

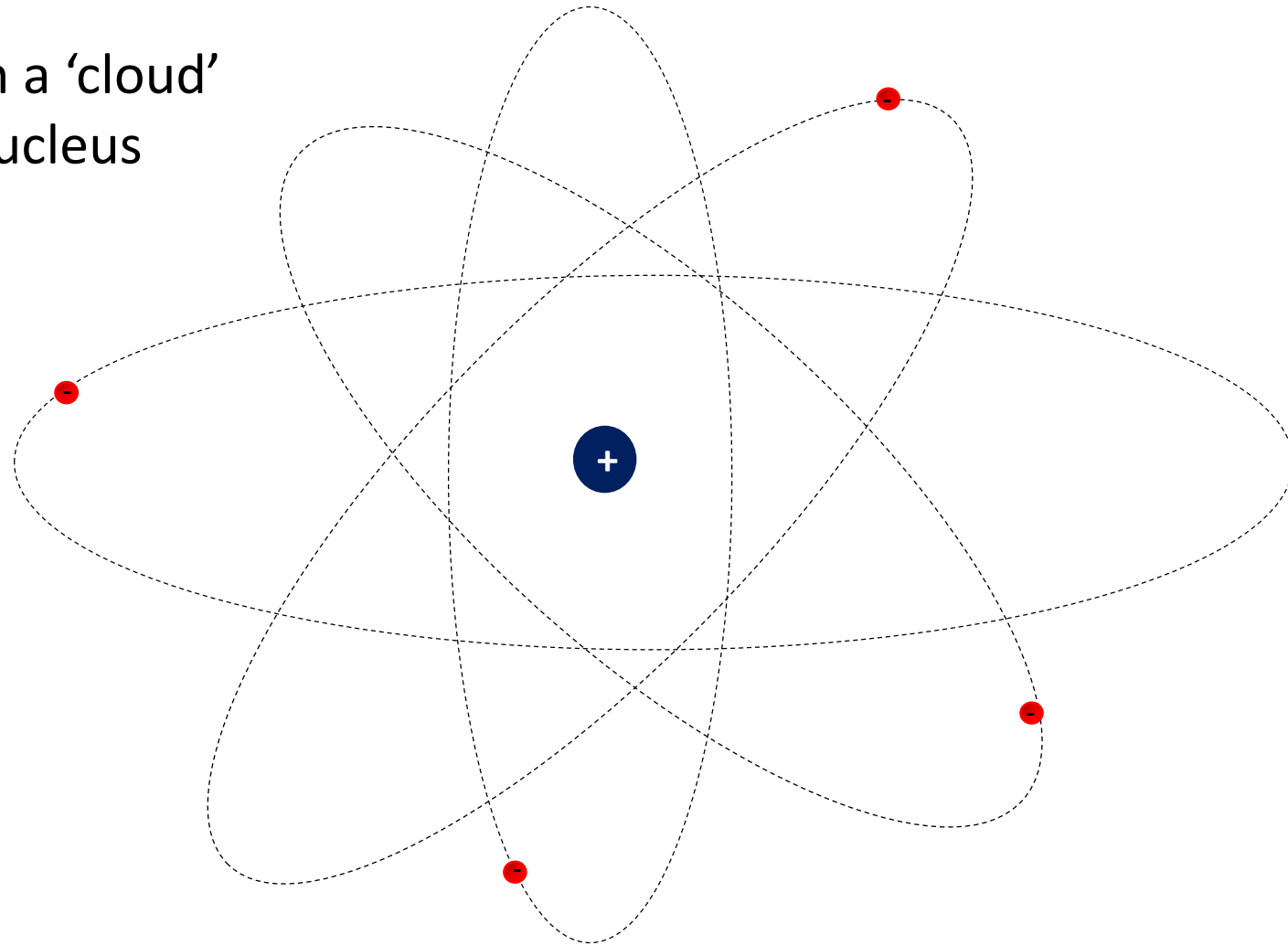


Niels Bohr (1885-1962)

Recall:

## Rutherford's Atomic Model

Electrons orbit in a 'cloud'  
around the nucleus



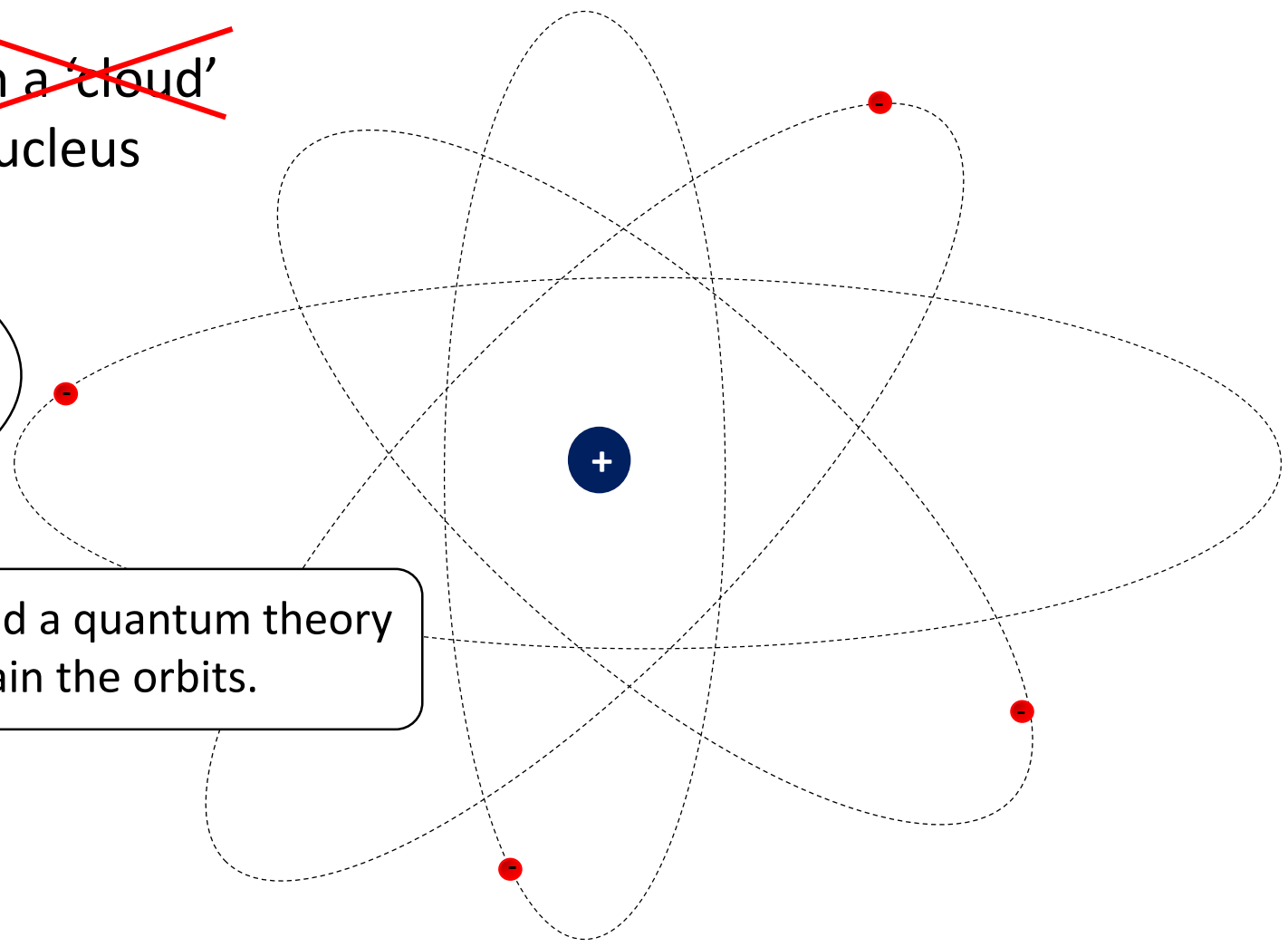
# Rutherford's Atomic Model

Electrons orbit in a ~~'cloud'~~  
around the nucleus

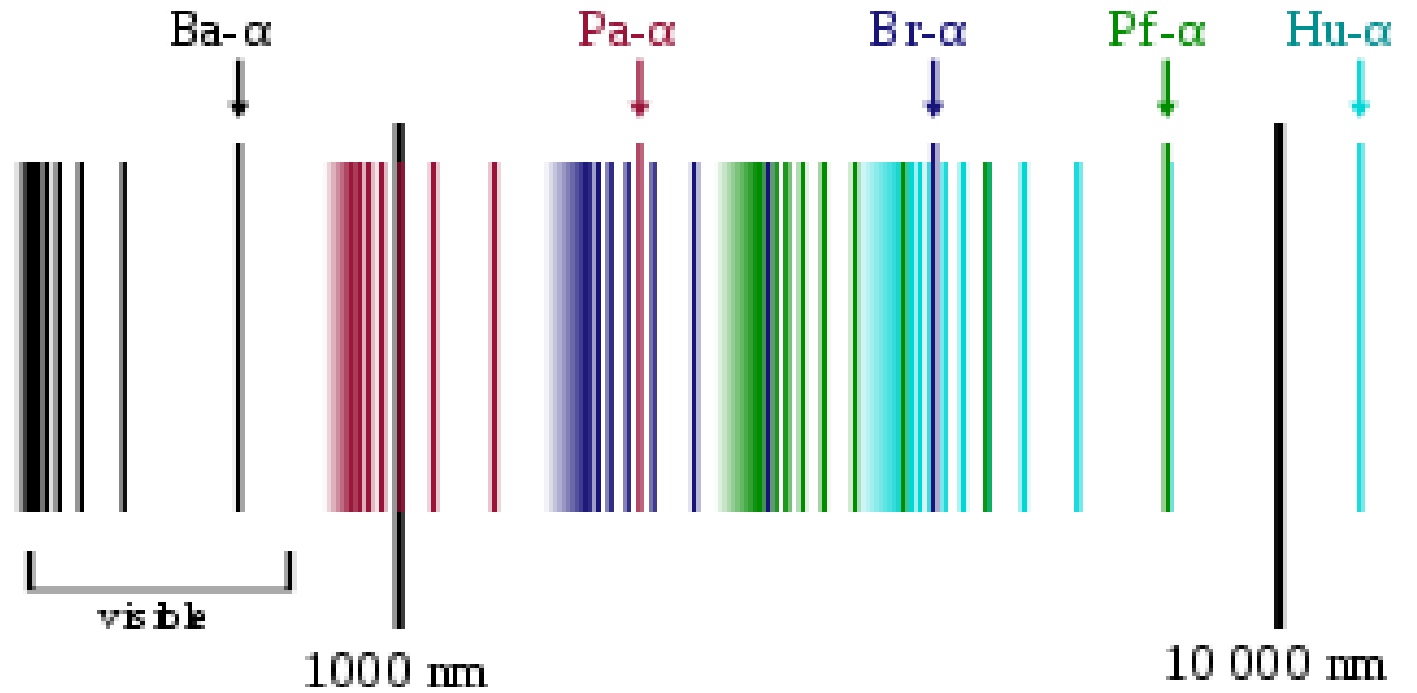
Electrons can't orbit  
just anywhere  
around the nucleus.



