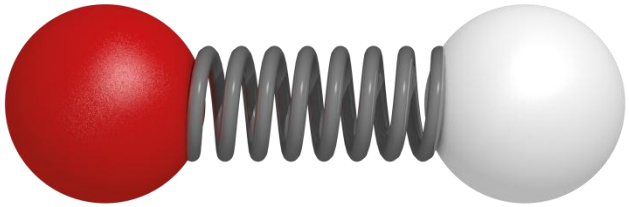
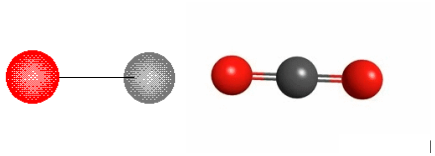
Alcune Applicazioni Chimiche della Spettroscopia



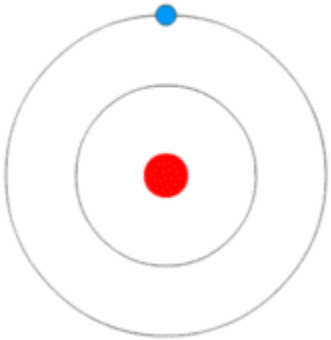
Francesco Ruffo
ruffo@unina.it

rotazioni molecolari



rotazioni molecolari

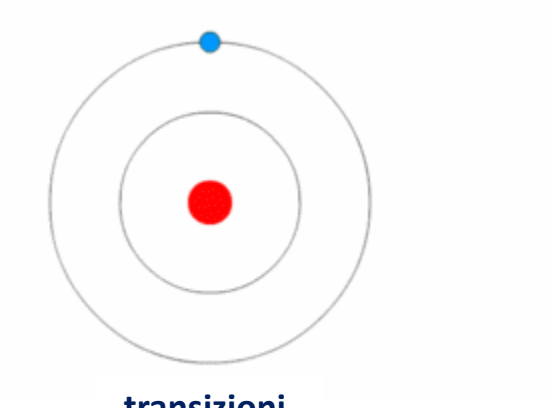
vibrazioni molecolari



rotazioni molecolari

vibrazioni molecolari

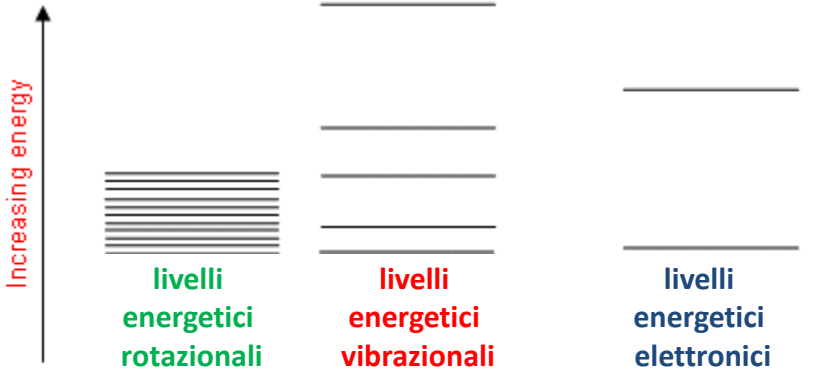
transizioni elettroniche



rotazioni molecolari

vibrazioni molecolari

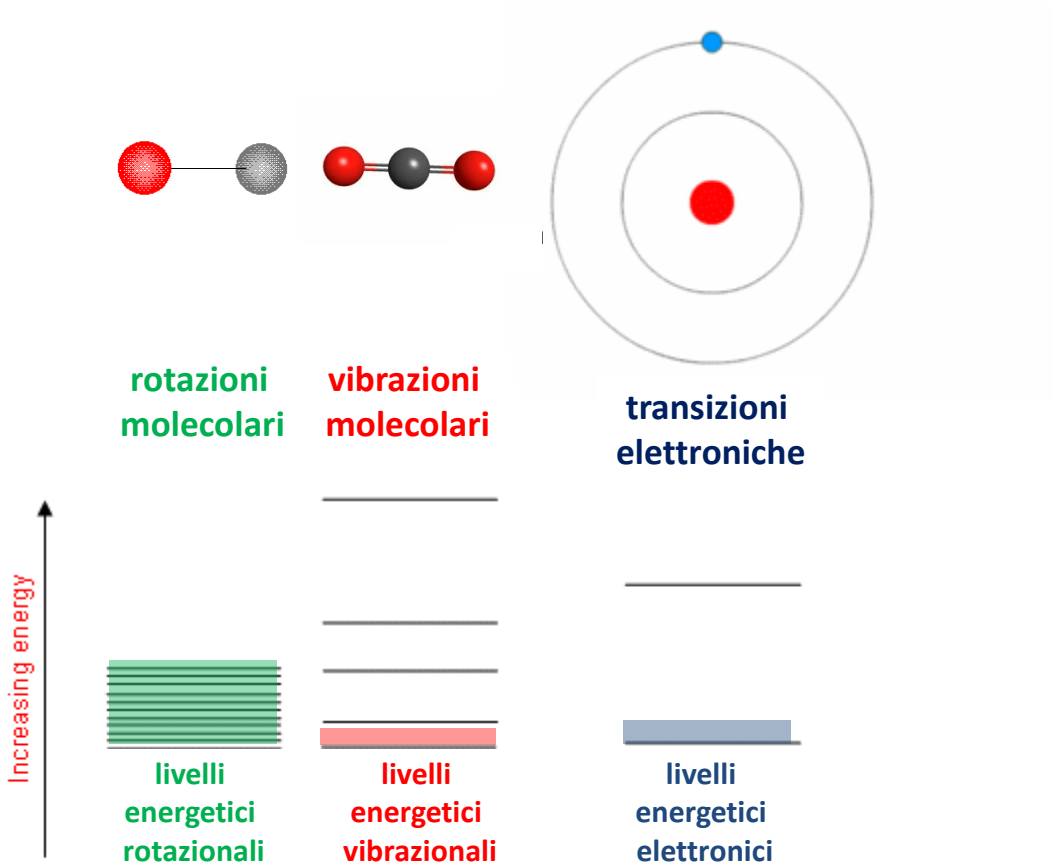
transizioni elettroniche

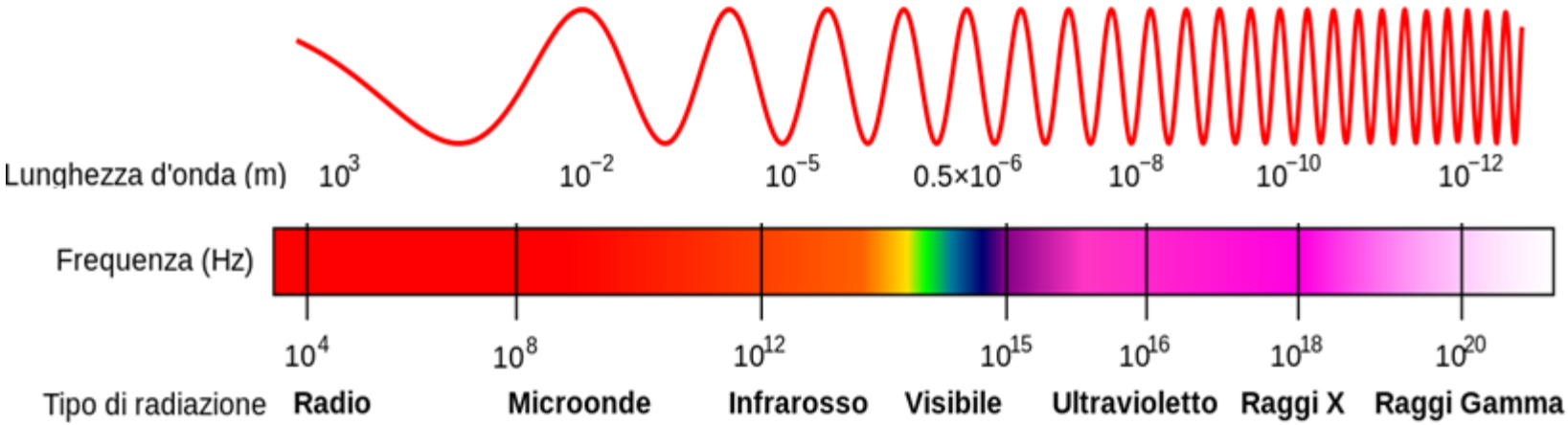


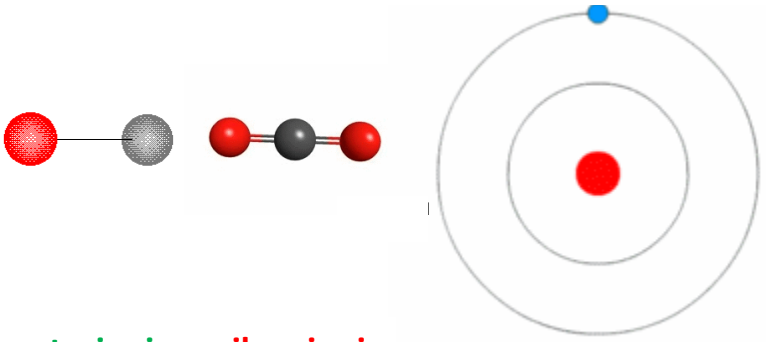
livelli energetici rotazionali

livelli energetici vibrazionali

livelli energetici elettronici


rotazioni
molecolari
vibrazioni
molecolari
transizioni
elettroniche
Increasing energy
livelli
energetici
rotazionali
livelli
energetici
vibrazionali
livelli
energetici
elettronici

