

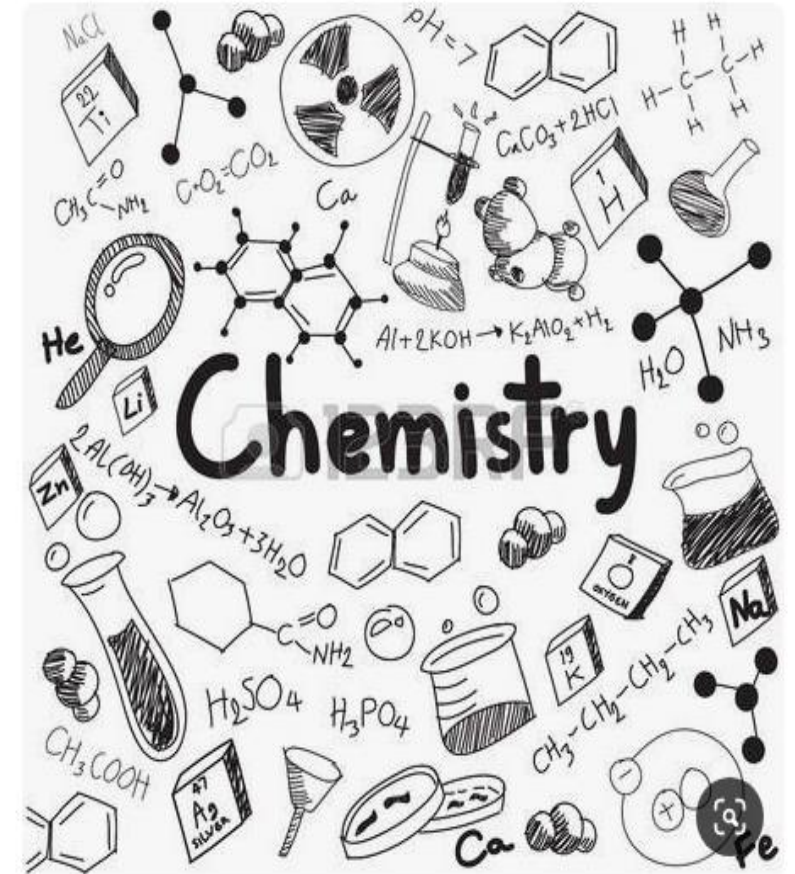
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- Lesson : (Trends in the periodic table)
- Scholastic Year: 2023-2024
- Grade: 8CS



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Objective:

1. To describe trends in the periodic table (Groups 1&2).

Trends in the periodic table

More than 20 properties change in predictable way based on the location of elements on the periodic table.

some properties:

Atomic radius

Reactivity

Density

Melting point/boiling point

Periodic Table of the Elements

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--------------------|------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|---------------------|---------------------|--------------------|----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|---------------------|---------------------|---------------------|--------------------|
| 1 H 1.01 | | | | | | | | | | | | | | | | | 18 He 4.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 Li 6.94 | 2 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 | | | | | | | | | | | 13 Al 26.98 | 14 Si 28.09 | 15 P 30.97 | 16 S 32.06 | 17 Cl 35.45 | 18 Ar 39.95 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 K 39.10 | 20 Ca 40.08 | 21 Sc 44.96 | 22 Ti 47.88 | 23 V 50.94 | 24 Cr 51.99 | 25 Mn 54.94 | 26 Fe 55.85 | 27 Co 58.93 | 28 Ni 58.69 | 29 Cu 63.55 | 30 Zn 65.38 | 31 Ga 69.72 | 32 Ge 72.63 | 33 As 74.92 | 34 Se 78.97 | 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 95.95 | 43 Tc 98.91 | 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 126.90 | 54 Xe 131.29 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 55 Cs 132.91 | 56 Ba 137.33 | 57-71 La 138.91 | 72 Hf 178.49 | 73 Ta 180.95 | 74 W 183.85 | 75 Re 186.21 | 76 Os 190.23 | 77 Ir 192.22 | 78 Pt 195.08 | 79 Au 196.97 | 80 Hg 200.59 | 81 Tl 204.38 | 82 Pb 207.20 | 83 Bi 208.98 | 84 Po [208.98] | 85 At 209.98 | 86 Rn 222.02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 87 Fr 223.02 | 88 Ra 226.03 | 89-103 Ac 227.03 | 104 Rf [261] | 105 Db [262] | 106 Sg [266] | 107 Bh [264] | 108 Hs [269] | 109 Mt [278] | 110 Ds [281] | 111 Rg [280] | 112 Cn [285] | 113 Nh [286] | 114 Fl [289] | 115 Mc [289] | 116 Lv [293] | 117 Ts [294] | 118 Og [294] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tbody> <tr> <td>57 La 138.91</td> <td>58 Ce 140.12</td> <td>59 Pr 140.91</td> <td>60 Nd 144.24</td> <td>61 Pm 144.91</td> <td>62 Sm 150.36</td> <td>63 Eu 151.96</td> <td>64 Gd 157.25</td> <td>65 Tb 158.93</td> <td>66 Dy 162.50</td> <td>67 Ho 164.93</td> <td>68 Er 167.26</td> <td>69 Tm 168.93</td> <td>70 Yb 173.06</td> <td>71 Lu 174.97</td> </tr> <tr> <td>89 Ac 227.03</td> <td>90 Th 232.04</td> <td>91 Pa 231.04</td> <td>92 U 238.03</td> <td>93 Np 237.05</td> <td>94 Pu 244.06</td> <td>95 Am 243.06</td> <td>96 Cm 247.07</td> <td>97 Bk 247.07</td> <td>98 Cf 251.08</td> <td>99 Es [254]</td> <td>100 Fm 257.10</td> <td>101 Md 258.10</td> <td>102 No 259.10</td> <td>103 Lr [262]</td> </tr> </tbody> </table> | | | | | | | | | | | | | | | | | | 57 La 138.91 | 58 Ce 140.12 | 59 Pr 140.91 | 60 Nd 144.24 | 61 Pm 144.91 | 62 Sm 150.36 | 63 Eu 151.96 | 64 Gd 157.25 | 65 Tb 158.93 | 66 Dy 162.50 | 67 Ho 164.93 | 68 Er 167.26 | 69 Tm 168.93 | 70 Yb 173.06 | 71 Lu 174.97 | 89 Ac 227.03 | 90 Th 232.04 | 91 Pa 231.04 | 92 U 238.03 | 93 Np 237.05 | 94 Pu 244.06 | 95 Am 243.06 | 96 Cm 247.07 | 97 Bk 247.07 | 98 Cf 251.08 | 99 Es [254] | 100 Fm 257.10 | 101 Md 258.10 | 102 No 259.10 | 103 Lr [262] |
| 57 La 138.91 | 58 Ce 140.12 | 59 Pr 140.91 | 60 Nd 144.24 | 61 Pm 144.91 | 62 Sm 150.36 | 63 Eu 151.96 | 64 Gd 157.25 | 65 Tb 158.93 | 66 Dy 162.50 | 67 Ho 164.93 | 68 Er 167.26 | 69 Tm 168.93 | 70 Yb 173.06 | 71 Lu 174.97 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 89 Ac 227.03 | 90 Th 232.04 | 91 Pa 231.04 | 92 U 238.03 | 93 Np 237.05 | 94 Pu 244.06 | 95 Am 243.06 | 96 Cm 247.07 | 97 Bk 247.07 | 98 Cf 251.08 | 99 Es [254] | 100 Fm 257.10 | 101 Md 258.10 | 102 No 259.10 | 103 Lr [262] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

