Chia Nhóm 4 em/nhóm

<u>Lựa chọn 1</u>: ***viết bài luận***. Mỗi nhóm chọn một chất hữu cơ nào đó, và viết về nó. Viết từ 1250 đến1500 từ, và có từ 2 đến 4 hình minh họa.

Chiếm 30% thi giữa kỳ.

Nội dung viết

Giới thiệu về chất, tại sao chọn viết về chất đó.
Tên gọi chất đó
Tính chất hóa lý và giải thích những tính chất này
Lịch sử khám phá ra chất, nguồn gốc trong thiên nhiên, và phương pháp sản xuất công nghiệp (nếu có).
Phương pháp bảo quản và vận chuyển.
Ứng dụng của chất đó (trong quá khứ và hiện nay) và nêu ví dụ
Tác hại của chất đó ra sao, nêu ví dụ
Ý kiến riêng của nhóm về chất đó.

Tiêu chí chấm điểm

- Nội dung hấp dẫn và ý nghĩa
- Trình bày đẹp, súc tích, mạch lạc
- Bố cục logic, dễ đọc dễ hiểu, nội dung tập trung vào chủ đề (không lan man)
- Có sử dụng từ chuyên ngành hóa học, khoa học dược, thực phẩm, sức khỏe…
- Có sử dụng tài liệu tham khảo uy tín (như báo nghiên cứu khoa học, sách chuyên ngành, sách giáo khoa, báo cáo…đặc biệt là tài liệu Tiếng Anh).
- Không (hoặc rất ít) sai lỗi chính tả, dấu chấm câu.

Nộp file pdf và word về địa chỉ: lequocchon@gmail.com

Deadline: 16h00 ngày 22 tháng 2 năm 2019.

Chia Nhóm 5 em/nhóm

Lựa chọn 2: ***làm poster***. Mỗi nhóm chọn một chất hữu cơ nào đó và viết, vẽ về nó. Trình bày đẹp trên poster giấy A0.
Nộp bảng giấy A0 và file pdf, và pptx.

Chiếm 30% thi giữa kỳ.

Chia Nhóm 5 em/nhóm

Lựa chọn 3: ***làm mô hình chất***. Mỗi nhóm chọn một chất hữu cơ nào đó và làm mô hình 3D về nó từ vật liệu gỗ, kim loại, nhựa, thủy tinh.... Mô hình đẹp, phân biệt dễ dàng các nhóm chức, cân đối (kích thước liên kết, nguyên tử). Nộp mô hình và hình lưu niệm của nhóm.

Chiếm 30% thi giữa kỳ.

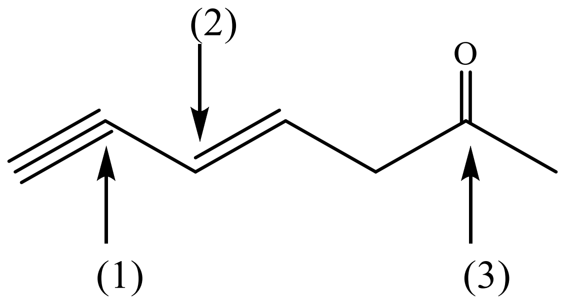
Gửi mail đăng ký nhóm và lựa chọn bài tập
về địa chỉ mail:
lequocchon@gmail.com
tên Sinh viên đại diện liên lạc
danh sách thành viên nhóm.
Đăng ký trước ngày 9/1/2019

Lịch tư vấn học tập

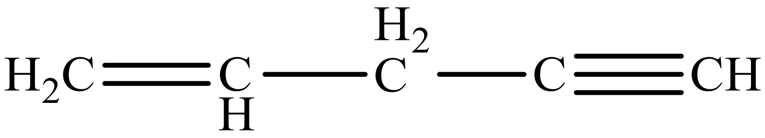
Nếu một số em nào cần tôi tư vấn thêm để học tốt môn hóa hữu cơ thì hãy liên hệ hẹn với tôi qua mail trước ít nhất 24 giờ. Tôi sẽ có ở phòng 707 (tầng 7), Khoa Tự Nhiên, số 3 đường Quang Trung vào sáng Thứ 5 và Chiều Thứ 6 hàng tuần.

lequocchon@gmail.com

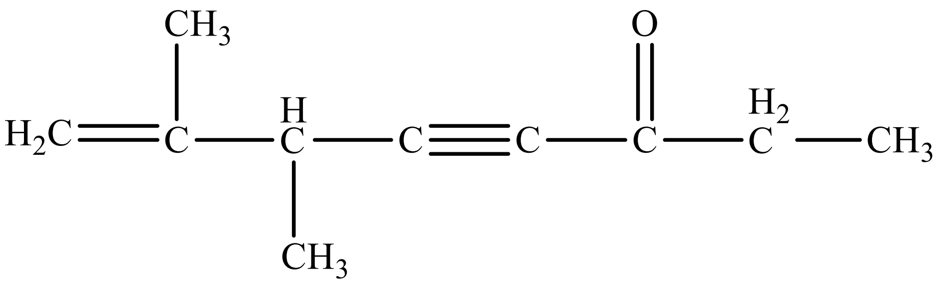
1. Lai hóa của các nguyên tử Carbon được chỉ ra sau đây là:



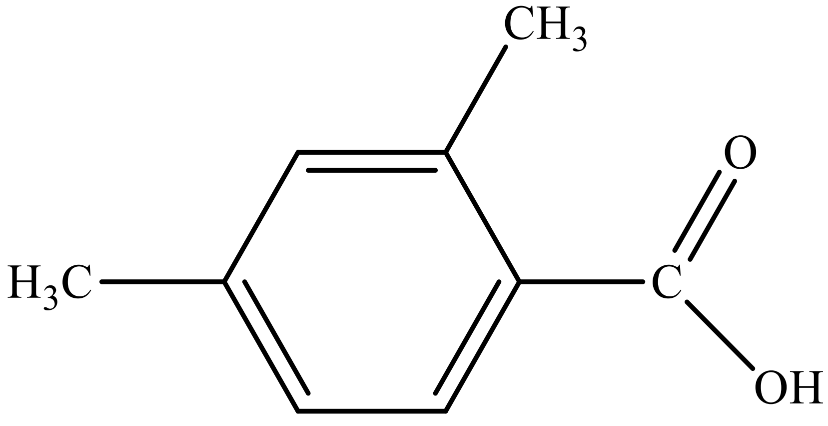
2. Số lượng liên kết σ và liên kết π trong hợp chất sau đây là:



3. Có bao nhiêu nguyên tử Carbon có lai hóa sp^3 trong hợp chất sau:

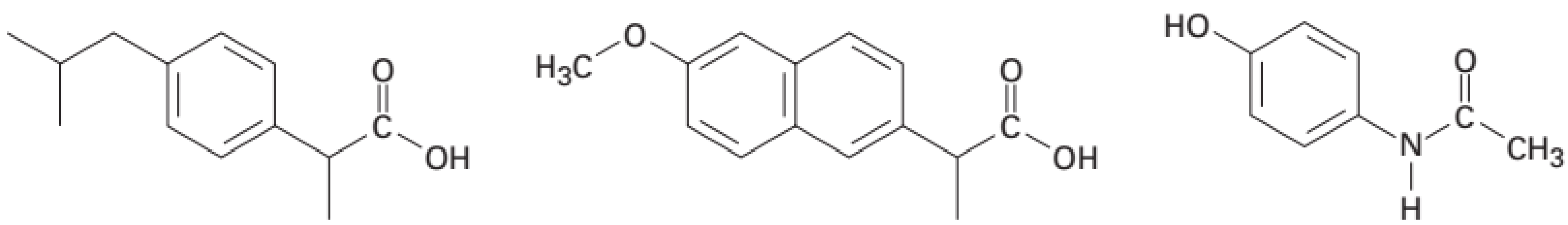


4. Có bao nhiêu nguyên tử carbon có lai hóa sp^2 trong hợp chất sau:



5. Tìm C có lai hóa sp^3, sp^2 trong các chất sau?

Among the most common over-the-counter drugs you might find in a medicine cabinet are mild pain relievers such ibuprofen (Advil, Motrin), naproxen (Aleve), and acetaminophen (Tylenol).

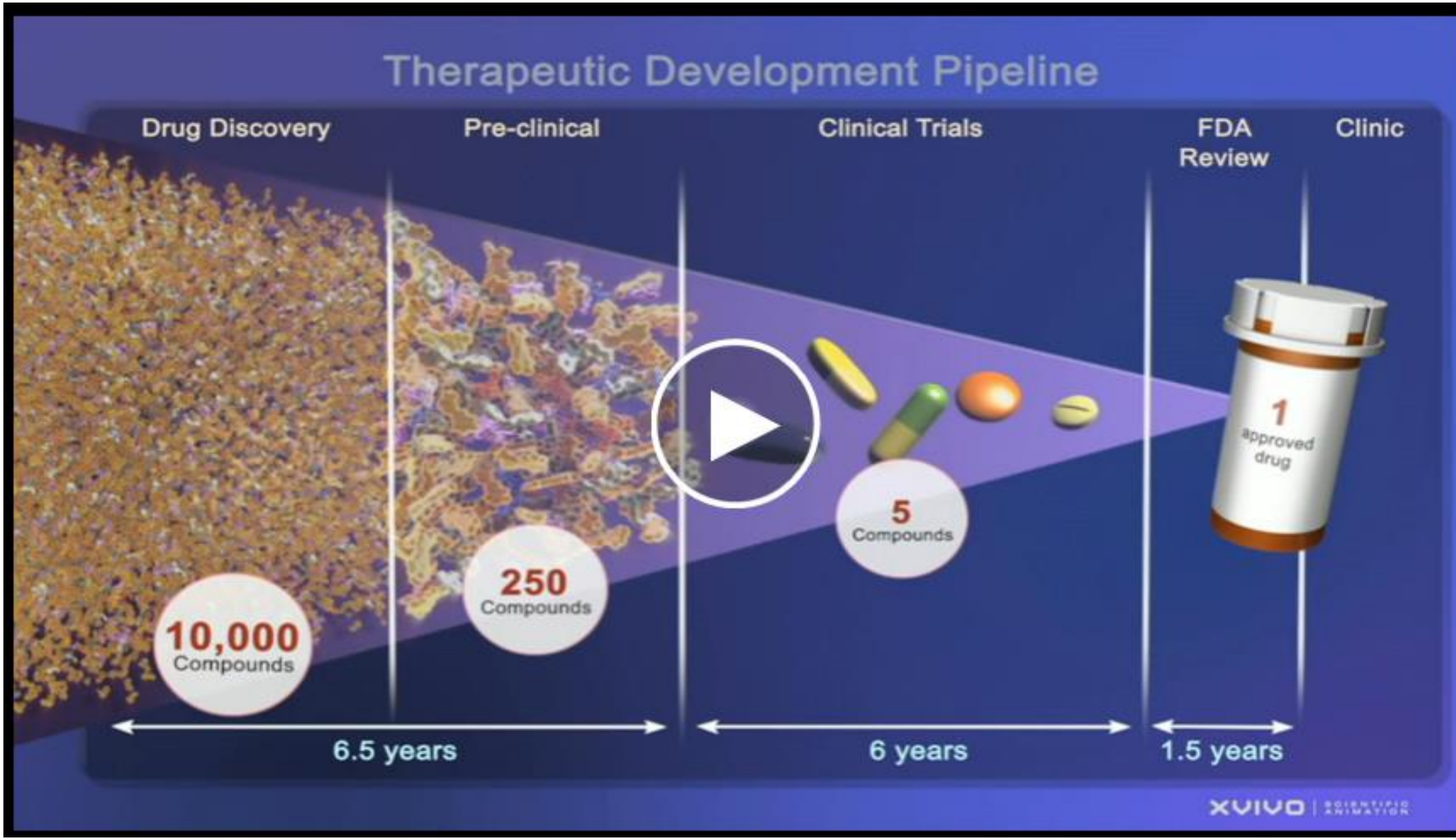


Ibuprofen Naproxen Acetaminophen

(a) How many sp^3-hybridized carbons does each molecule have?

(b) How many sp^2-hybridized carbons does each molecule have?

(c) Can you spot any similarities in their structures?



Today we know the molecular cause of 4,000 diseases, but treatments are available for only 250 of them. So what's taking so long?

Francis Collins: We need better drugs on TED talk

Organic Chemistry

CHE 203

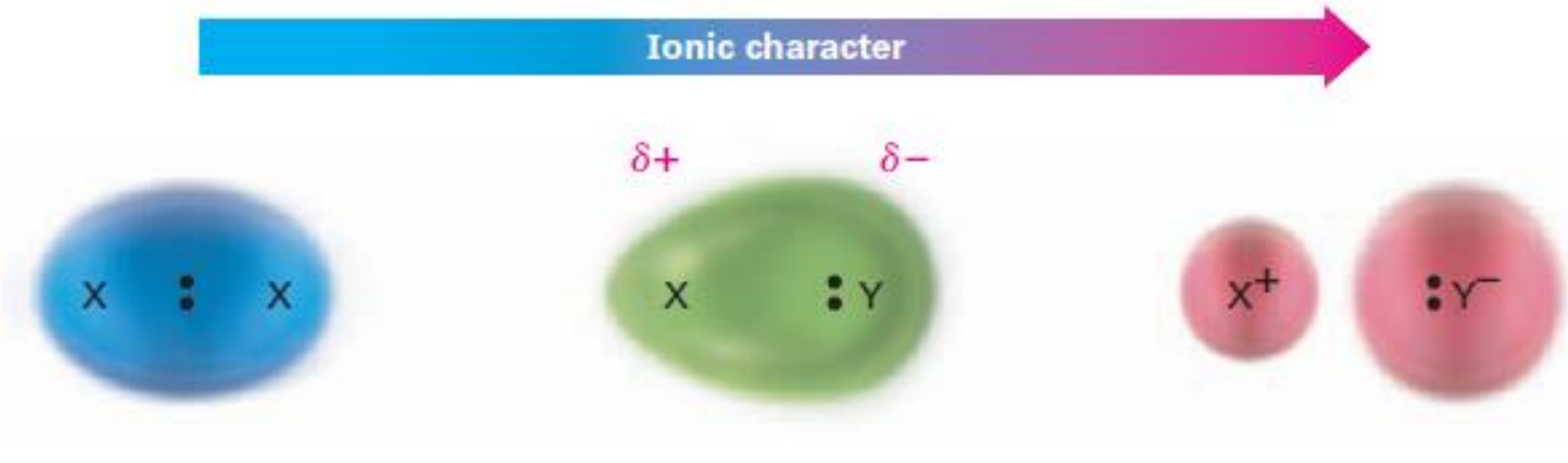
Lecture 2: Covalent bonds, acids & bases

Le Quoc Chon – Duy Tan University

Bonding and molecules

- Electronegativity (độ âm điện)
- Dipole moments
- Formal charges
- Resonance
- Acids and Bases: Brønsted-Lowry vs Lewis
- Noncovalent interactions