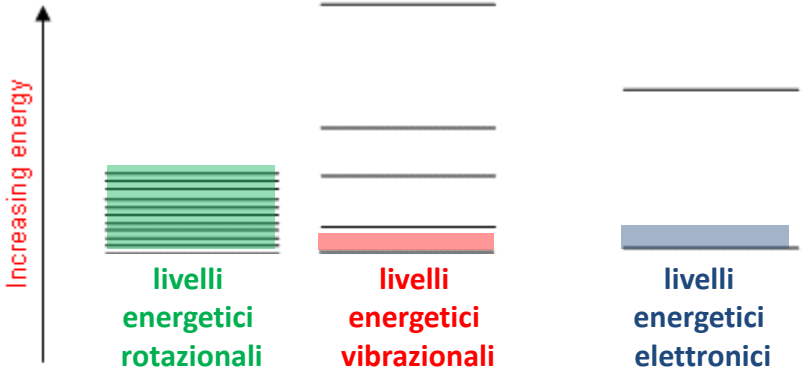




rotazioni molecolari

vibrazioni molecolari

transizioni elettroniche



livelli energetici rotazionali

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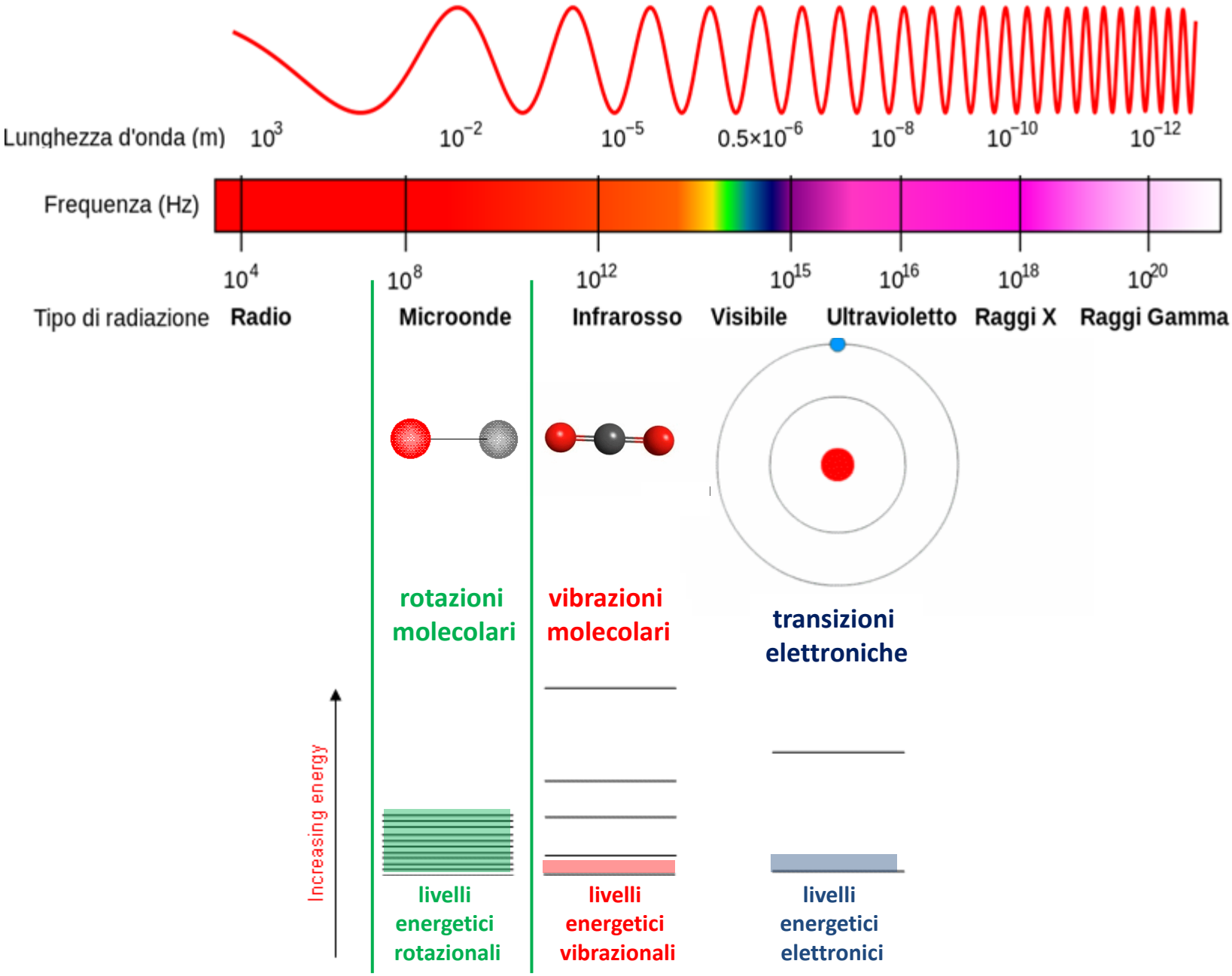
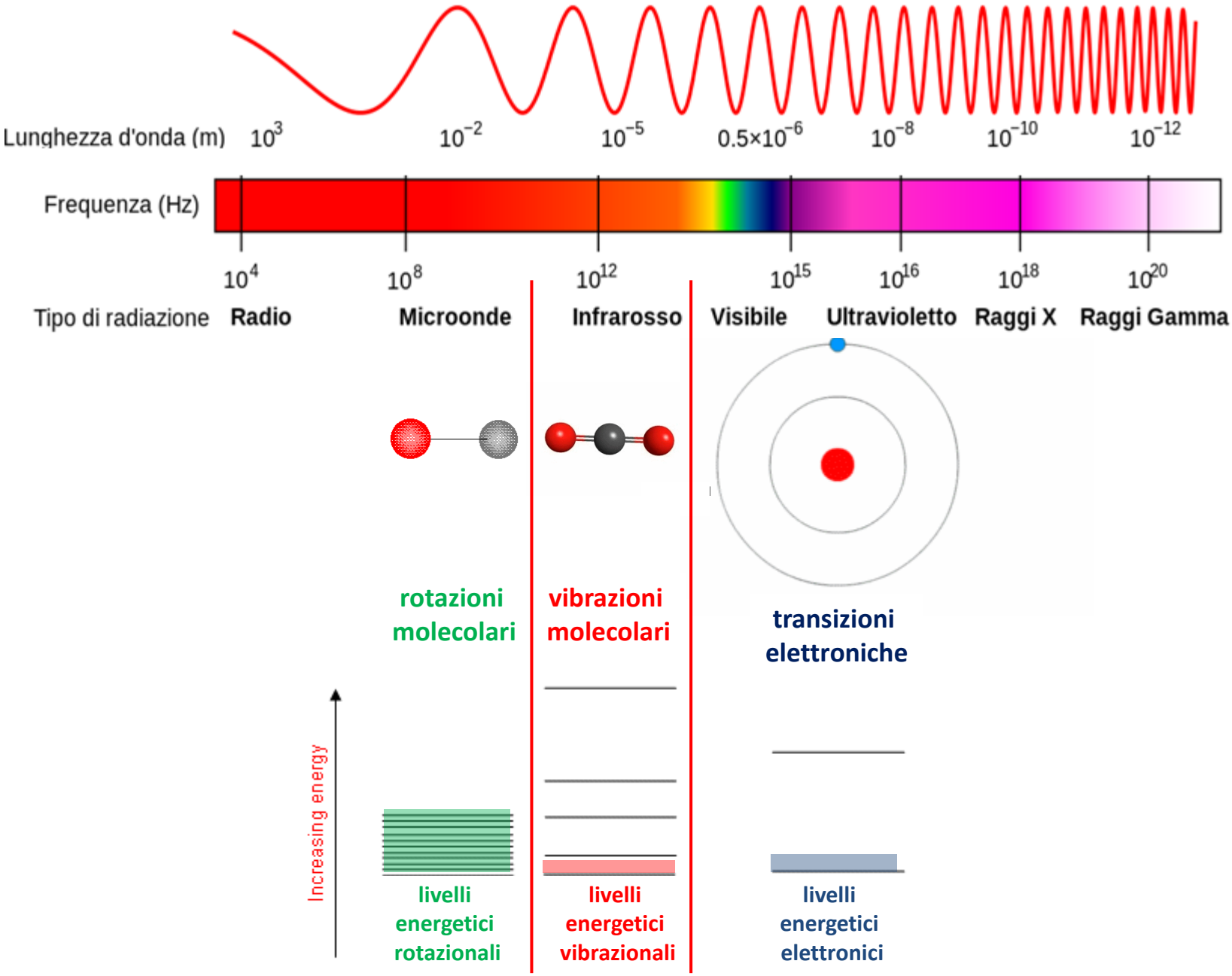
livelli energetici elettronici