We need a quantum theory  
to explain the orbits.

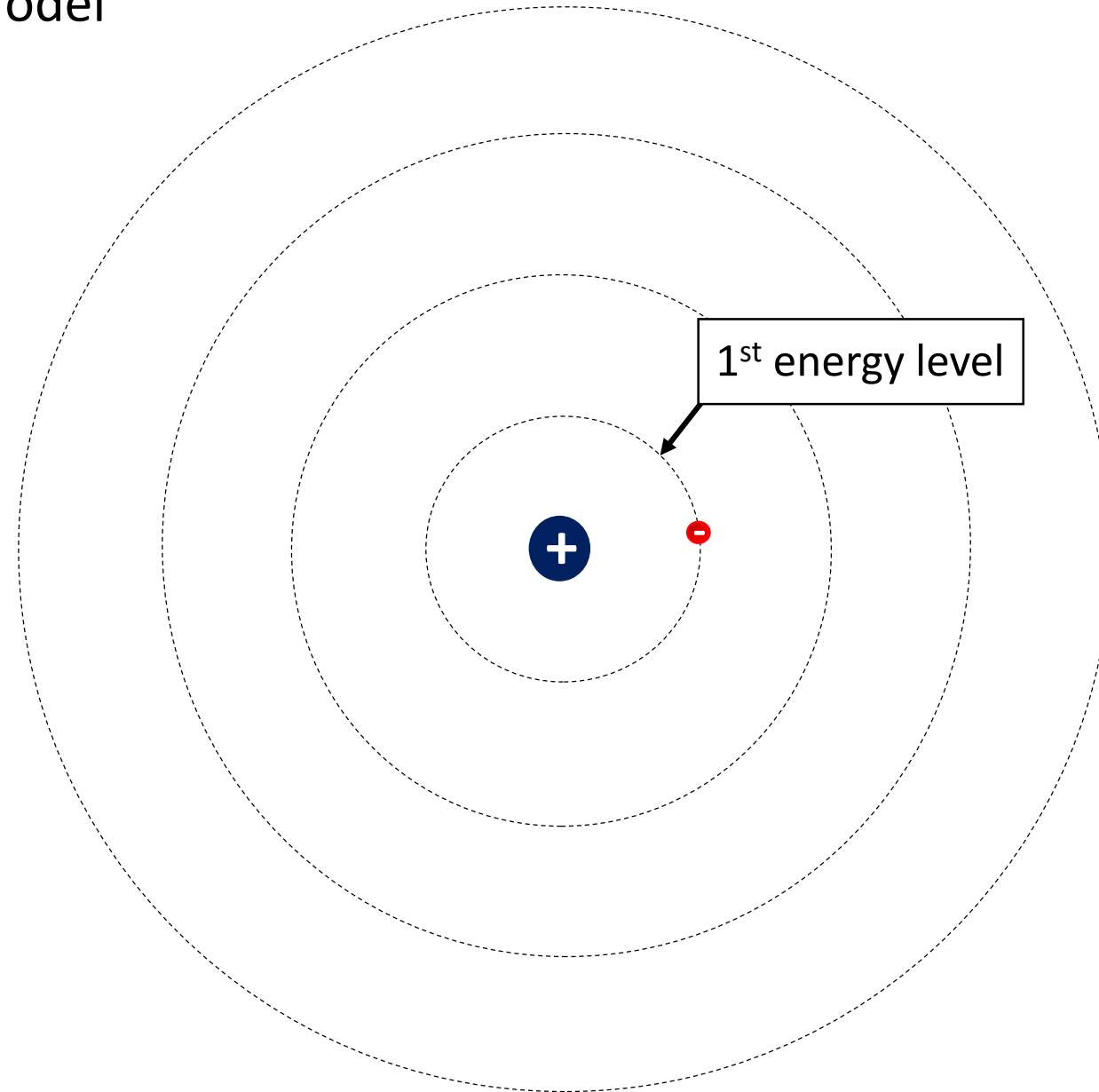


After analyzing the spectral lines emitted by hydrogen atoms, I've come to the following conclusion...



