Why write electrons in 4 pairs?

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$[He]2s^2 2p^5$

$[He]2s^2 2p_x^{\ 2} 2p_y^{\ 2} 2p_z^{\ 1}$

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$[He]2s^2 2p^5$

$[He]2s^2 2p_x^{\ 2} 2p_y^{\ 2} 2p_z^{\ 1}$

Drawing Lewis Structures

The Octet Rule

1. Determine the arrangement of atoms in the molecule
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H_2CO

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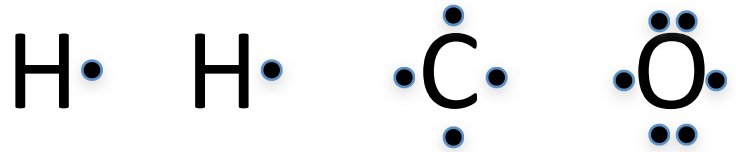

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H_2CO

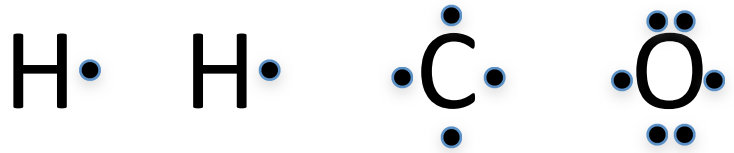
H – terminal

C – internal

Up to 4 bonds

O – internal?

Up to 2 bonds



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H_2CO

H – terminal

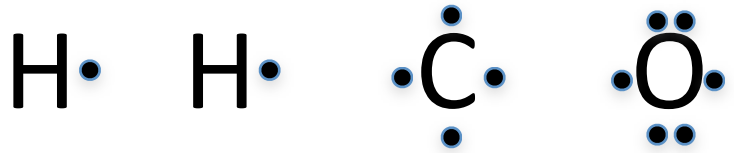
C – internal

Up to 4 bonds

O – internal?

Up to 2 bonds

So try C in middle



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H_2CO

$H - 1s^1$

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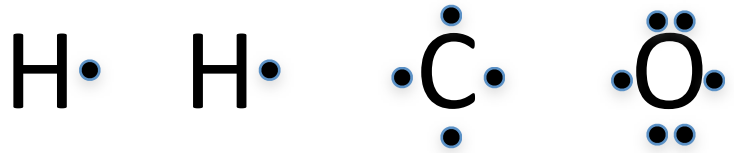
$C - [He]2s^2 2p^2$

$O - [He]2s^2 2p^4$

$12\ e^-$



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H_2CO

$12\ e^-$

H C O

H

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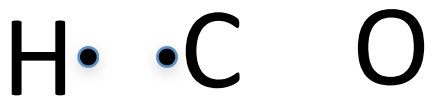

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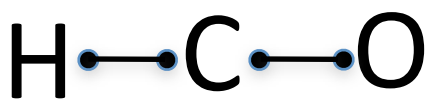

H

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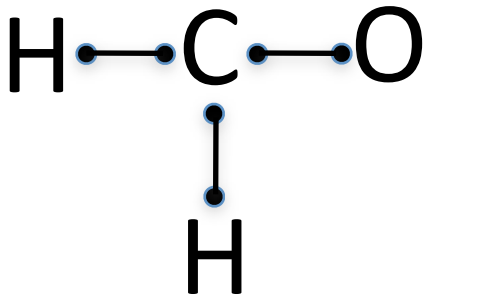

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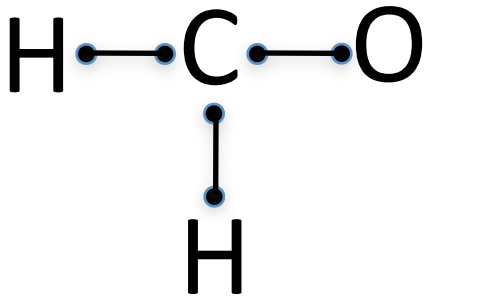

