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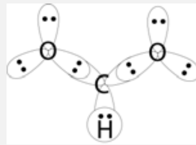
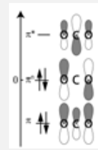
[TP] How many pairs of electrons are shared by each O and the C of formate, $HC(O)O^-$

20% 1. 1 pair (2 electrons)
20% 2. 1 ½ pair (3 electrons)
20% 3. 2 pair (4 electrons)
20% 4. Something else
20% 5. The answer is different for the two O-C bonds





Response Counter 10

1

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Monday, January 30, 2017

- Complete: Polyatomic MO recipe: Formate, $HC(O)O^-$ (delocalized π bonds)

Begin Mahaffy et al., Chapter 11: States of Matter

- Behavior of gases: Macroscopic versus microscopic understanding
- Kinetic molecular theory, PDF: http://goo.gl/njf3em

Next: Continue ch11: Molecular speeds and their distribution; real gases (attraction and size)

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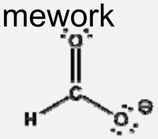
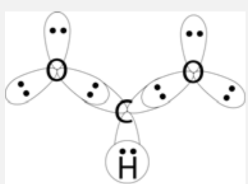
$HC(O)O^-$ sp^2 σ framework



9 pairs in Lewis structure, 7 pairs in σ framework, and so 2 pairs in (delocalized) π framework.



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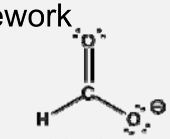
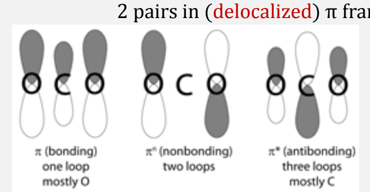
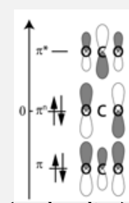
$HC(O)O^-$ π framework



2 pairs in (delocalized) π framework





1 pair in π (bonding) and 1 pair in π^n (nonbonding); bond order 1

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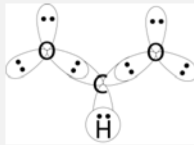
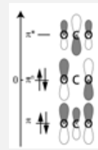
[TP] How many pairs of electrons are shared by each O and the C of formate, HC(O)O⁻





20% 1. 1 pair (2 electrons)
20% 2. 1 ½ pair (3 electrons)
20% 3. 2 pair (4 electrons)
20% 4. Something else
20% 5. The answer is different for the two O-C bonds

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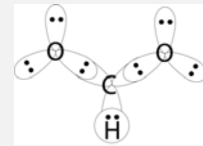
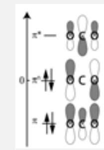
[Group quiz] How many lone pairs of electrons are on each O of formate, HC(O)O⁻





14% 1. 1 pair (2 electrons)
14% 2. 1 ½ pair (3 electrons)
14% 3. 2 pair (4 electrons)
14% 4. 2 ½ pair (5 electrons)
14% 5. 3 pair (6 electrons)
14% 6. Something else
14% 7. The answer is different for the two O atoms

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Behavior of gases

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[TP] A container of volume V is filled with a gas at 20 °C. If V is decreased (while keeping T constant), pressure P exerted by the gas on the walls of the container must …

25% 1. go down
25% 2. stay the same
25% 3. go up
25% 4. Further information needed

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Macroscopic behavior

Very likely you know and have a lot of experience working with the ideal gas equation relating P, T, V and n, …

$$P\,V = R\,n\,T$$

The constant of proportionality is the gas constant …

$$R = 8.314\ \mathrm{J/(K\ mol)}$$

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Macroscopic behavior

From

$$P\,V = R\,n\,T$$

we know that if V is decreased (while keeping T constant), the pressure P exerted by the gas on the walls of the container must go up, since the left-hand side of the equation is unchanged.

This is an example of macroscopic understanding.

Our goal is to understand this kind of behavior at a microscopic level.

That is, at the level of the individual particles of the gas.

Our method is called the kinetic molecular theory of gases.

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Microscopic behavior

Our goal is to understand this kind of behavior at a microscopic level.

That is, at the level of the individual particles of the gas.

Our method is called the kinetic molecular theory of gases.

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Kinetic-molecular theory of gases

Goal: Get microscopic expression for pressure P

Key idea 1: Pressure is due to force exerted by particles during collisions with the container walls

Key idea 2: Force is due to momentum change in collision with the container walls.