Electronegativity



Covalent bond

< 0.5

Polar covalent

0.5 - 2

Ionic bond

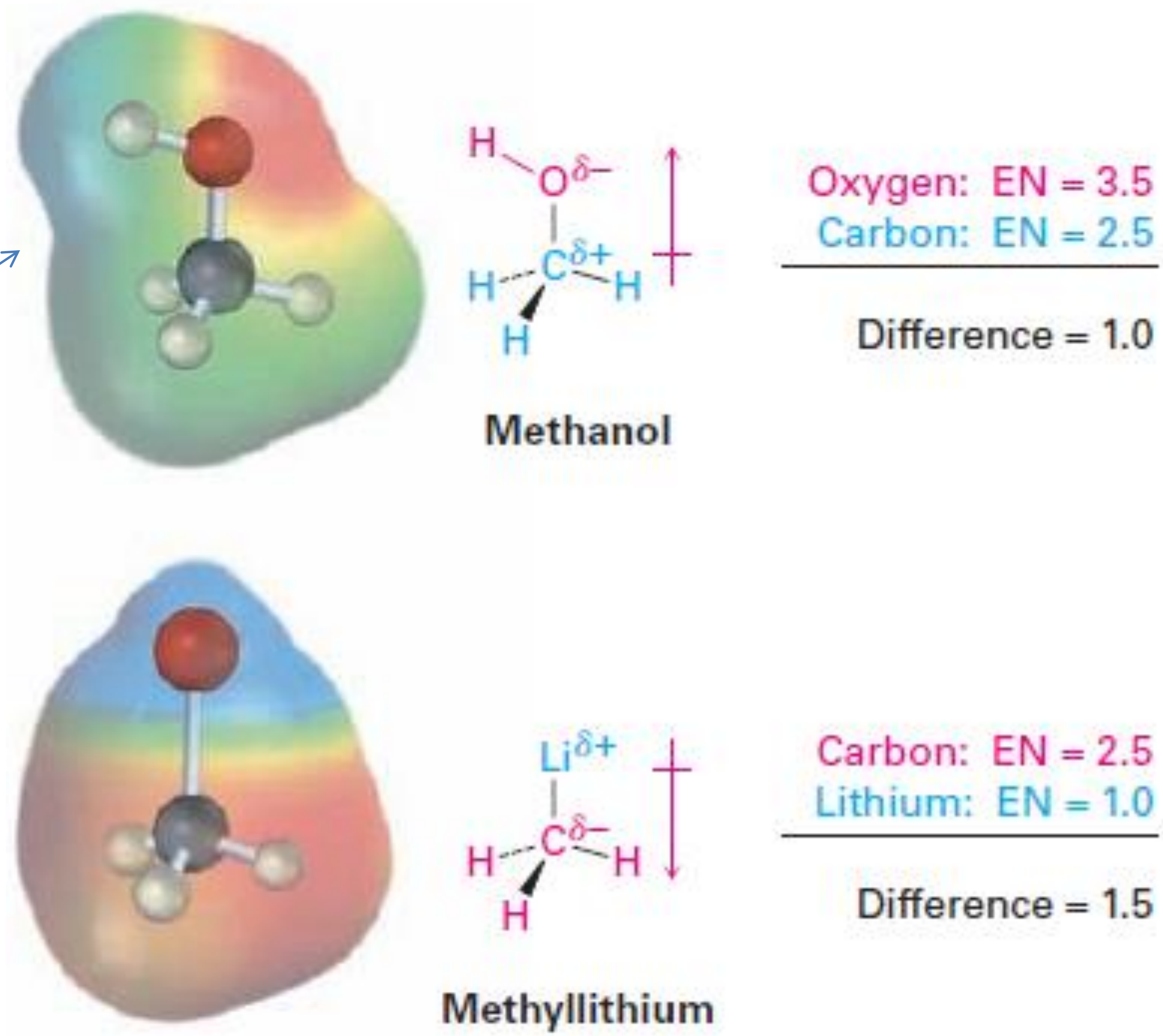
> 2

Electronegativity

Trend in periodic table!

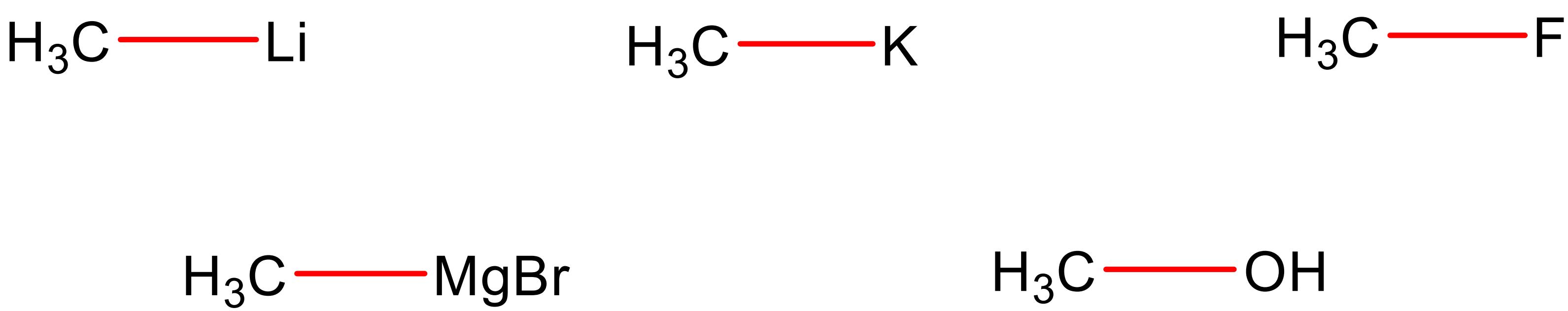
H 2.1																	He
Li 1.0	Be 1.6											B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	Ne
Na 0.9	Mg 1.2											Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0	Ar
K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.9	Ni 1.9	Cu 1.9	Zn 1.6	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8	Kr
Rb 0.8	Sr 1.0	Y 1.2	Zr 1.4	Nb 1.6	Mo 1.8	Tc 1.9	Ru 2.2	Rh 2.2	Pd 2.2	Ag 1.9	Cd 1.7	In 1.7	Sn 1.8	Sb 1.9	Te 2.1	I 2.5	Xe
Cs 0.7	Ba 0.9	La 1.0	Hf 1.3	Ta 1.5	W 1.7	Re 1.9	Os 2.2	Ir 2.2	Pt 2.2	Au 2.4	Hg 1.9	Tl 1.8	Pb 1.9	Bi 1.9	Po 2.0	At 2.1	Rn

Electrostatic potential map



Problem 2.3

Rank the following bonds (red) from least to most polar:



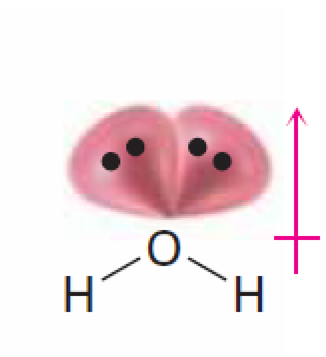
Solubility

(khả năng hòa tan trong nhau)

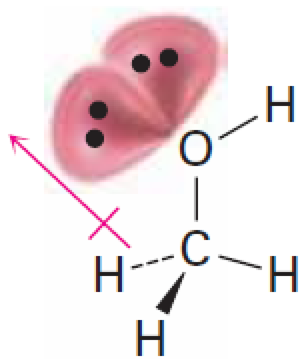
Dipole moment

$$\mu = \sum_{i}^{N} q_i * \vec{r}_i$$

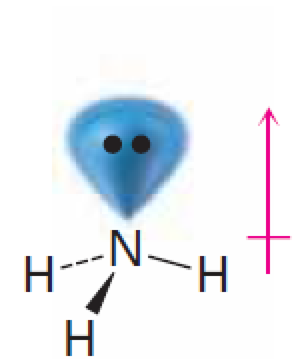
coulomb meters (C.m)
1 Debyes = $3.336*10^{-30}$ C.m



Water
(μ = 1.85 D)



Methanol
(μ = 1.70 D)



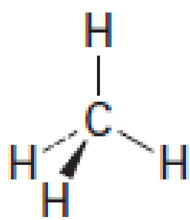
Ammonia
(μ = 1.47 D)

Direction: positive to negative >< physics

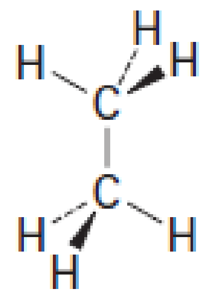
Dipole moment

Symmetrical structures have zero dipole moment

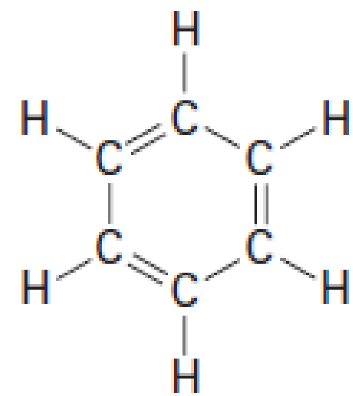
Carbon dioxide
(μ = 0)



Methane
(μ = 0)



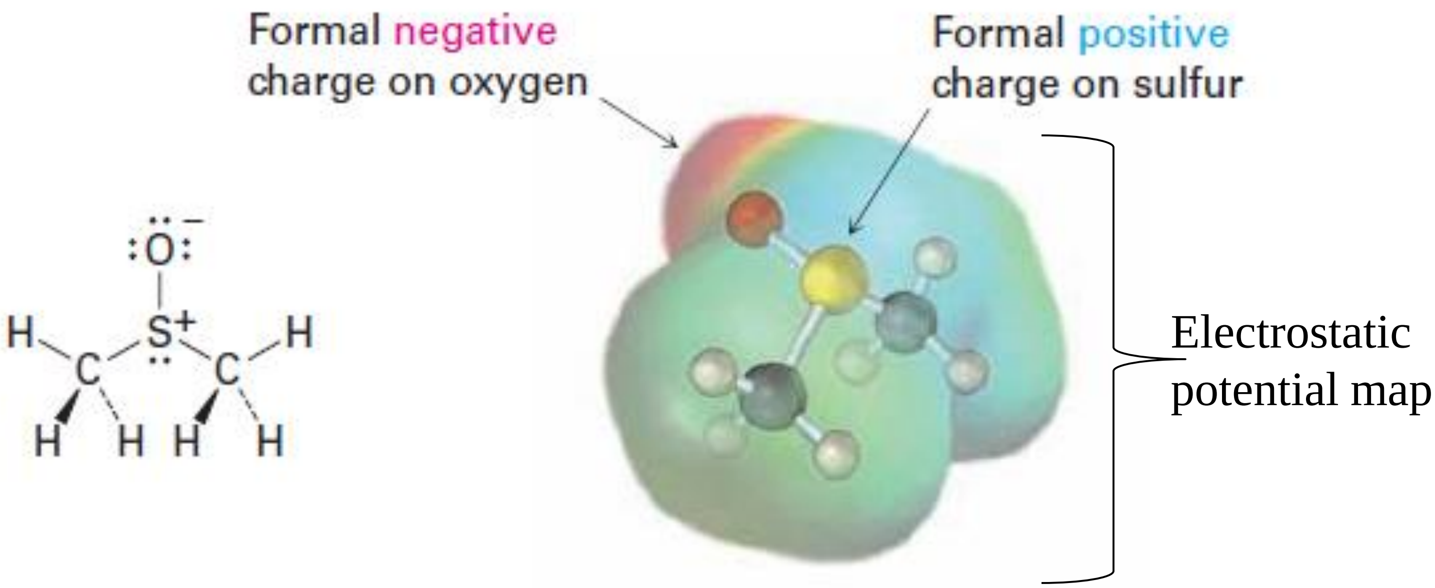
Ethane
(μ = 0)



Benzene
(μ = 0)

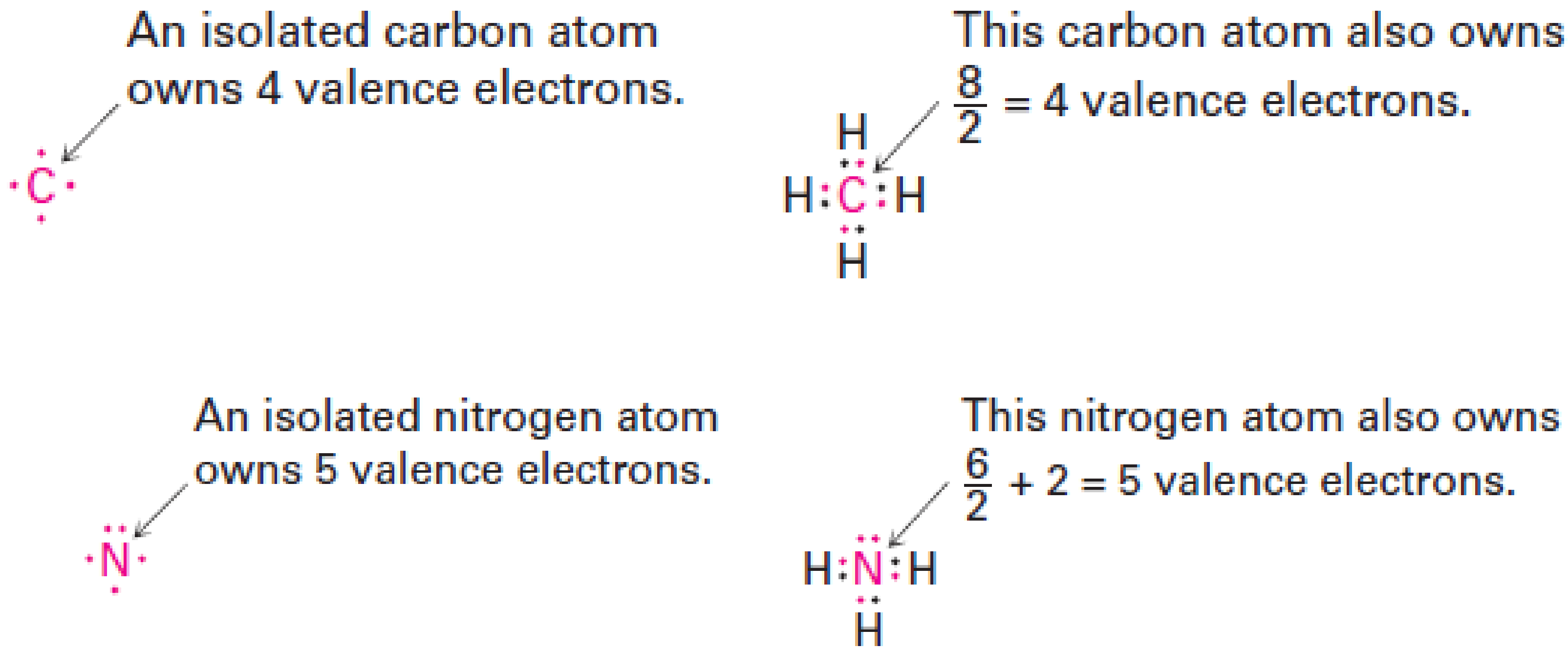
Formal charges

DMSO is used for cell line preservation at low temperature.