Lunghezza d'onda (m)
10^{3}
10^{-2}
10^{-5}
0.5×10^{-6}
10^{-8}
10^{-10}
10^{-12}
Frequenza (Hz)
10^{4}
10^{8}
10^{12}
10^{15}
10^{16}
10^{18}
10^{20}
Tipo di radiazione
Radio
Microonde
Infrarosso
Visibile
Ultravioletto
Raggi X
Raggi Gamma
rotazioni molecolari
vibrazioni molecolari
transizioni elettroniche
Increasing energy
livelli energetici rotazionali
livelli energetici vibrazionali
livelli energetici elettronici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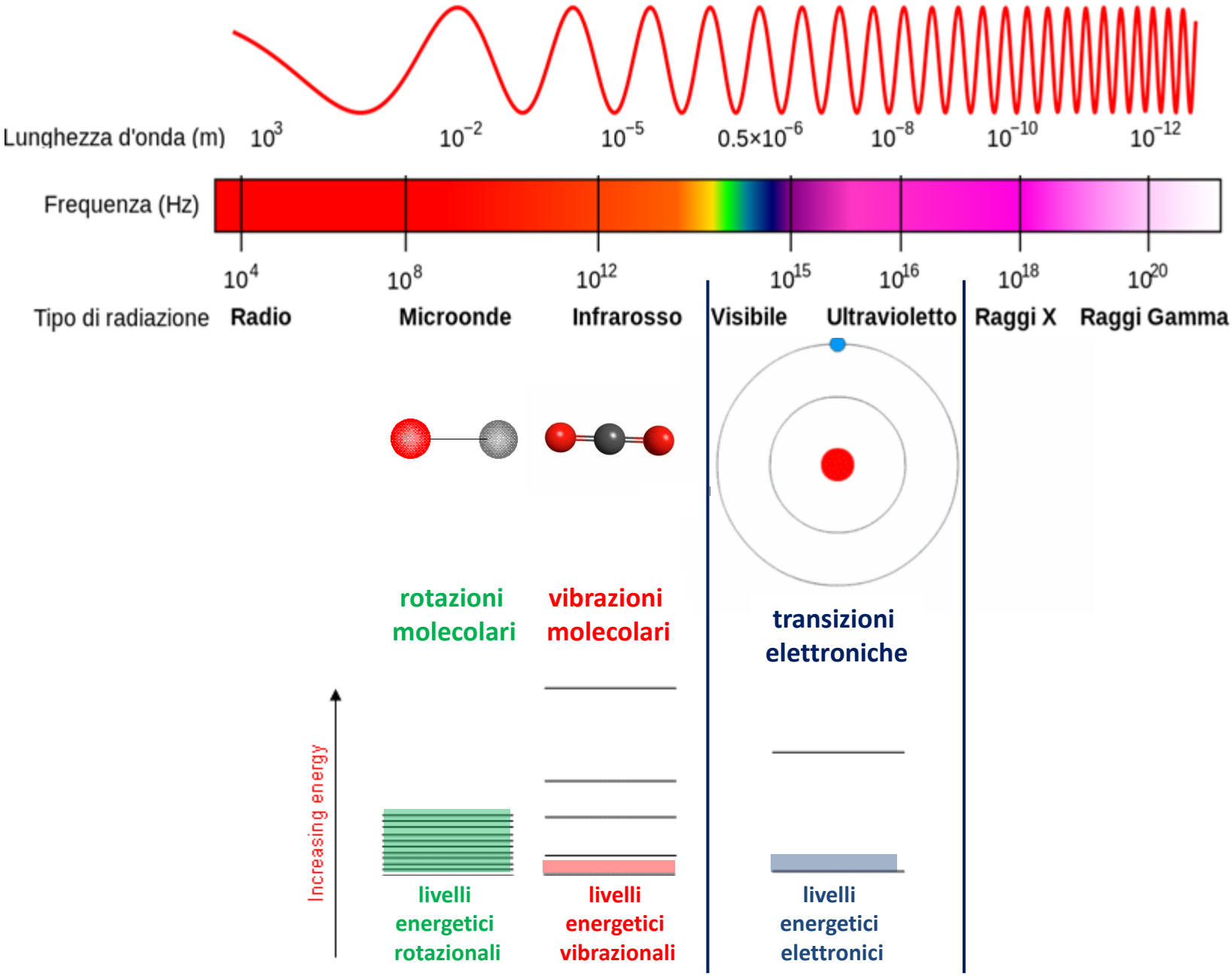
Lunghezza d'onda (m) 10^{3} 10^{-2} 10^{-5} 0.5×10^{-6} 10^{-8} 10^{-10} 10^{-12}
Frequenza (Hz)
10^{4} 10^{8} 10^{12} 10^{15} 10^{16} 10^{18} 10^{20}
Tipo di radiazione
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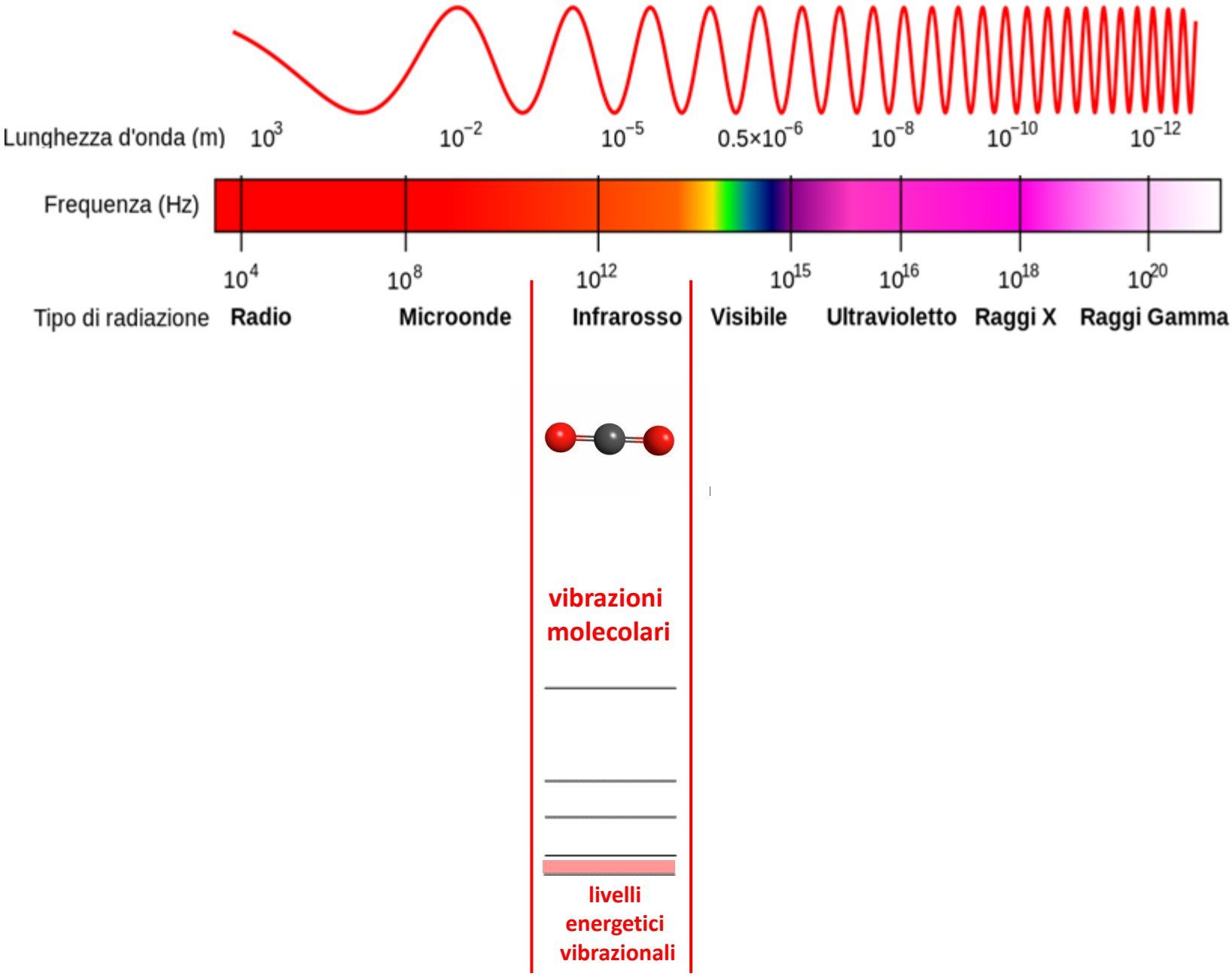
Lunghezza d'onda (m)
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10^{-2}
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10^{-12}
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Tipo di radiazione
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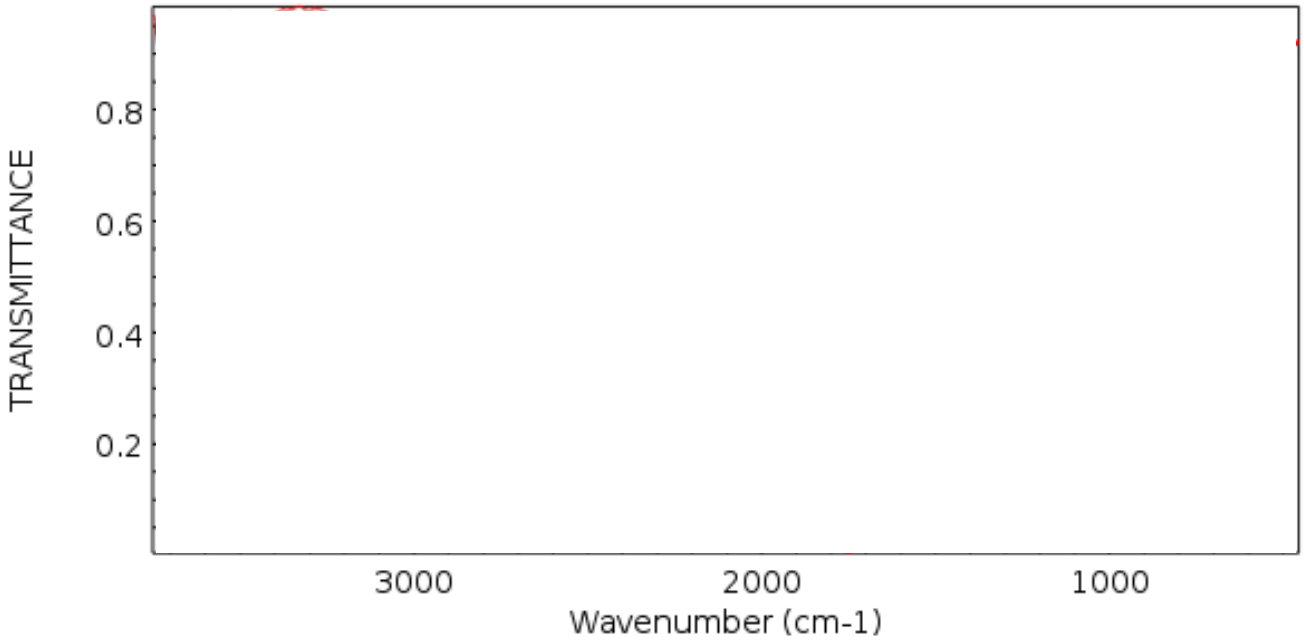
Ultravioletto
Raggi X
Raggi Gamma
vibrazioni molecolari
livelli energetici vibrazionali

