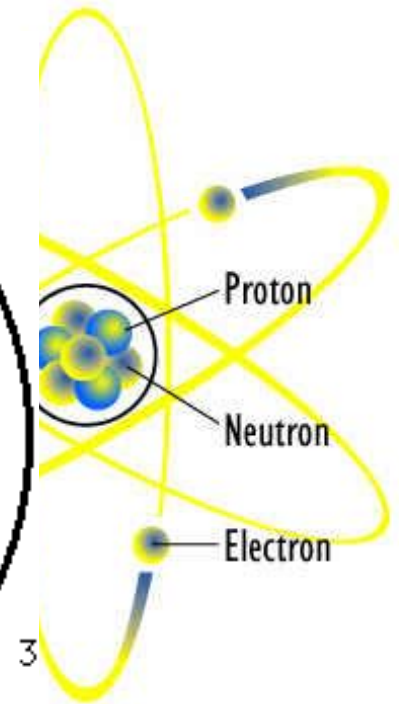
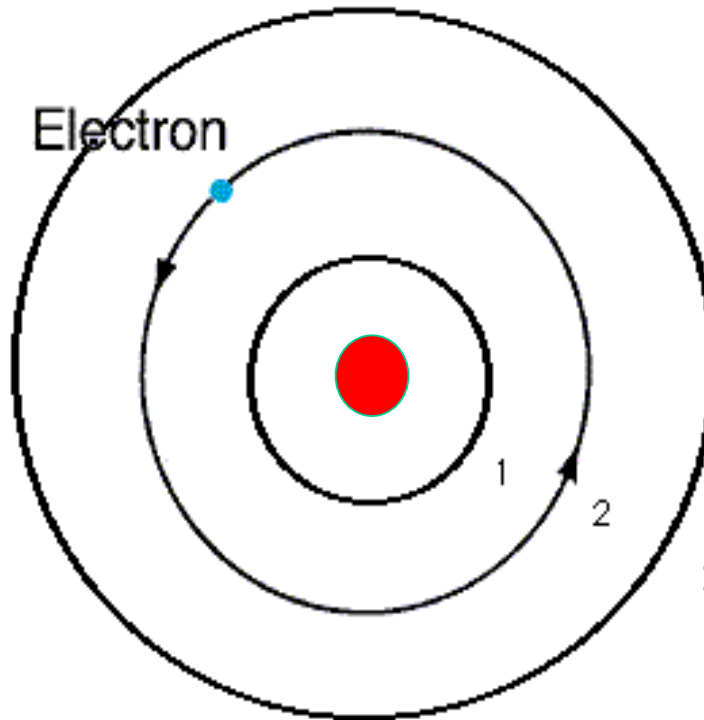
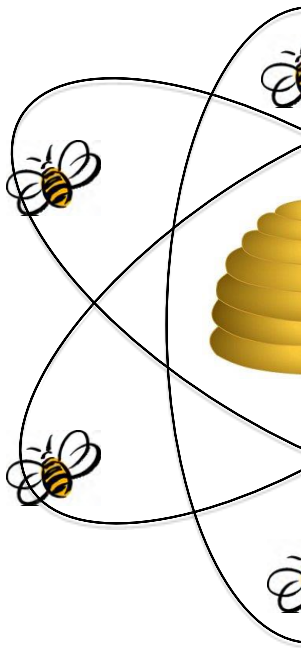


Models of Matter: Bohr Diagrams



OUTCOME QUESTION(S):

S1-2-05

How do you draw an atom using the Bohr model?

