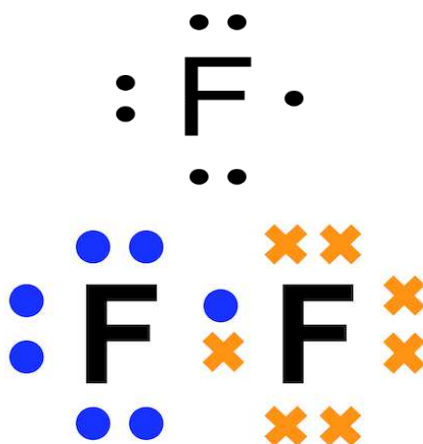


Atomic Combinations Memo

1.1



Lewis structure of F₂

F F

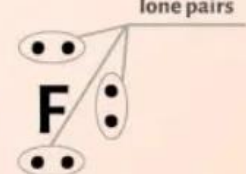
Step 1: Make the sketch

F : F

Step 2: Put 2 electrons between the atoms



Step 3: Complete the octet on outside atom



Step 4: Put the remaining electrons on the central atom

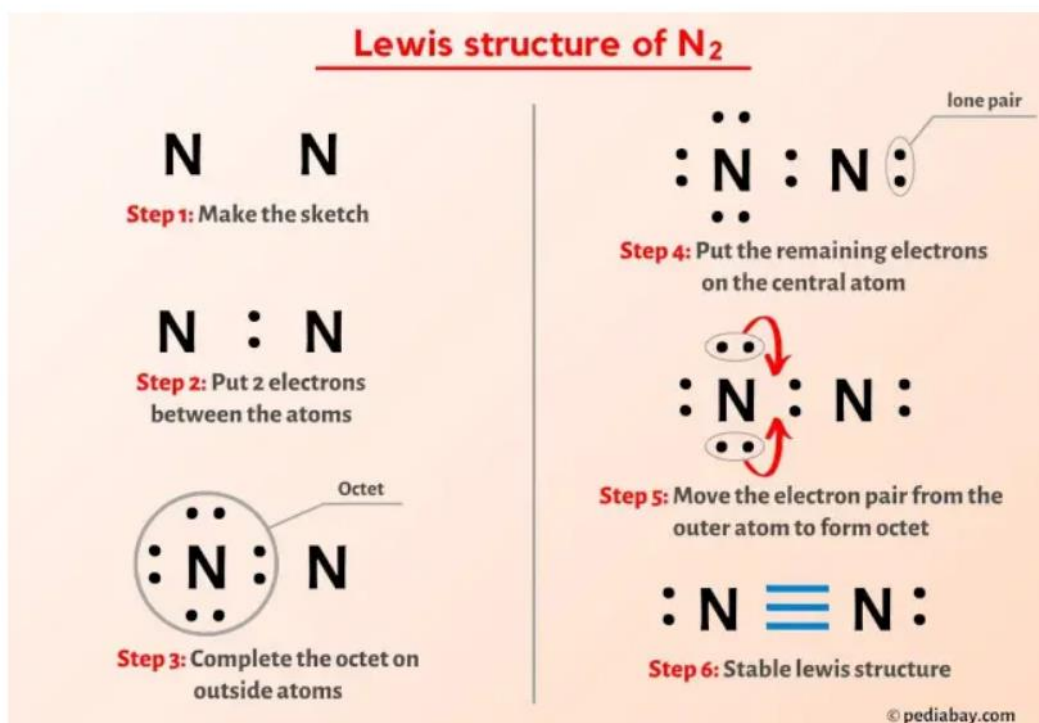
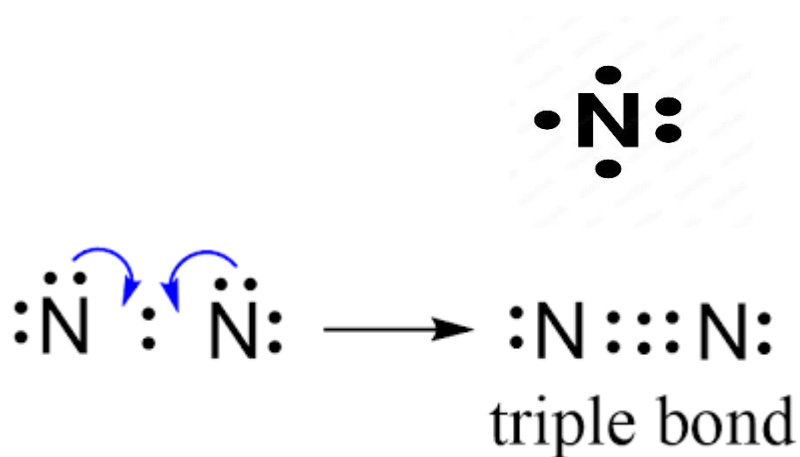


