

Exercise walk-through

2.5

Lewis Diagrams

AP Chemistry

Lewis diagrams and resonance

A **Lewis diagram** shows shared **bonds** (lines) and **lone pairs**, aiming for an **octet**.

Formal charge picks the best

$$\text{FC} = V - (\text{lone}) - (\text{bonds})$$

Resonance : when several equal structures exist, the real bonds are an **average** (delocalized).



Exercises 2.1-2.3

2.1 Count the total valence electrons in H_2O .

[1]

2.2 Count the total valence electrons in NH_3 .

[1]

2.3 How many lone pairs are on the oxygen in a water molecule?

[1]

Exercises 2.1-2.3

2.1 Count the total valence electrons in H_2O . [1]

2.1

- $2(1) + 6 = 8$
-

2.2 Count the total valence electrons in NH_3 . [1]

2.2

- $5 + 3(1) = 8$
-

2.3 How many lone pairs are on the oxygen in a water molecule? [1]

2.3

- Two lone pairs

Exercise 3.1

3.1 The number of valence electrons to use in the Lewis diagram of NO_3^- is [1]

☐

A 22

B 23

C 24

D 5

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☐

A 22

B 23

C 24

D 5

3.1 C

- $5 + 3(6) + 1 = 24$ (the +1 for the negative charge)

Exercise 3.2 (a)

3.2 Draw the Lewis diagram of CO_2 .

(a) State the total number of valence electrons.

[1]

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(a)

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Exercise 3.2 (b)

3.2 Draw the Lewis diagram of CO_2 .

(b) Describe the bonding (single/double/triple) between C and each O.

[2]

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[2]

(b)

- Each O forms a **double** bond with C, so all atoms reach an octet

Exercise 3.3

3.3 For N_2 , state the total valence electrons and the bond order (single/double/triple) needed to satisfy both octets. [3]

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3.3

- N_2 : $2(5) = 10$ valence electrons; a **triple** bond between the N atoms, leaving one lone pair on each N