Vocabulary & Concepts

orbit

Bohr Diagram

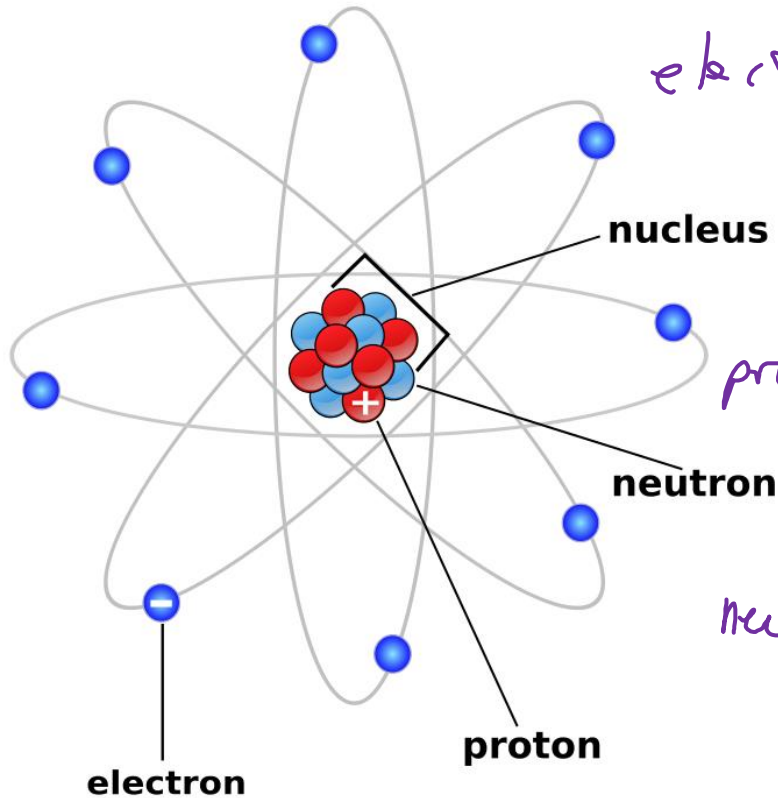
valence

PRE-NOTE QUESTION(S):

Where is each subatomic particle placed in an atom?

- neutrons & protons in nucleus
- electrons around

Refresh



electron → **e**: *negative charge, around the nucleus*

proton → **p**⁺: *Positive charge, in nucleus*

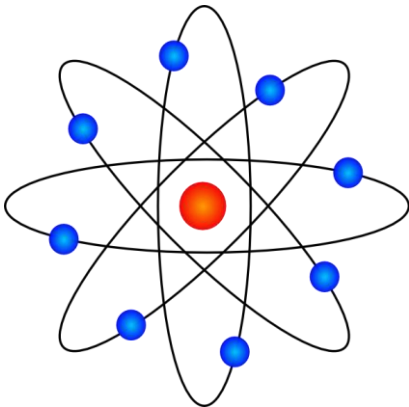
neutron → **n**⁰: *no charge, in nucleus*

Niels Bohr (1913)

“*Flame Test*” experiments show **heated** elements emit a *unique pattern of colour*.

Each element showed a **unique colour** signature that is used to identify elements in mixtures or compounds

- This **emitted** light was *from excited electrons!*



Colour	Element
green	<u>copper</u>
red	<u>strontium</u>
purple	potassium
lavender	<u>Lithium</u>
<u>yellow</u>	sodium

Hypothesis:

Electrons move in *organized circular paths* of different *distances* around a nucleus.

Flame Tests

Sodium



Potassium



Rubidium



Cesium



Calcium



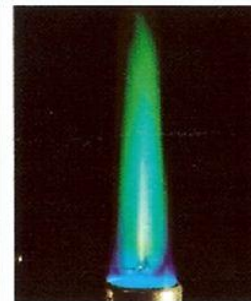
Strontium



Barium

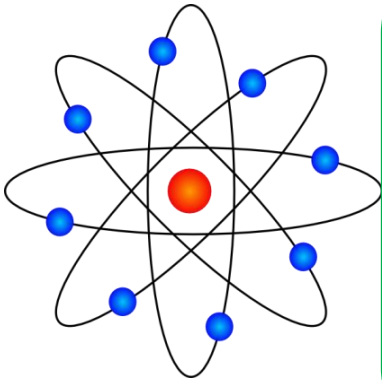


Copper

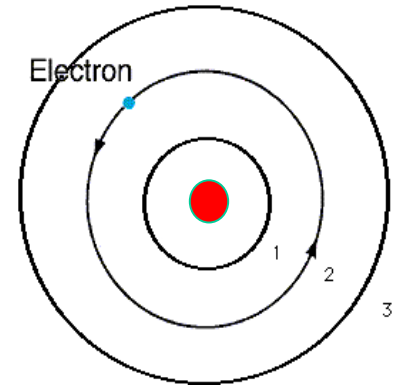


Orbit: location of electron motion around a nucleus.

Only a specific number of electrons fill each orbit!