Spettroscopia IR: le **vibrazioni molecolari**

Ascissa: **lunghezze d'onda** da 2.5 μ a 25 μ, pari a **numeri d'onda** da 400 a 4000 cm^{-1}
Ordinata: **trasmittanza (T)**



Spettroscopia IR: le **vibrazioni molecolari**

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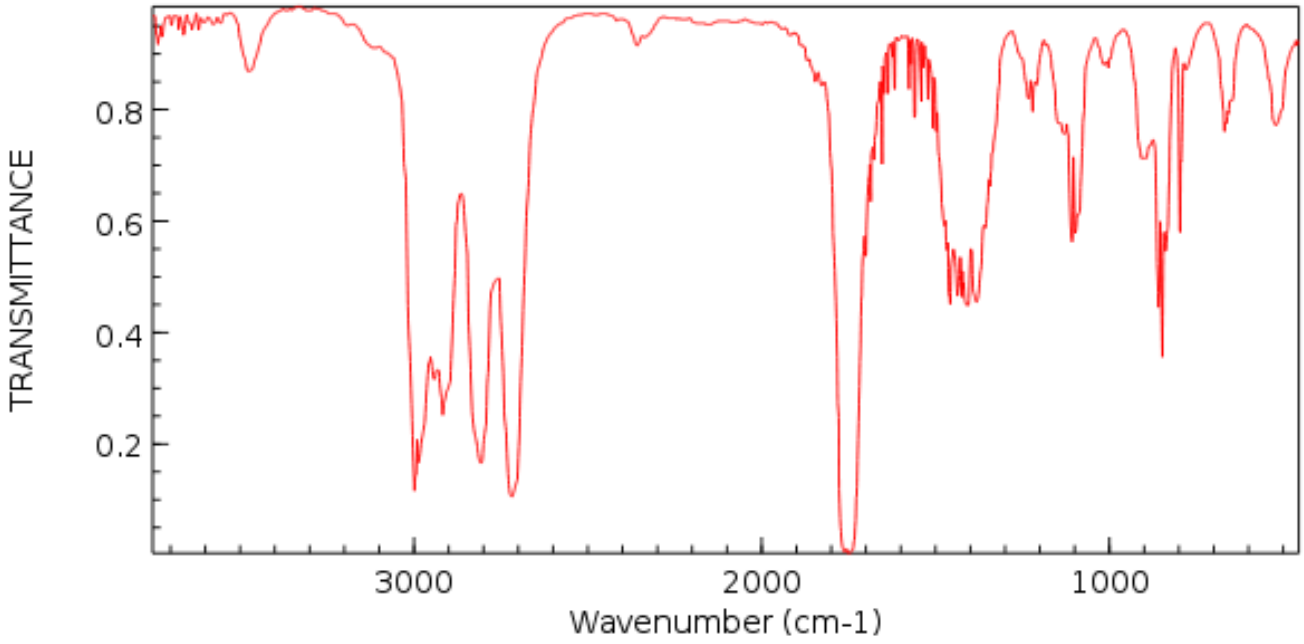


Spettroscopia IR

Ascissa: **lunghezze d'onda** da 2.5 μ a 25 μ, pari a **numeri d'onda** da 500 a 5000 cm^{-1}
Ordinata: **trasmittanza (T)**
Regola di selezione: variazione del momento di dipolo

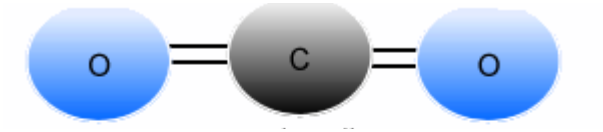
Spettroscopia IR

Ascissa: **lunghezze d'onda** da 2.5 μ a 25 μ, pari a **numeri d'onda** da 500 a 5000 cm^{-1}
Ordinata: **trasmittanza (T)**
Regola di selezione: variazione del momento di dipolo

stretching **simmetrico**: inattivo

Spettroscopia IR

Ascissa: **lunghezze d'onda** da 2.5 μ a 25 μ, pari a **numeri d'onda** da 500 a 5000 cm^{-1}
Ordinata: **trasmittanza (T)**
Regola di selezione: variazione del momento di dipolo



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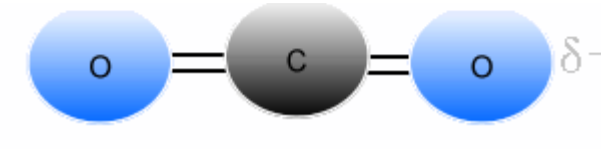
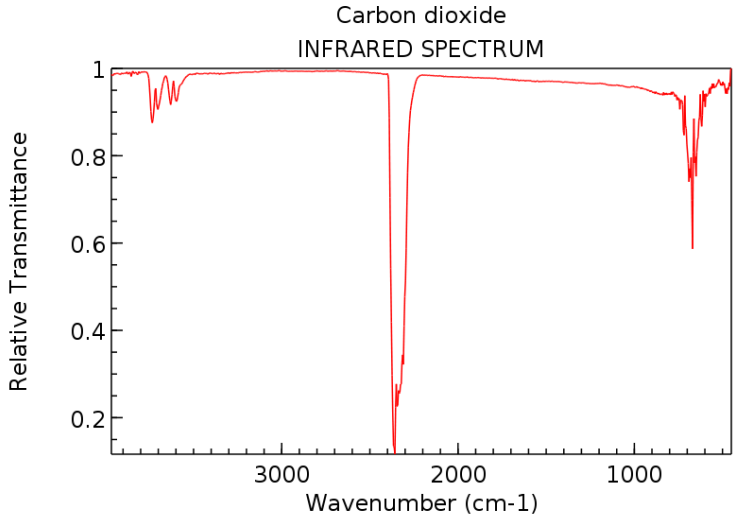
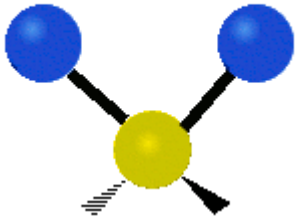


stretching **asimmetrico**: attivo



Spettroscopia IR

Ascissa: **lunghezze d'onda** da 2.5 μ a 25 μ, pari a **numeri d'onda** da 500 a 5000 cm^{-1}
Ordinata: **trasmittanza (T)**
Regola di selezione: variazione del momento di dipolo



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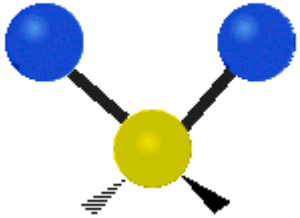
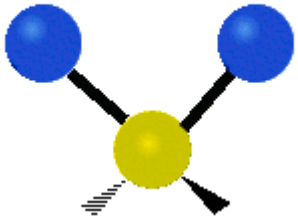


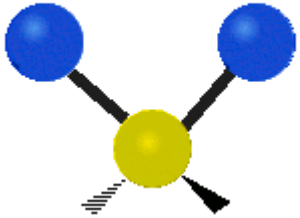
stretching **asimmetrico**: attivo

Spettroscopia IR

Ascissa: **lunghezze d'onda** da 2.5 μ a 25 μ, pari a **numeri d'onda** da 500 a 5000 cm^{-1}
Ordinata: **trasmittanza (T)**
Regola di selezione: variazione del momento di dipolo