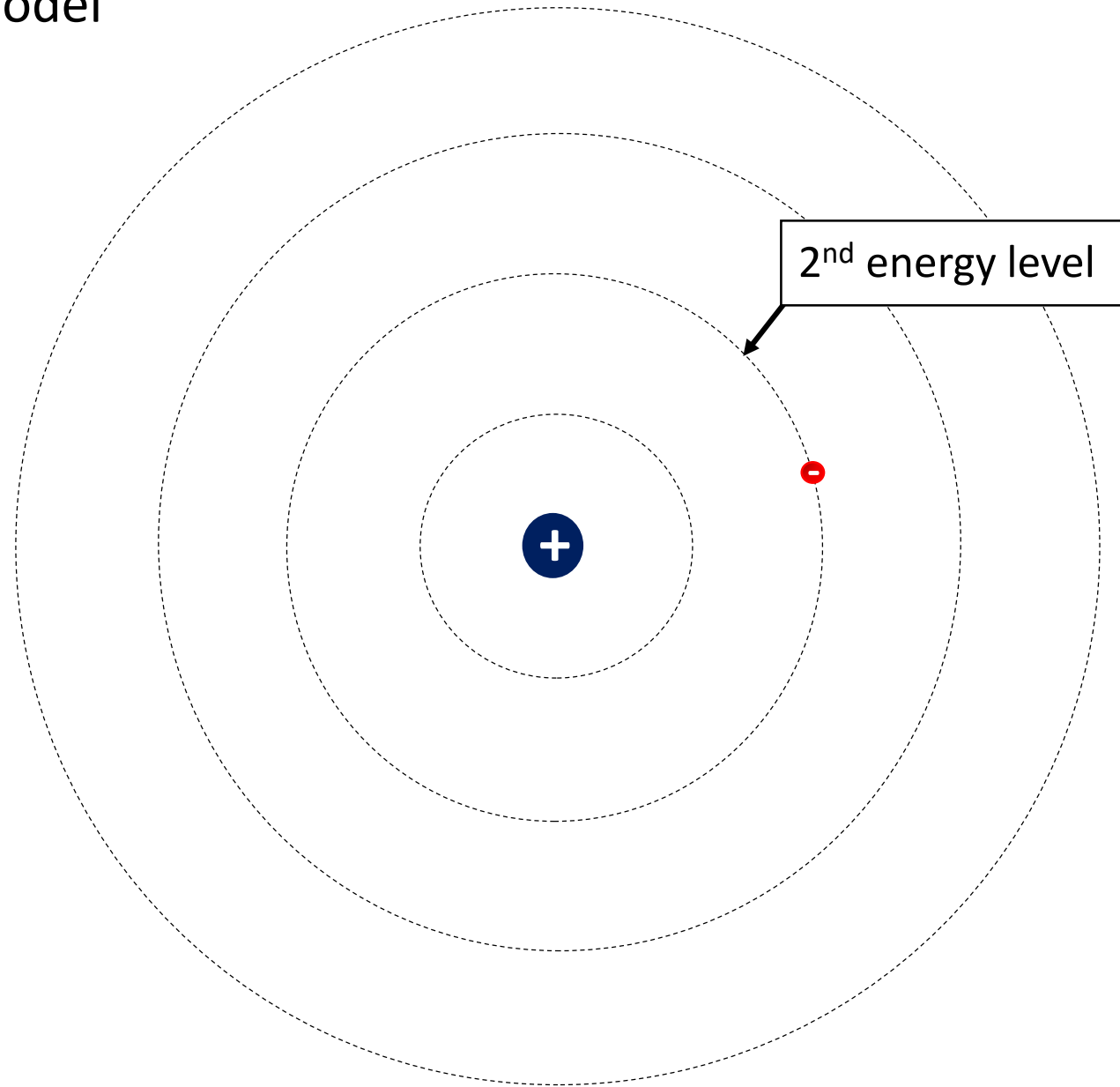
# Bohr Atomic Model

The electrons must orbit the nucleus in specific energy levels



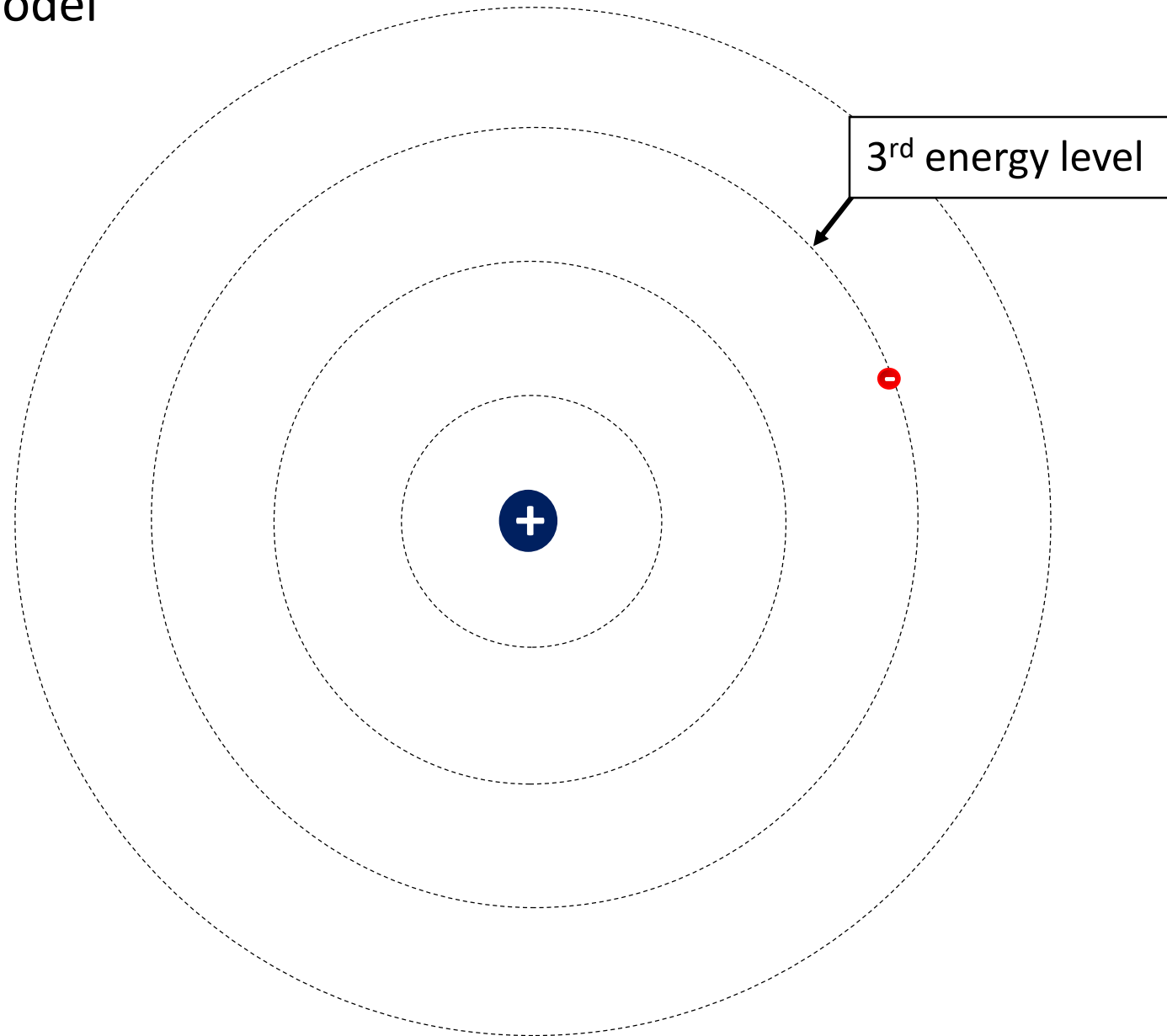
# Bohr Atomic Model

The electrons must orbit the nucleus in specific energy levels



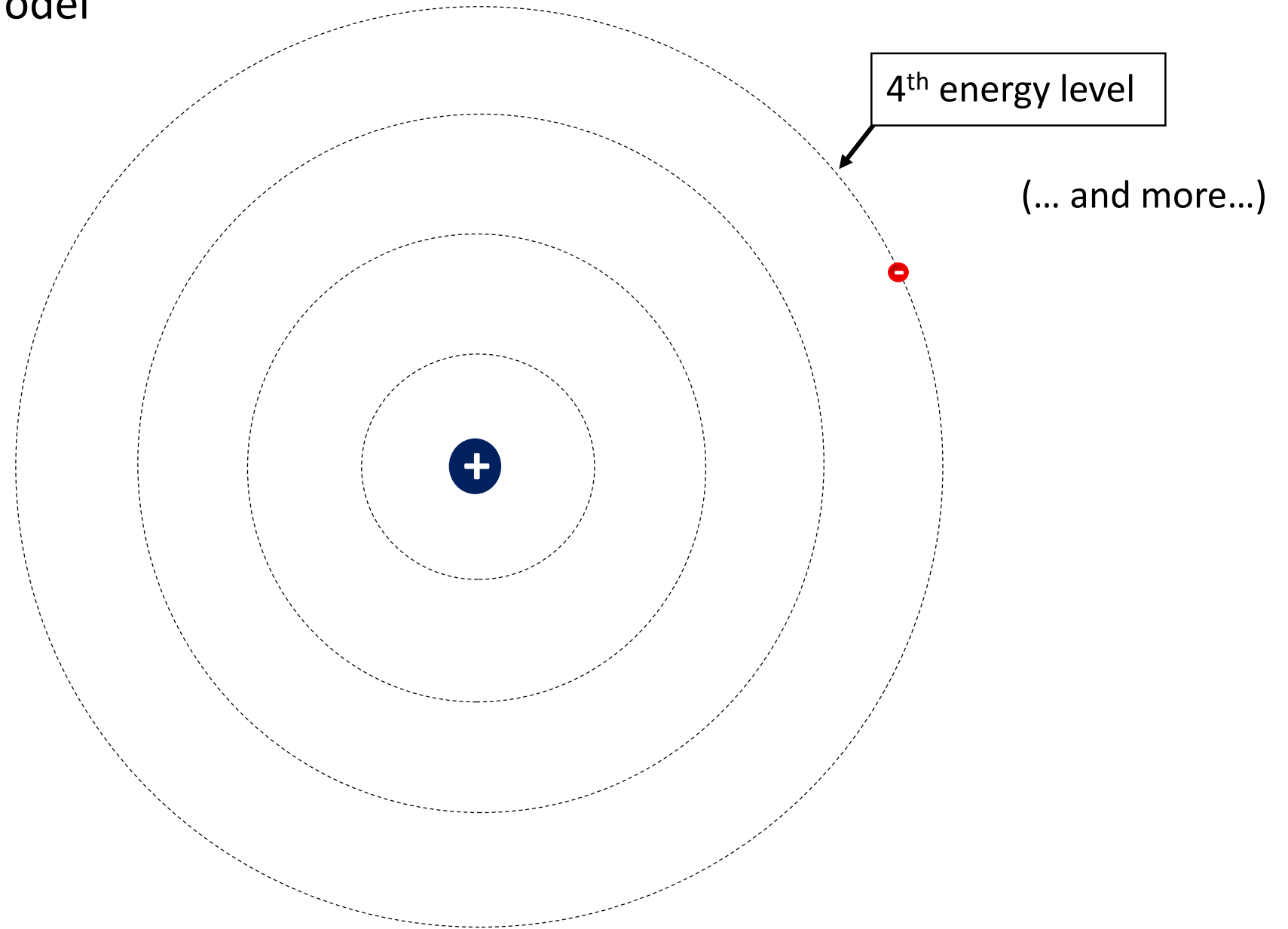
# Bohr Atomic Model

The electrons must orbit the nucleus in specific energy levels



# Bohr Atomic Model

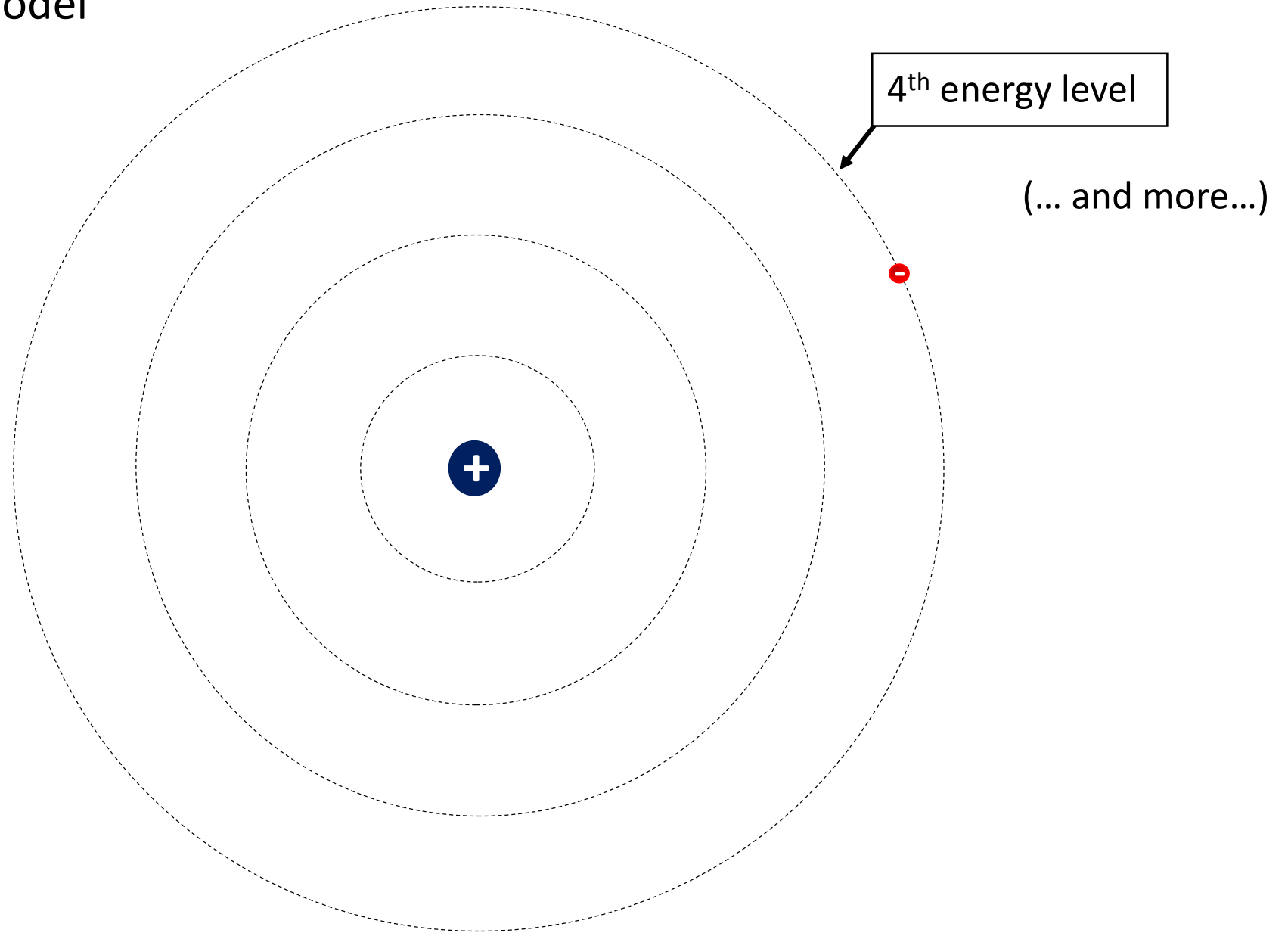
The electrons must orbit the nucleus in specific energy levels