Step 5: Fluorine has a stable octet

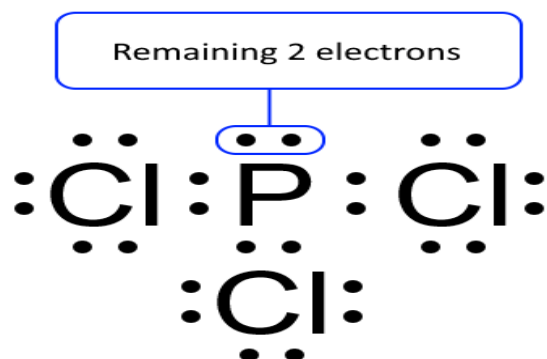
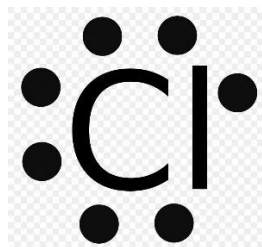
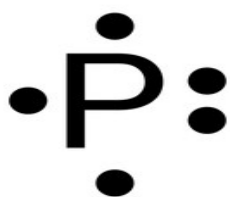
F — F

Step 6: Stable lewis structure

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1.3



Lewis structure of PCl_3

Cl P Cl
 Cl

Step 1: Select the center atom

Cl : P : Cl
 Cl

Step 2: Put 2 electrons between the atoms

Step 3: Complete the octet on outside atoms

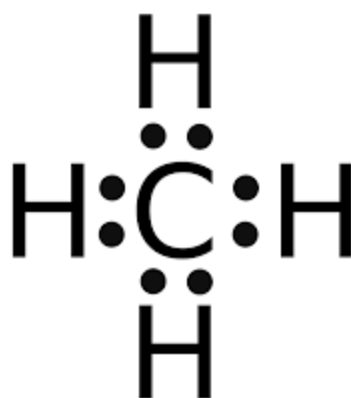
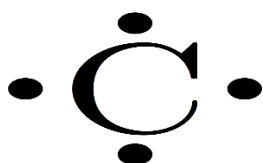
Step 4: Put the remaining electrons on the central atom

Step 5: Phosphorus has stable octet

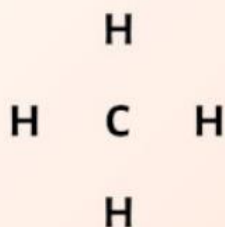
Step 6: Stable lewis structure

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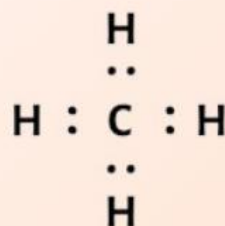
1.4