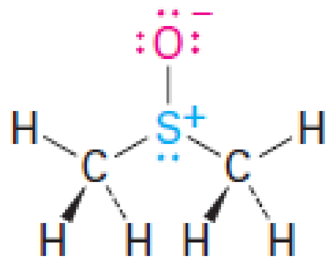
Dimethyl sulfoxide

Formal charges



Number of valence electrons in isolated = bonded atom

Formal charges



For sulfur:

Sulfur valence electrons = 6
Sulfur bonding electrons = 6
Sulfur nonbonding electrons = 2

Formal charge = 6 − 6/2 − 2 = +1

For oxygen:

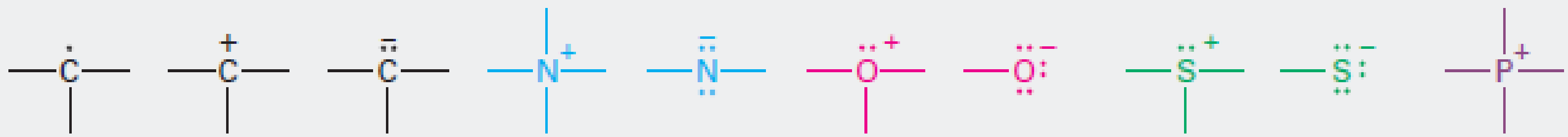
Oxygen valence electrons = 6
Oxygen bonding electrons = 2
Oxygen nonbonding electrons = 6

Formal charge = 6 − 2/2 − 6 = −1

$$\textbf{Formal charge} = \left(\begin{array}{c}\text{Number of}\\ \text{valence electrons}\\ \text{in free atom}\end{array}\right) - \left(\begin{array}{c}\text{Number of}\\ \text{valence electrons}\\ \text{in bonded atom}\end{array}\right)$$

Summary: formal charges

TABLE 2-2 A Summary of Common Formal Charges

Atom	C			N		O		S		P
Structure										
Valence electrons	4	4	4	5	5	6	6	6	6	5
Number of bonds	3	3	3	4	2	3	1	3	1	4
Number of nonbonding electrons	1	0	2	0	4	2	6	2	6	0
Formal charge	0	+1	−1	+1	−1	+1	−1	+1	−1	+1

Problem 2.7 & 2.8

PROBLEM 2-7

Calculate formal charges for the nonhydrogen atoms in the following molecules:

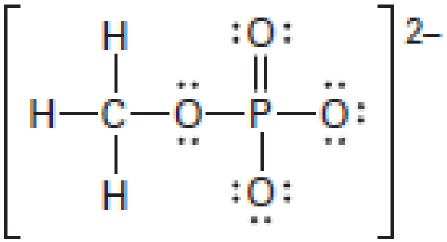
(a) Diazomethane, $H_2C{=}N{=}\ddot{N}:$

(b) Acetonitrile oxide, $H_3C{-}C{\equiv}N{-}\ddot{\underset{\cdot\cdot}{O}}:$

(c) Methyl isocyanide, $H_3C{-}N{\equiv}C:$

PROBLEM 2-8

Organic phosphate groups occur commonly in biological molecules. Calculate formal charges on the four O atoms in the methyl phosphate dianion.



Methyl phosphate dianion

Technology Quarterly: Q3 2003

NUTRITION

We are what we eat

Studies linking how genes and diet interact are helping food companies design products capable of protecting people prone to certain diseases

Sep 4th 2003

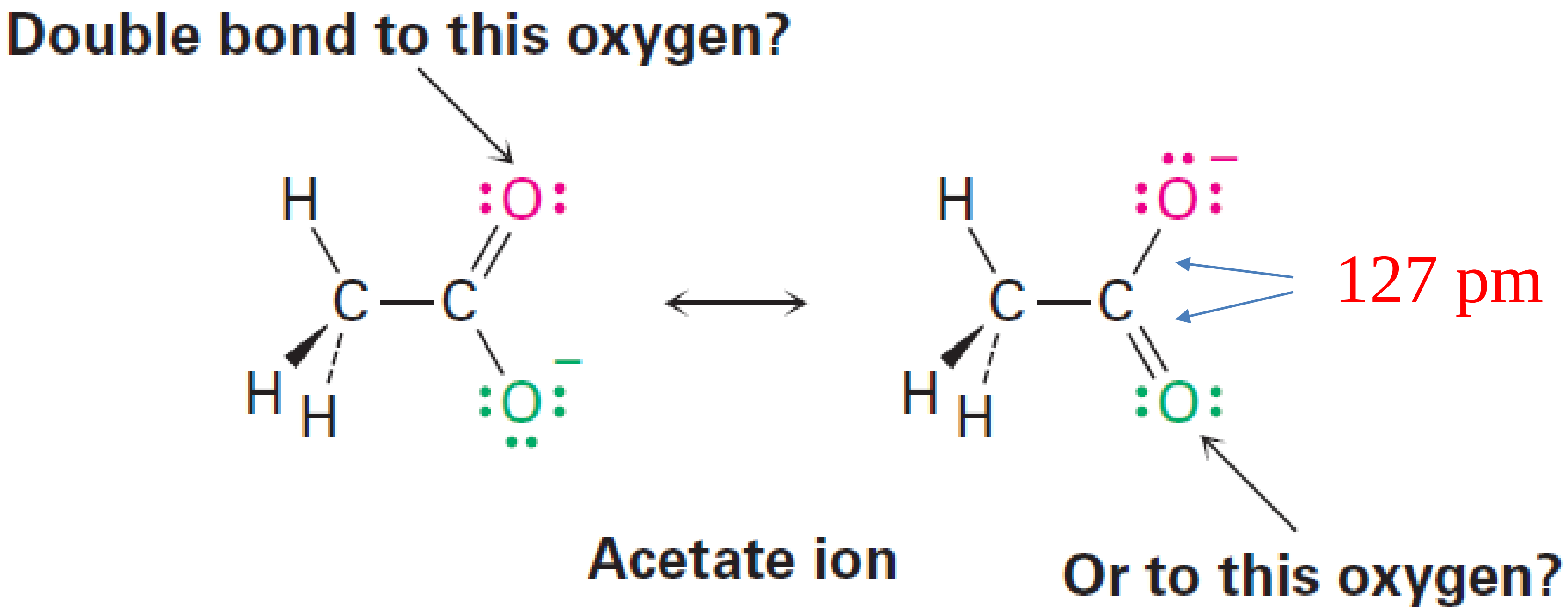
Timekeeper | Like 40 | Tweet

Anthony Blake

Eat what your genes like

SOME people eat three-egg omelettes topped with slivers of bacon and show no sign of a spike in cholesterol. Others indulge in one chocolate bar after another and stay as thin as a rake. Many, however, are less fortunate. Current research suggests that the culprit may be found in one's genes. Differences in

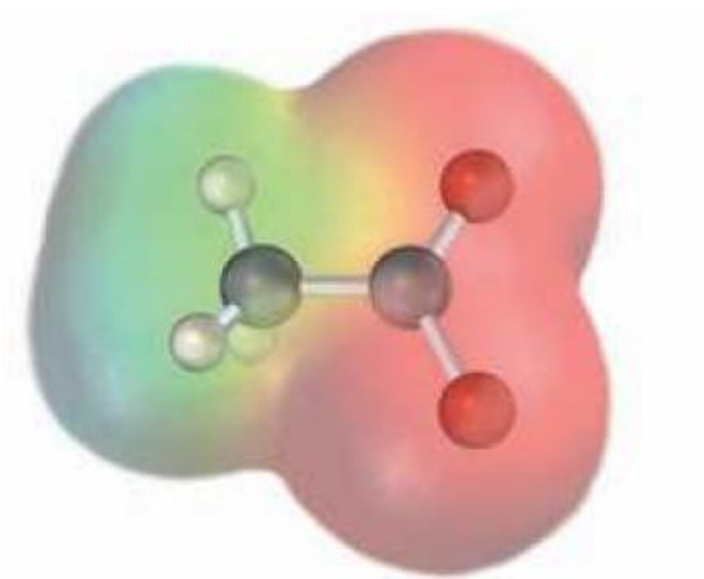
Resonance



C-O: 135 pm
C=O: 120 pm

Resonance

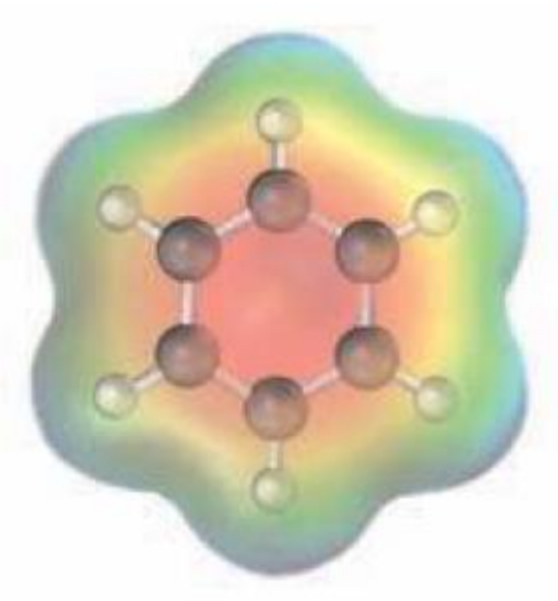
Delocalization of electrons equally well on two oxygen atoms.

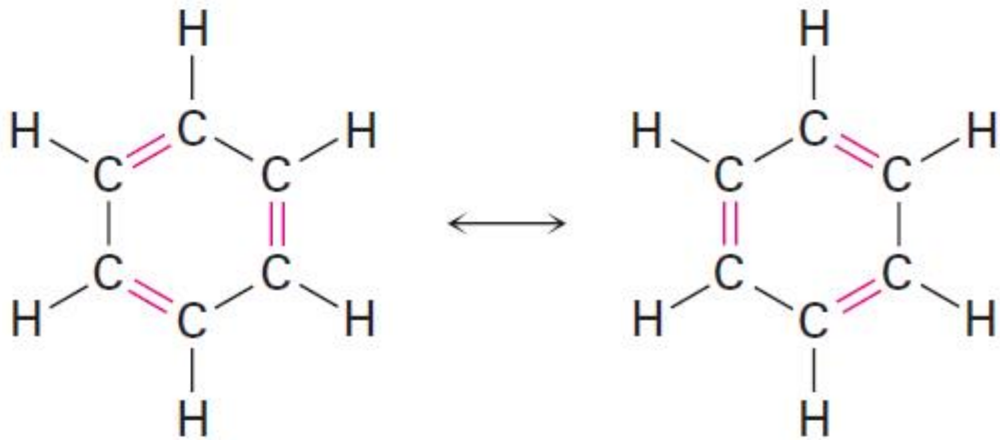


Acetate ion—two resonance forms

The limit of line-bond structures?

Resonance





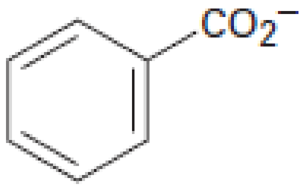
Benzene (two resonance forms)

Problem 2.10

PROBLEM 2-10

Draw the indicated number of resonance forms for each of the following species:

(a) The methyl phosphate anion, $CH_3OPO_3^{2-}$ (3)
(b) The nitrate anion, NO_3^- (3)
(c) The allyl cation, $H_2C{=}CH{-}CH_2^+$ (2)
(d) The benzoate anion (4)



Acid and Bases

The Brønsted-Lowry:

acid: (cho H^+) donate hydrogen ion, H^+

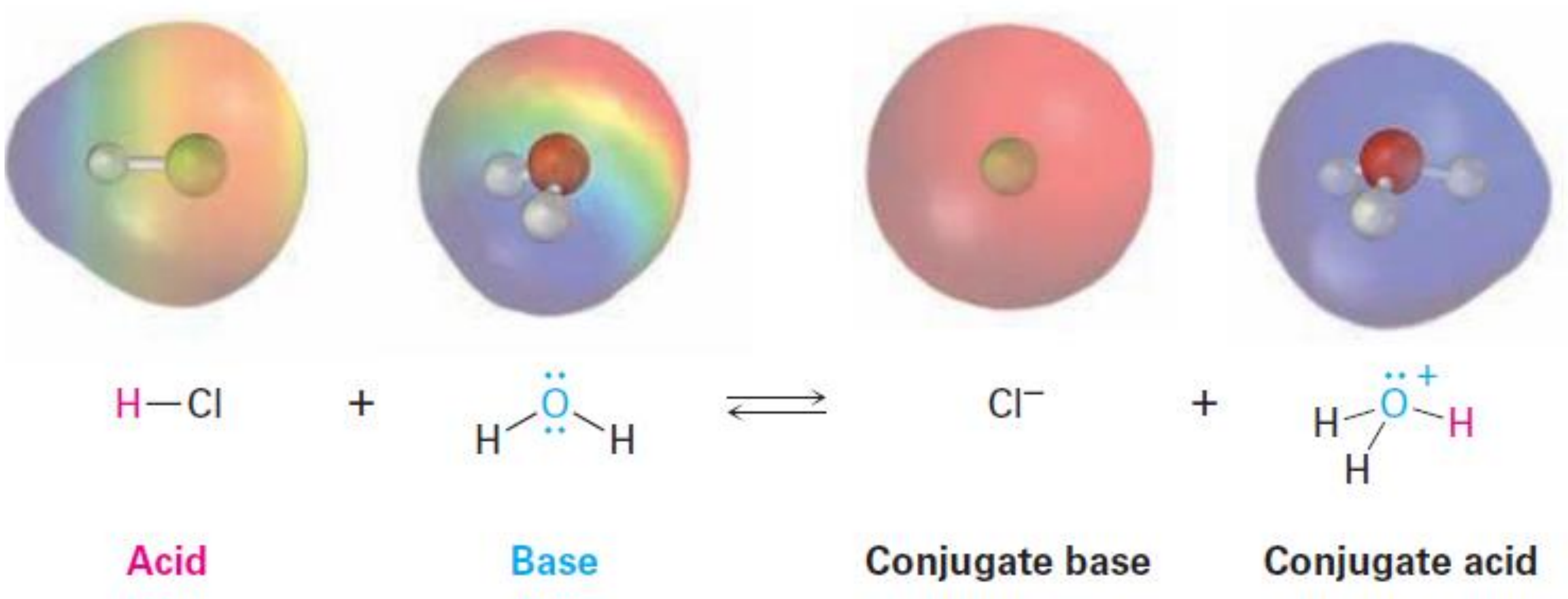
base: (nhận H^+) ccept hydrogen ion, H^+