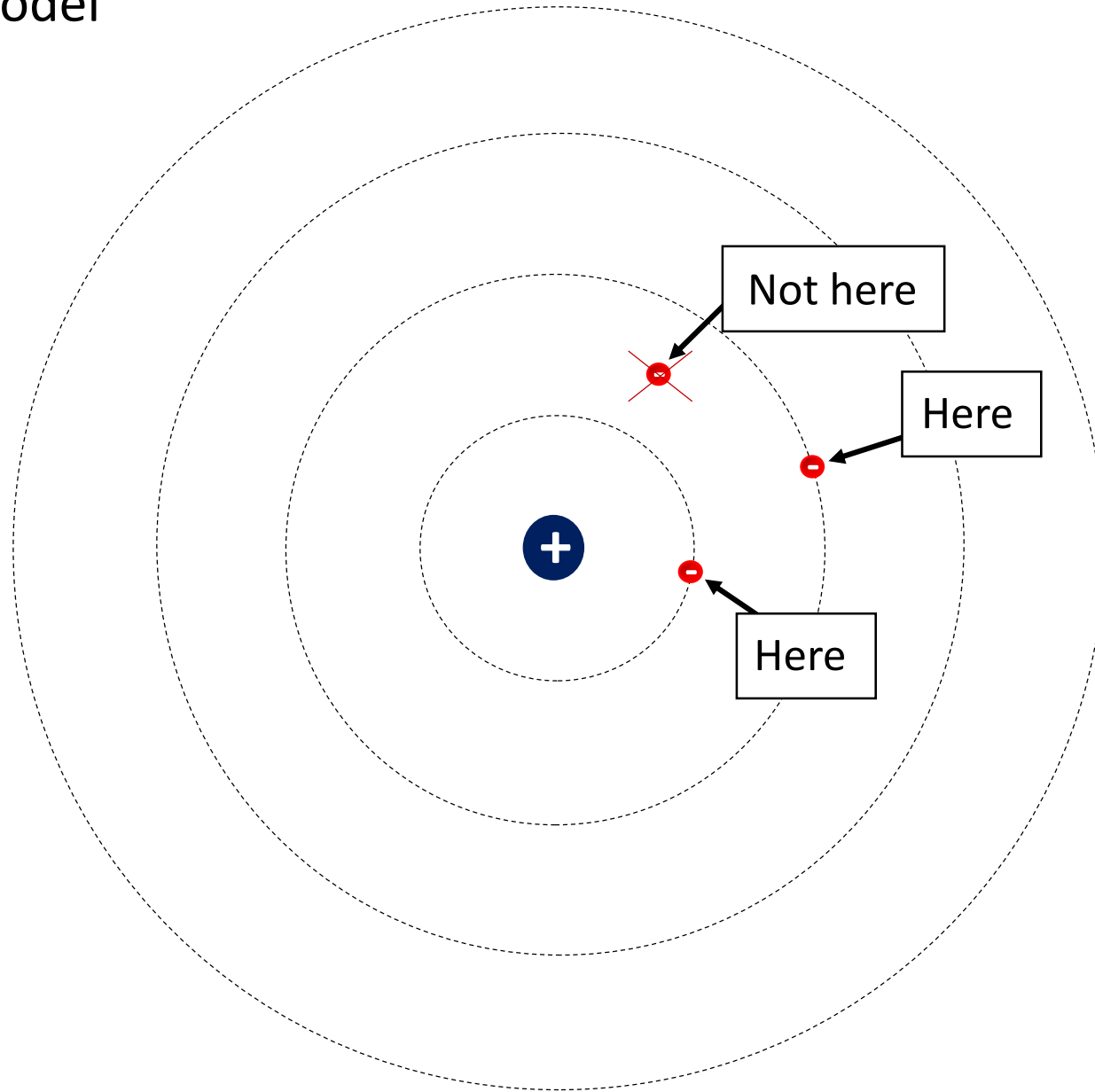
# Bohr Atomic Model

Energy levels are also referred to as:  
**Shells,**  
**Layers,**  
**Orbits.**



# Bohr Atomic Model

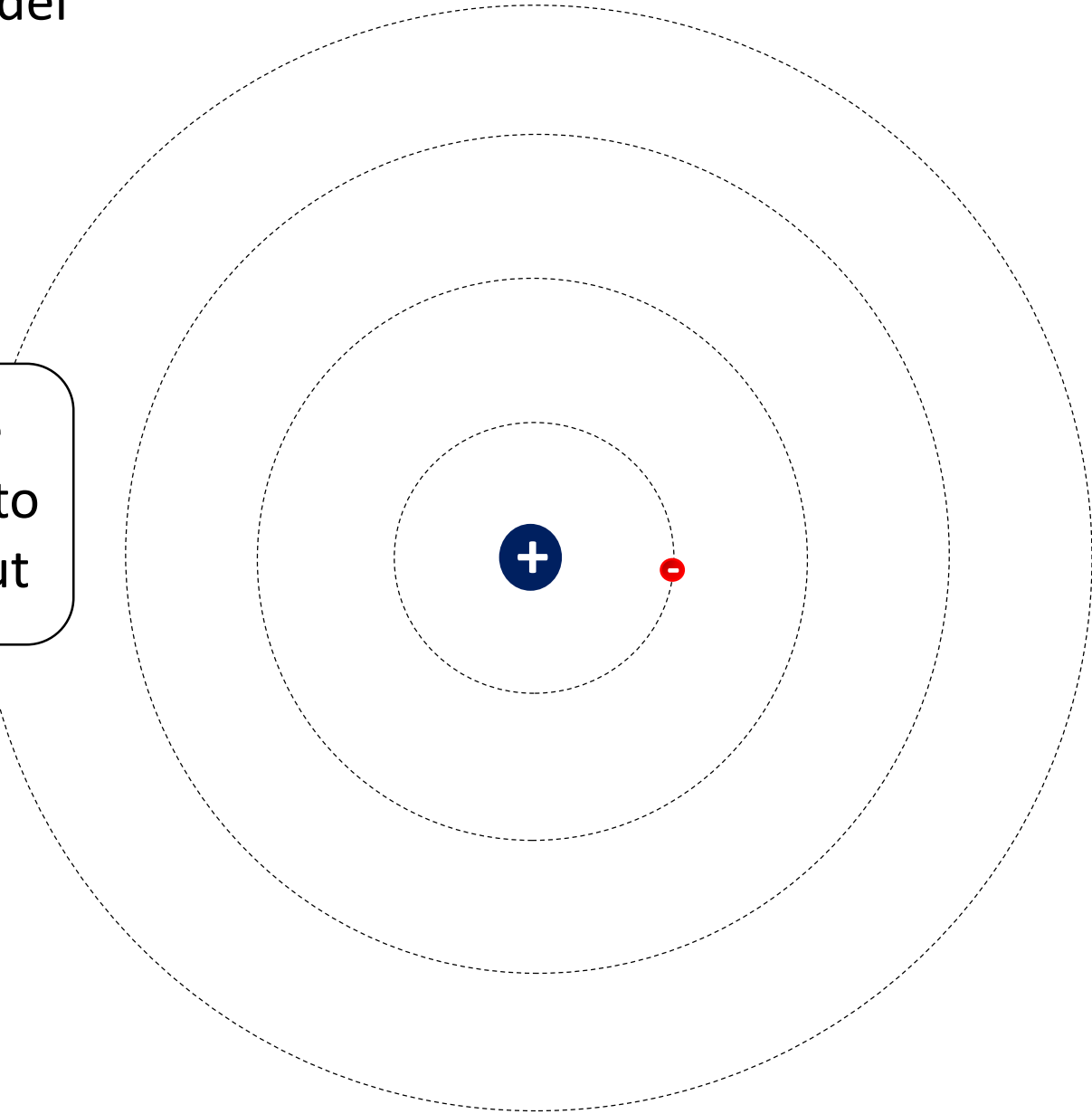
An electron can orbit in any of the layers; but not between the layers



# Bohr Atomic Model

Electrons can jump from one energy level to another

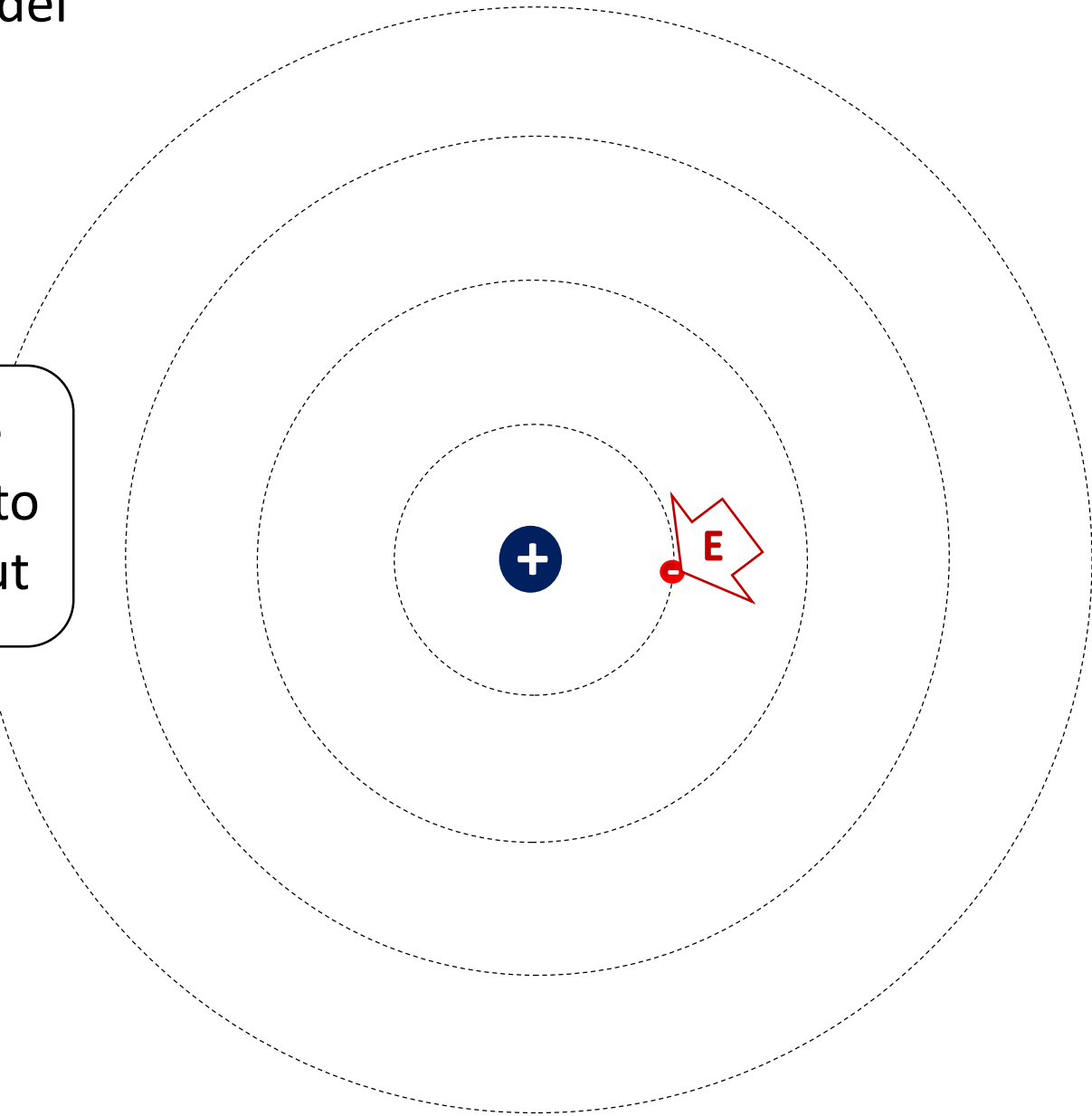
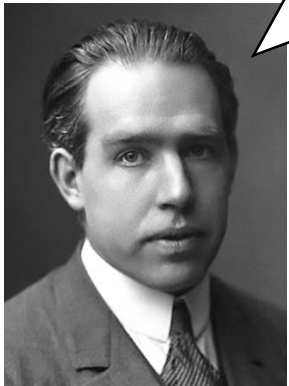
They need more energy to jump to layers further out