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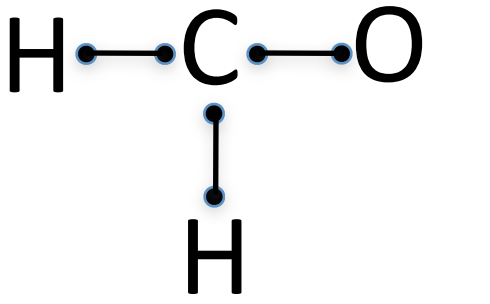

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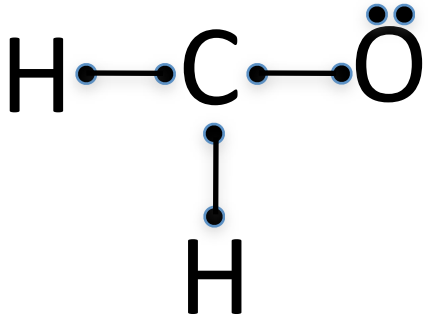

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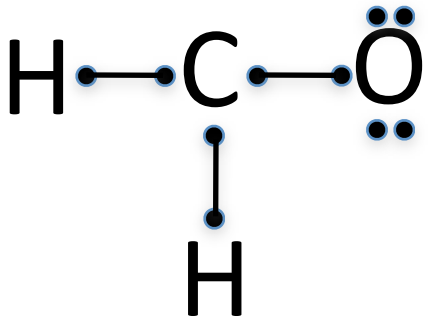

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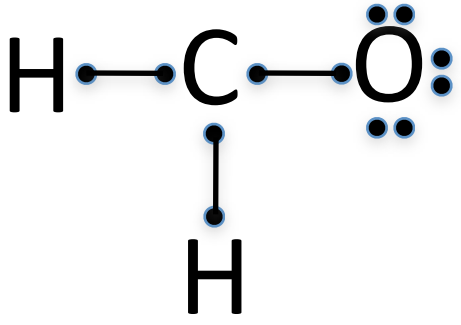

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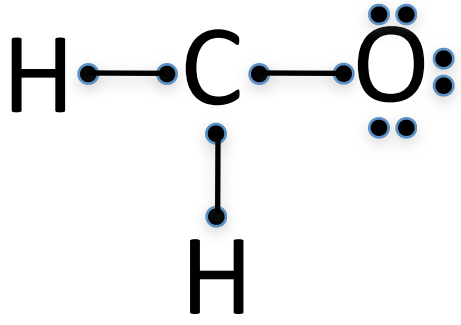

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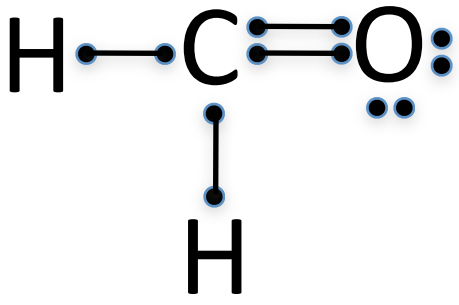

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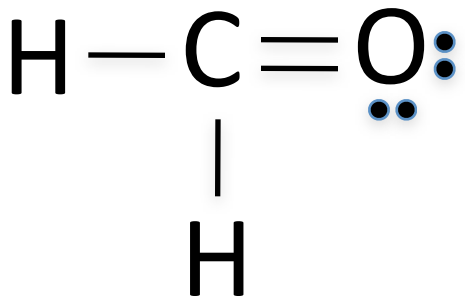

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The Octet Rule

Slightly alternate route

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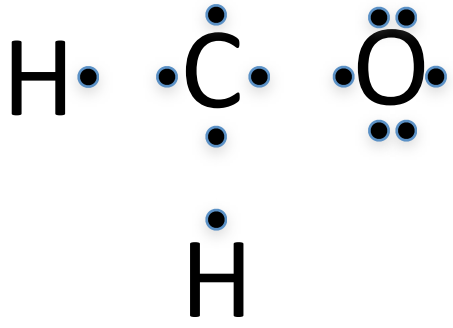

