}_6]$ (B) $\text{cis-}[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ (C) $\text{trans-}[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
 (D) $\text{cis-}[\text{Pt}(\text{NH}_3)_2\text{Cl}_4]$ (E) $\text{trans-}[\text{Pt}(\text{NH}_3)_2\text{Cl}_4]$ 中國 87 (24)

下列錯化合物，何者具有抗癌的活性？



(E) 以上皆是

中國 89 (40)

註: $\text{cis-Pt}(\text{NH}_3)_2\text{Cl}_2$ 的商業名稱為順鉑(cisplatin)，是一種化療藥物。順鉑為第一種含鉑抗癌藥物，此類藥物還包括卡鉑(carboplatin)及草酸鉑(oxaliplatin)。這些鉑的錯合物在活體內參與反應與鍵結，造成 DNA 交聯(crosslinking of DNA)，最後引發癌細胞凋亡，而順鉑的幾何異構物-反鉑(transplatin)並無此機制。

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68. NF_3 has a bond angle of 102.5° , while PF_3 has a bond angle of 96.3° . What is the **best** explanation for the larger bond angle in NF_3 ?
- (A) The nitrogen $2s$ orbital participates more in bonding than the phosphorus $3s$ orbital does.
 - (B) Nitrogen is more electronegative than phosphorus.
 - (C) NF_3 has no unpaired electrons while PF_3 has two unpaired electrons.
 - (D) NF_3 is an ionic compound while PF_3 forms covalent bonds.
 - (E) NF_3 adopts a trigonal geometry, while PF_3 displays a trigonal planar configuration.

與普化講義 Page 6-56 觀念相同

● **注意：簡易的預測模型一定會有例外 (simple models will certainly have exceptions)**

雖然 VSEPR 理論在預測大部分化學鍵角上都十分成功，但還是有少數分子的鍵角不符合 VSEPR 理論的預測。例如： PH_3 (93.8°)的鍵角與 NH_3 (106.6°)的鍵角差很多。

原因：

The sulfur atom has two of the p orbitals singly occupied, and overlap of hydrogen $1s$ orbital could produce two bonds at 90° . Similarly, the phosphorus atom has the three $3p$ orbitals singly occupied, and overlap of three hydrogen $1s$ orbitals could lead to three bonds at 90° .

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75. When the permanganate ion, MnO_4^- , acts as an oxidizing agent which forms different products depending on the pH of the solution. Which species corresponding to the conditions listed below is **correct**?

	acidic	basic	neutral
A	Mn^{2+}	Mn(OH)_2	MnO_2
B	Mn^{2+}	MnO_4^{2-}	MnO_2
C	MnO_2	MnO_4^{2-}	Mn(OH)_2
D	Mn^{2+}	Mn(OH)_2	MnO_4^{2-}
E	MnO_2	Mn(OH)_2	MnO_4^{2-}

(A) A

(B) B

(C) C

(D) D

(E) E

與普化解析(英文題目)第二回第 42 題完全相同

42. When the permanganate ion, MnO_4^- , acts as an oxidizing agent it forms different products depending on the pH of the solution. Which species correspond to the conditions listed?

	acidic	basic	neutral
A	Mn^{2+}	Mn(OH)_2	MnO_2
B	Mn^{2+}	MnO_4^{2-}	MnO_2
C	MnO_2	MnO_4^{2-}	Mn(OH)_2
D	Mn^{2+}	Mn(OH)_2	MnO_4^{2-}

(A) A

(B) B

(C) C

(D) D

(E) None of the above

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