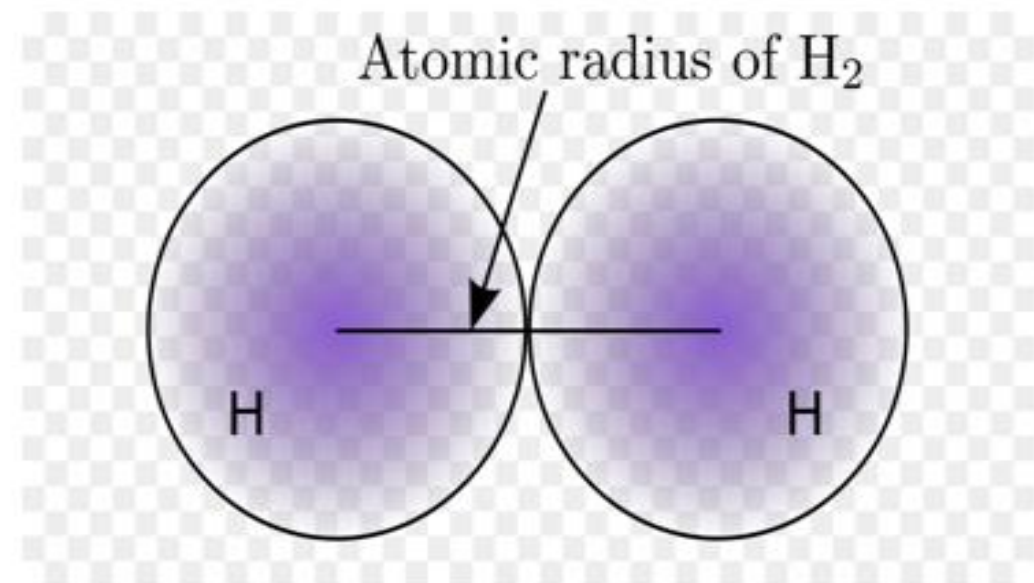
Alkali Metal Alkaline Earth Transition Metal Basic Metal Semimetal Nonmetal Halogen Noble Gas Lanthanide Actinide

Atomic Radius

The **atomic radius** of an element is a measure of the size of its atoms, usually it is the distance from the center of the nucleus to the boundary of the surrounding shells of electrons.

The atomic radius is affected by

1. The number of layers of electrons around the nucleus (for elements of the same group)
2. The attraction the outer electrons feel from the nucleus (For elements of the same period)





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Activity 2: Answer the following questions

| Atomic Radius | | | | | | | |
|--------------------|----|----|----|----|----|----|----|
| (Scale: 1 cm = %Å) | | | | | | | |
| 1 | | | | | | | 18 |
| 1 | | | | | | | 2 |
| 3 | 2 | 13 | 14 | 15 | 16 | 17 | 10 |
| 4 | | 5 | 6 | 7 | 8 | 9 | |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 31 | 32 | 33 | 34 | 35 | 36 |

| Element | Atomic radius | element | Atomic radius |
|---------|---------------|---------|---------------|
| H | 0.38 | Na | 1.86 |
| He | 0.32 | Mg | 1.60 |
| Li | 1.52 | Al | 1.43 |
| Be | 1.12 | Si | 1.18 |
| B | 0.87 | P | 1.10 |
| C | 0.77 | S | 1.03 |
| N | 0.75 | Cl | 1.00 |
| O | 0.73 | Ar | 0.98 |
| F | 0.72 | K | 2.31 |
| Ne | 0.71 | Ca | 1.97 |

| Atomic num | Element | Atomic radius |
|------------|---------|---------------|
| 31 | Ga | 1.35 |
| 32 | Ge | 1.22 |
| 33 | As | 1.20 |
| 34 | Se | 1.19 |
| 35 | Br | 1.14 |
| 36 | Kr | 1.12 |