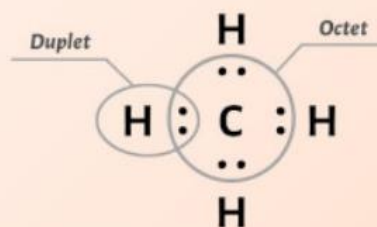
Lewis structure of CH₄



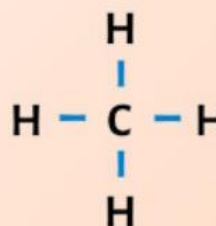
Step 1: Select the center atom



Step 2: Put 2 electrons between the atoms



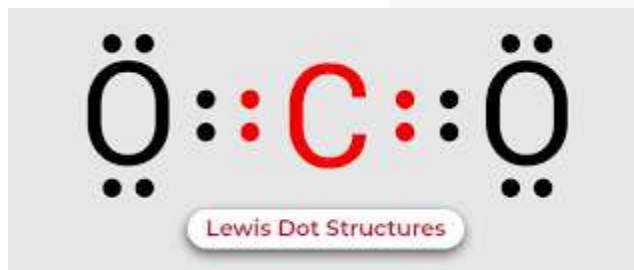
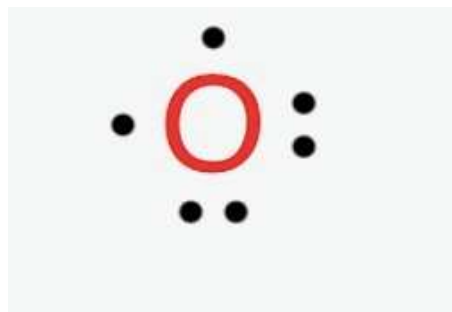
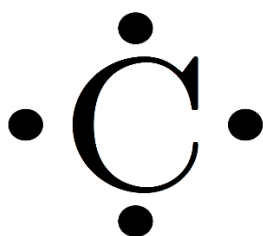
Step 3: Carbon has stable octet.
Hydrogen has stable duplet.



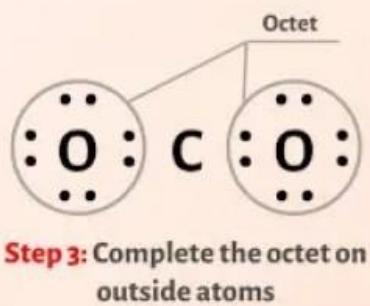
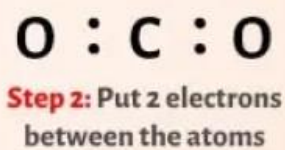
Step 4: Stable lewis structure

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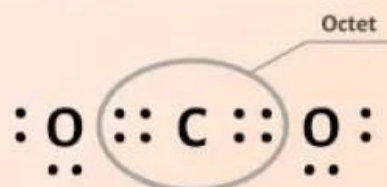
1.5



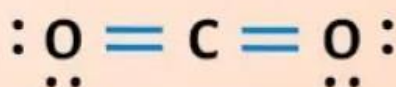
Lewis structure of CO₂



Step 4: Move the electron pairs from the outer atoms



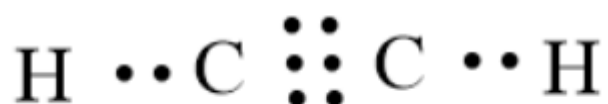
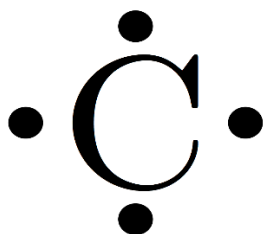
Step 5: Carbon also has a stable octet



Step 6: Stable lewis structure

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1.6



Lewis structure of C₂H₂



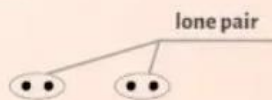
Step 1: Select the center atom



Step 2: Put 2 electrons between the atoms



Step 3: Outer atoms form a duplet



Step 4: Put the remaining electrons on the central atom



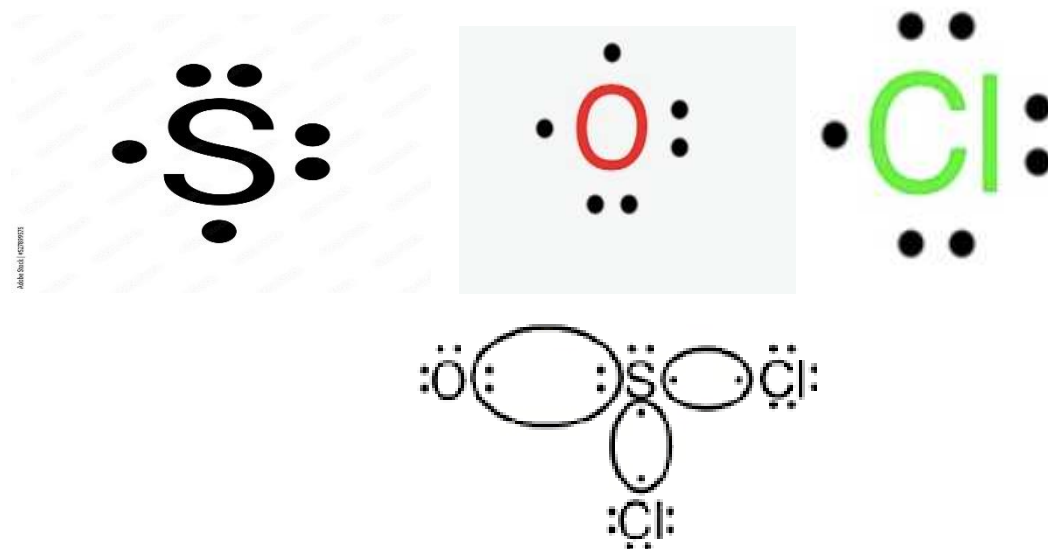
Step 5: Convert the lone pairs into bonds to form octet