The Lewis

acid: accept electron pair

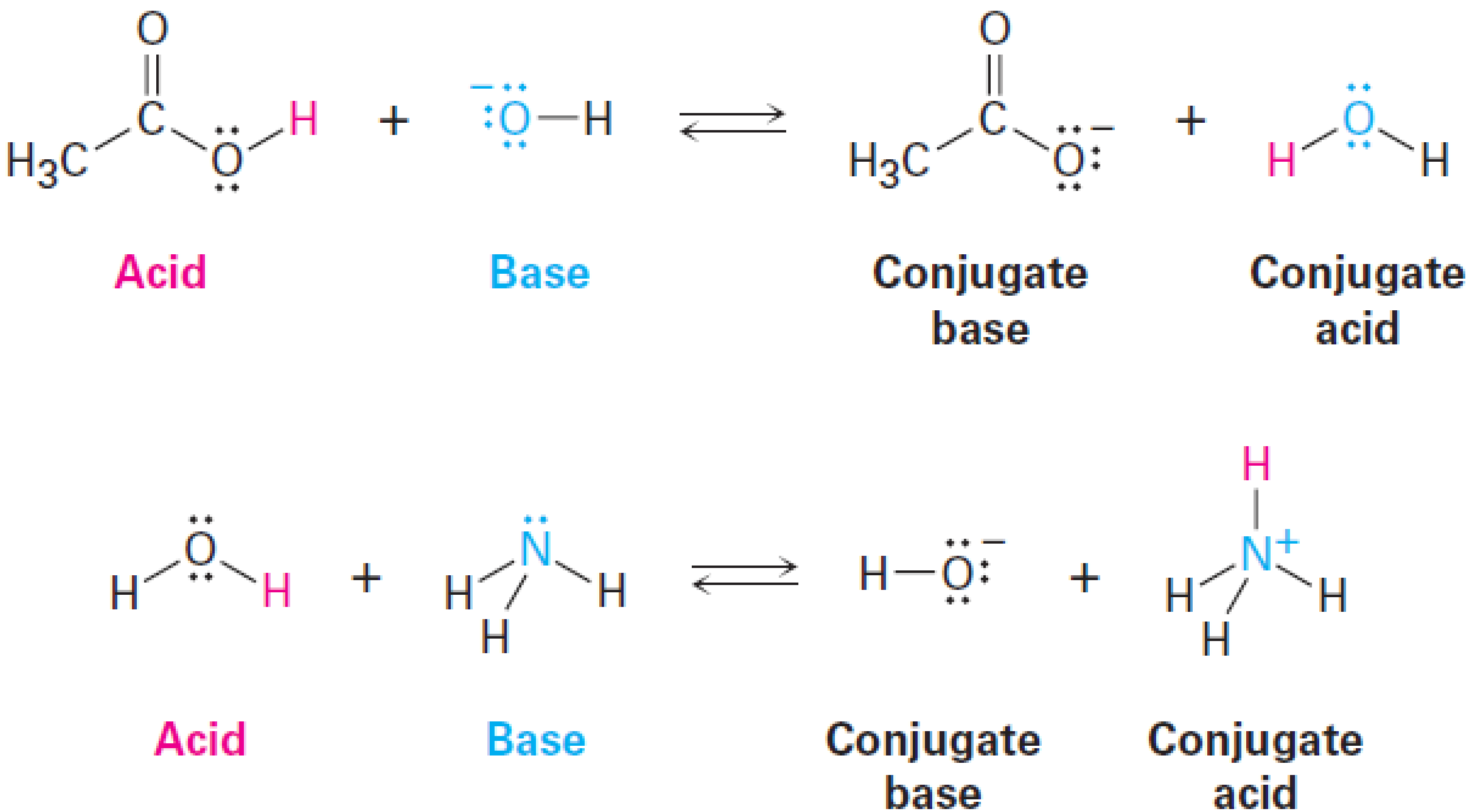
base: donate electron pair

Acid & Bases: Brønsted-Lowry



(hydronium ion)

Acid & Bases: Brønsted-Lowry



Problem 2.11

PROBLEM 2-11

Nitric acid (HNO_3) reacts with ammonia (NH_3) to yield ammonium nitrate. Write the reaction, and identify the acid, the base, the conjugate acid product, and the conjugate base product.

Acid and base strength

(độ mạnh yếu của acid và base)

$$HA + H_2O \rightleftharpoons A^- + H_3O^+$$

$$K_a = \frac{[H_3O^+][A^-]}{[HA]}$$

$$pK_a = -\log K_a$$

Why pKa?

Acid and base strength

(độ mạnh yếu của acid và base)

TABLE 2-3 Relative Strengths of Some Common Acids and Their Conjugate Bases

	Acid	Name	pK_a	Conjugate base	Name	
Weaker acid	CH_3CH_2OH	Ethanol	16.00	$CH_3CH_2O^-$	Ethoxide ion	Stronger base
	H_2O	Water	15.74	HO^-	Hydroxide ion	
	HCN	Hydrocyanic acid	9.31	CN^-	Cyanide ion	
	$H_2PO_4^-$	Dihydrogen phosphate ion	7.21	HPO_4^{2-}	Hydrogen phosphate ion	
	CH_3CO_2H	Acetic acid	4.76	$CH_3CO_2^-$	Acetate ion	
	H_3PO_4	Phosphoric acid	2.16	$H_2PO_4^-$	Dihydrogen phosphate ion	
	HNO_3	Nitric acid	−1.3	NO_3^-	Nitrate ion	
Stronger acid	HCl	Hydrochloric acid	−7.0	Cl^-	Chloride ion	Weaker base

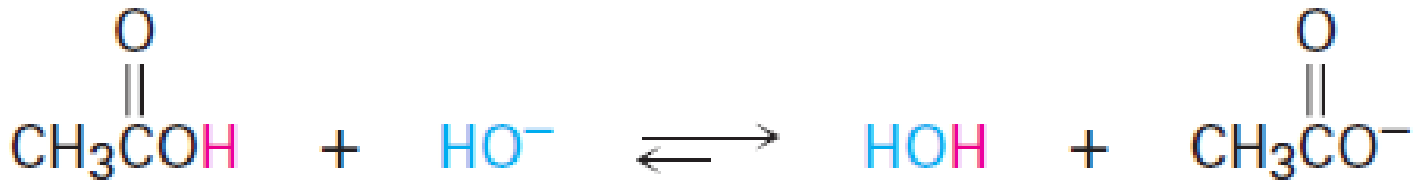
Problem 2.13

PROBLEM 2-13

Amide ion, H_2N^-, is a much stronger base than hydroxide ion, HO^-. Which is the stronger acid, NH_3 or H_2O? Explain.

Acid-base reaction

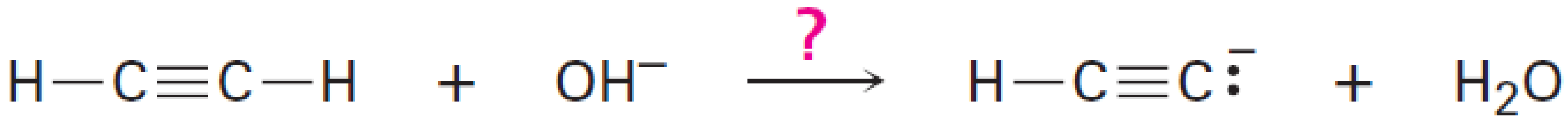
(phản ứng của acid và base)



Stronger acid | Stronger base | Weaker acid | Weaker base

Acid-base reaction

pKa of water 15.74 and of acetylene is 25. Which is the stronger acid? Does hydroxide ion reacts to a significant extent with acetylene?

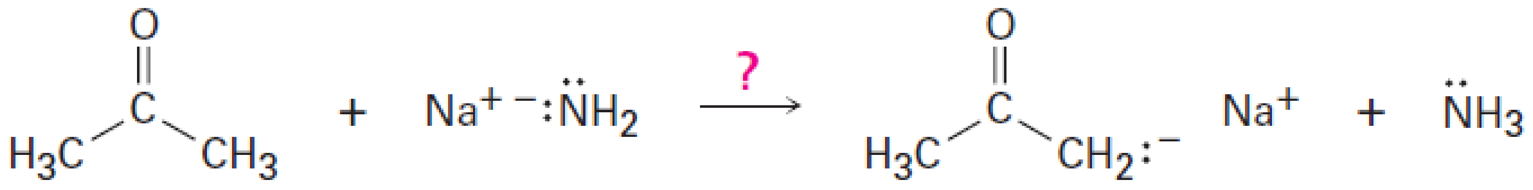


Acetylene

Problem 2.15

PROBLEM 2-15

Ammonia, NH_3, has p$K_a \approx 36$, and acetone has p$K_a \approx 19$. Will the following reaction take place to a significant extent?

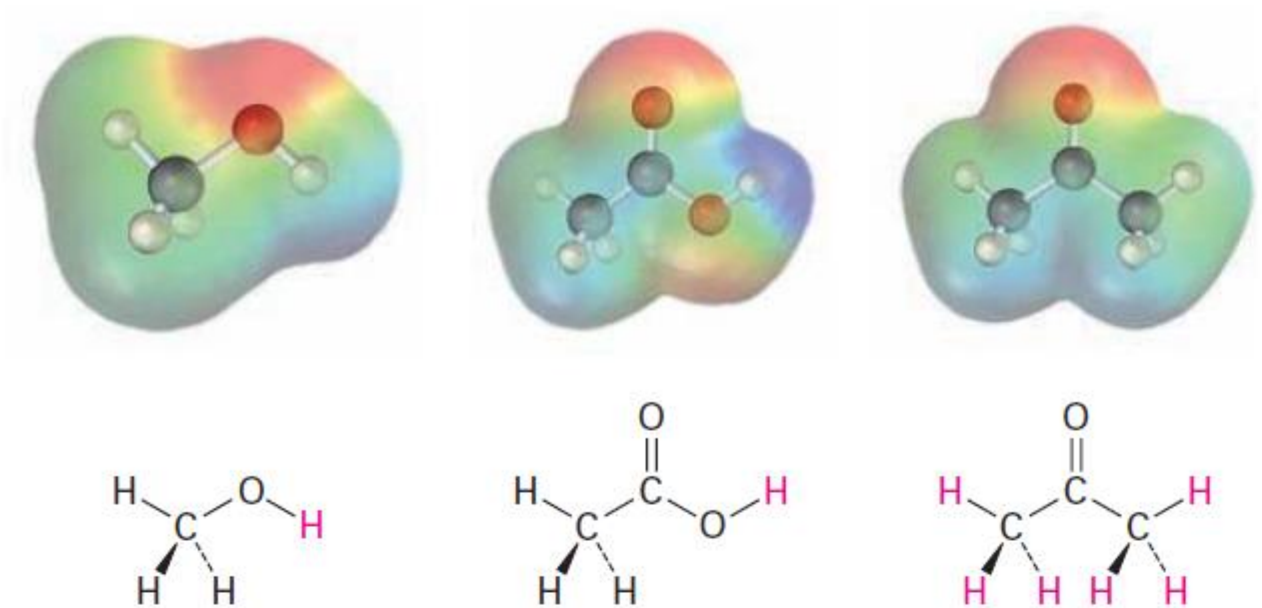


Acetone

Organic acids/bases

(acid/base hữu cơ)

Some organic acids

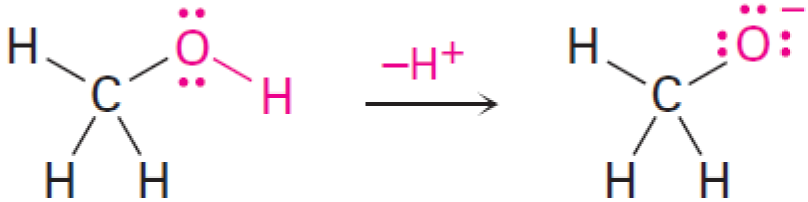


Methanol (pK_a = 15.54)

Acetic acid (pK_a = 4.76)

Acetone (pK_a = 19.3)

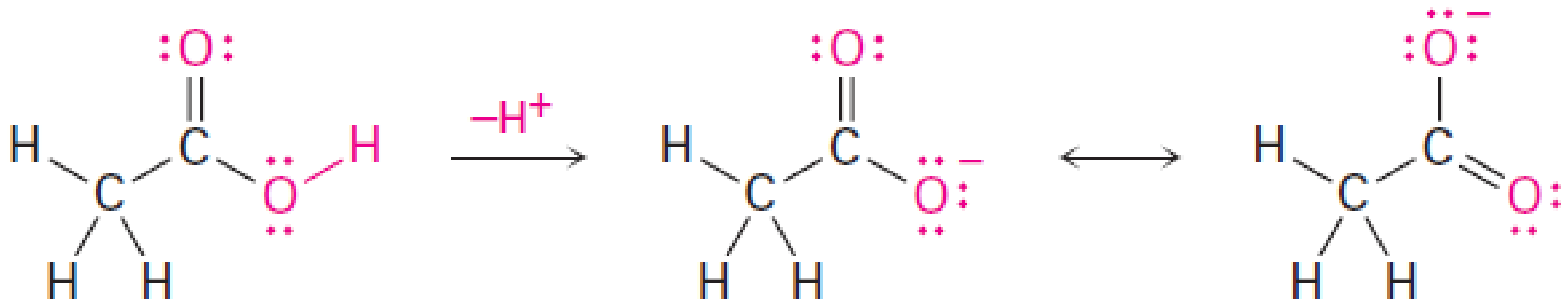
Organic acids/bases
(acid/base hữu cơ)



Anion is stabilized by having negative charge on a highly electronegative atom.

Anion bền nhờ điện tích âm phân bố trên nguyên tử có độ âm điện cao

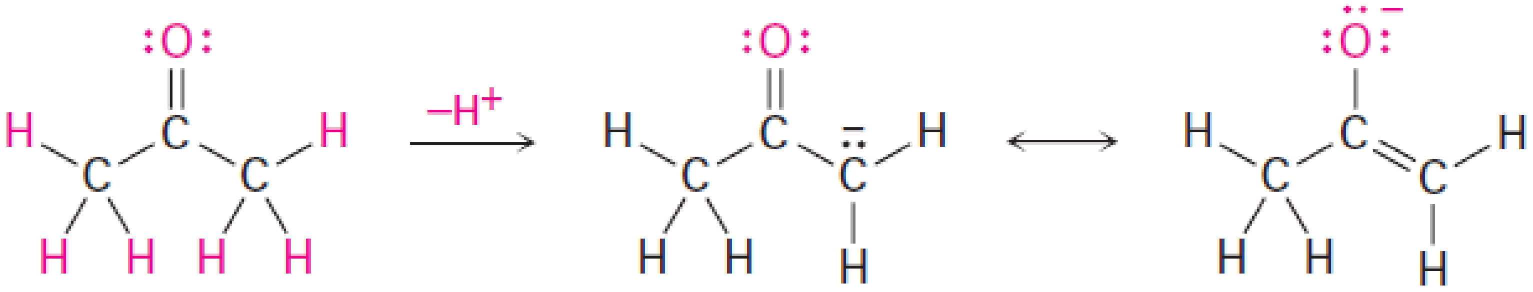
Organic acids/bases



Anion is stabilized both by having negative charge on a highly electronegative atom and by resonance.