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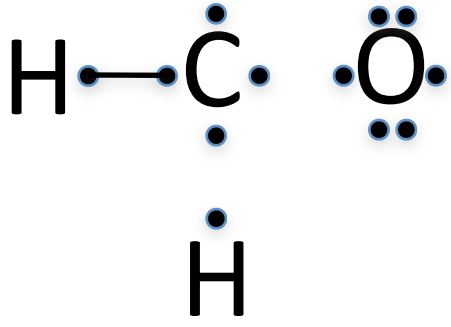

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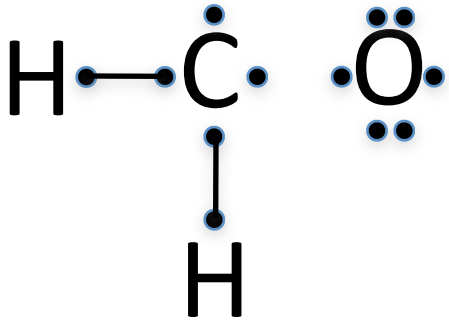

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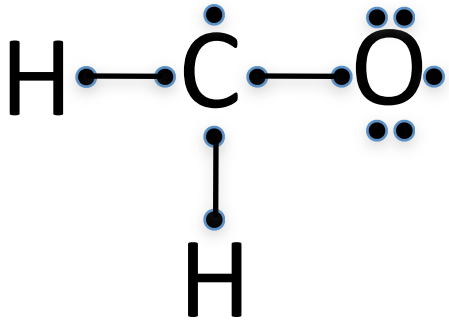

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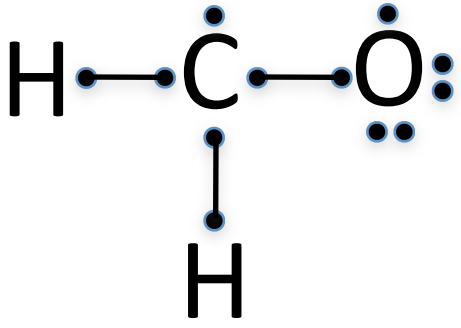

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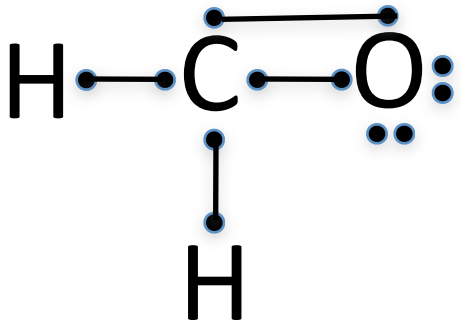

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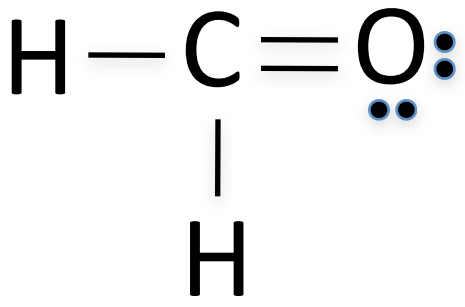
H_2CO

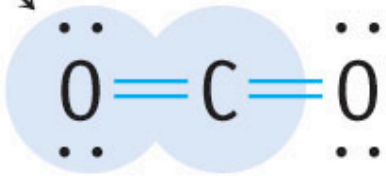
$12\ e^-$



N N

Octet of electrons around each N atom (six in triple bond and two in lone pair)

Octet of electrons around each O atom (four in double bond and four in lone pairs)

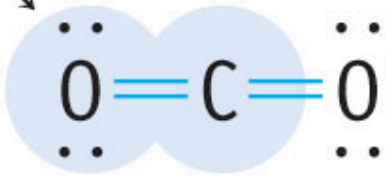


Octet of electrons around the C atom (four in each of two double bonds)

N • • N

Octet of electrons around each N atom (six in triple bond and two in lone pair)

Octet of electrons around each O atom (four in double bond and four in lone pairs)