Step 6: Stable Lewis structure

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1.7



Lewis structure of SOCl_2

$\begin{array}{c} \text{O} \\ \text{Cl} \quad \text{S} \quad \text{Cl} \end{array}$

Step 1: Select the center atom

$\begin{array}{c} \text{O} \\ \cdot\cdot \\ \text{Cl} : \text{S} : \text{Cl} \end{array}$

Step 2: Put 2 electrons between the atoms

$\begin{array}{c} \text{O} \\ \cdot\cdot \\ \text{Cl} : \text{S} : \text{Cl} \end{array}$

Step 3: Complete the octet on outside atoms

$\begin{array}{c} \text{O} \\ \cdot\cdot \\ \text{Cl} : \text{S} : \text{Cl} \end{array}$

$\begin{array}{c} \text{O} \\ \cdot\cdot \\ \text{Cl} : \text{S} : \text{Cl} \end{array}$

Step 4: Put the remaining electrons on the central atom

$\begin{array}{c} \text{O} \\ \cdot\cdot \\ \text{Cl} : \text{S} : \text{Cl} \end{array}$

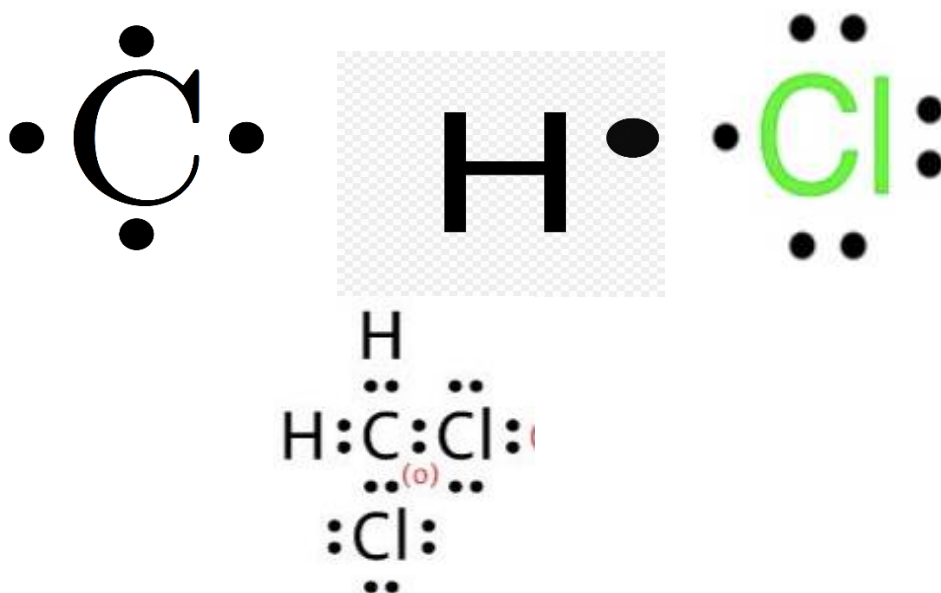
Step 5: Reduce the formal charges

$\begin{array}{c} \text{O} \\ \cdot\cdot \\ \text{Cl} : \text{S} : \text{Cl} \end{array}$

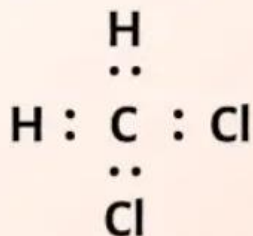
Step 6: Stable lewis structure

$\begin{array}{c} \text{O} \\ \cdot\cdot \\ \text{Cl} : \text{S} : \text{Cl} \end{array}$