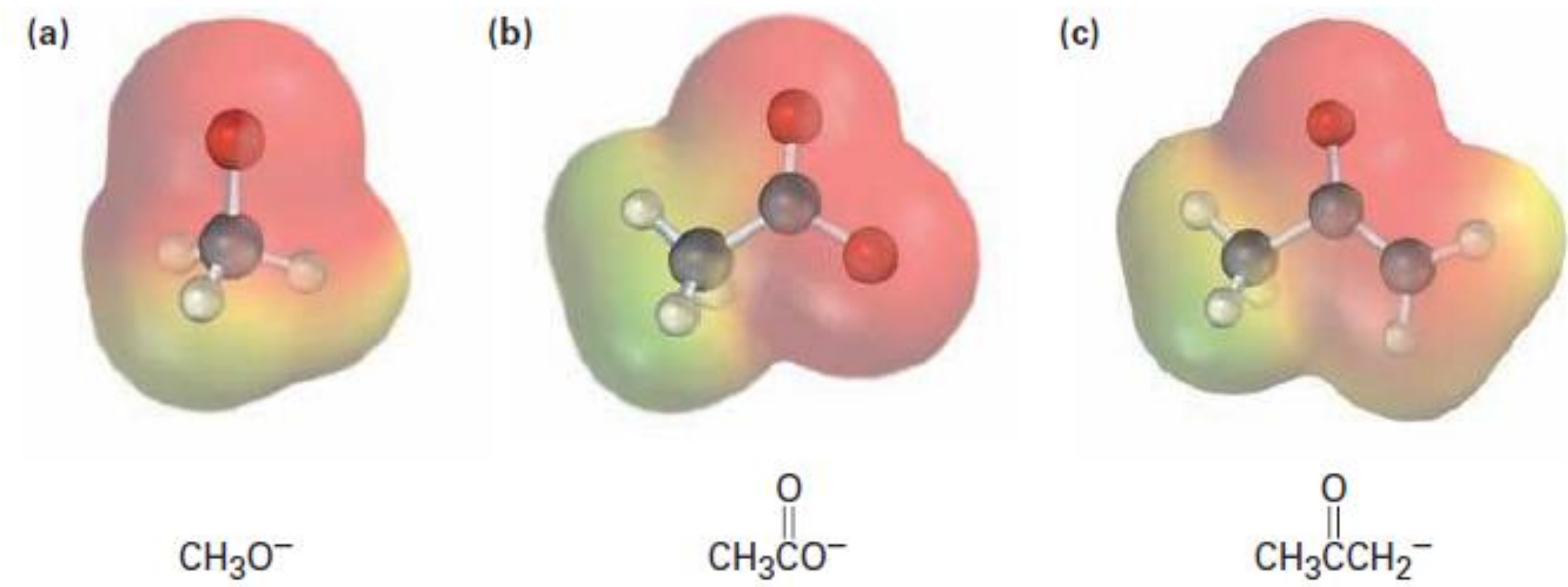
Anion bền nhờ điện tích âm phân bố trên nguyên tử có độ âm điện cao và hiện tượng dịch chuyển điện tích resonance

Organic acids/bases

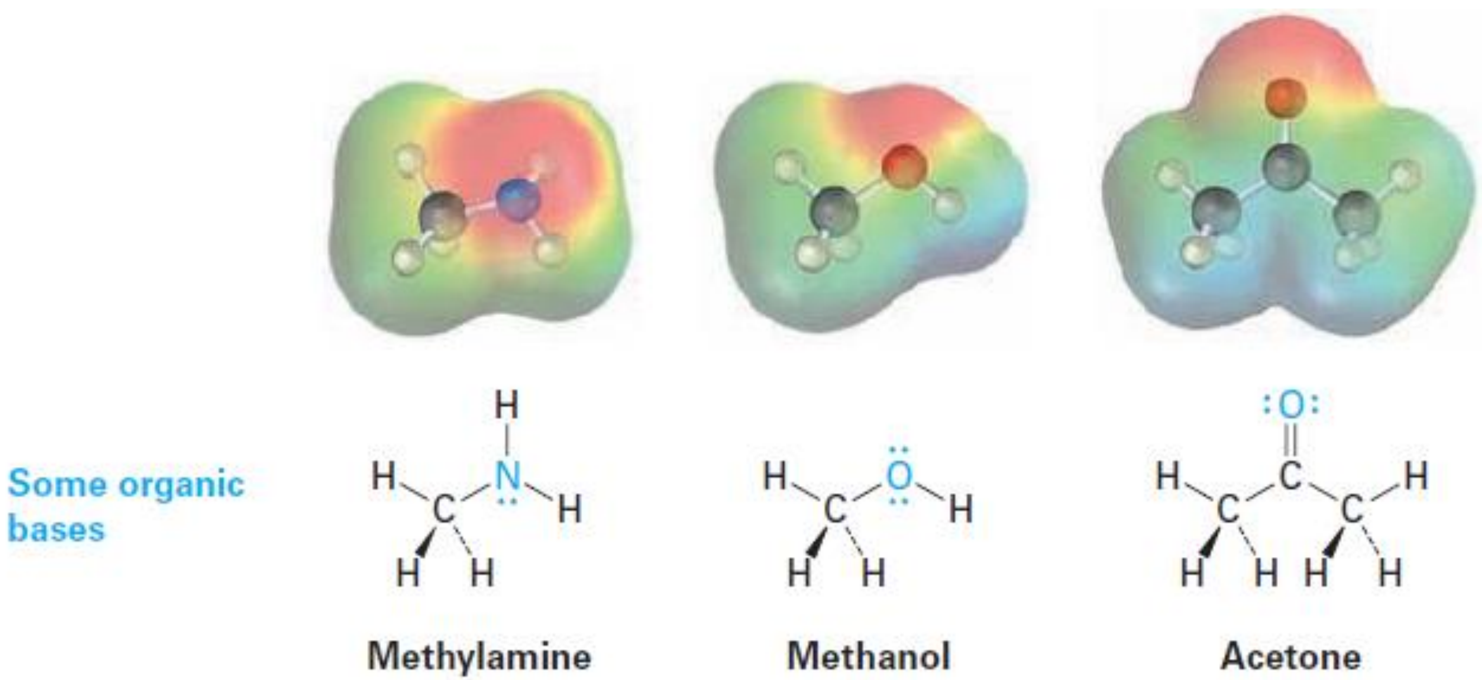


Anion is stabilized both by resonance and by having negative charge on a highly electronegative atom.

Organic acids/bases



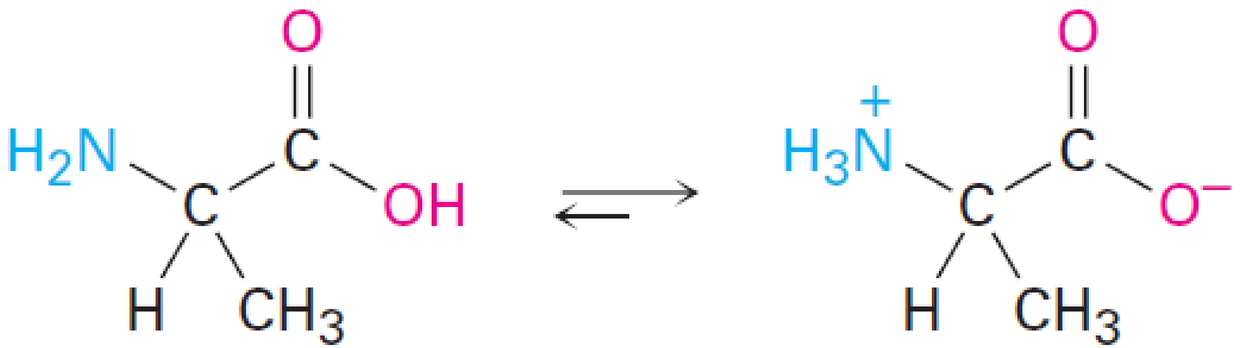
Organic bases



Oxygen or Nitrogen can accept proton H^{+}

Zwitterion: acid & base

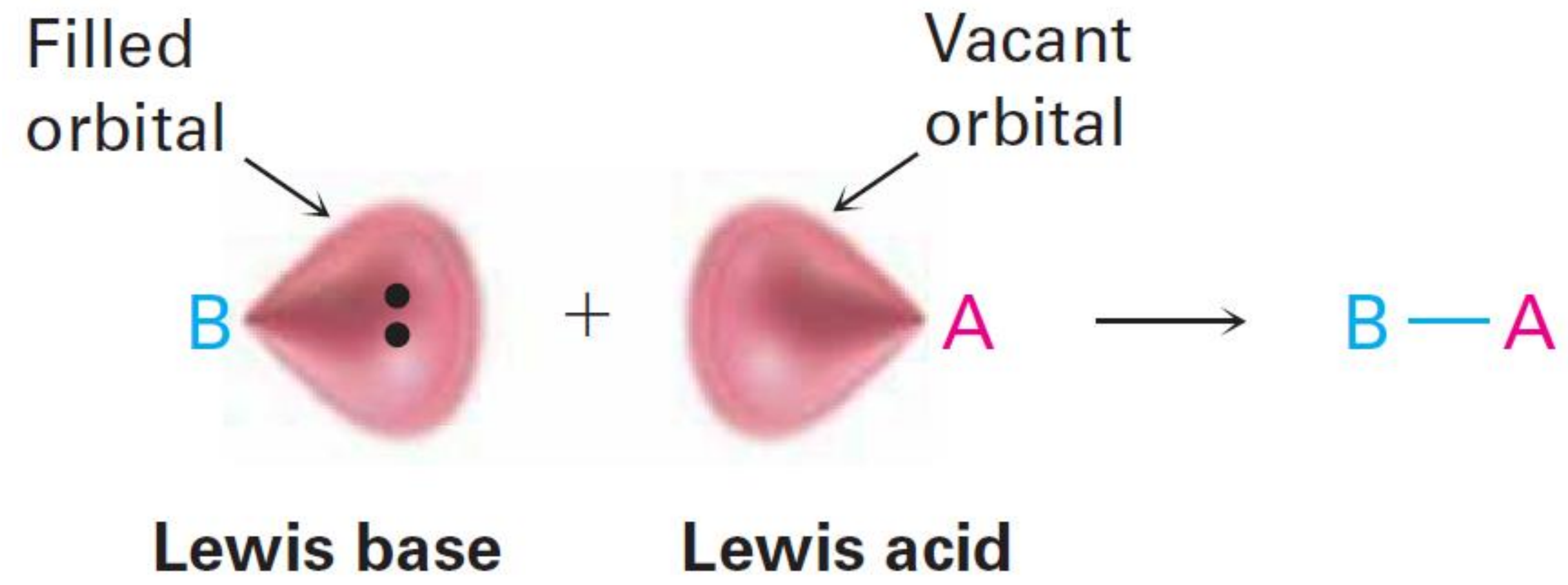
(tích điện âm và dương trên cùng một phân tử)



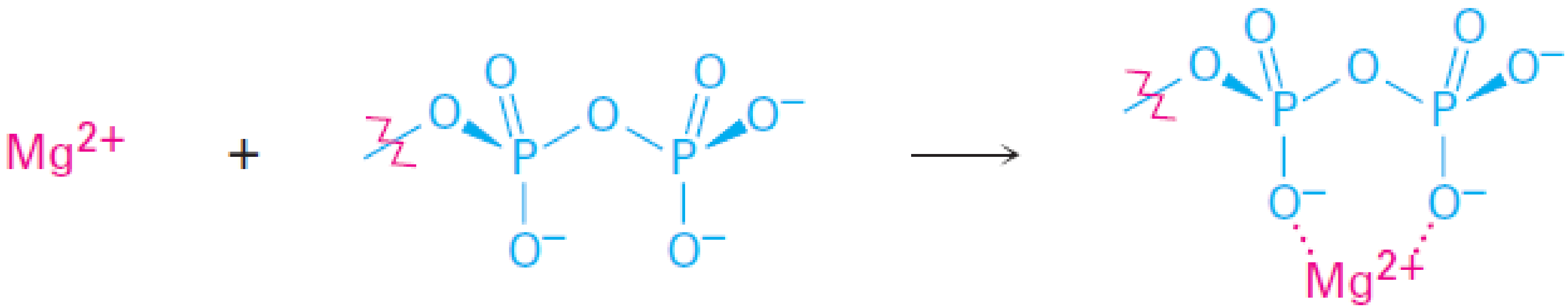
Alanine (uncharged form)

Alanine (zwitterion form)

Lewis acids & bases

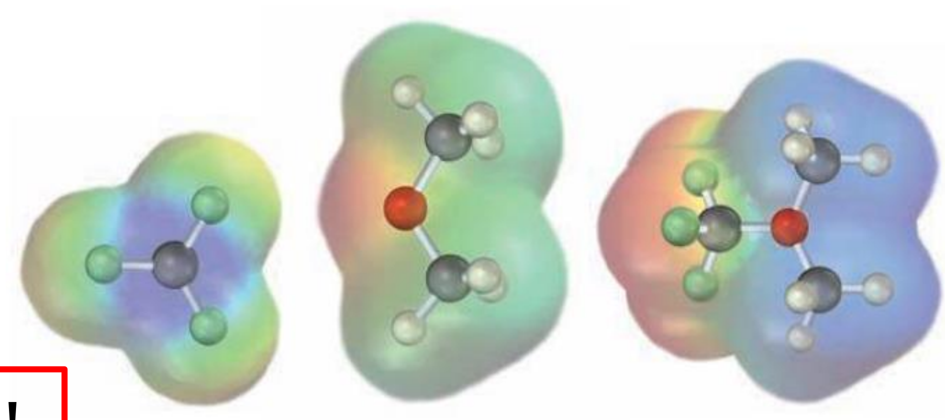


Lewis acids

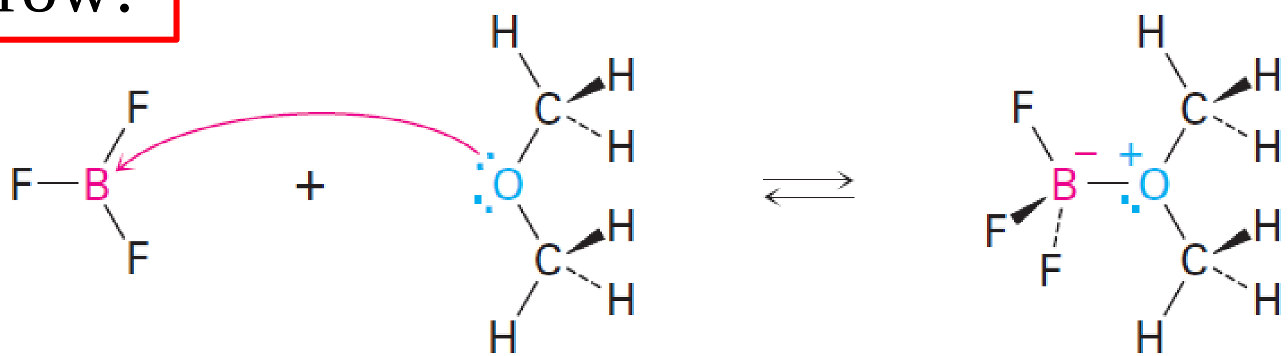


Lewis acid | **Lewis base (an organodiphosphate ion)** | **Acid–base complex**

Lewis acids



Curved arrow!