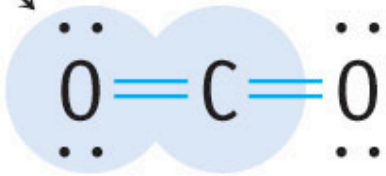


Octet of electrons around the C atom (four in each of two double bonds)

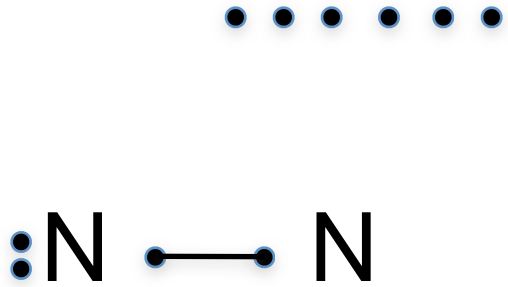
N — N

Octet of electrons around each N atom (six in triple bond and two in lone pair)

Octet of electrons around each O atom (four in double bond and four in lone pairs)



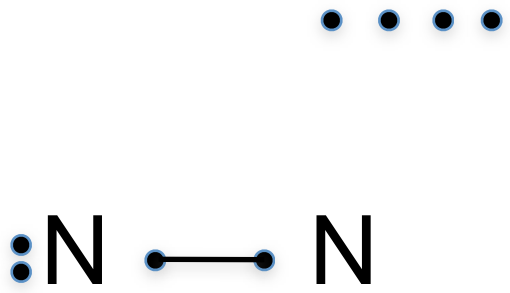
Octet of electrons around the C atom (four in each of two double bonds)



Octet of electrons around each N atom (six in triple bond and two in lone pair)

Octet of electrons around each O atom (four in double bond and four in lone pairs)

Octet of electrons around the C atom (four in each of two double bonds)



Octet of electrons around each N atom (six in triple bond and two in lone pair)

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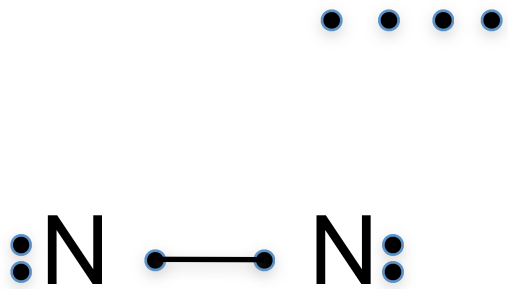
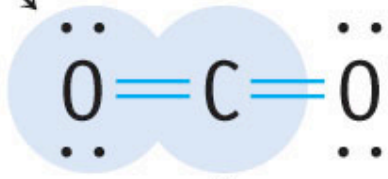
Octet of electrons around the C atom (four in each of two double bonds)

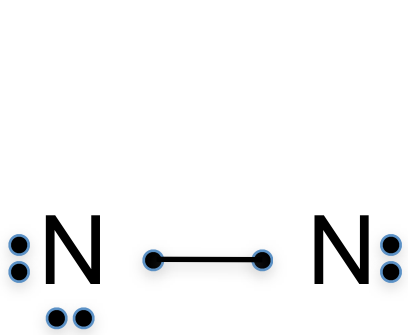


Octet of electrons around each N atom (six in triple bond and two in lone pair)

Octet of electrons around each O atom (four in double bond and four in lone pairs)

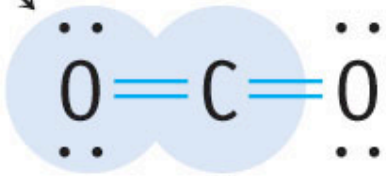


Octet of electrons around the C atom (four in each of two double bonds)

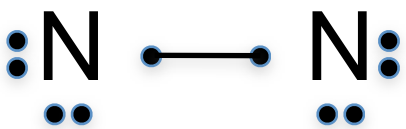


Octet of electrons around each N atom (six in triple bond and two in lone pair)

Octet of electrons around each O atom (four in double bond and four in lone pairs)



Octet of electrons around the C atom (four in each of two double bonds)



Octet of electrons around each N atom (six in triple bond and two in lone pair)