stretching **simmetrico**: attivo



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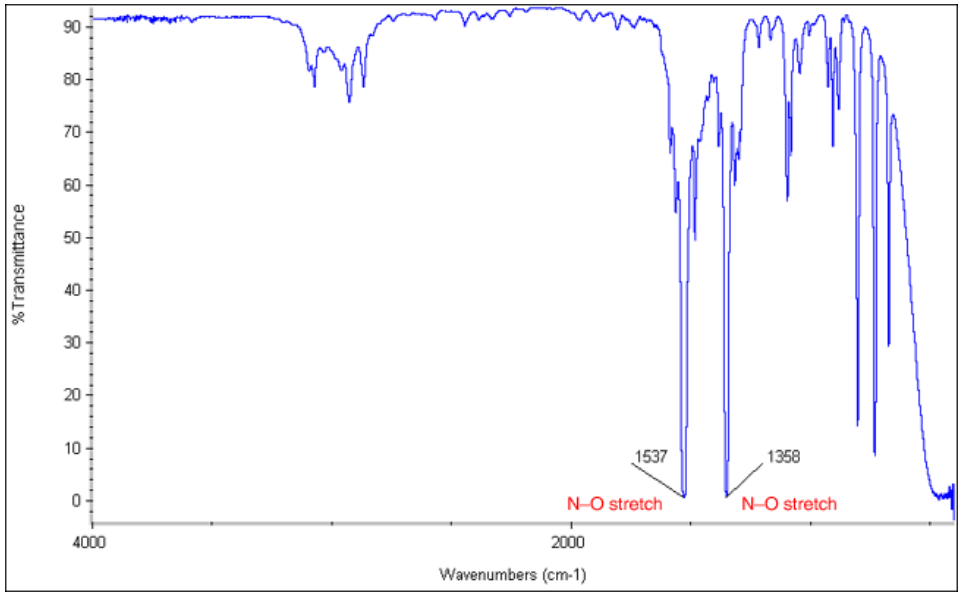
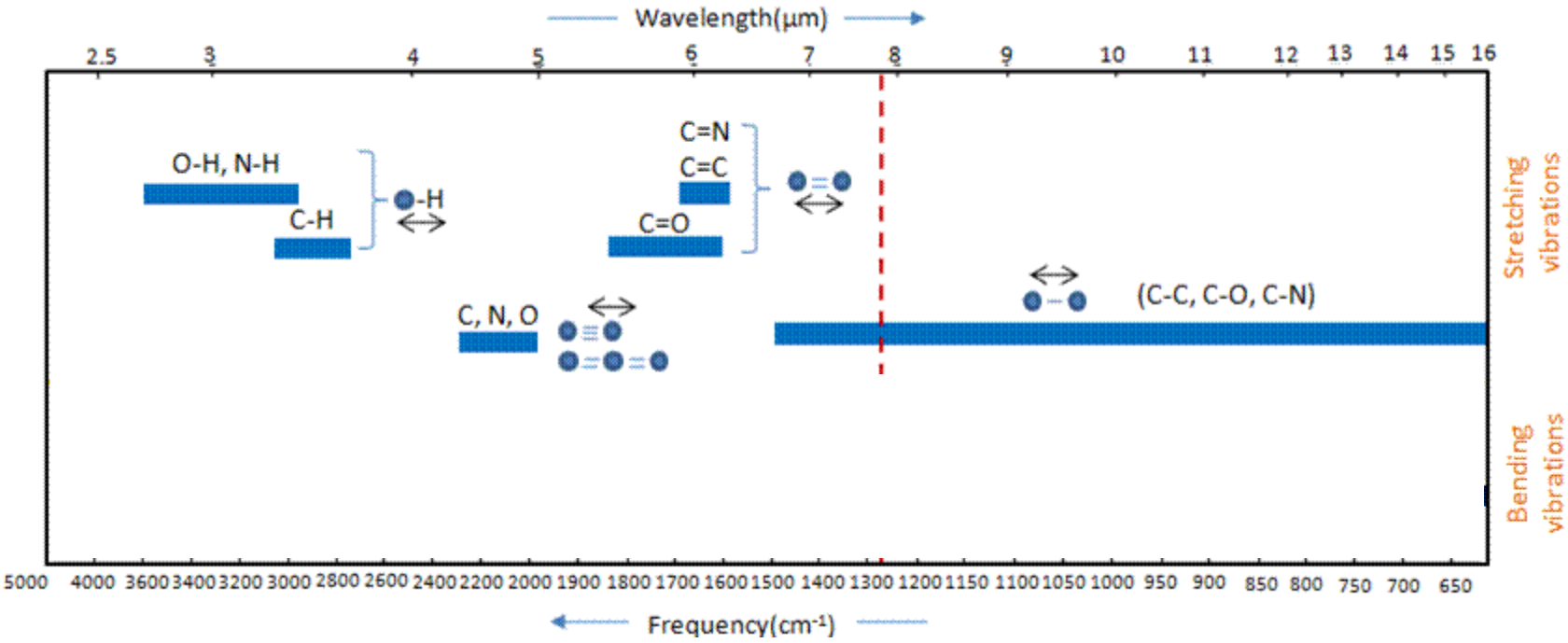
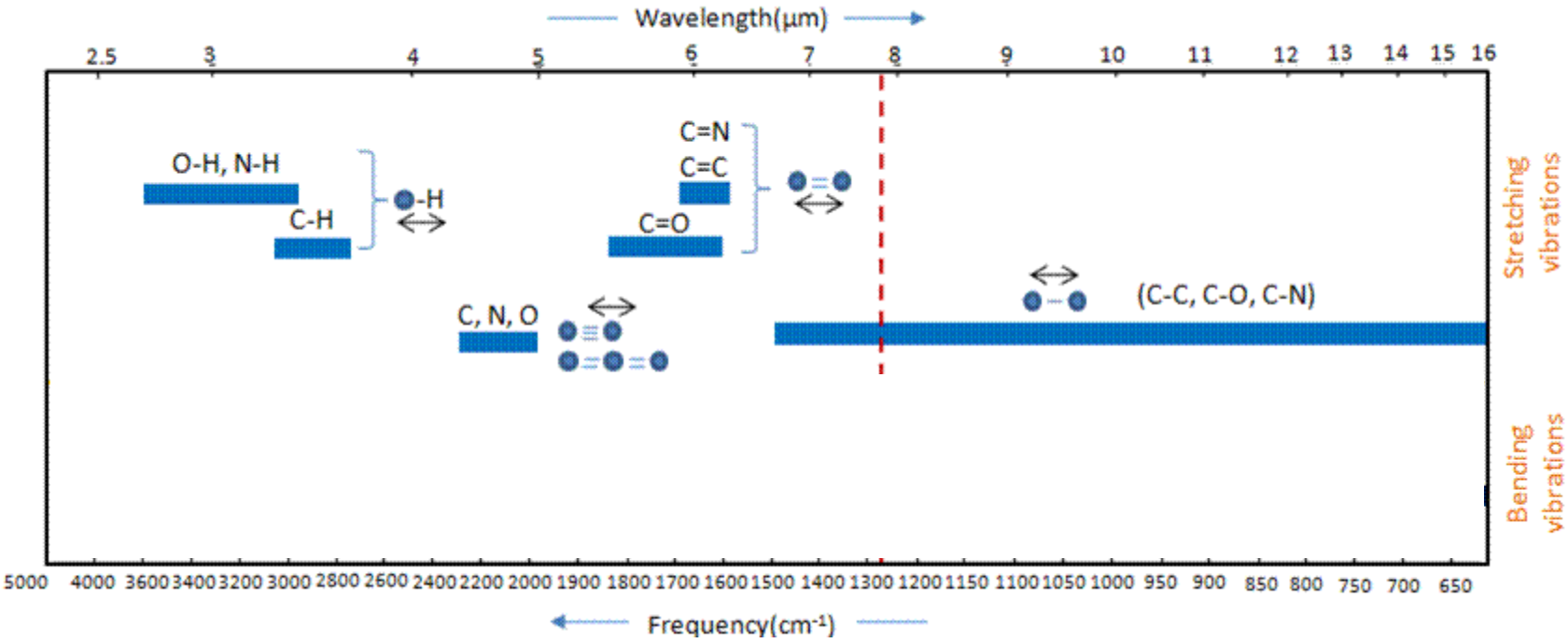


Spettroscopia IR

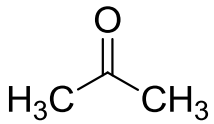


Spettroscopia IR

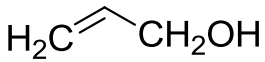


2 isomeri di formula

C_3H_6O

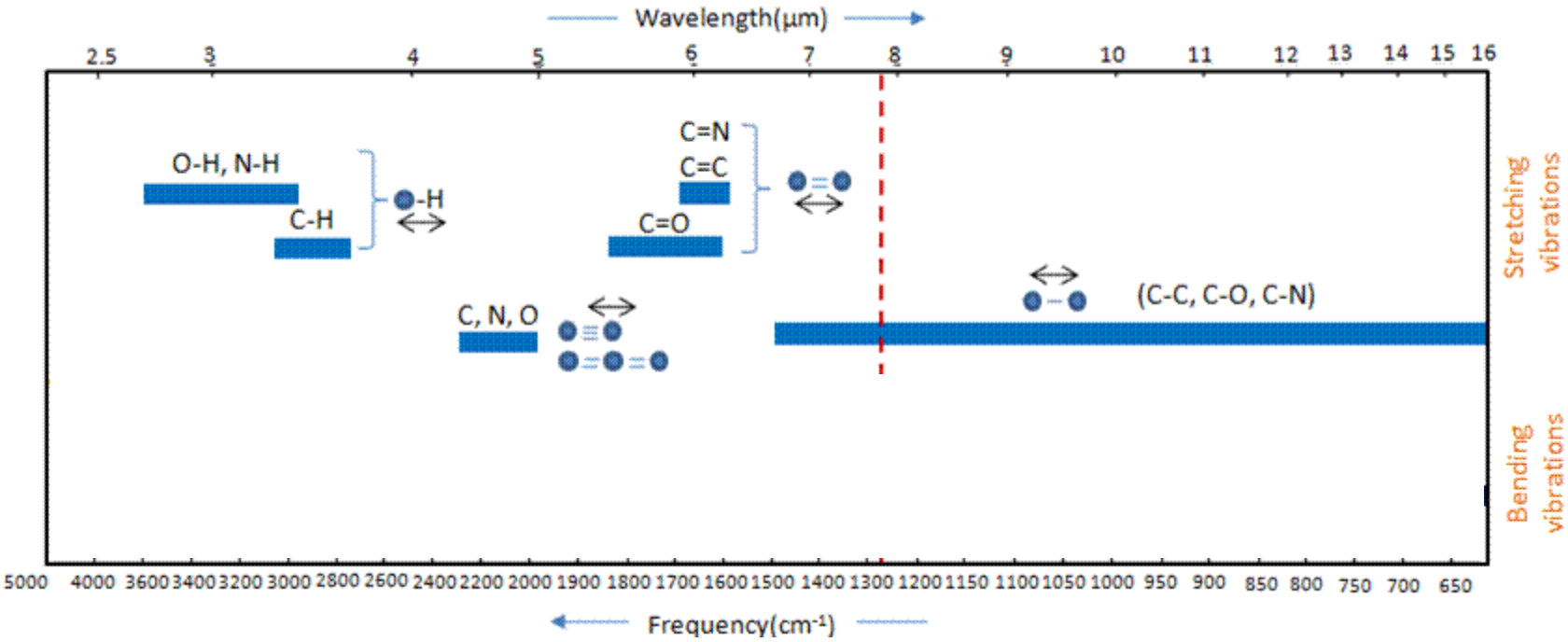


acetone



alcol allilico

Spettroscopia IR



2 isomeri di formula

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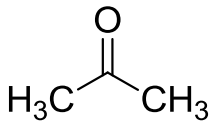