Boron trifluoride (Lewis acid)

Dimethyl ether (Lewis base)

Acid–base complex

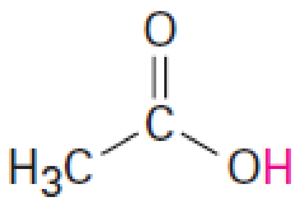
(một số Lewis acid)

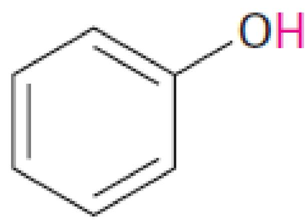
Lewis acids

Some Lewis acids

Some neutral proton donors:

H_2O HCl HBr HNO_3 H_2SO_4





CH_3CH_2OH

A carboxylic acid **A phenol** **An alcohol**

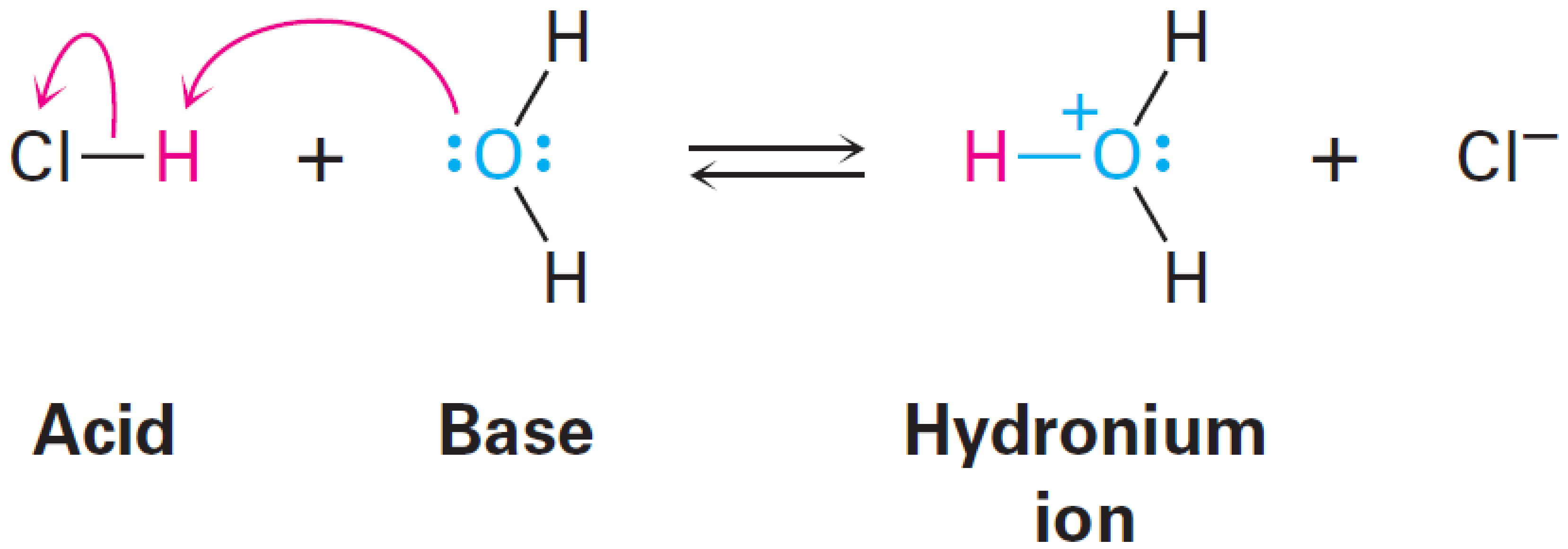
Some cations:

Li^+ Mg^{2+}

Some metal compounds:

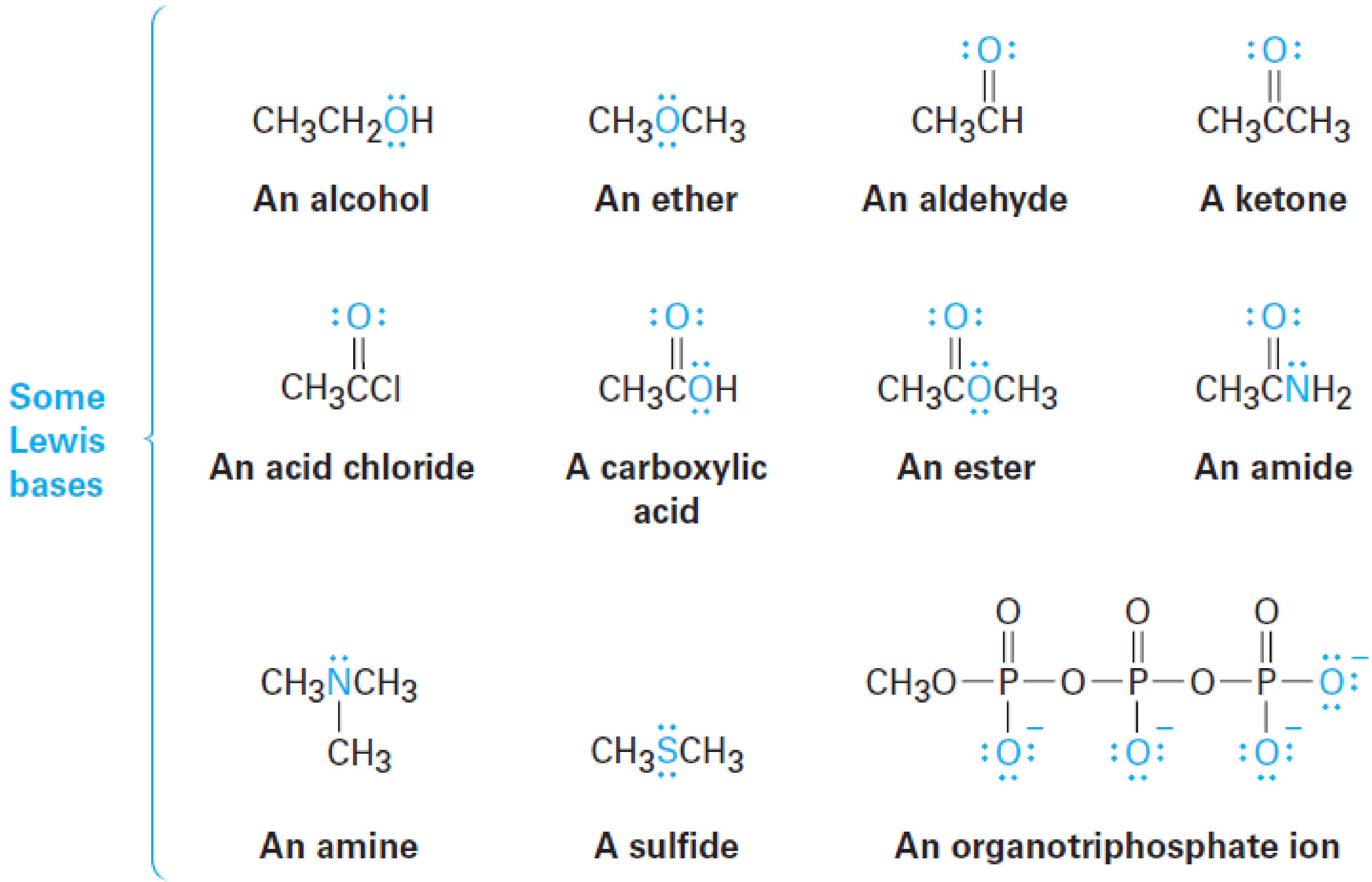
$AlCl_3$ $TiCl_4$ $FeCl_3$ $ZnCl_2$

Lewis bases

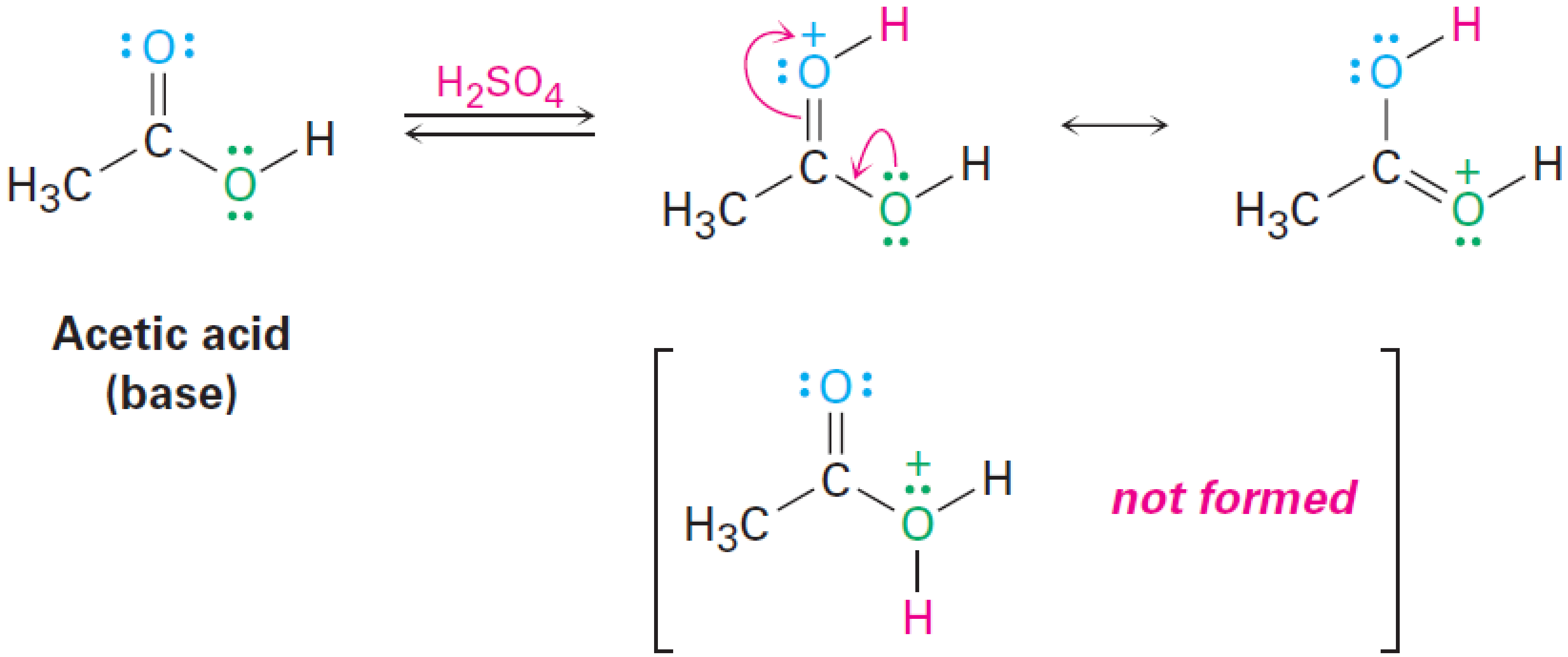


(một số Lewis base)

Lewis bases

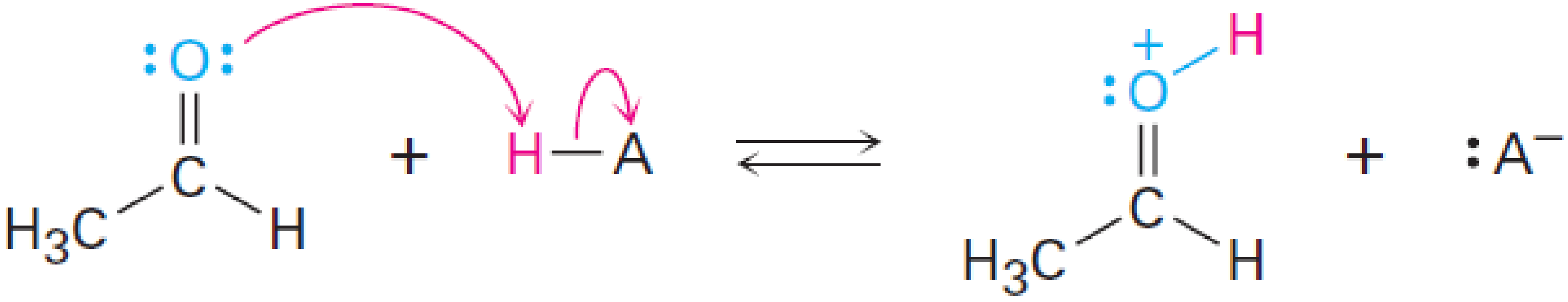


Lewis bases



Problem

Using curved arrows, show how acetaldehyde, CH_3CHO can act as a Lewis base.



Acetaldehyde

Problem 2.17

PROBLEM 2-17

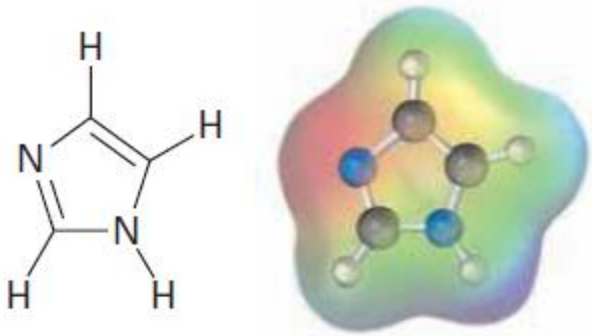
Using curved arrows, show how the species in part **(a)** can act as Lewis bases in their reactions with HCl, and show how the species in part **(b)** can act as Lewis acids in their reaction with OH^-.

(a) CH_3CH_2OH, $HN(CH_3)_2$, $P(CH_3)_3$ **(b)** H_3C^+, $B(CH_3)_3$, $MgBr_2$

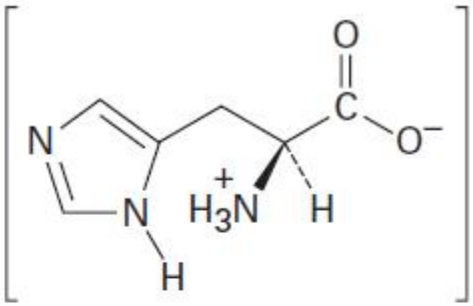
Problem 2.18

PROBLEM 2-18

Imidazole forms part of the structure of the amino acid histidine and can act as both an acid and a base.



Imidazole



Histidine

(a) Look at the electrostatic potential map of imidazole, and identify the most acidic hydrogen atom and the most basic nitrogen atom.

(b) Draw structures for the resonance forms of the products that result when imidazole is protonated by an acid and deprotonated by a base.