# Bohr Atomic Model

Electrons can jump from one energy level to another

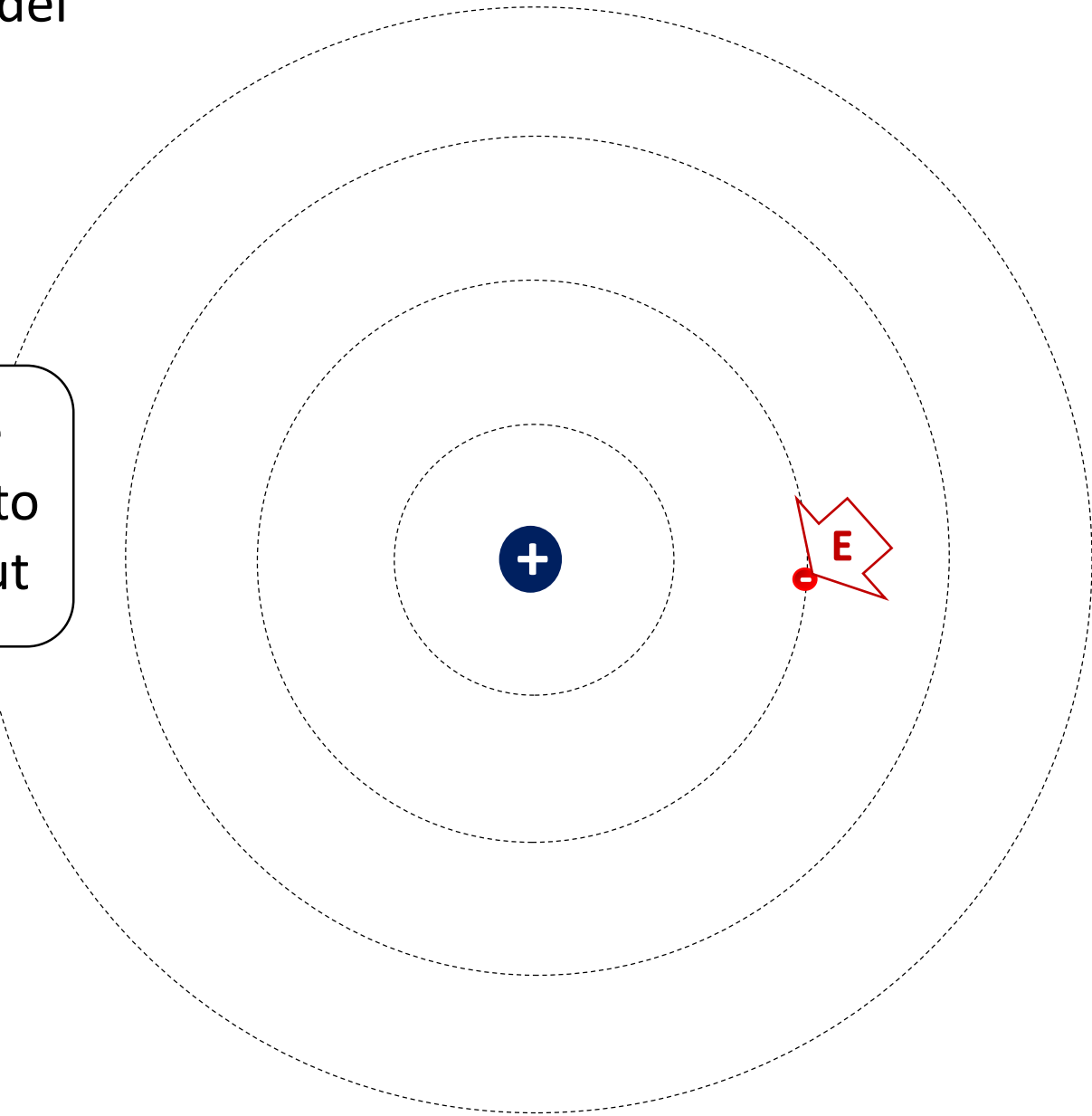
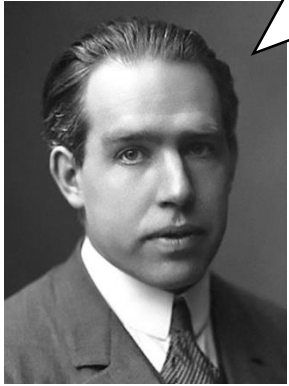
They need more energy to jump to layers further out