Note: Here upper-case P is used for pressure and lower-case p is used for momentum.

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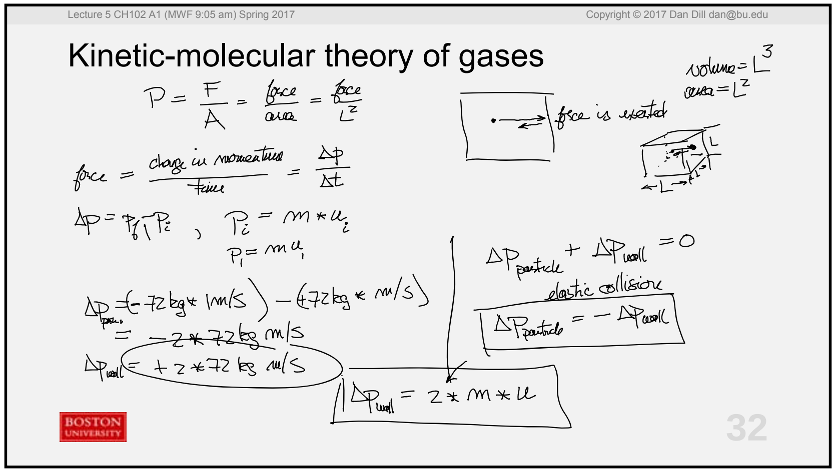
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Kinetic-molecular theory of gases
volume = L^3
area = L^2
force is exerted
elastic collision
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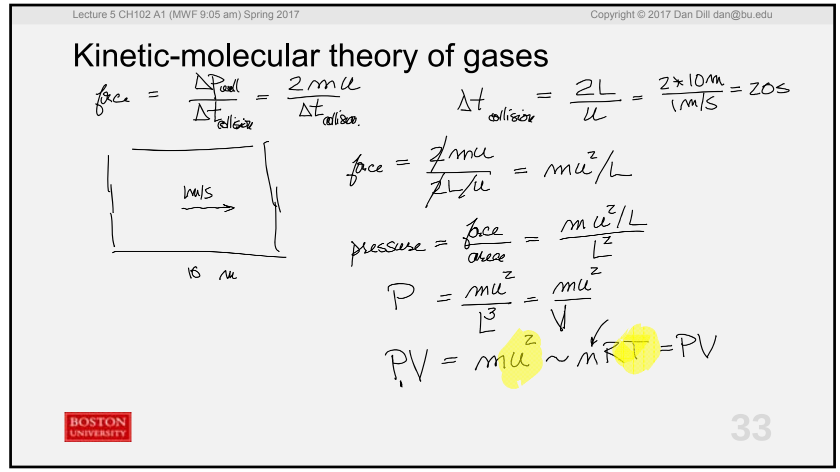
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Kinetic-molecular theory of gases
pressure
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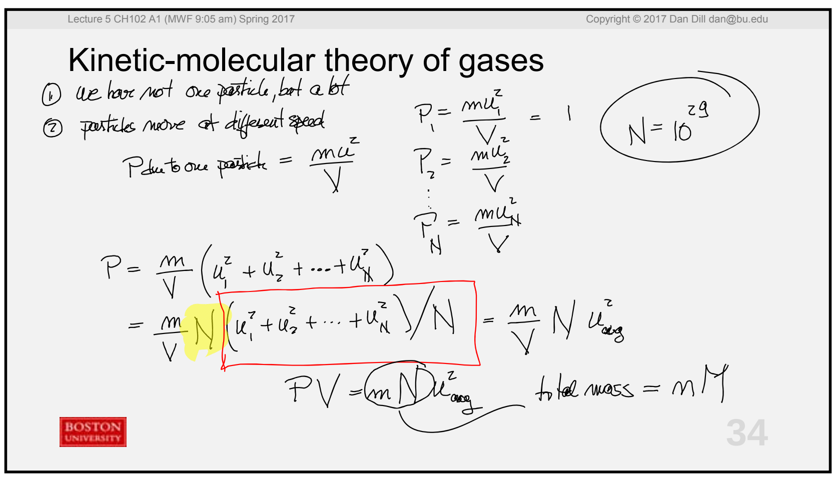
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Kinetic-molecular theory of gases
① we have not one particle, but a lot
② particles move at different speed
N = 10^29
total mass
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