Nonvalent interactions

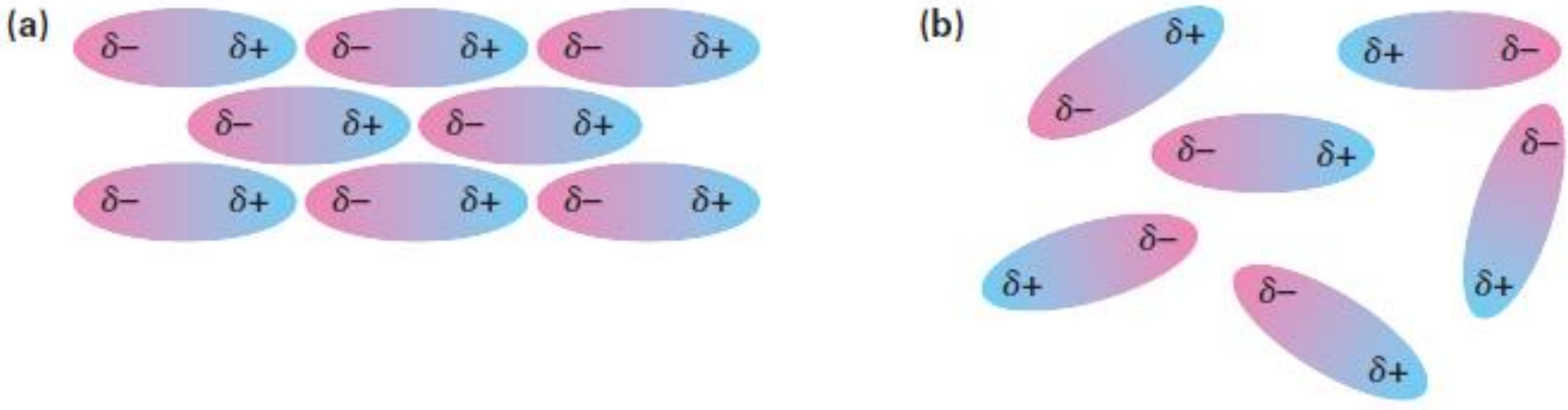
Dipole-dipole forces

Dispersion forces

Hydrogen bond

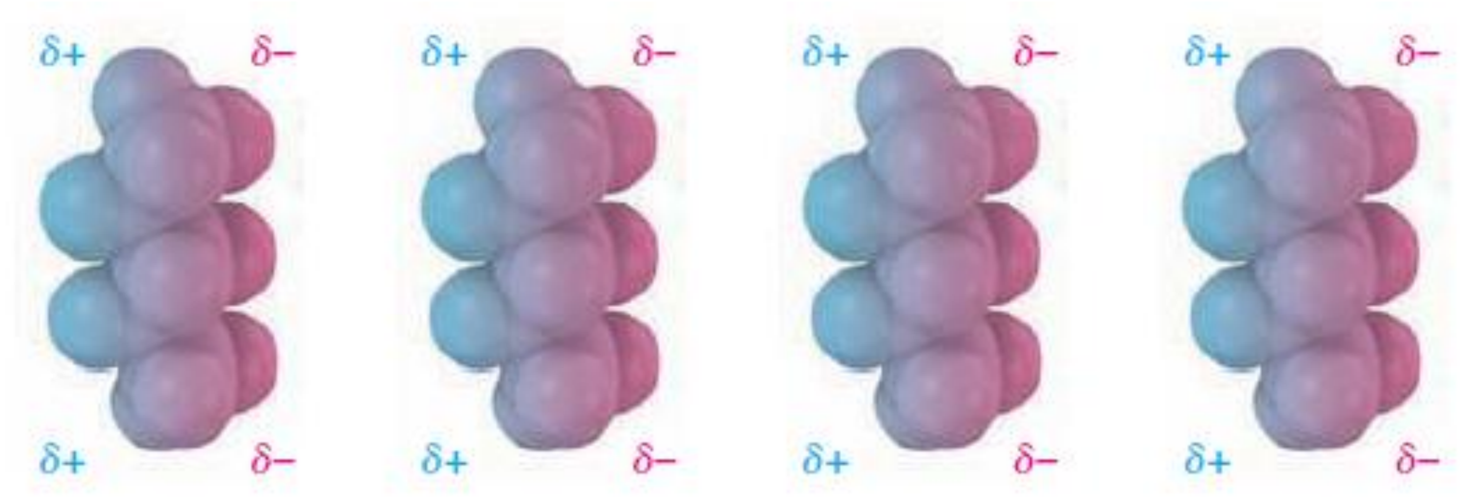
Dipole-dipole interactions

Attractive or repulsive

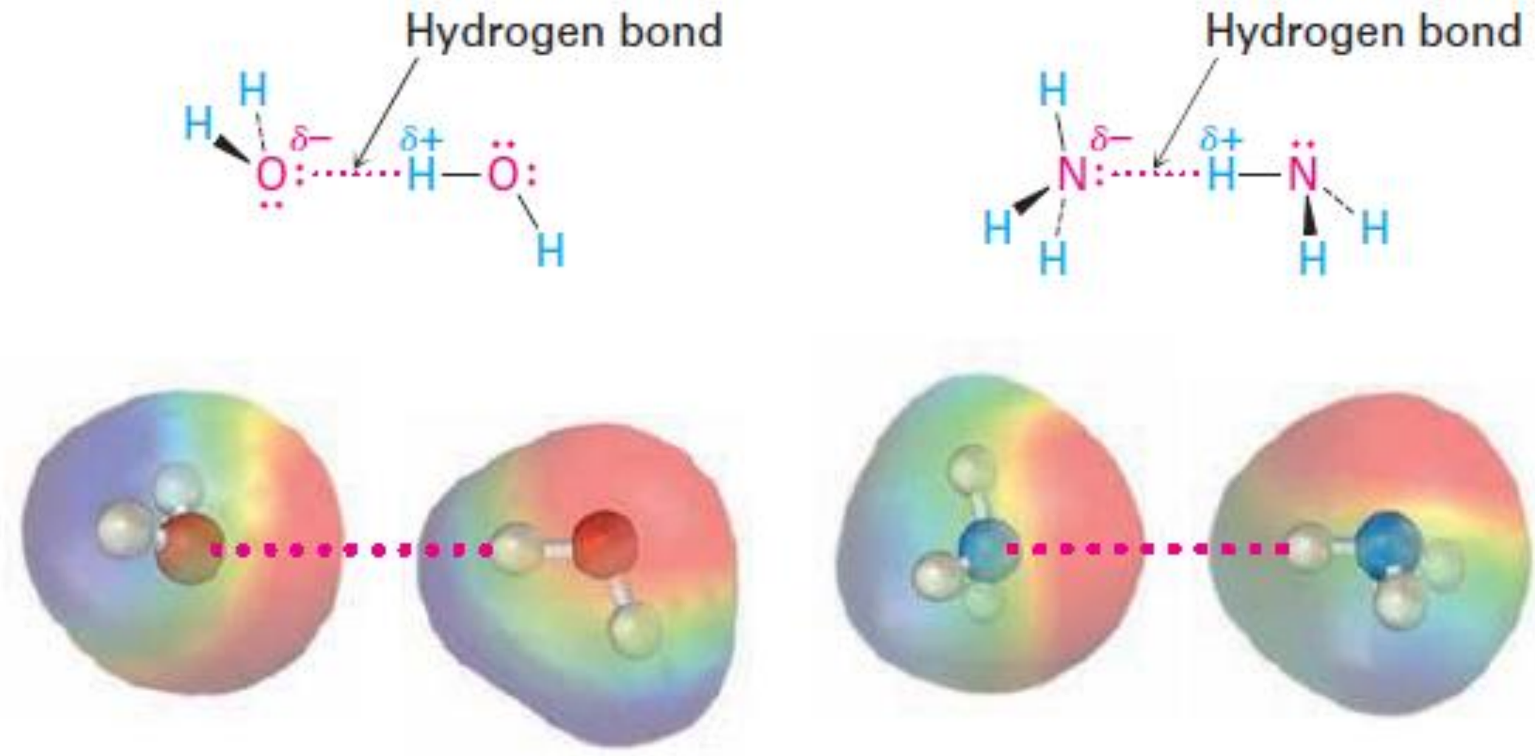


Dispersion forces

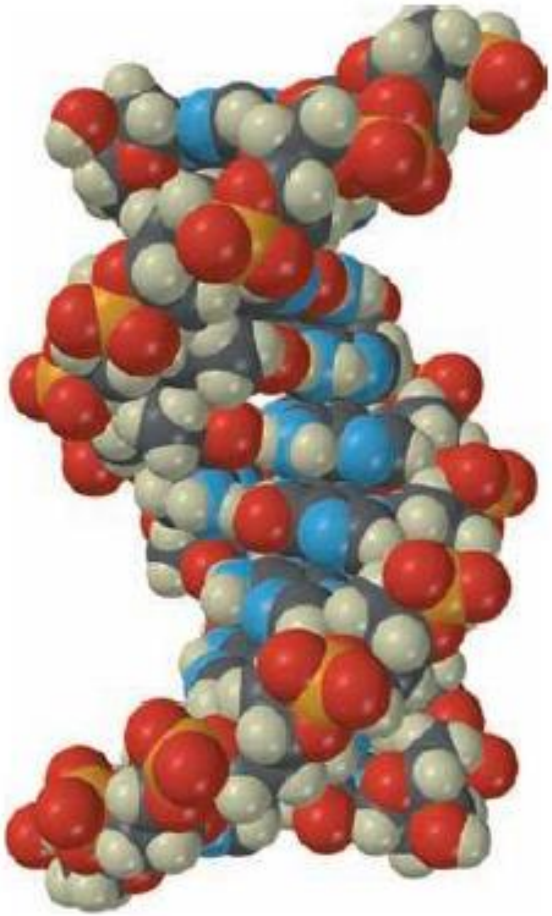
C_5H_{12}

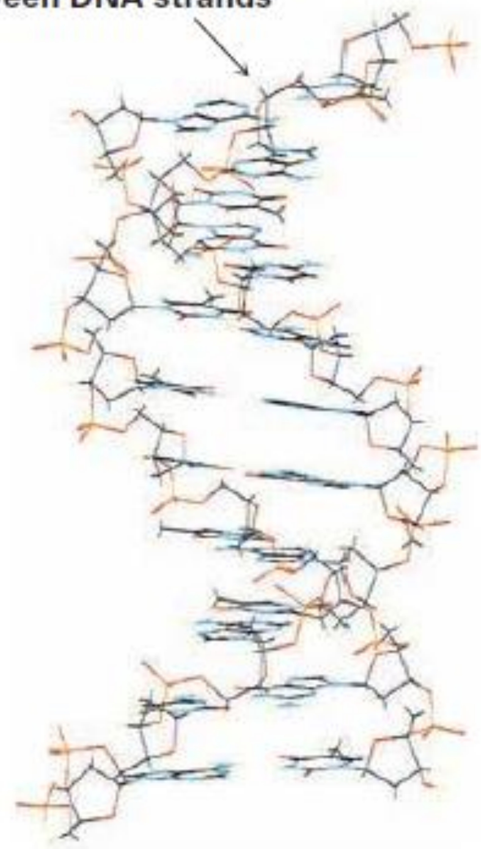


Hydrogen bonds



Hydrogen bonds



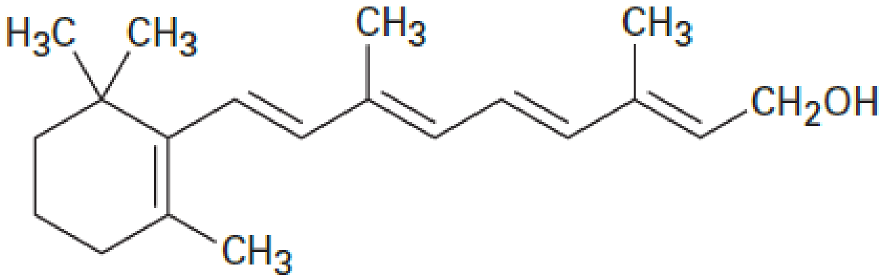


A deoxyribonucleic acid segment

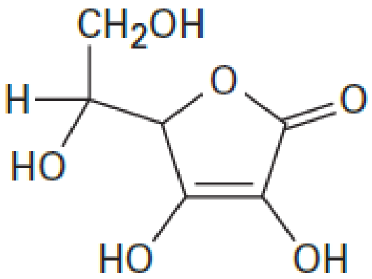
Problem 2.19

PROBLEM 2-19

Of the two vitamins A and C, one is hydrophilic and water-soluble while the other is hydrophobic and fat-soluble. Which is which?



Vitamin A
(retinol)



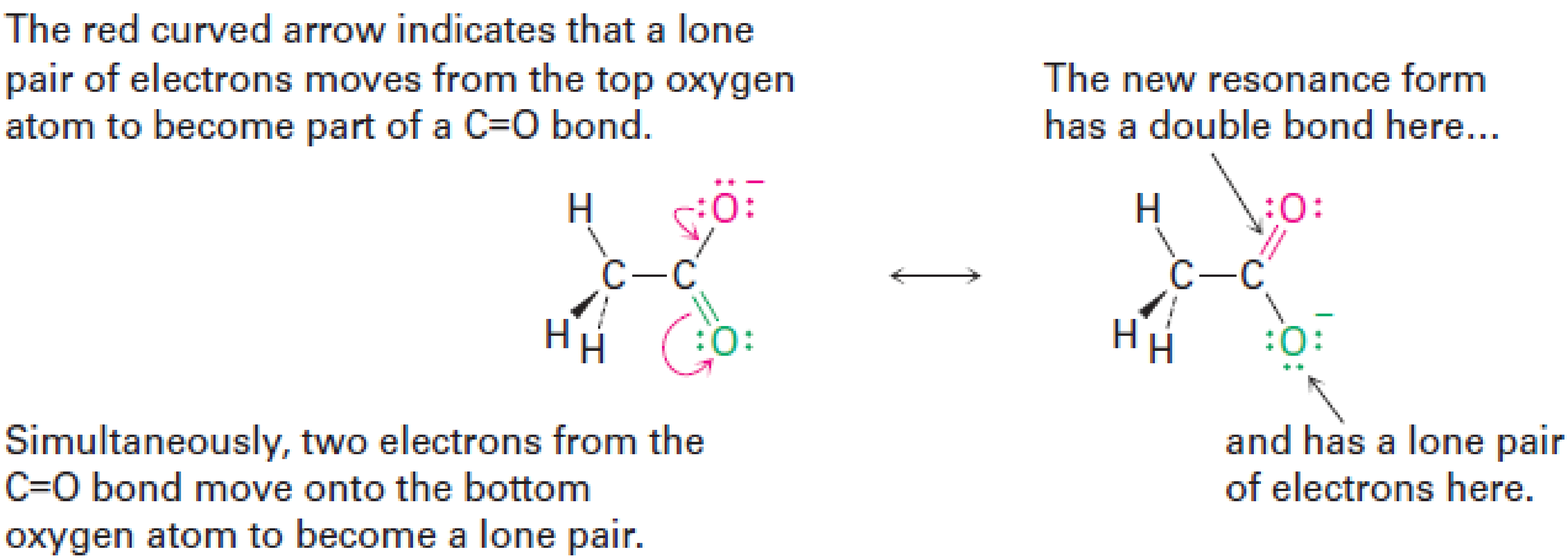
Vitamin C
(ascorbic acid)

Rules for resonance forms

- Resonance is imaginary; the true is hybrid.
- Resonance forms differ in location of π and nonbonding electrons
- Not all resonance forms are equivalent
- Resonance forms obey the rules of valency
- Hybrid form is more stable than any individual.