The values in the data tables are the most

common found in high school textbooks

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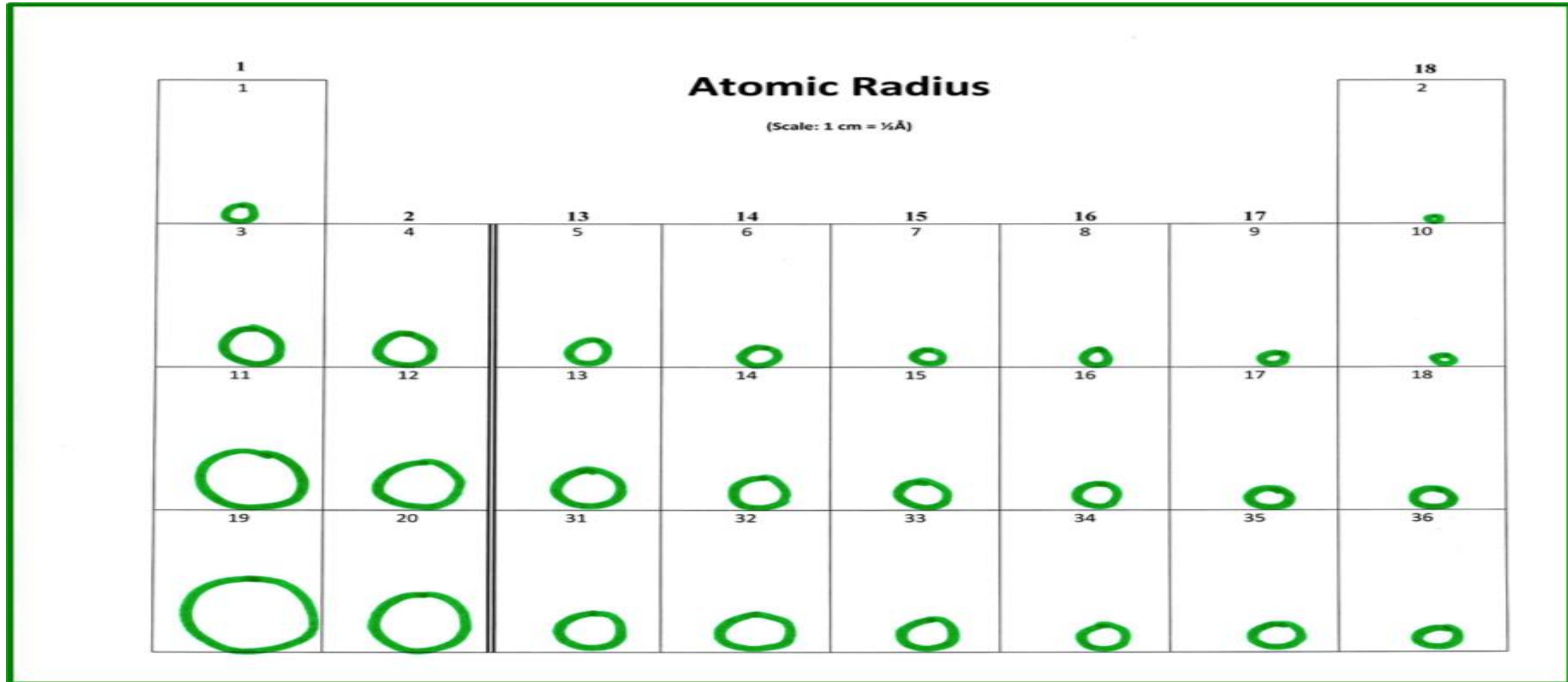


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1. What trend in the atomic radius can you see between the elements of the same group?

.....As you go down the group, the atomic radius increases.....

1. How do you compare the results for G1 and G2?

.....G1 elements have wider atomic radius comparing to G2 elements.....

1. How does the trend changes in G7?

.....G7 is NOT included in the second exam.....