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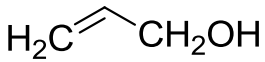
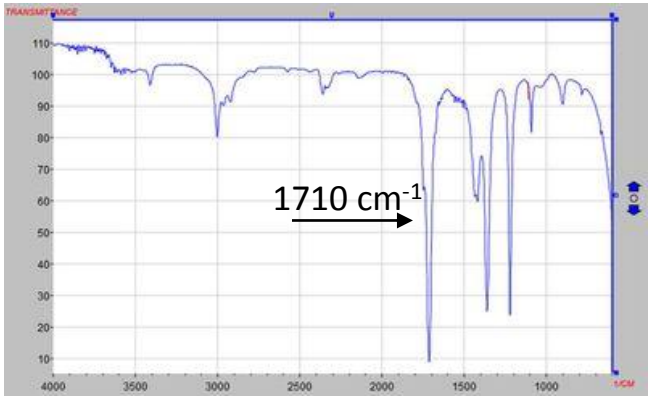
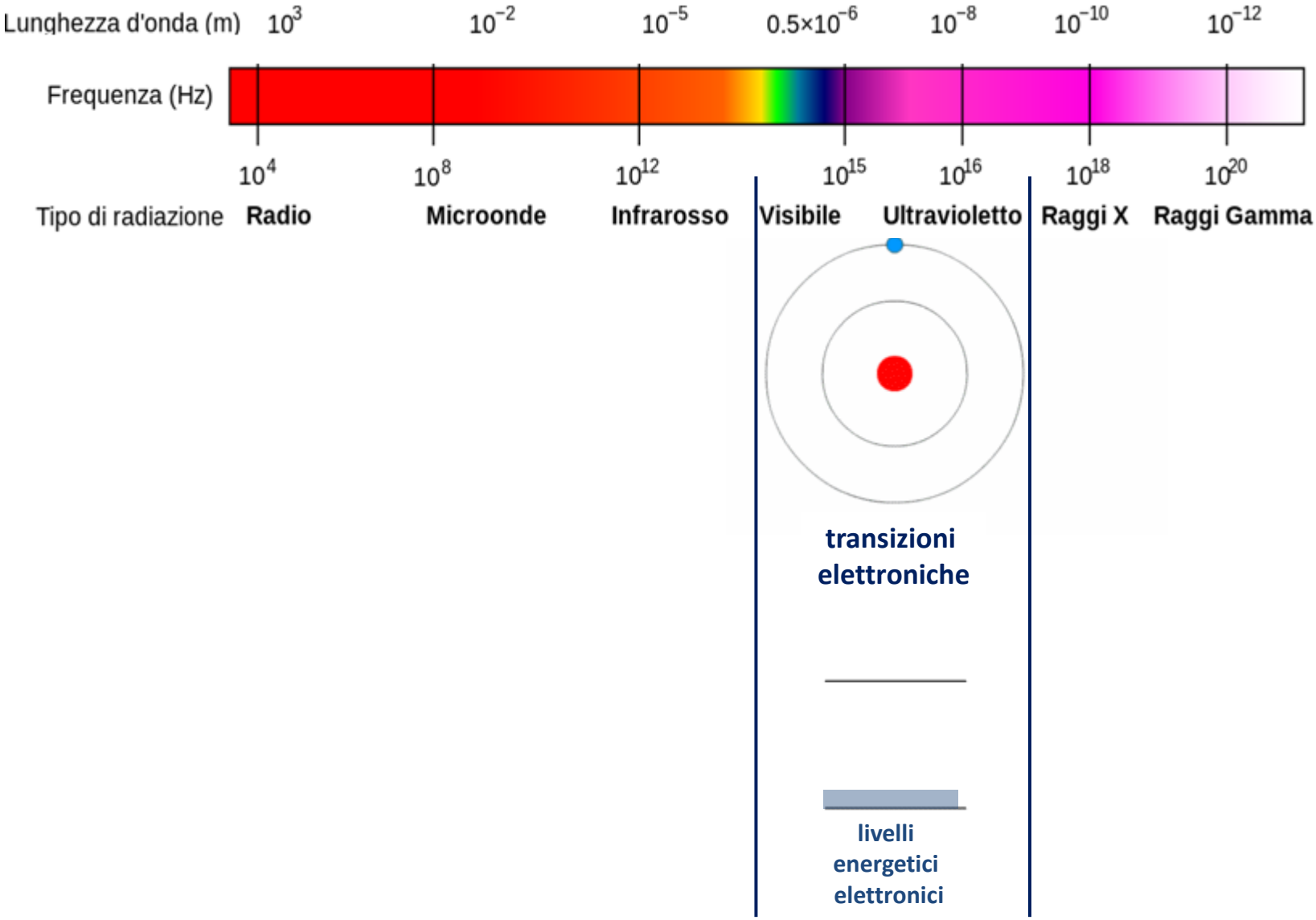


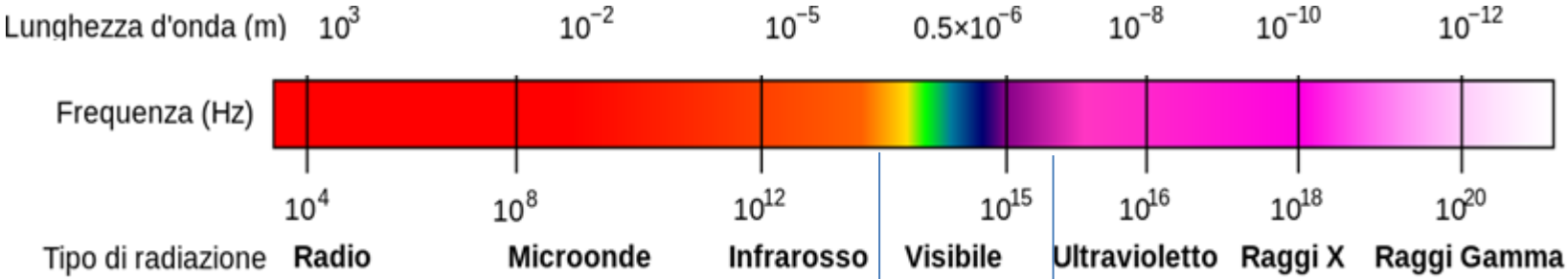
alcol allilico

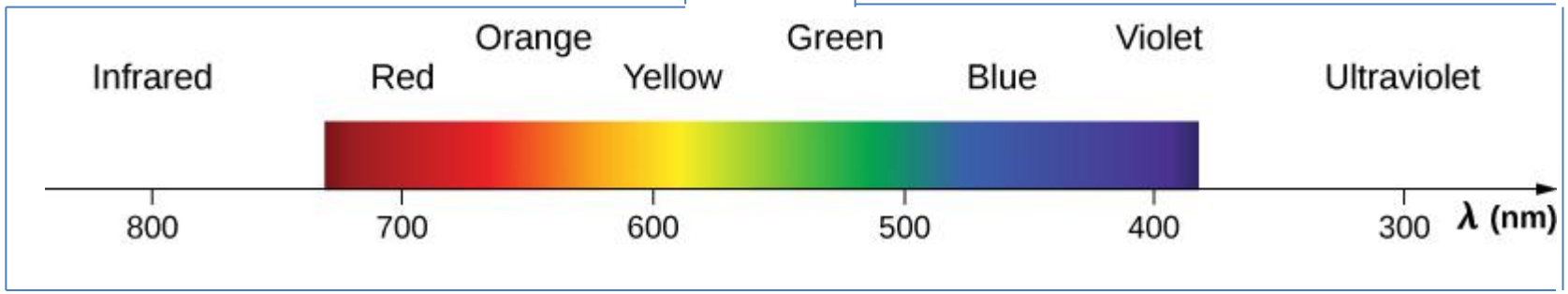


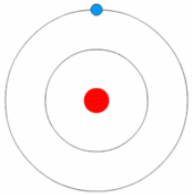
Spettroscopia UV-visibile: le transizioni elettroniche