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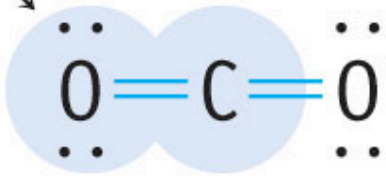
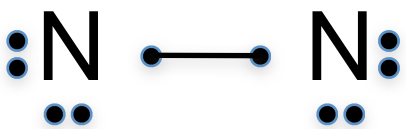
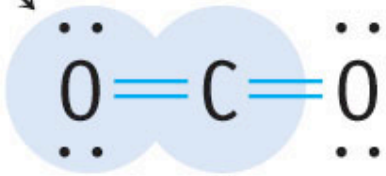


Octet of electrons around the C atom (four in each of two double bonds)

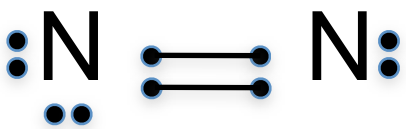


Octet of electrons around each N atom (six in triple bond and two in lone pair)

Octet of electrons around each O atom (four in double bond and four in lone pairs)



Octet of electrons around the C atom (four in each of two double bonds)



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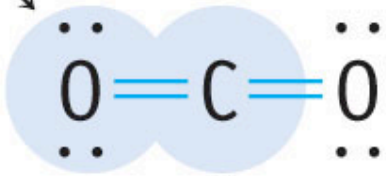
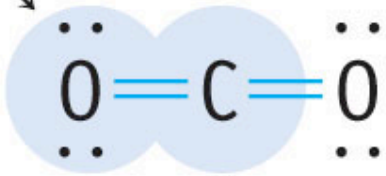
Octet of electrons around each O atom (four in double bond and four in lone pairs)



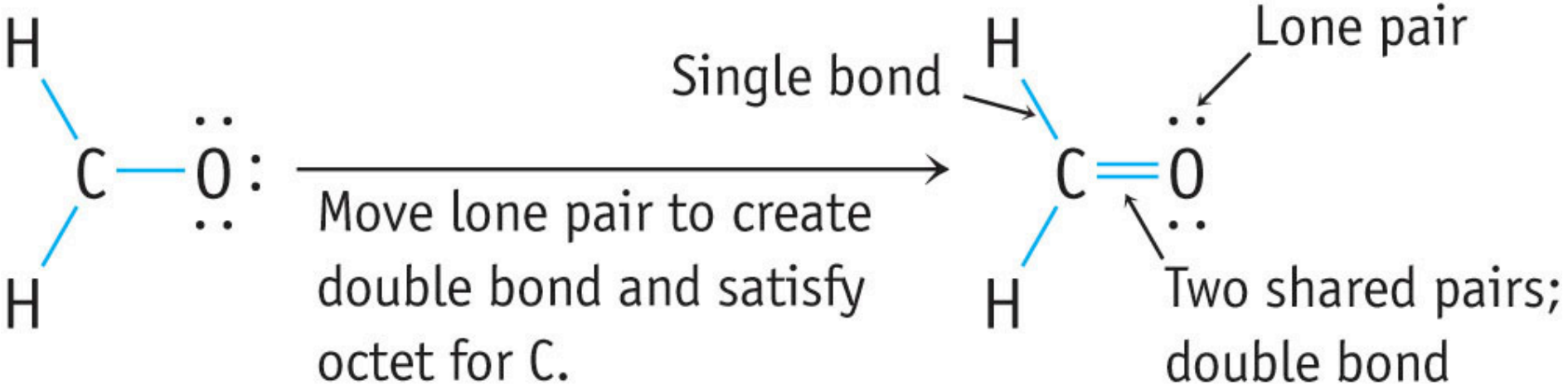
Octet of electrons around the C atom (four in each of two double bonds)