# Bohr Atomic Model

Electrons can jump from one energy level to another

They need more energy to jump to layers further out

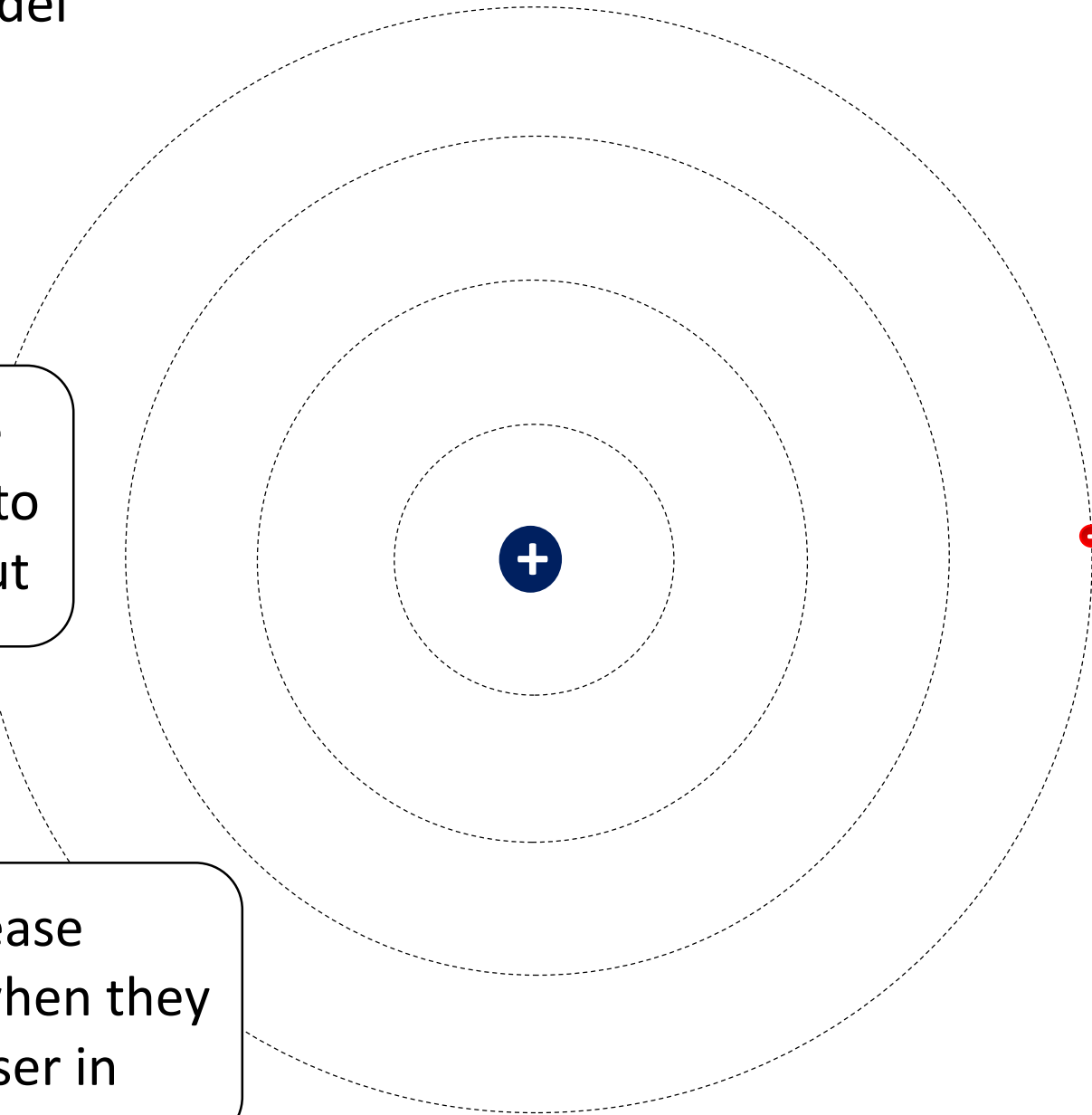


# Bohr Atomic Model

Electrons can jump from one energy level to another

They need more energy to jump to layers further out

They release energy when they jump closer in

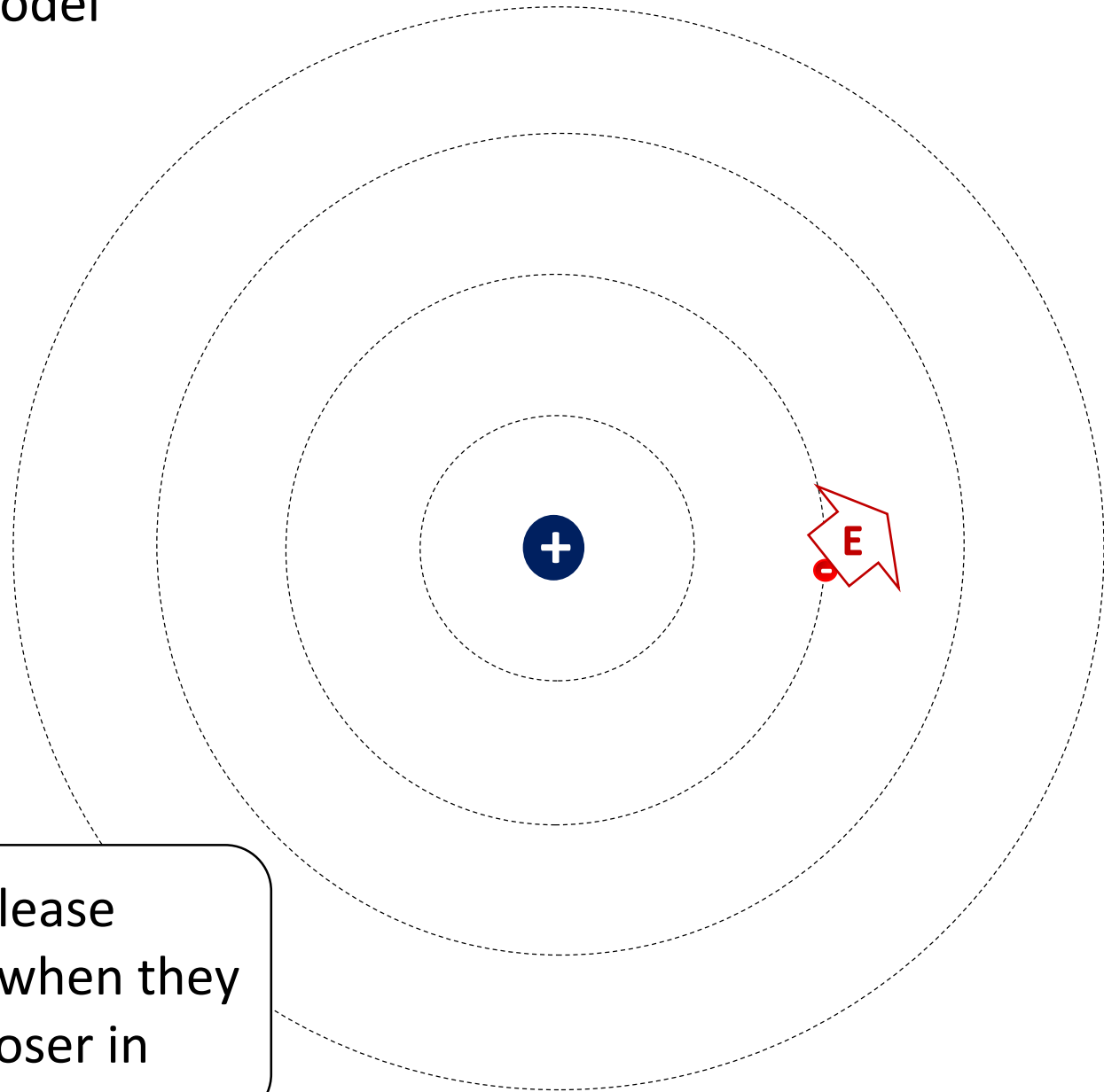


# Bohr Atomic Model

Electrons can jump from one energy level to another



They release energy when they jump closer in

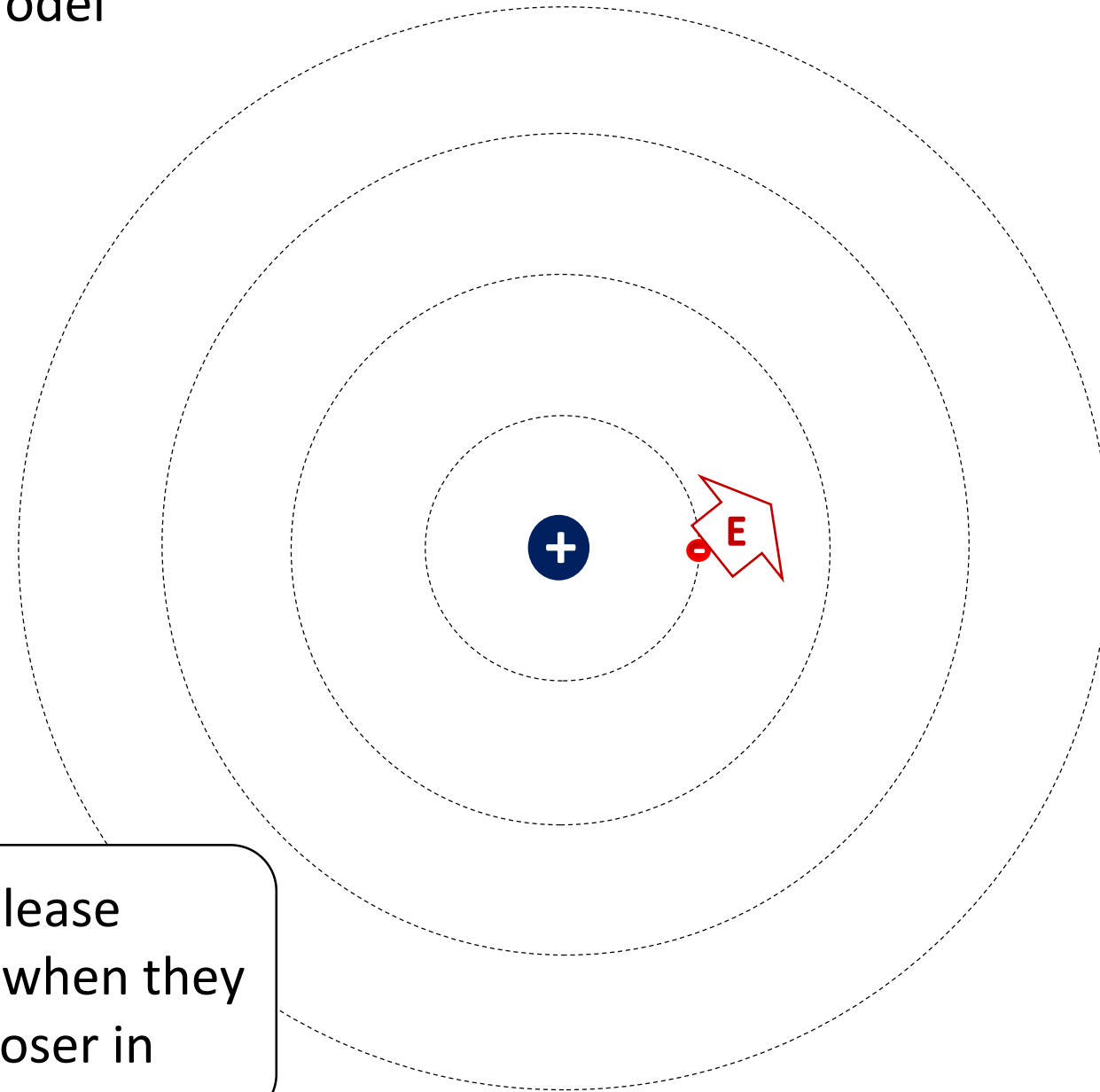


# Bohr Atomic Model

Electrons tend to orbit in layers that require the least amount of energy



They release energy when they jump closer in



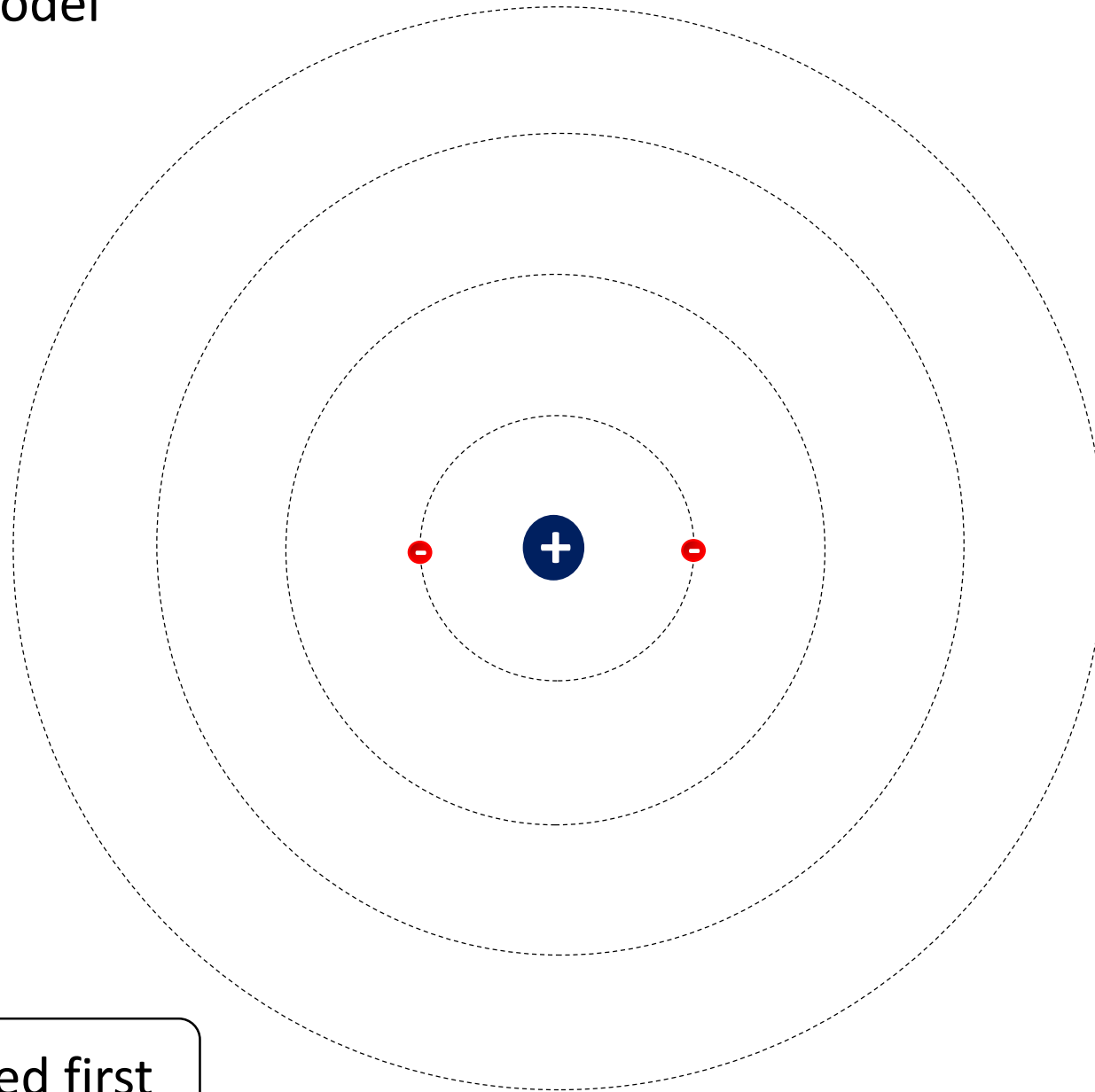


# Bohr Atomic Model

The **1<sup>st</sup> layer**  
can only hold  
**2** electrons

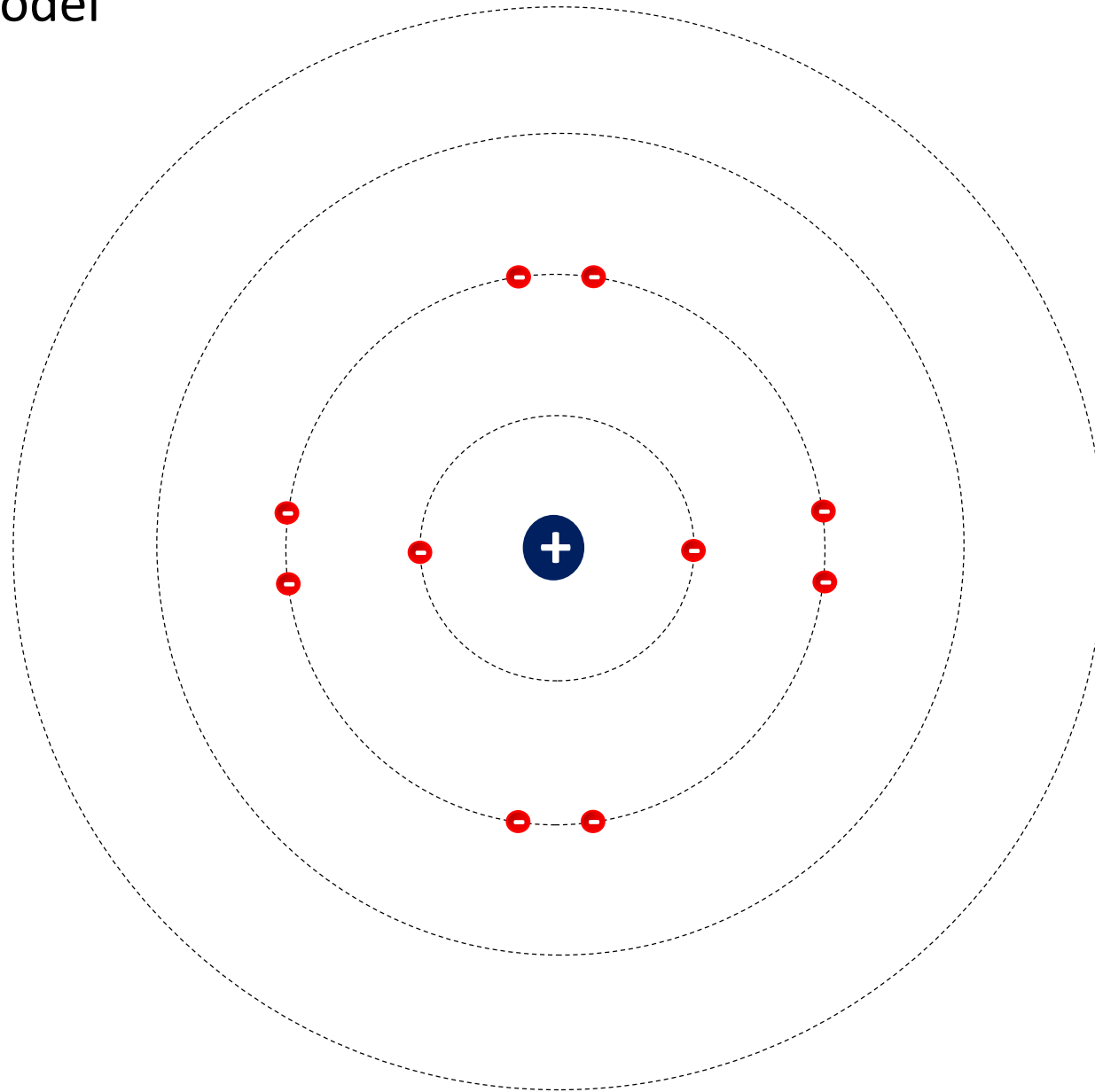