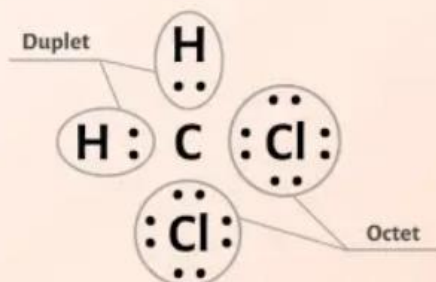
© pediabay.com



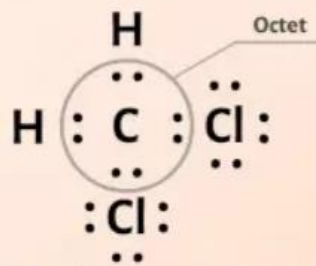
Lewis structure of CH_2Cl_2



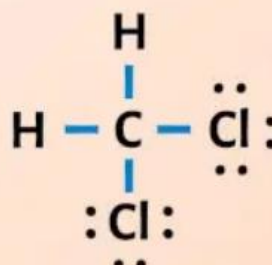
Step 1: Select the center atom and put 2 electrons between the atoms



Step 2: Complete the octet on outside atoms

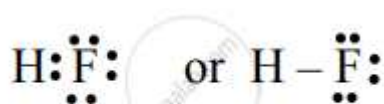
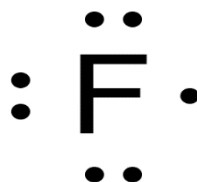


Step 3: Carbon has stable octet



Step 4: Stable lewis structure

1.9



Lewis structure of HF

H F

Step 1: Make the sketch

H : F

Step 2: Put 2 electrons between the atoms

Duplet

Step 3: Hydrogen has a stable duplet

lone pairs

H : F :

Step 4: Put the remaining electrons on the central atom

Octet

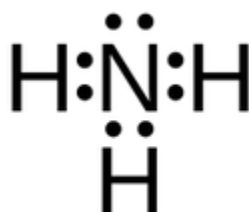
Octet

Step 5: Fluorine has a stable octet

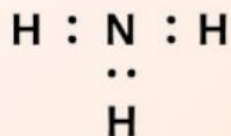
Stable lewis structure

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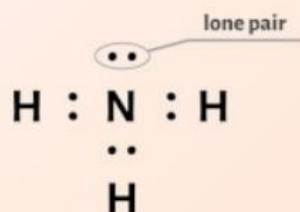
1.10



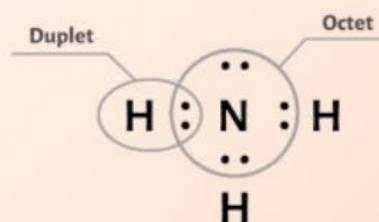
Lewis structure of NH₃



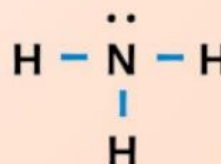
Step 1: Select the center atom and put 2 electrons between the atoms