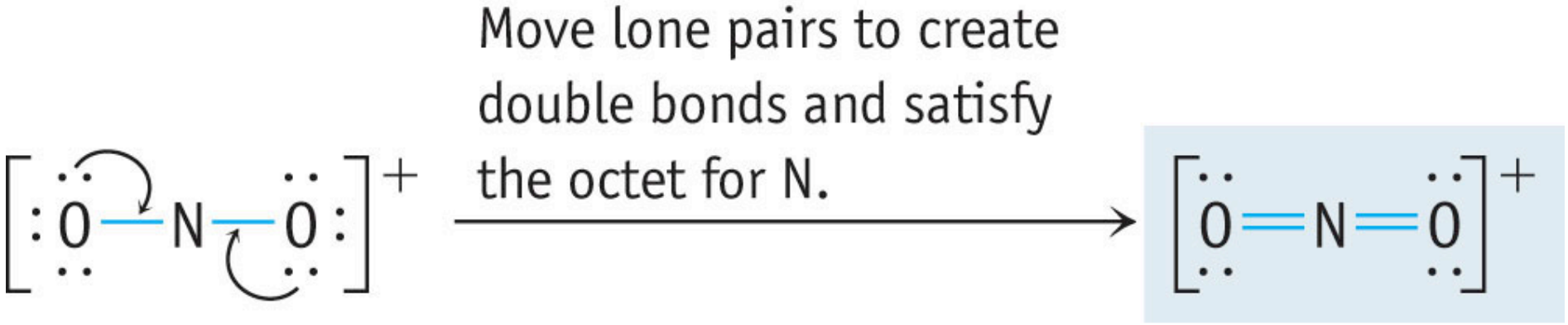
Octet of electrons around each N atom (six in triple bond and two in lone pair)

Octet of electrons around each O atom (four in double bond and four in lone pairs)



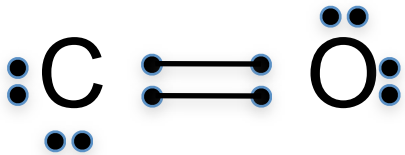
Octet of electrons around the C atom (four in each of two double bonds)

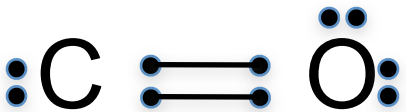




Which is the best Lewis structure

1) 

2) 

3) 

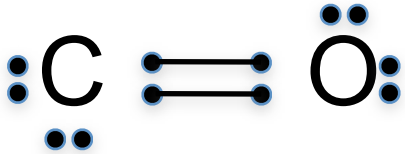
Which is the best Lewis structure

1) 

10 e^-

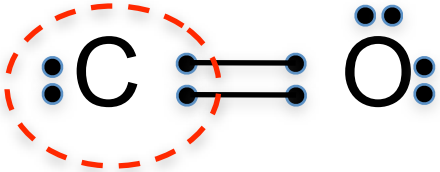
C – $[He]2s^2 2p^2$

O – $[He]2s^2 2p^4$

2) 

12 e^-

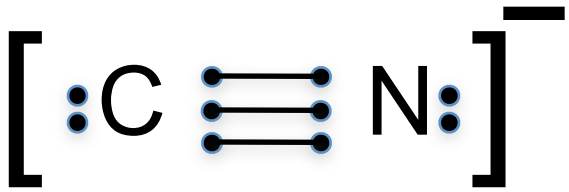
Too many electrons

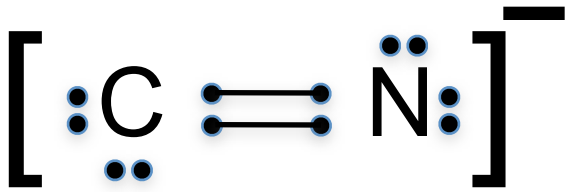
3) 

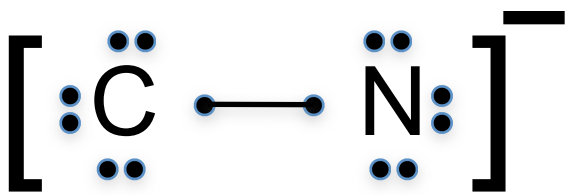
10 e^-

Incomplete Octet (6)

