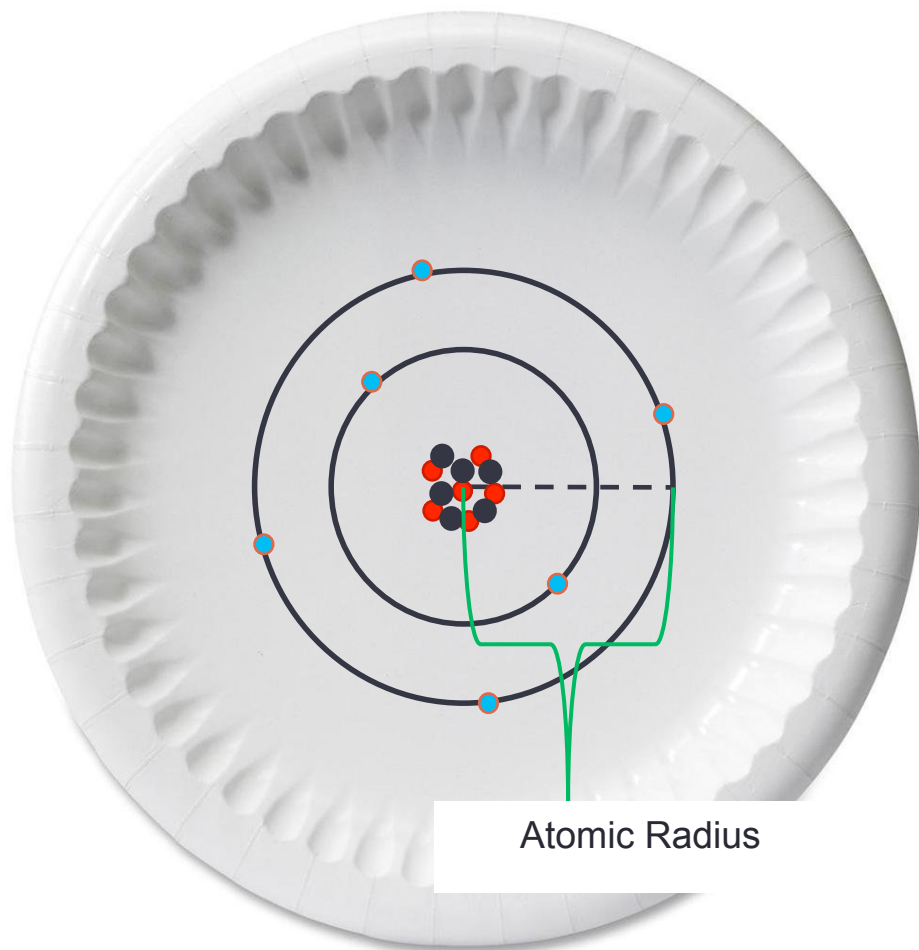


Paper Plate Model of Carbon



Blue = electrons

Red = protons

Black = neutrons

Our scale is:
2 pm : 1 mm

If the actual atomic radius of carbon is **77 pm**, how big should the radius be on this paper plate model?

77 / 2 = 38.5 cm in this model

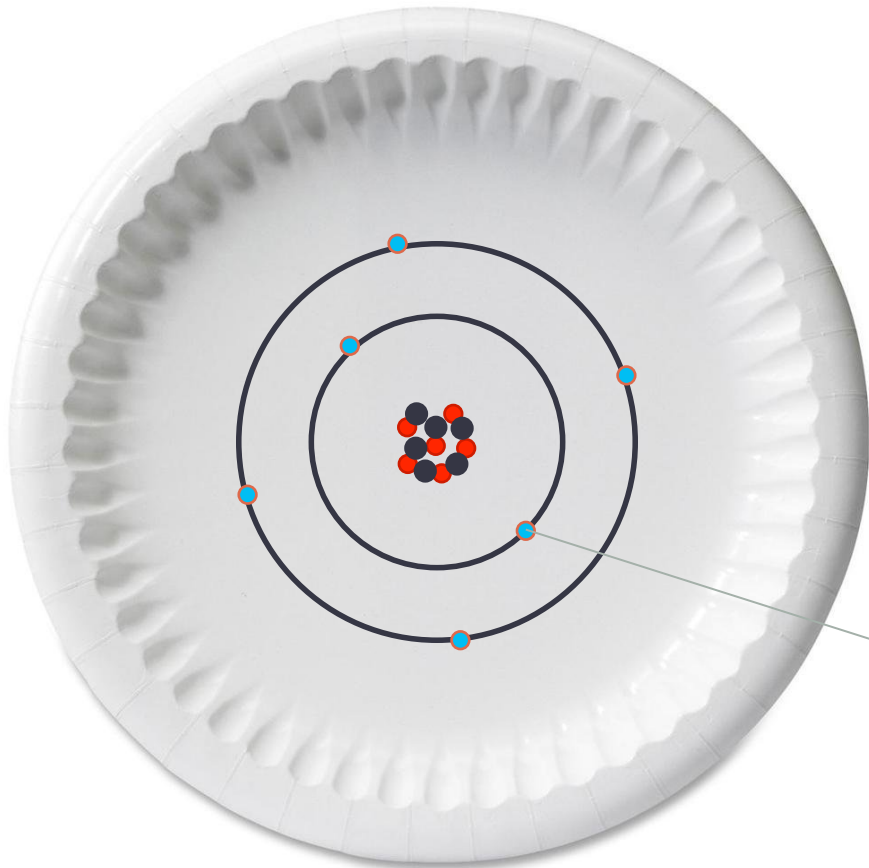
Atomic Radii (all in picometers)

| Element | Radius (pm) |
|---------|-------------|
| H | 37 |
| He | 31 |
| Li | 152 |
| Be | 111 |
| B | 80 |
| C | 77 |
| N | 74 |
| O | 73 |
| F | 72 |
| Ne | 71 |

| Element | Radius (pm) |
|---------|-------------|
| Na | 186 |
| Mg | 160 |
| Al | 143 |
| Si | 113 |
| P | 110 |
| S | 103 |
| Cl | 100 |
| Ar | 98 |
| K | 227 |
| Ca | 197 |

Again, these are all in picometers!!! Remember to scale your model appropriately

The “Shielding Effect”



Carbon

Are electrons attracted to or repelled from each other?

Repelled

Electrons in shells closer to the nucleus reduce the attraction between the protons and the valence (outer shell) electrons

First Ionization Energy

Ionization Energy Increases

| | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|--|
| 1 | | | | | | | | | | | | | | | | | 18 | |
| H | | | | | | | | | | | | | | | | | He | |
| 2 | | | | | | | | | | | 13 | 14 | 15 | 16 | 17 | 18 | | |
| Li | Be | | | | | | | | | | | B | C | N | O | F | Ne | |
| Na | Mg | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Al | Si | P | S | Cl | Ar | |
| K | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | Br | Kr | |
| Rb | Sr | Y | Zr | Nb | Mo | Tc | Ru | Rh | Pd | Ag | Cd | In | Sn | Sb | Te | I | Xe | |
| Cs | Ba | La | Hf | Ta | W | Re | Os | Ir | Pt | Au | Hg | Tl | Pb | Bi | Po | At | Rn | |
| Fr | Ra | Ac | Rf | Db | Sg | Bh | Hs | Mt | Ds | Rg | Cn | Uut | Uuq | Uup | Uuh | Uus | Uuo | |
| | | | Ce | Pr | Nd | Pm | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | | |
| | | | Th | Pa | U | Np | Pu | Am | Cm | Bk | Cf | Es | Fm | Md | No | Lr | | |