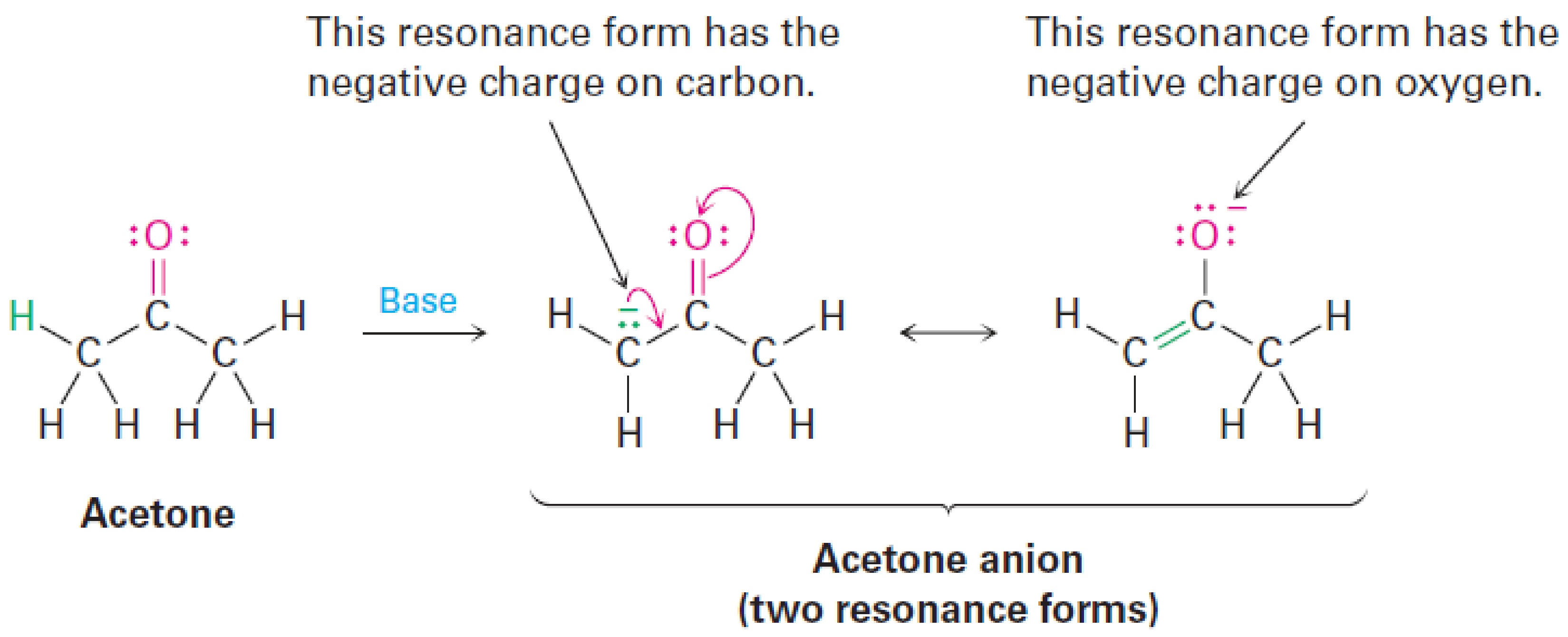
Rules for resonance forms

- Resonance forms differ in location of π and nonbonding electrons



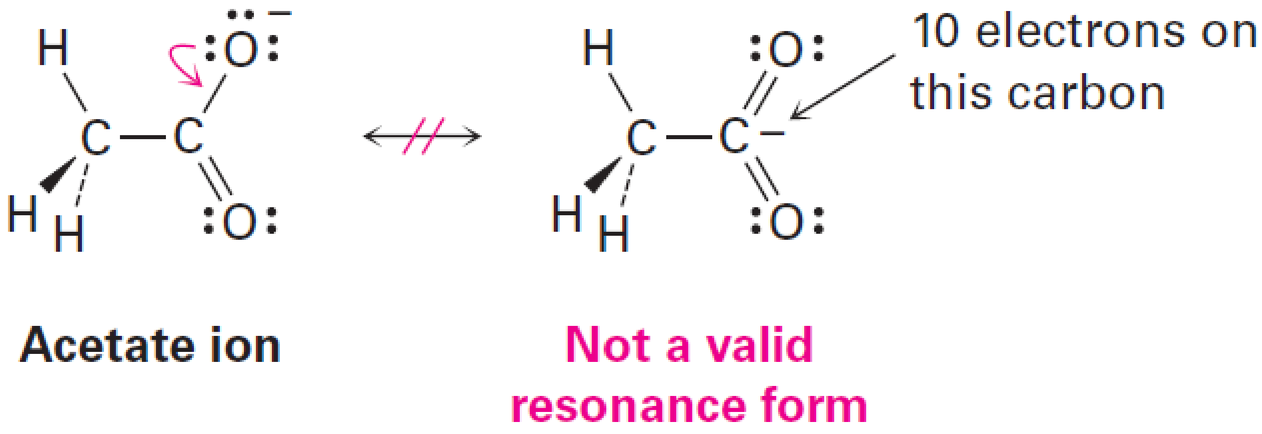
Rules for resonance forms

- Not all resonance forms are equivalent



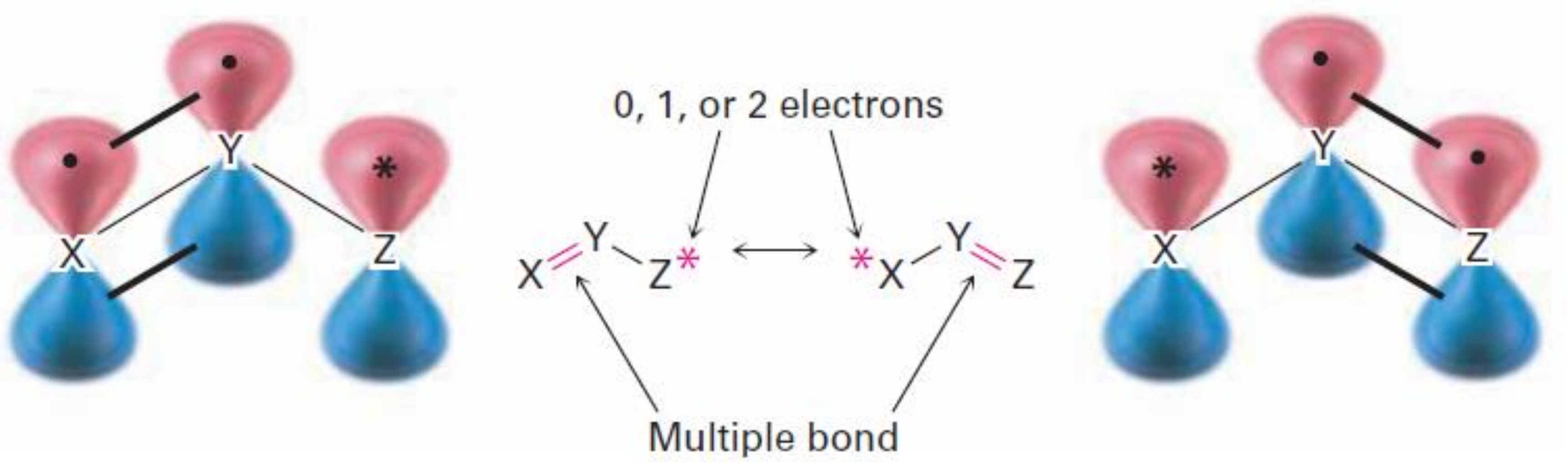
Rules for resonance forms

- Resonance forms obey the rules of valency



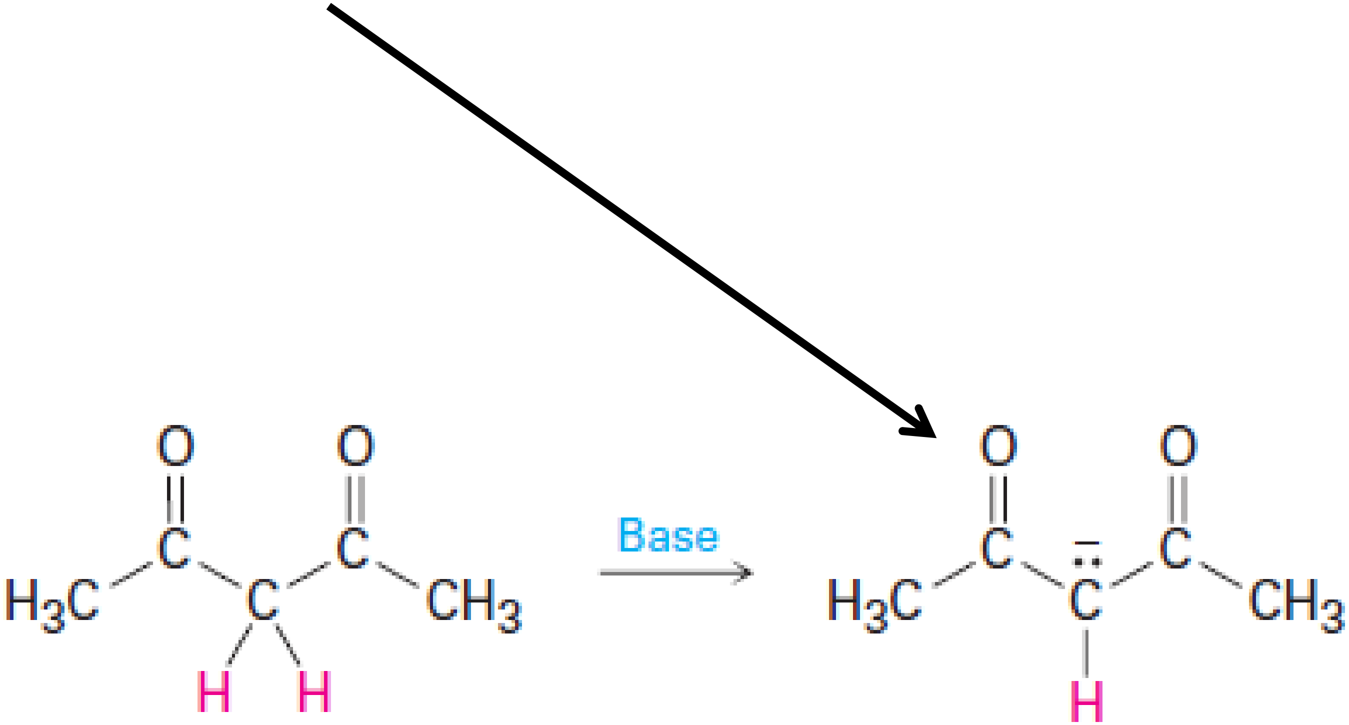
Draw resonance forms

X, Y, Z are generally C, N, O, P or S.



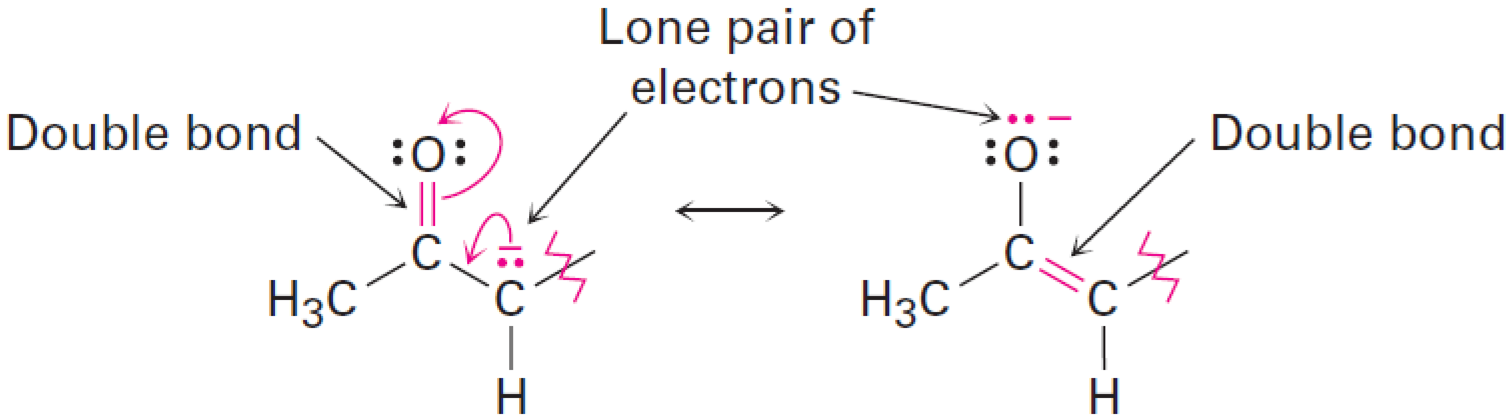
Asterisk: vacant, a single electron or a lone pair of electrons

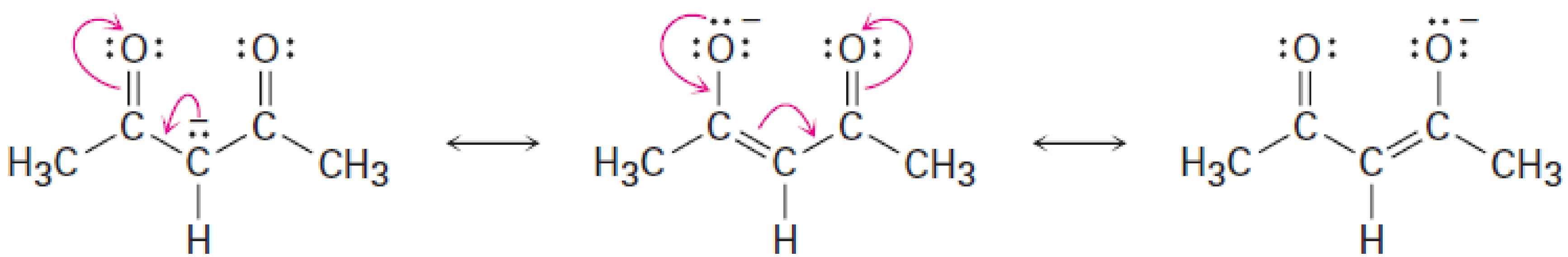
Draw resonance forms



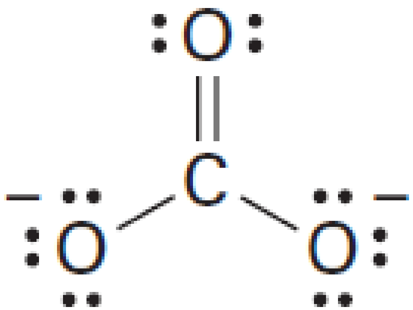
2,4-Pentanedione

Draw resonance forms

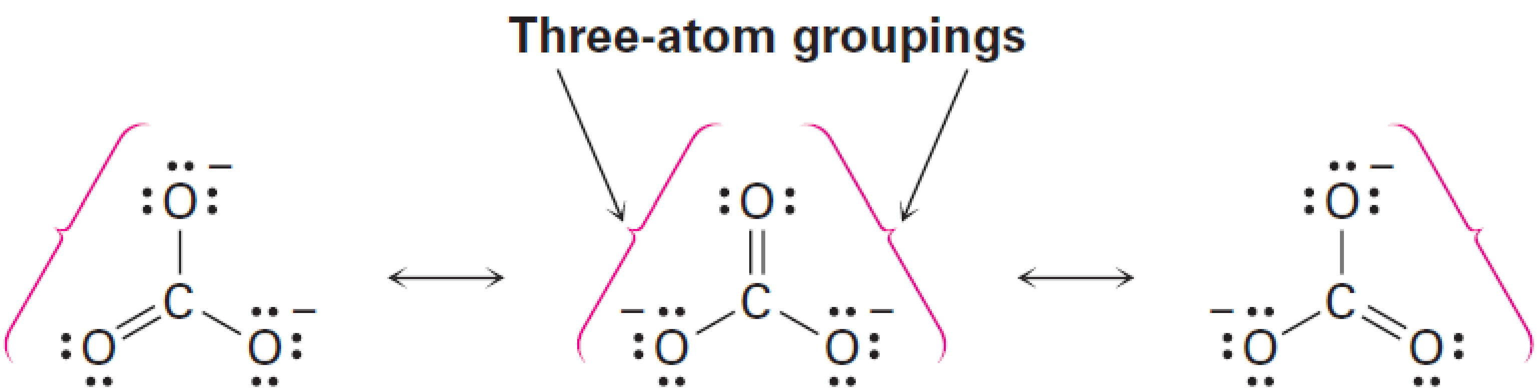




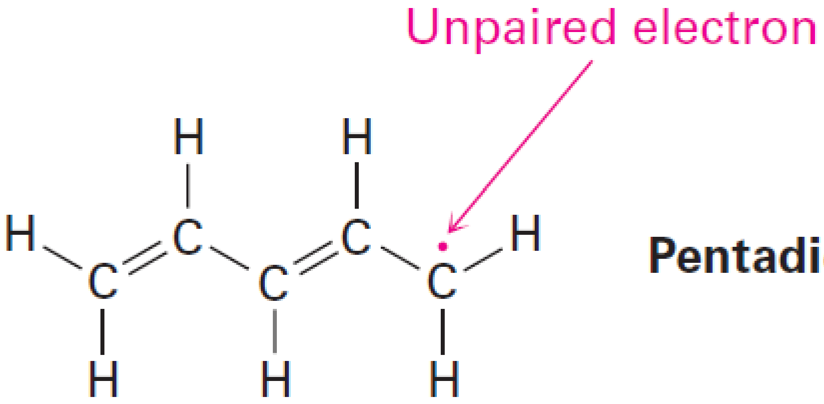
Draw resonance forms



Carbonate ion



Draw resonance forms



Pentadienyl radical