Step 2: Put the lone pair on central atom

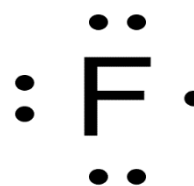


Step 3: Hydrogen has stable duplet and nitrogen has stable octet



Step 4: Stable lewis structure

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Lewis structure of OF₂

F O F

Step 1: Select the center atom

F : O : F

Step 2: Put 2 electrons between the atoms

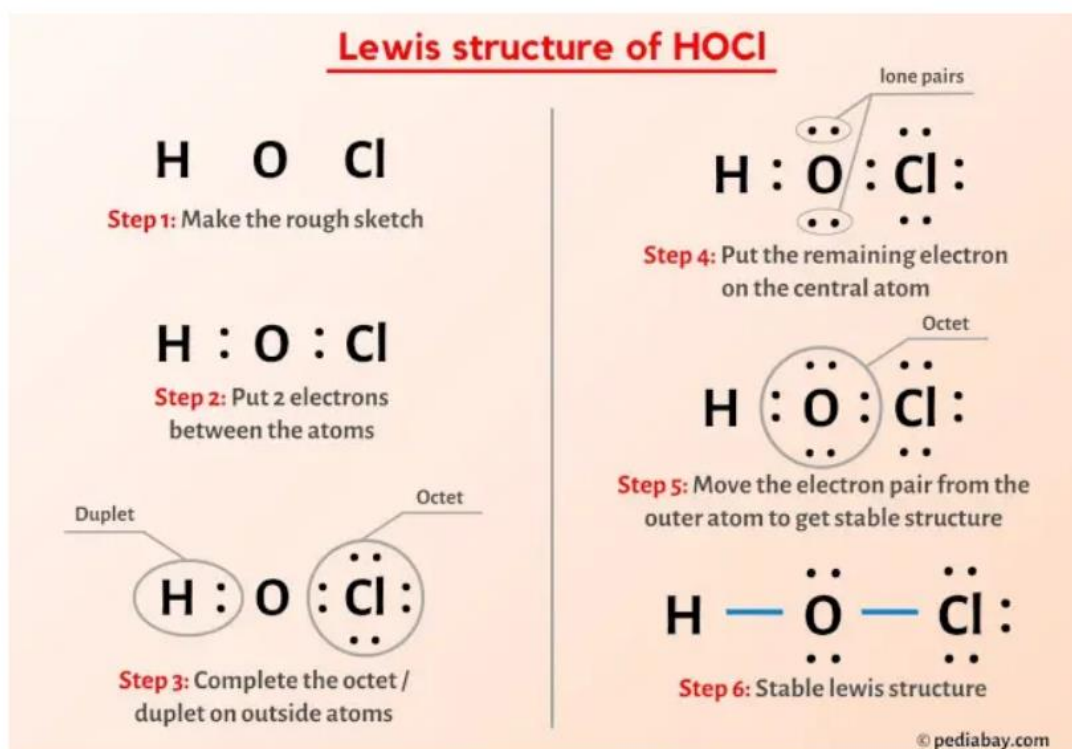
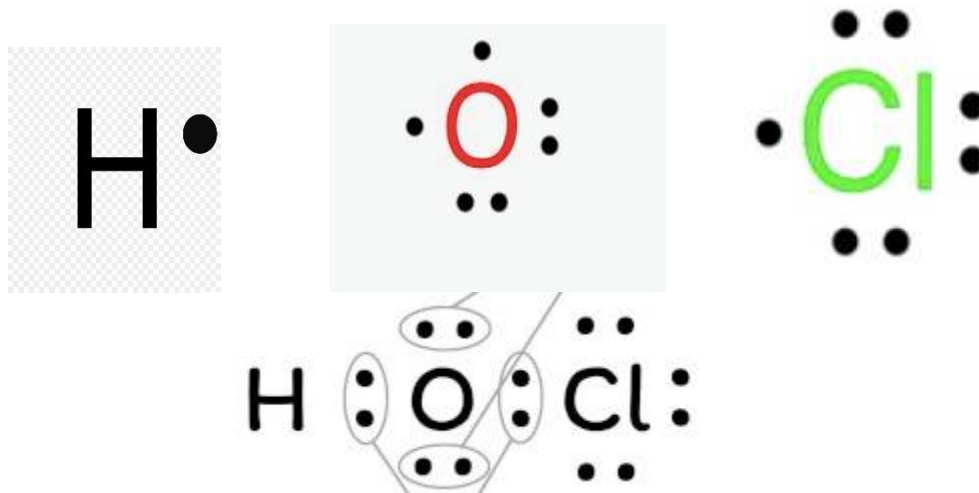
Step 3: Complete the octet on outside atoms