Bohr reasoned that **random** electron movement **cannot** produce the **same** unique colour pattern **EVERY TIME**



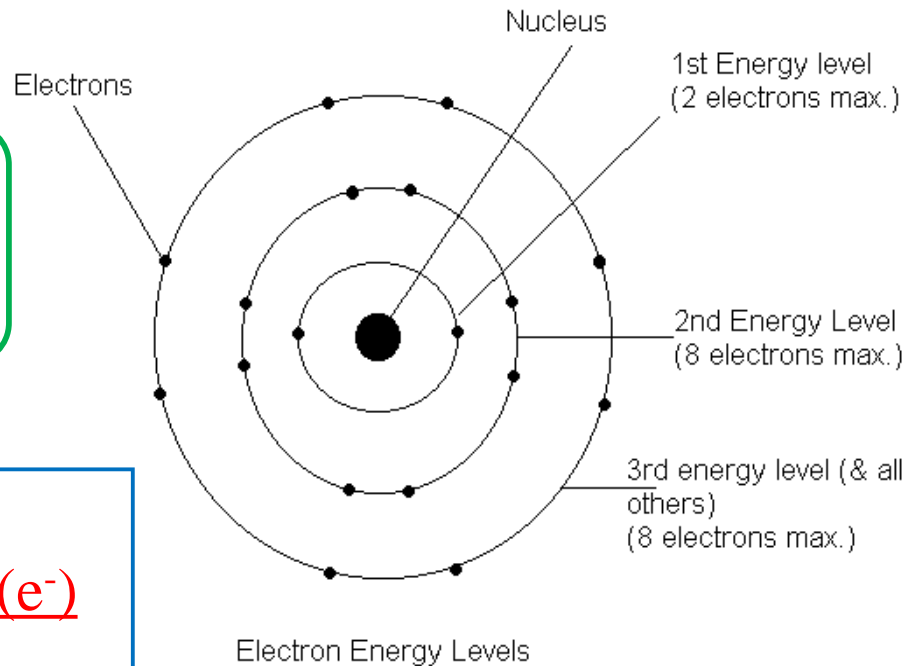
Bohr's model is called the **“planetary” model**

ORBITS:

1st : holds two electrons (e^-)

2nd : holds eight e^-

3rd : holds eight e^-



energy level
↑

- Electrons occupy the **closest orbital first**
- *Each element have a **different** number of electron*

HOW DO WE KNOW HOW MANY PROTONS, NEUTRONS, AND ELECTRONS AN ATOM HAS?

1 IA H 1.01	2 IIA He 4.00											13 IIIA B 10.81	14 IVA C 12.01	15 VA N 14.01	16 VIA O 16.00	17 VIIA F 19.00	18 VIIIA Ne 20.18
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 VIIIB	9 VIIIB	10	11 IB	12 IIB	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
potassium 19 K 39.098	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.6	53 I 126.9	54 Xe 131.29
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	58 Hf 178.5	59 Ta 180.9	60 W 183.9	61 Re 186.2	62 Os 190.2	63 Ir 192.2	64 Pt 195.1	65 Au 197.0	66 Hg 200.6	67 Tl 204.4	68 Pb 207.2	69 Bi 209	70 Po (209)	71 At (210)	72 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac^ (227)	90 Rf (261)	91 Db (262)	92 Sg (263)	93 Bh (264)	94 Hs (265)	95 Mt (268)	96 Ds (271)	97 Rg (272)							

potassium

19

K

39.098

Use the atomic mass and atomic number to find the information (p^+ , n^0 , e^-) to build **Bohr** atomic models

HOW DO WE KNOW HOW MANY PROTONS, NEUTRONS AND ELECTRONS AN ATOM HAS?

Look at the atomic number and atomic mass!

Protons = atomic number

Neutrons = atomic mass – atomic number

Electrons = atomic number

potassium
19
K
39.098

Protons = 19

Neutrons = 39 - 19 = 20

Electrons = 19

Drawing a Complete Bohr Diagram:

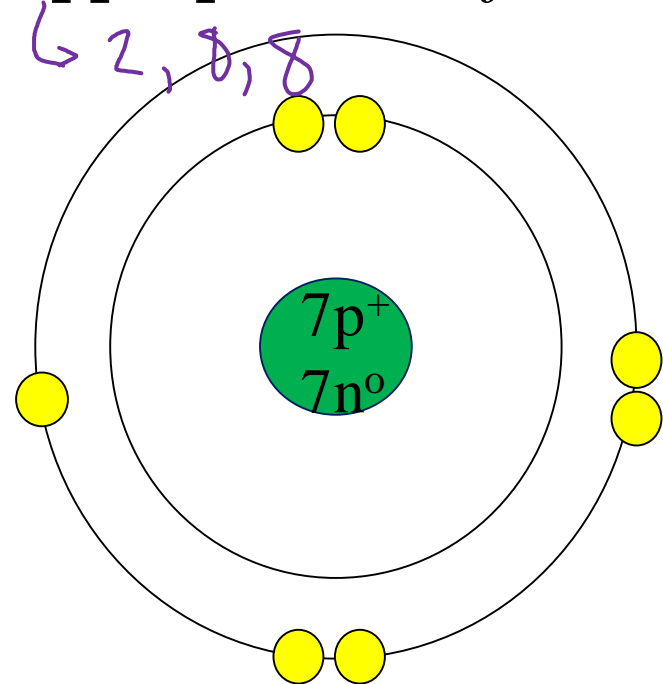
1. Determine the **number** of n^0 , p^+ , e^- in the atom.
2. Draw the *nucleus*.
3. Label the #of protons and neutrons. *in nucleus*
4. Add orbits and fill with the appropriate # of e^- .