This layer is filled first

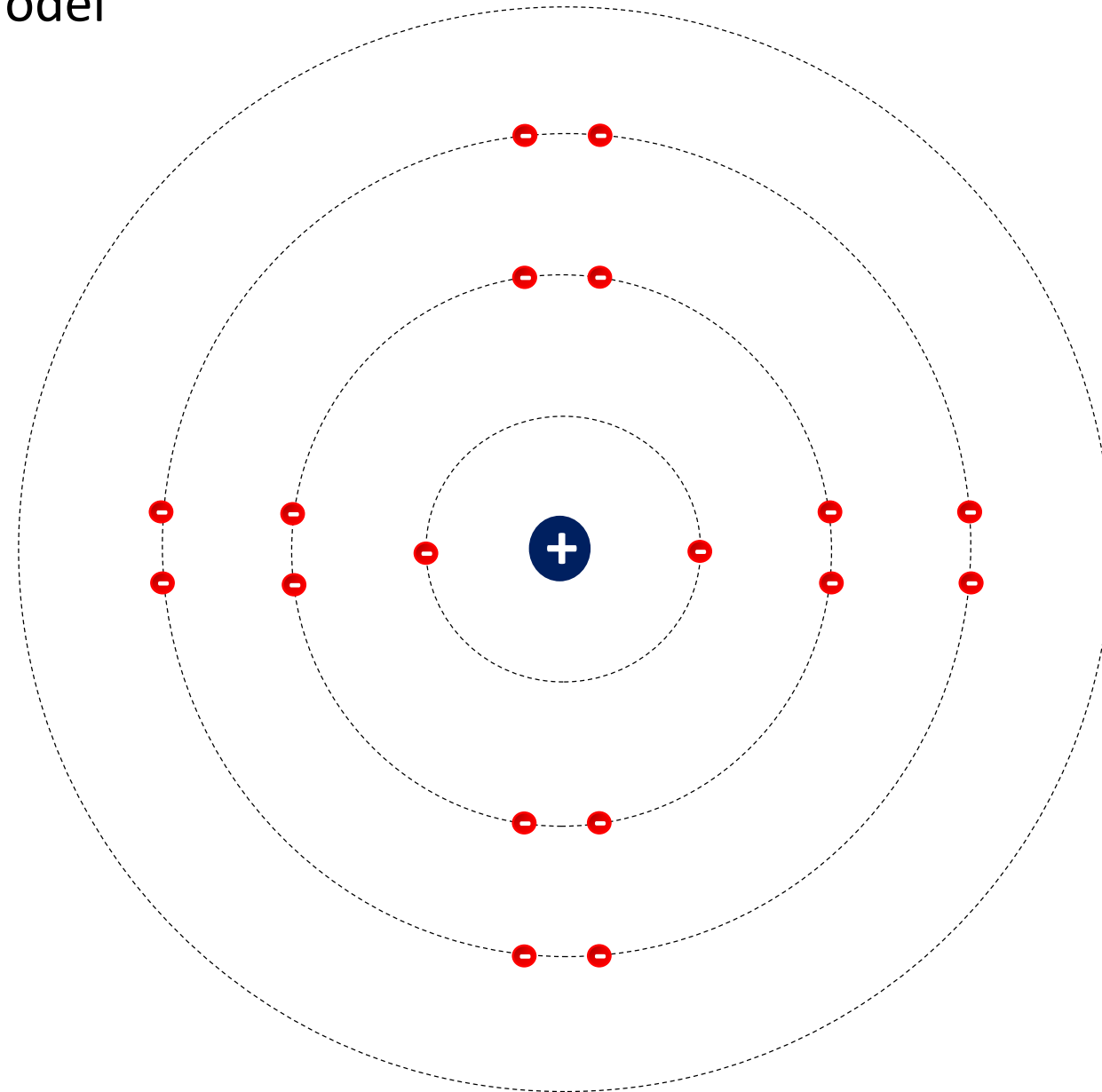


# Bohr Atomic Model

The 2<sup>nd</sup> layer  
can hold up to  
**8** electrons



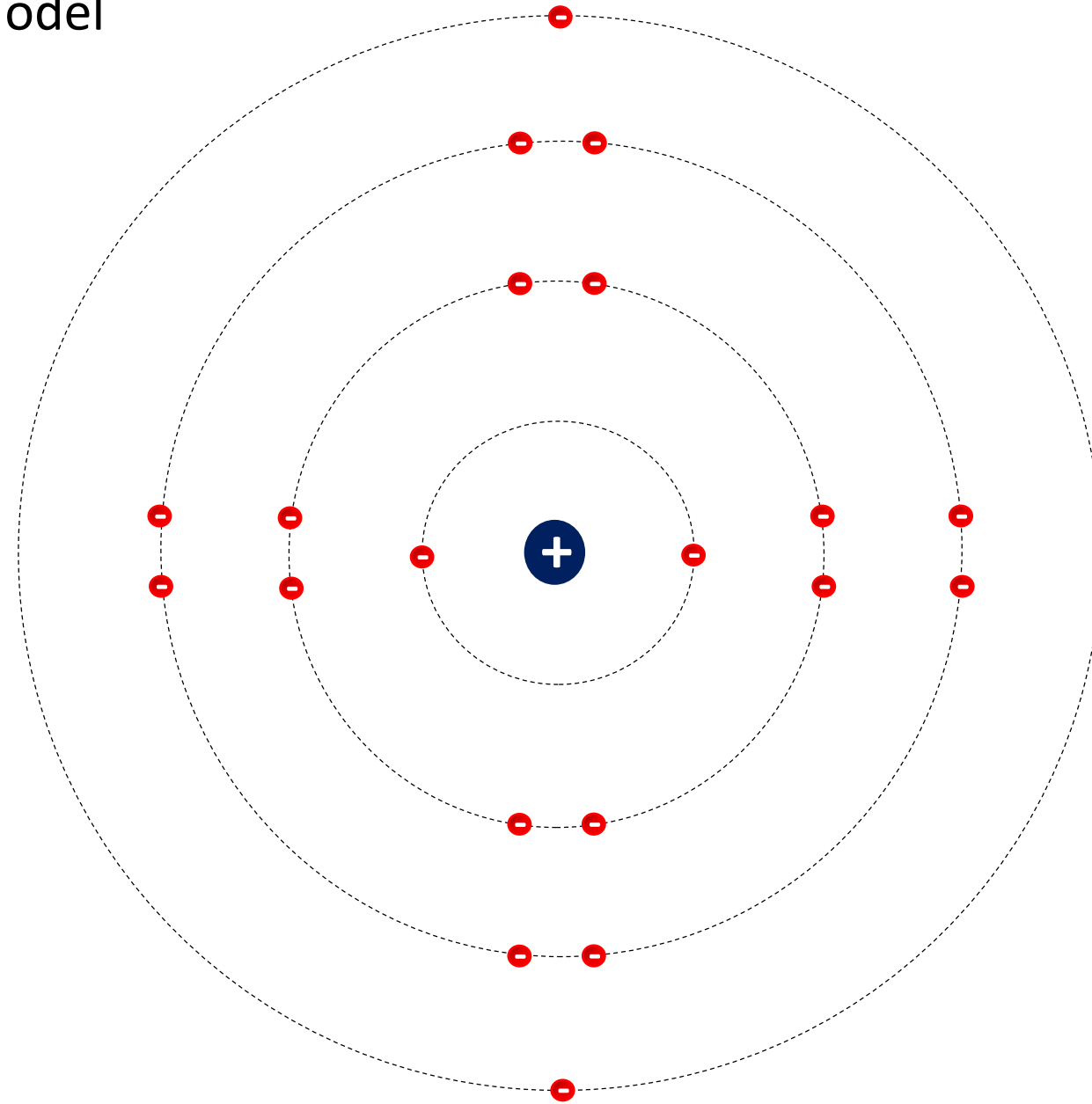
# Bohr Atomic Model



The next 8 electrons will go in the 3<sup>rd</sup> layer



# Bohr Atomic Model

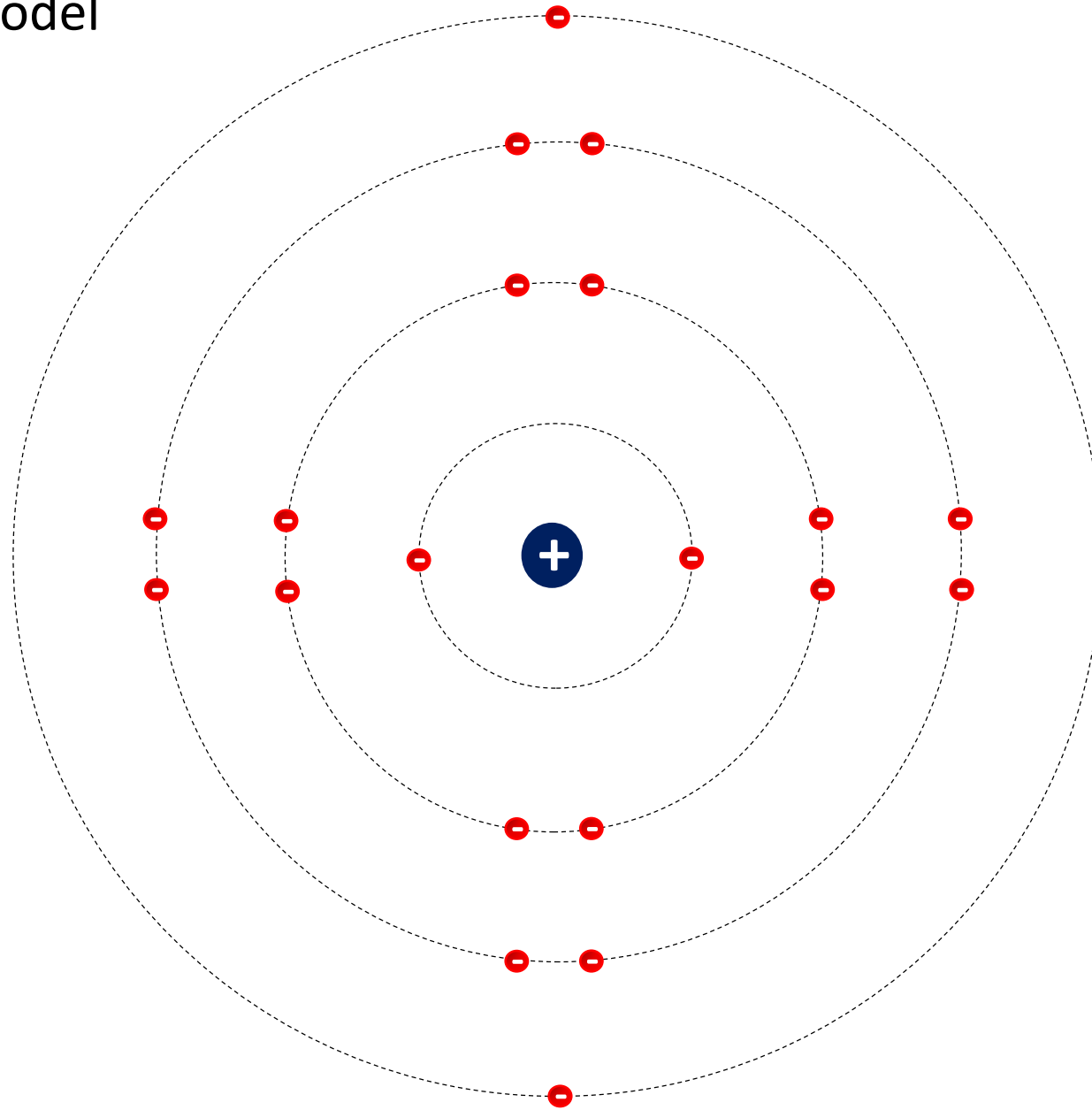


The next 2 electrons  
will go in the 4<sup>th</sup> layer



# Bohr Atomic Model

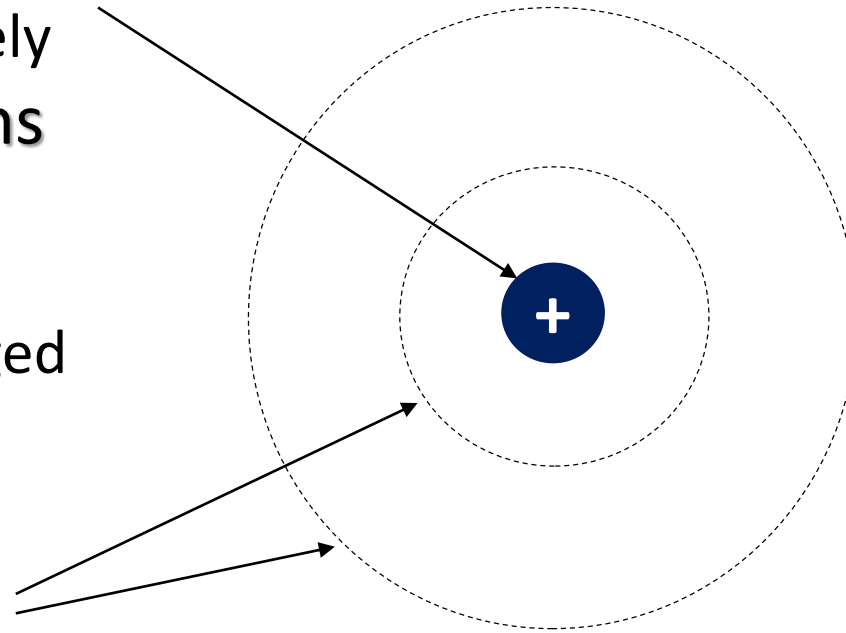
The first 20 electrons orbiting the nucleus fill the layers in the order: 2 – 8 – 8 – 2



# Bohr Atomic Model

The nucleus of an atom contains positively charged **protons**

Negatively charged **electrons** orbit the nucleus in specific energy levels



Atoms are normally **neutral**

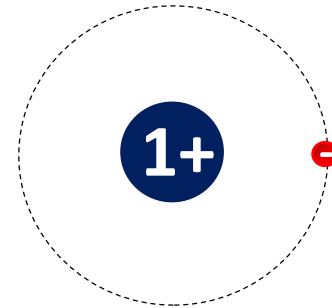
In a neutral atom,  