Step 4: Put the remaining electrons on the central atom

Step 5: Oxygen has stable octet

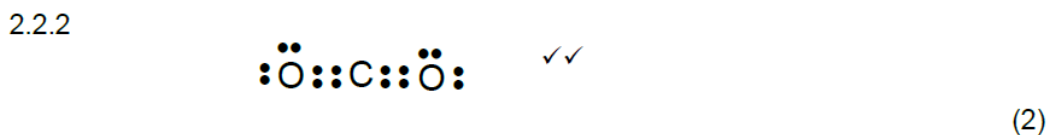
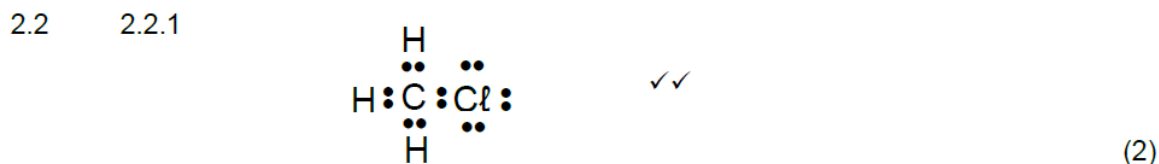
Step 6: Stable lewis structure

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2017 November Paper 2 Q 2

- 2.1 A covalent bond is the sharing of electrons between two atoms to form a molecule. ✓✓
'n Kovalente binding is die deel van elektrone tussen twee atome van 'n molekule. ✓✓ (2)



- 2.3 None/zero ✓/Geen/nul ✓ (1)

- 2.4 H_2O ✓ (1)

- 2.5.1 H_2O is angular/bent/hoekig ✓ (1)

- 2.5.2 CO_2 is linear/lineêr ✓ (1)

- 2.6 (The charge distribution in) CH_3Cl is asymmetrical and CH_4 is symmetrical. ✓
(Die verspreiding van lading in) CH_3Cl is asimmetries en CH_4 is simmetries.

OR/OF

- The chlorine has a higher electronegativity than the hydrogen. ✓
Die chloor het 'n hoër elektronegatiwiteit as waterstof. (1)

2023 Eastern Cape November Paper 2 Q 2.2 –Q 2.4



2.3 1 $\checkmark$ (1)

2.4 Non-polar $\checkmark$

- B – Cl is a polar bond $\checkmark$ ($\Delta \text{EN} = 3,0 - 2,0 = 1$)
- BCl_3 is a trigonal planar $\checkmark$
- Charge distribution /molecular geometry / molecule is symmetrical $\checkmark$ /
 The polar bonds cancel each other out

Nie-polêr

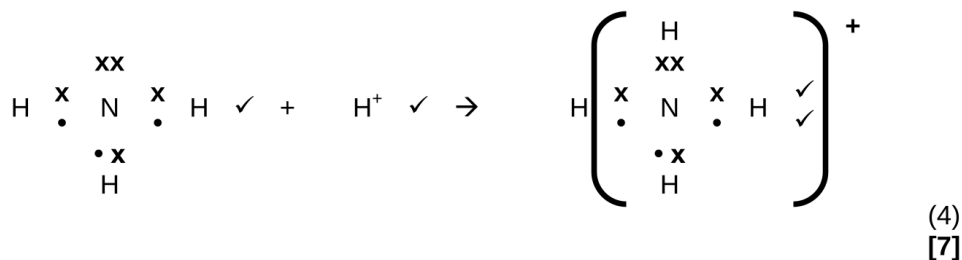
- B – Cl is 'n polêre binding ($\Delta \text{EN} = 3,0 - 2,0 = 1$)
- BCl_3 het 'n trigonaal planêre vorm
- Lading verspreiding / molekulêre vorm(geometrie) / molekule is simmetries
 / Die polêre bindings kanselleer mekaar uit. (4)

2022 KwaZulu Natal November Paper 2 Q 7

QUESTION 7

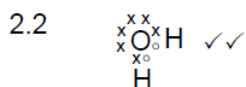
7.1 The sharing of electrons between two atoms to form a molecule. $\checkmark \checkmark$ (2)

7.2 7.2.1 Dative covalent bond $\checkmark$ (Co-ordinate covalent bond) (1)
 7.2.2



2015 November Paper 2 Q 2

- 2.1 The sharing of electrons ✓ between (two) atoms (to form a molecule). ✓
Die deling van elektrone tussen (twee) atome (om 'n molekule te vorm). (2)

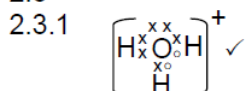


Marking criteria/Nasienriglyne:

- O atom shown with 8 electrons around it.
O-atoom getoon met 8 elektrone rondom dit.
- Two electron pairs on O atom shared with two H atoms as shown.
Twee elektronpare op O-atoom word gedeel met H-atome soos getoon.