Nitrogen (N)

p^+ : 7

n^0 : $14 - 7 = 7$

e^- : 7



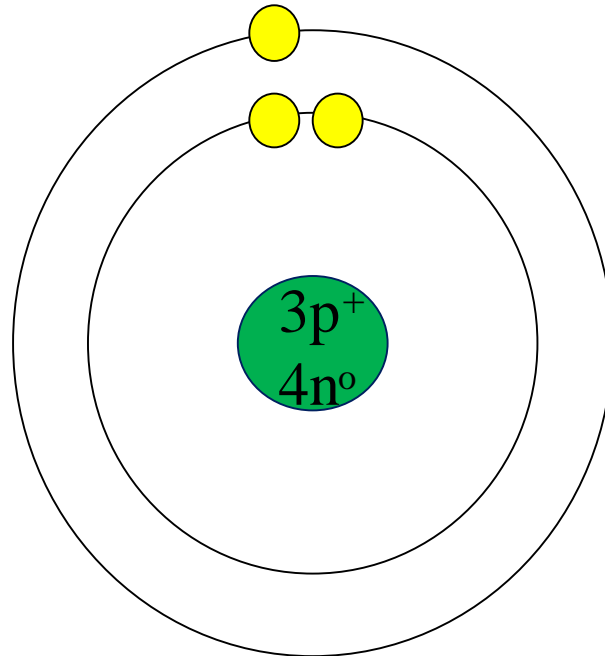
Lithium (Li)

p^+ : 3

n^o : 7 - 3 = 4

e^- : 3

Remember the first shell can only hold 2 electrons before being "full"



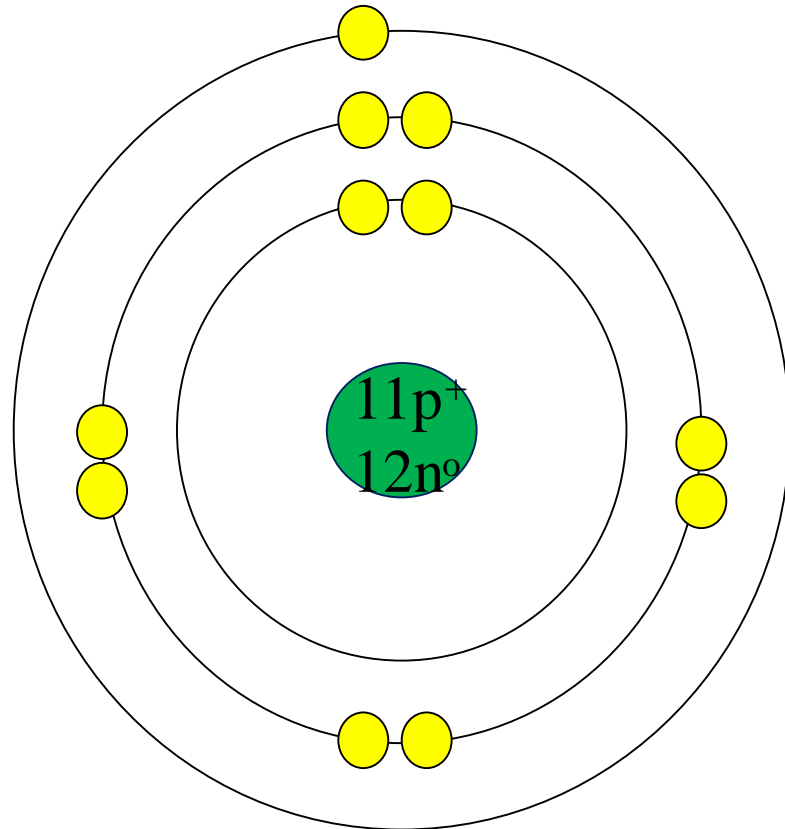
Sodium (Na)