**# electrons = # protons**

# Bohr Atomic Model

If an atom has 1 proton  
in the nucleus ...

... it will have 1 electron  
orbiting the nucleus

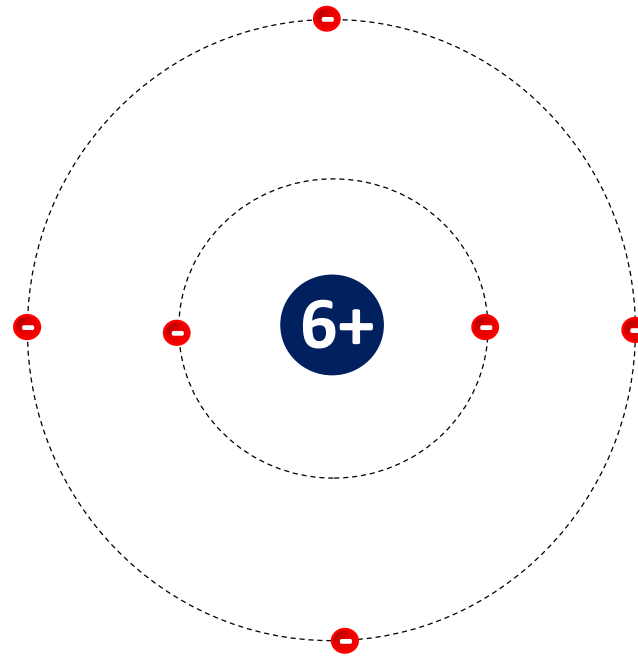
That electron will orbit  
in the 1<sup>st</sup> energy level



# Bohr Atomic Model

An atom that has 6 protons  
in its nucleus ...

... will have 6 electrons  
orbiting the nucleus



2 electrons in the  
1<sup>st</sup> energy level

*(1<sup>st</sup> layer is full)*

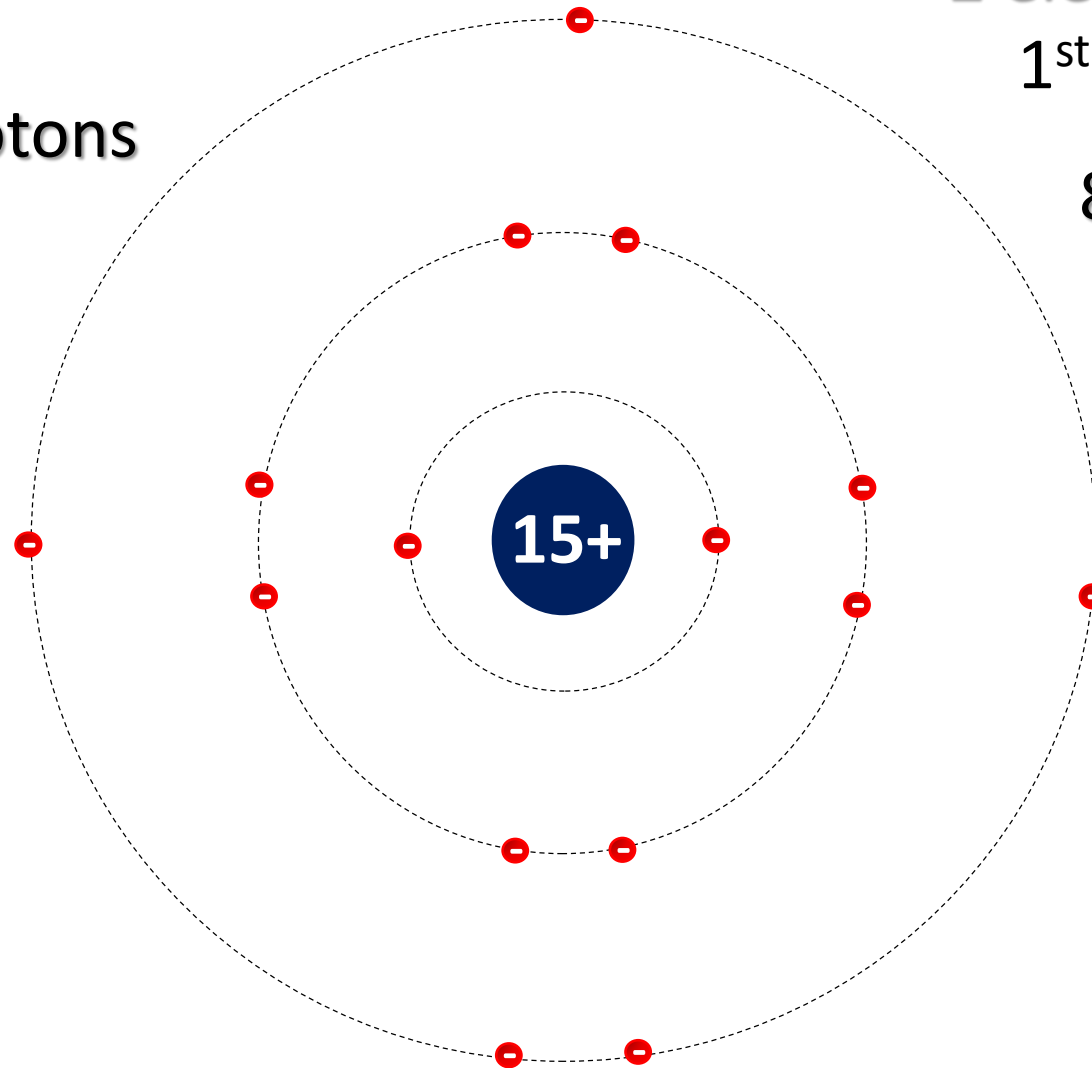
Remaining 4 electrons  
in the 2<sup>nd</sup> energy level



# Bohr Atomic Model

An atom that has 15 protons  
in the nucleus ...

... will have 15 electrons  
orbiting the nucleus



2 electrons in the  
1<sup>st</sup> energy level

8 electrons in the  
2<sup>nd</sup> energy level

Last 5 electrons  
in the 3<sup>rd</sup> layer

