Answers:

1.

a. All elements in period 2 so no difference shielding. Li has the lowest core charge so the nucleus has weakest hold on valence electrons, therefore increasing A.R.

b. All elements in the same Group, so no difference in core charge. Number of inner shells increases with the Period, so shielding increases. Therefore the Z_{eff} decreases in elements in higher periods.

c. same as (b)

2. Higher # = smaller atoms within a Period, but not true within a Group
3. Only complete shells of electrons result in significant impact on electron-electron repulsion
4. Moving down = shielding is much more repulsive than just one more electron
5. Rb is larger and has more shielding/outer electron is in a higher level.
6. shielding, size, nuclear charge
7.

a. F has the highest core charge and thus its nucleus has the strongest force of attraction on its valence electrons

b. Li has the least number of inner shells, therefore least amount of e-e repulsion due to shielding c. Cl. Same explanation as (b)

8. A.R. K, Li, Cs, I, Se, Na, Na, Cl-; I.E.: Ca, N, F, Cl, S, Cl, Na+, Na+
9. Br: gains, repulsion due to complete shell
10. Ca: entire shell lost
11. Cl: repulsion/fewer protons
12. K: level lost, smaller atom
13. 2
14. Stronger nuclear attraction/still within same level
15. 1 (9.2), 3 (4.2), 5 (3.38), 2 (3.97)
16. Both likely high as if it is more difficult to remove an electron it is more likely to gain
17. Br, S, C
18. yes, electrons can be removed (not preferred though)
19. not stable, energy required to force atom to take an electron
20. 2-Mg^{2+}, 1-Cl^{-}. 3-N^{3-}, 3-Al^{3+}, 2-S^{2-}, 0-Ar