p^+ : 11

n^0 : 23 - 11 = 12

e^- : 11

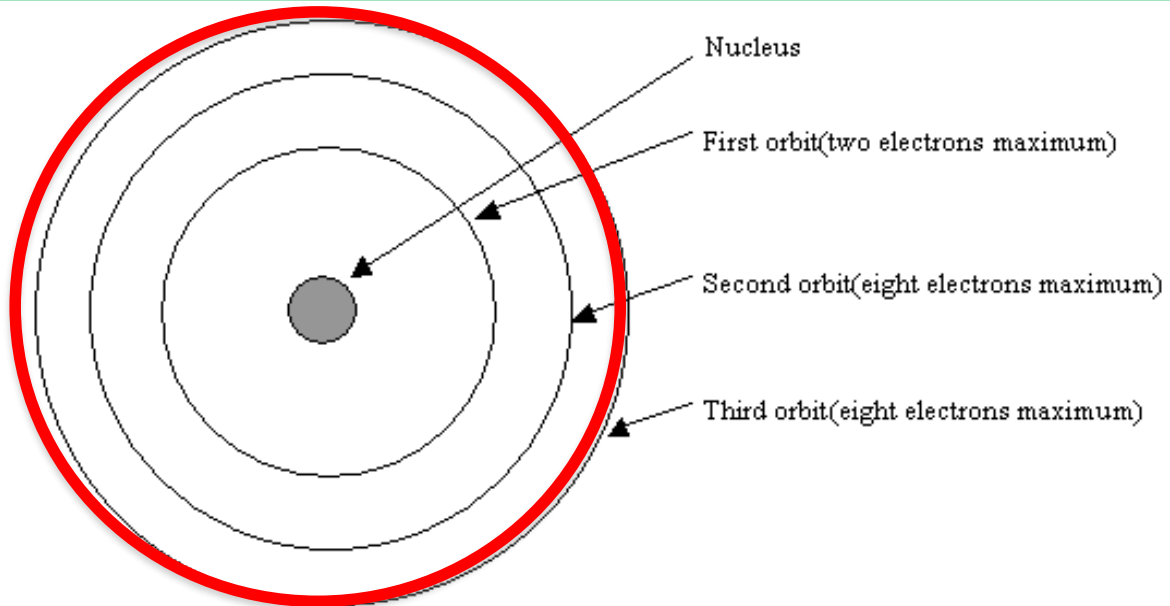
Putting electrons around in pairs at the quadrants makes it easier to count later

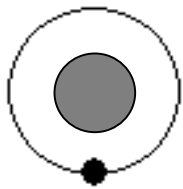


Valence:

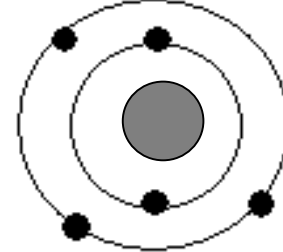
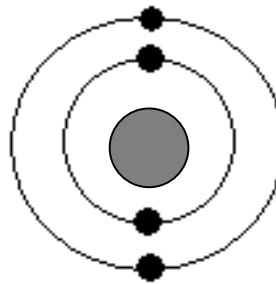
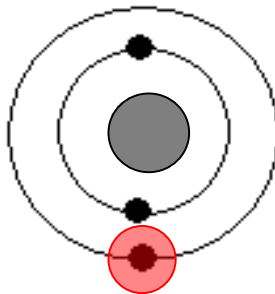
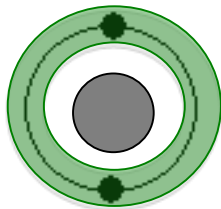
- **Last** (outer) atom **orbit**
- *All* electrons in **last orbit** are called **valence electrons**

The number of **valence** electrons in an atom determines how the atom **chemically reacts**





Hydrogen

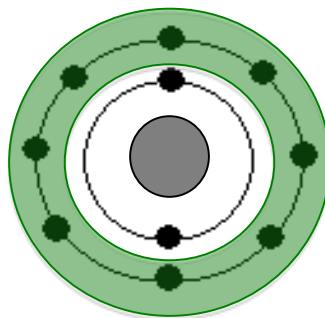


Boron

Hydrogen has a total of **1 e⁻** (**1 valence e⁻**)

Boron has a total of **5 e⁻** (**3 valence e⁻**)

Neon has a total of **10 e⁻** (**8 valence e⁻**)



Neon