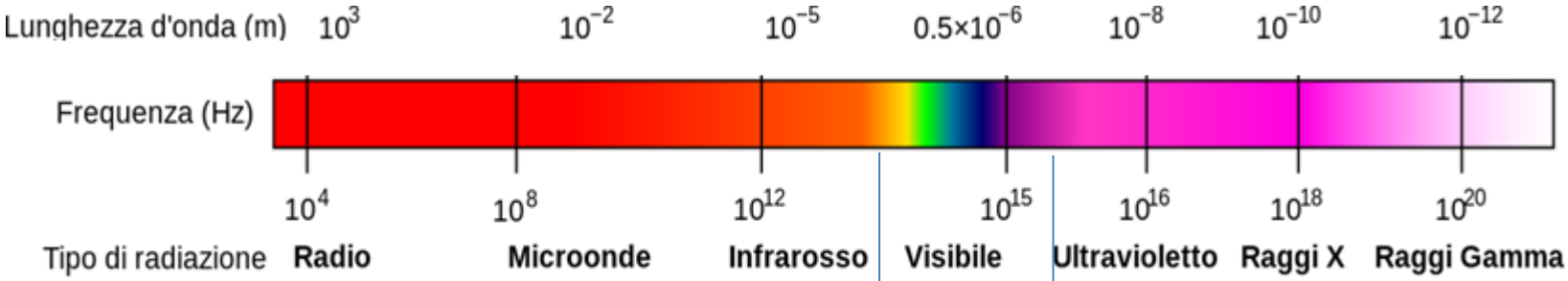
Spettroscopia UV-visibile: le transizioni elettroniche