(2)

2.3



(1)

- 2.3.2
- One atom/ion must have an empty valence shell / orbital. ✓
Een atoom/ioon moet 'n leë valensskil/orbitaal hê.
 - The other atom must have a lone pair of electrons. ✓
Die ander atoom moet 'n alleenpaar-elektrone hê.
- (2)

2.4

- 2.4.1 The tendency of an atom in a molecule ✓ to attract bonding electrons closer to itself. ✓
Die neiging van 'n atoom in 'n molekule om bindingselektrone nader aan ditself aan te trek. (2)

- 2.4.2 (a) $\Delta \text{EN}(\text{between C and O}) = 1$ ✓ (1)

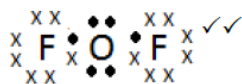
- (b) $\Delta \text{EN}(\text{between H and O}) = 1,4$ ✓ (1)

- 2.4.3
- The bonds in both molecules are polar ✓ due to the difference in electronegativities ✓ between C and O and H and O.
Die bindings in beide molekule is polêr weens die verskil in elektronegatiwiteit tussen C en O en H en O.
 - The shape of the H₂O molecule is angular ✓ and therefore the molecule is polar ✓ because one side of the molecule can be positive and the other side negative.
Die vorm van die H₂O-molekule is hoekig en dus is die molekule polêr omdat een kant van die molekule positief en die anderkant negatief kan wees.
 - The shape of the CO₂ molecule is linear ✓ and thus it is non-polar ✓ because the charge distribution is symmetrical.
Die vorm van die CO₂-molekule is liniêr en dus is die molekule nie-polêr omdat die ladingsverspreiding simmetries is.
- (6)

2016 November Paper 2 Q 2.1-2.4

- 2.1 Electronegativity is a measure of the tendency of an atom in a molecule to attract bonding electrons. ✓✓
Elektronegatiwiteit is 'n maatstaf van die neiging van 'n atoom in 'n molekule om bindingselektrone aan te trek (2)

2.2



Marking Criteria/Nasienkriteria

- O atom shown with 8 electrons around it.
O-atoom met 8 elektrone rondom getoon
- Two electron pairs on O atoms shared with two F atoms as shown.
Twee elektronpare op O-atome gedeel met twee F-atome, soos getoon

(2)

- 2.3 $\Delta EN (O - F) = 4 - 3,5 = 0,5$ ✓
 $0 < \Delta EN < 1$, the bond is weakly polar/*die binding is swak polêr* ✓ (2)

- 2.4
- The bonds in both molecules are polar ✓ due to the difference in electronegativity ✓ between O and F and C and O.
 - The shape of the OF_2 molecule is angular and because the charge distribution is asymmetrical around the central atom the molecule is polar. ✓
 - The shape of the CO_2 molecule is linear and because the charge distribution is symmetrical around the central atom the molecule is non-polar. ✓
 - *Die bindings in albei molekules is polêr as gevolg van die verskil in elektronegatiwiteit tussen O en F en tussen C en O.*
 - *Die vorm van die OF_2 -molekule is hoekig en omdat die ladings asimmetries versprei is rondom die sentrale atoom is die molekule polêr*
 - *Die vorm van die CO_2 -molekule is lineêr en omdat die ladings simmetries versprei is rondom die sentrale atoom is die molekule nie-polêr*
- (4)

2018 November Paper 2 Q 2.1-2.5

2.1 Chemical bond is mutual attraction between two atoms resulting from the simultaneous attraction between their nuclei and (outer) electrons. ✓✓
Chemiese binding is die wedersydse aantrekking tussen twee atome as gevolg van die gelyktydige aantrekking tussen hulle kerne en (buite)-elektrone. (2)

2.2.1 $\text{H}:\text{C}::\text{N}:$ ✓✓ (2)

2.2.2 $\begin{array}{c} \cdot\cdot \\ \cdot\cdot \\ \text{O}:\text{H} \\ \cdot\cdot \\ \text{H} \end{array}$ ✓✓ (2)

2.3 Linear ✓
Lineêr (1)

2.4 $3 - 2,5 = 0,5$ ✓ (1)

2.5 Polar ✓
Polêr (1)