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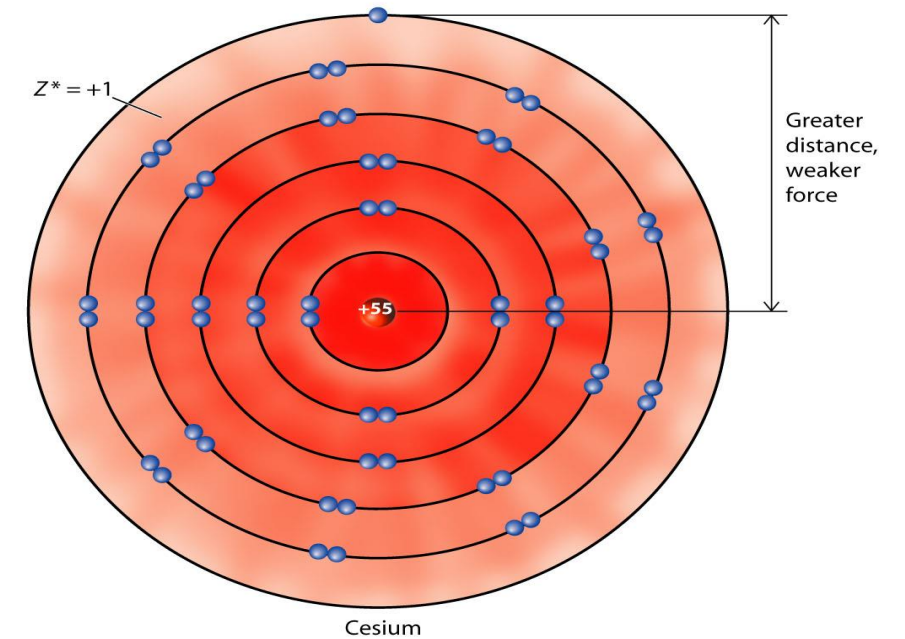
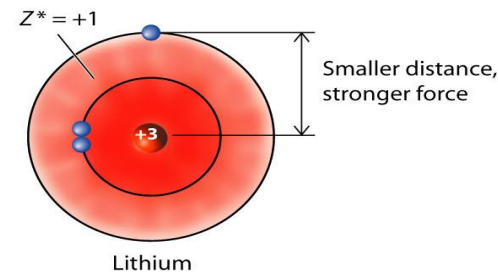


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• An atom gets larger as the number of electronic shells increase; therefore the radius of atoms increases as you go down a certain group in the periodic table of elements.

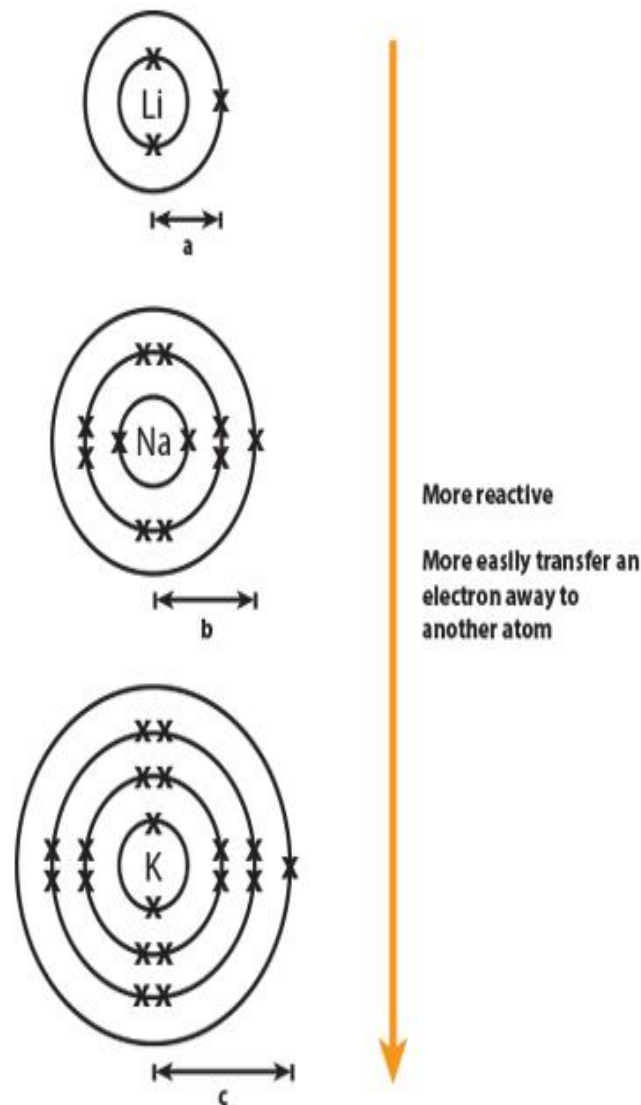


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Reactivity of Group 1 & 2

The reactivity of group 1& 2 elements increases as you go down the group because:

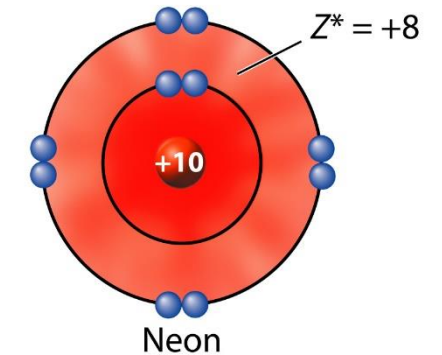
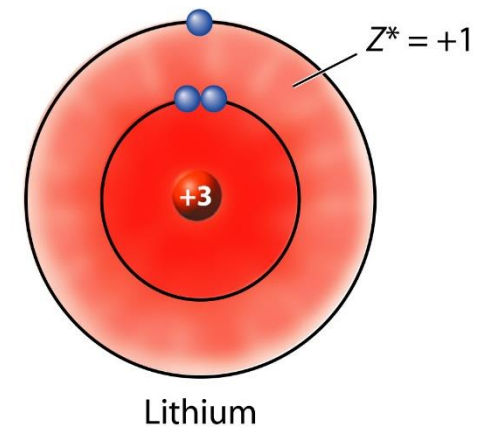
- The atoms become larger, then outer electron becomes further from the nucleus.
- The force of attraction between the nucleus and the outer electron decreases so the outer electron are lost more easily.



- The size of an atom will decrease as you move from left to the right of a certain period.

because of greater PPP “proton pulling power”

| | | | | | | | | | | | | | | | | | |
|----|----|----|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Li | Be | | | | | | | | | | | B | C | N | O | F | Ne |
| Na | Mg | | | | | | | | | | | Al | Si | P | S | Cl | Ar |
| K | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | Br | Kr |

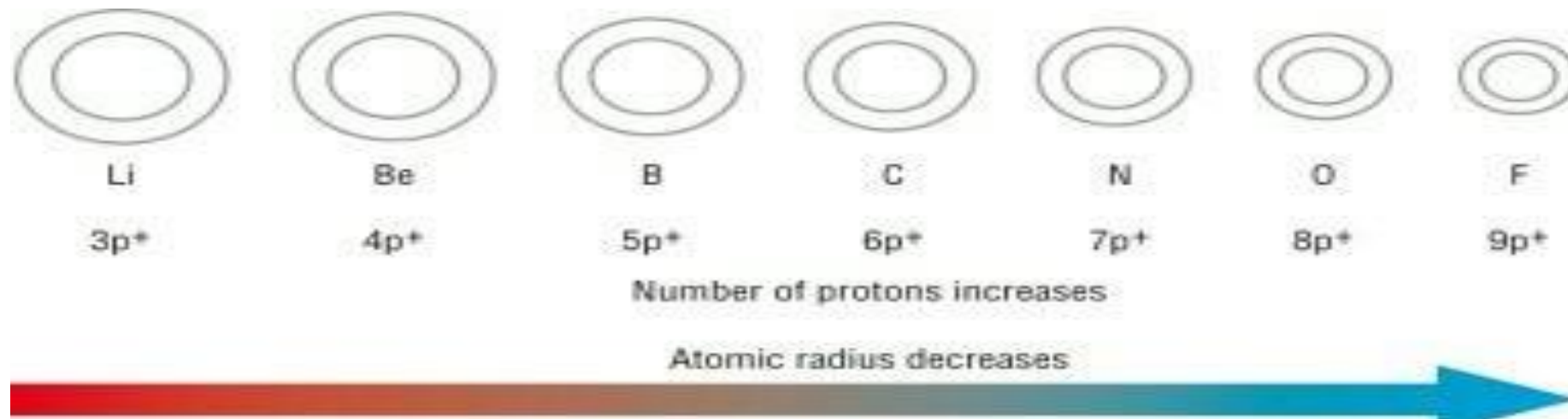


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As we move from left to right in a period, the number of electrons in the outer shell of the atom increase.

This increases the force of attraction between the nucleus and electrons in outer shell.

Due to this increased force, the size of the atom shrinks towards the nucleus, and hence the size decrease.



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Thank you