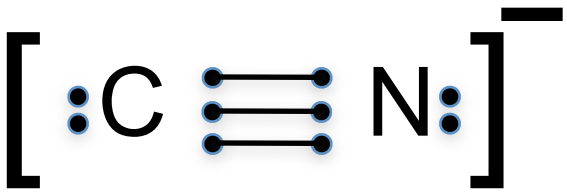
Which is the best Lewis structure

1) 

2) 

3) 

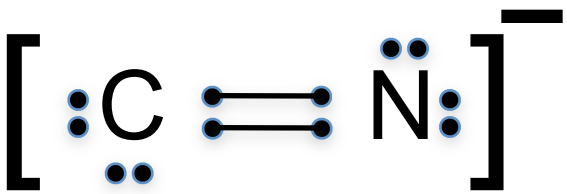
Which is the best Lewis structure

1) 

10 e^-

C – $[He]2s^2 2p^2$

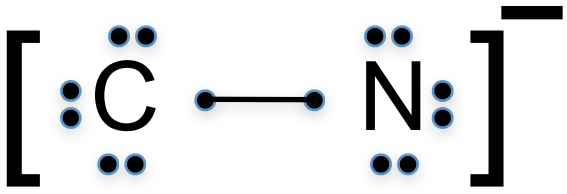
N – $[He]2s^2 2p^3$

2) 

12 e^-

Plus 1 e^-

Too many electrons

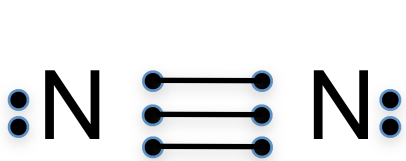
3) 

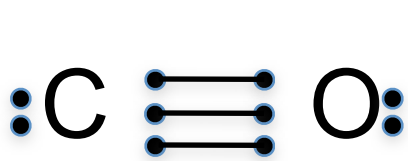
14 e^-

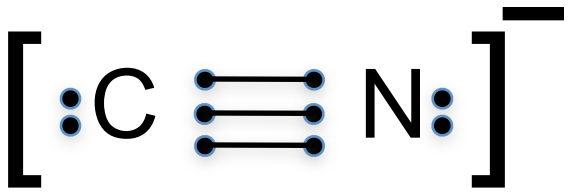
Too many electrons

Isoelectronic species

(10 electrons)







N – $[He]2s^2 2p^3$
N – $[He]2s^2 2p^3$

C – $[He]2s^2 2p^2$
O – $[He]2s^2 2p^4$

C – $[He]2s^2 2p^2$
N – $[He]2s^2 2p^3$

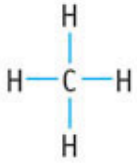
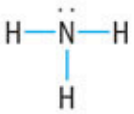
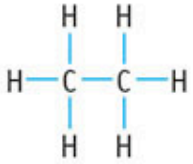
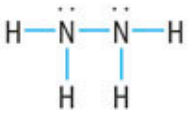
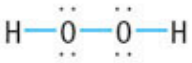
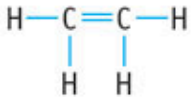
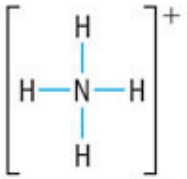
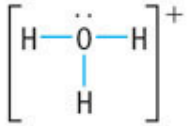
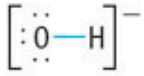
Plus 1 e^-

2+3+2+3

2+2+2+4

2+2+2+3**+1**

TABLE 8.3 Lewis Structures of Common Hydrogen-Containing Molecules and Ions of Second-Period Elements

Group 4A		Group 5A		Group 6A		Group 7A	
CH_4 methane		NH_3 ammonia		H_2O water		HF hydrogen fluoride	
C_2H_6 ethane		N_2H_4 hydrazine		H_2O_2 hydrogen peroxide			
C_2H_4 ethylene		NH_4^+ ammonium ion		H_3O^+ hydronium ion			
C_2H_2 acetylene		NH_2^- amide ion		OH^- hydroxide ion			

Start to think about the common elements like this