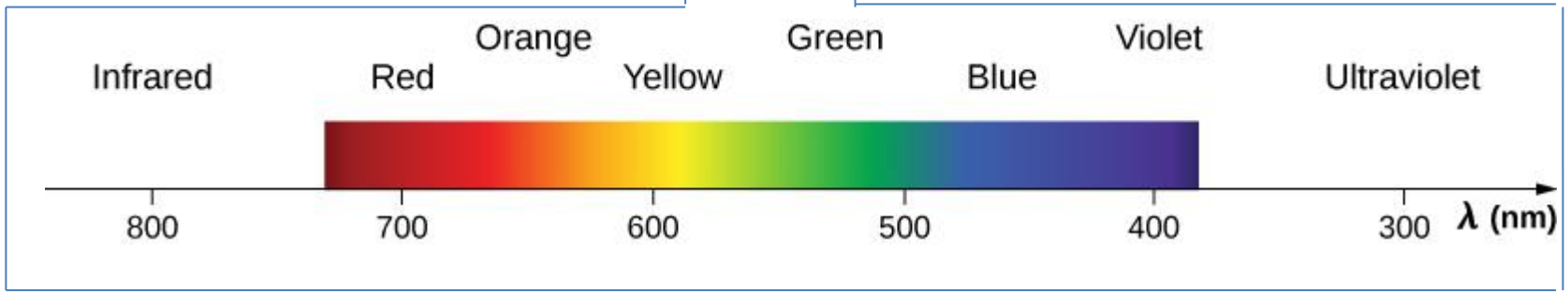


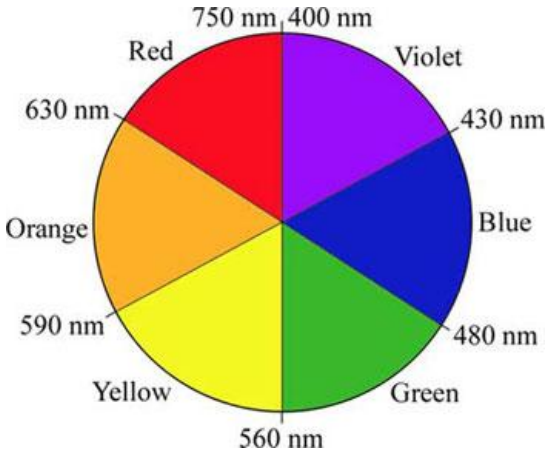


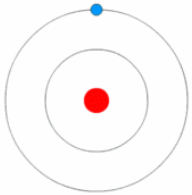


Spettroscopia UV-visibile: le transizioni elettroniche

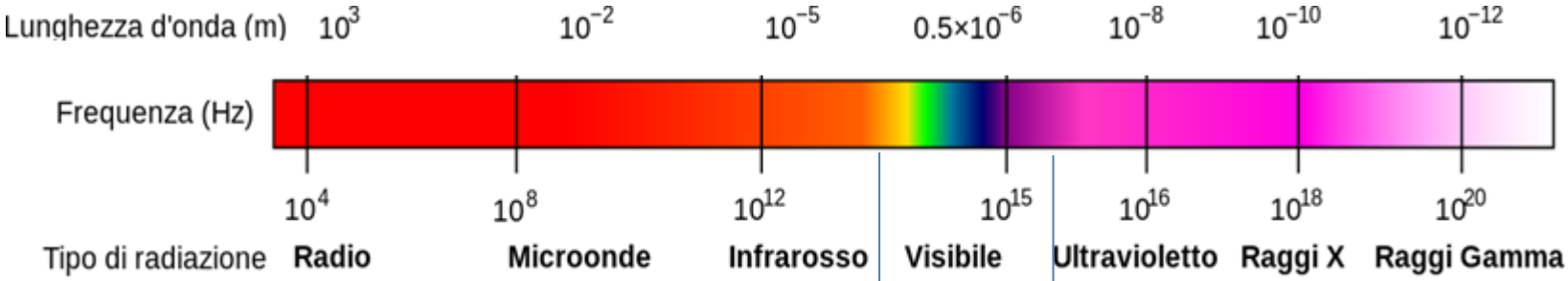


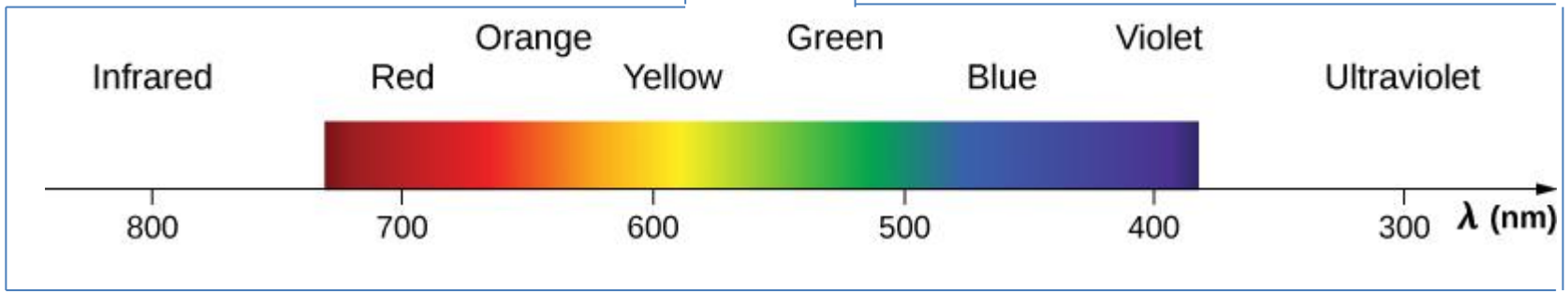


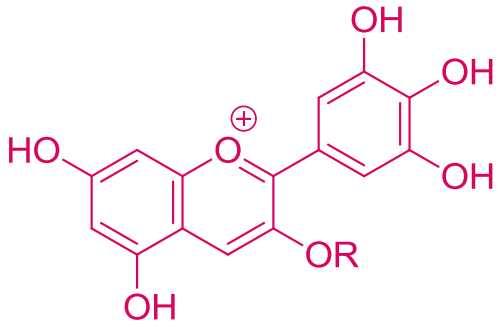


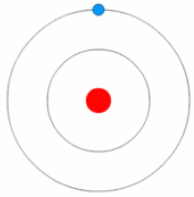


Spettroscopia UV-visibile: le transizioni elettroniche

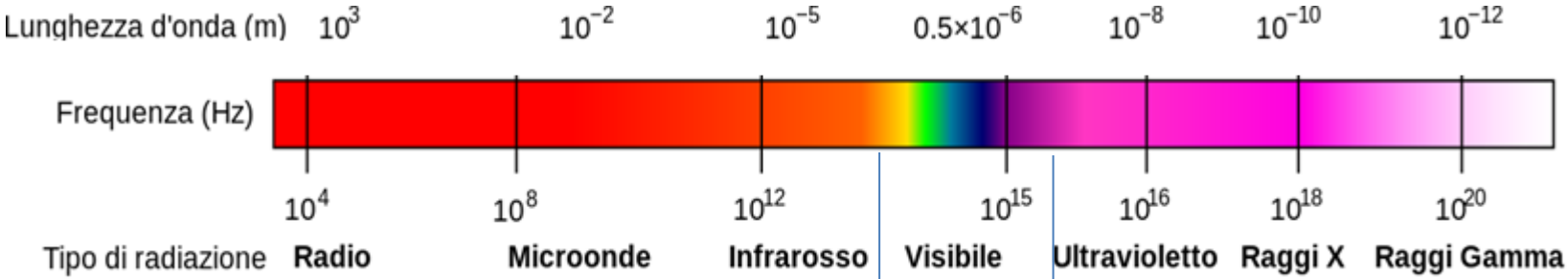


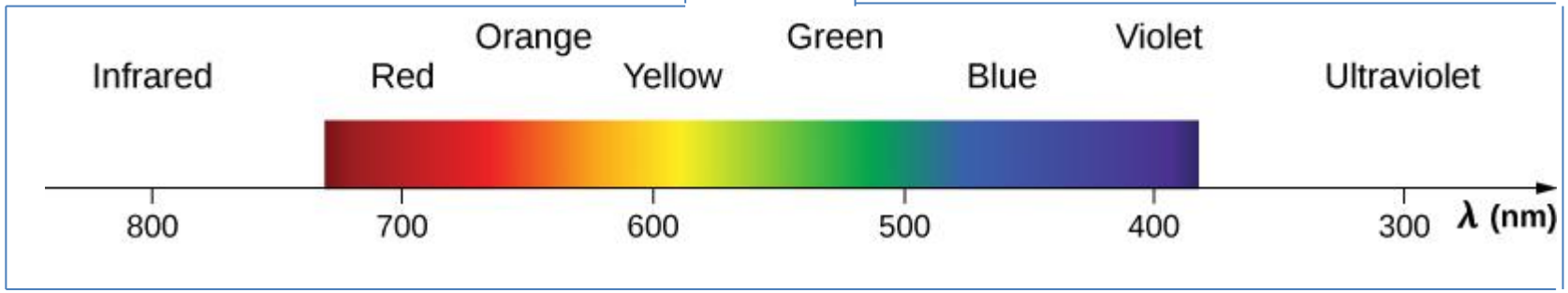






Spettroscopia UV-visibile: le transizioni elettroniche

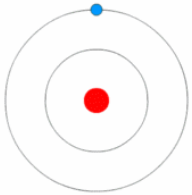




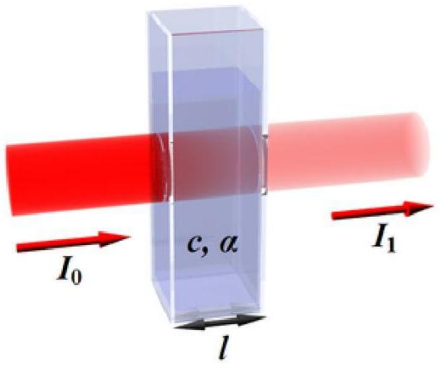
smeraldo
cromo

rubino
cromo

zaffiro
titanio



Spettroscopia UV-visibile: le transizioni elettroniche



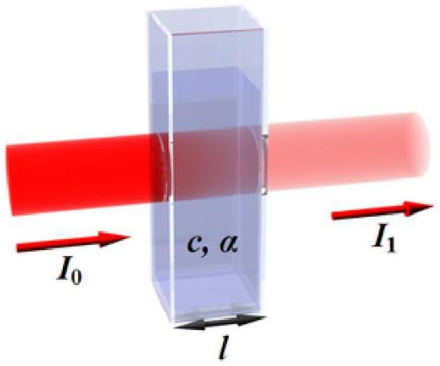
$$\frac{I_1}{I_0} = e^{-\varepsilon C l}$$

ε= coefficiente di estinzione molare

C= concentrazione molare

l= cammino ottico

Spettroscopia UV-visibile: le transizioni elettroniche



$$\frac{I_1}{I_0} = e^{-\varepsilon C l}$$

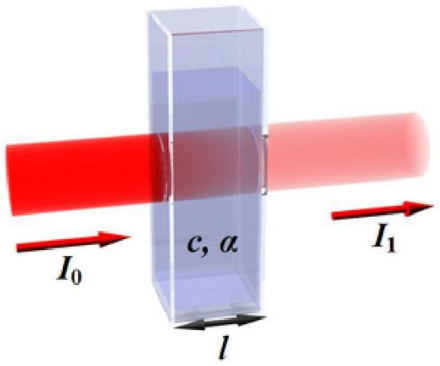
ε= coefficiente di estinzione molare

C= concentrazione molare

l= cammino ottico

$$A = -\ln\frac{I_1}{I_0} = \varepsilon C l$$

Spettroscopia UV-visibile: le transizioni elettroniche



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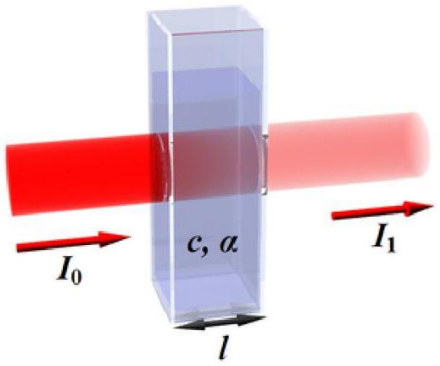
$$A = \varepsilon C l$$

A= assorbanza

Spettroscopia UV-visibile: le transizioni elettroniche



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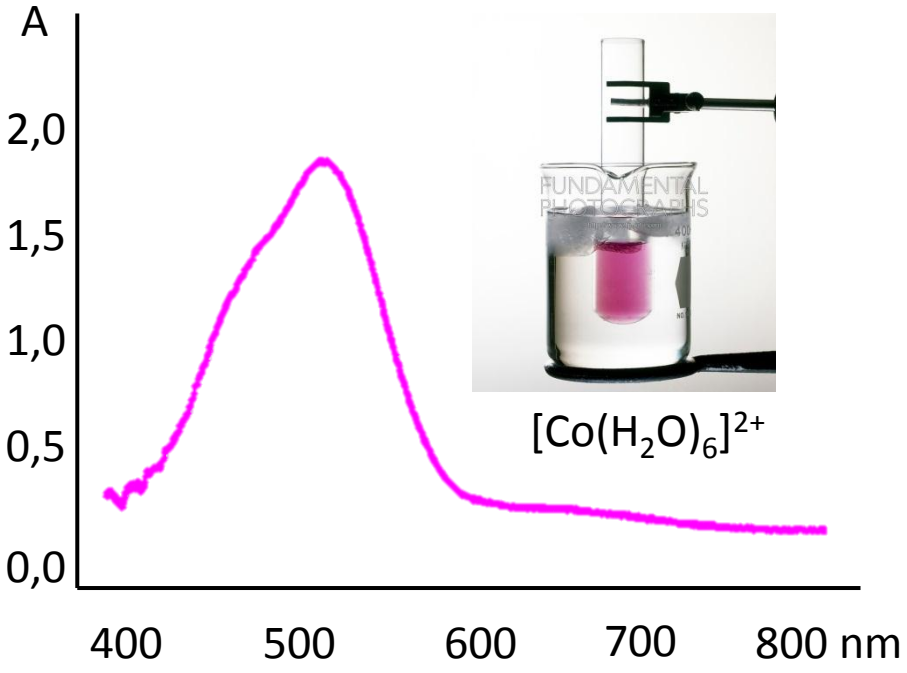
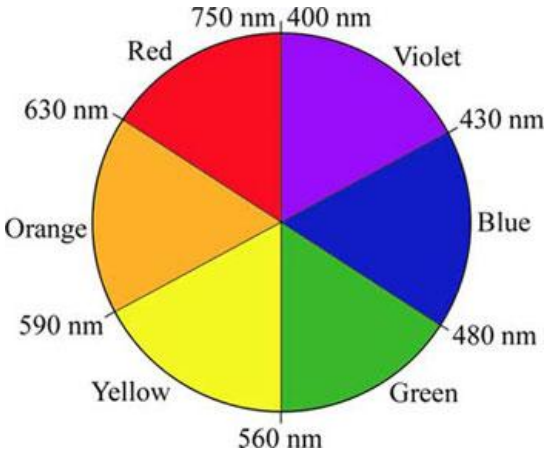
$$A = \varepsilon C l$$

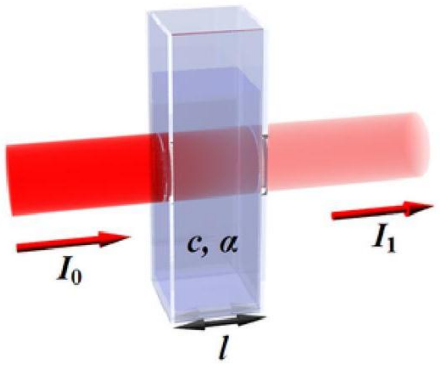
A= assorbanza



$[Co(H_2O)_6]^{2+}$



Spettroscopia UV-visibile: le transizioni elettroniche



ε= coefficiente di estinzione molare

C= concentrazione molare

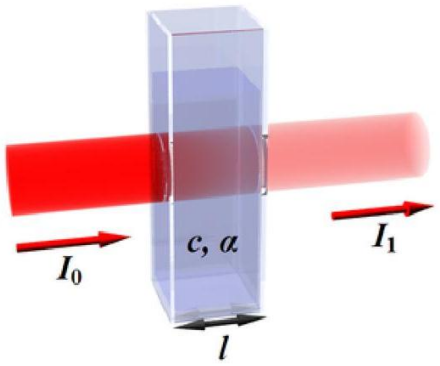
l= cammino ottico

$$A = \varepsilon C l$$

A= assorbanza

A che può servire?

Spettroscopia UV-visibile: le transizioni elettroniche



ε= coefficiente di estinzione molare

C= concentrazione molare

l= cammino ottico

$$A = \varepsilon C l$$

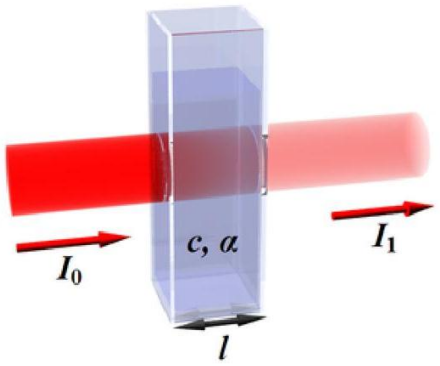
A= assorbanza

A che può servire?

a una certa λ

normalmente 1 cm

Spettroscopia UV-visibile: le transizioni elettroniche



ε= coefficiente di estinzione molare

C= concentrazione molare

l= cammino ottico

$$A = kC$$

A= assorbanza

A che può servire?

…e dal valore di A, si ricava la concentrazione della soluzione…
…con numerose possibili applicazioni…