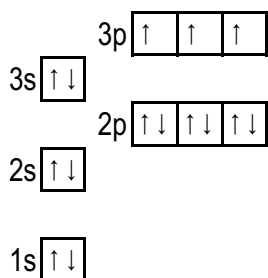
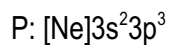
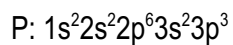


PRACTICE: ELECTRON CONFIGURATIONS

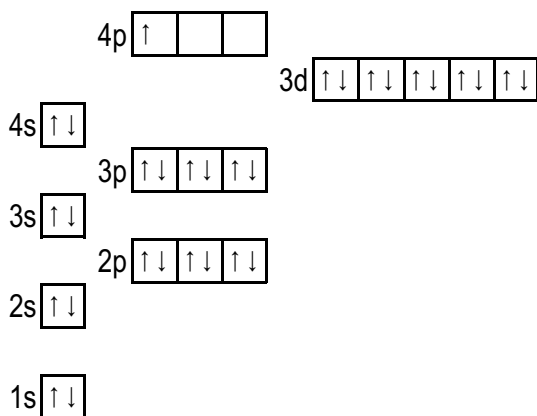
1. (a) phosphorus atom



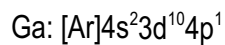
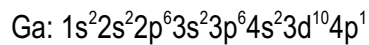
P



gallium atom

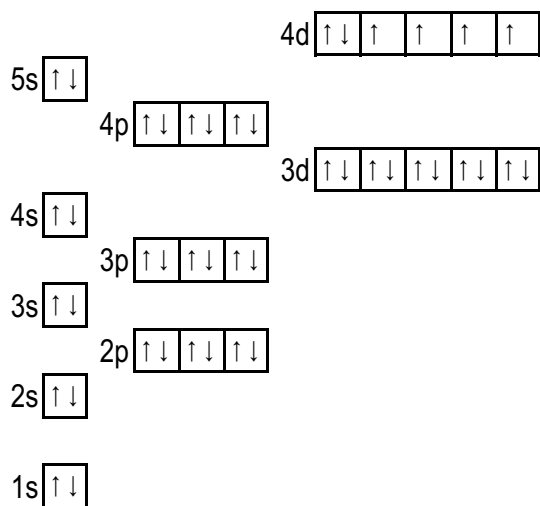


Ga

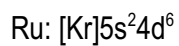
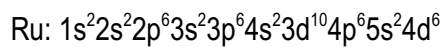


ANSWERS

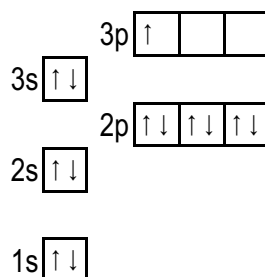
ruthenium atom



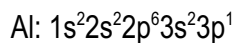
Ru



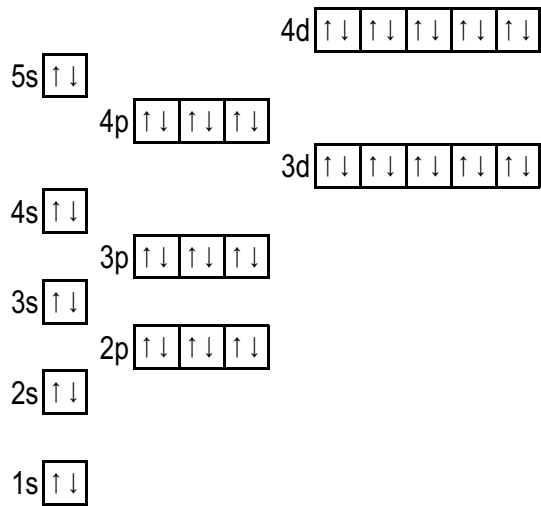
aluminum atom



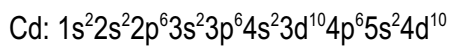
Al



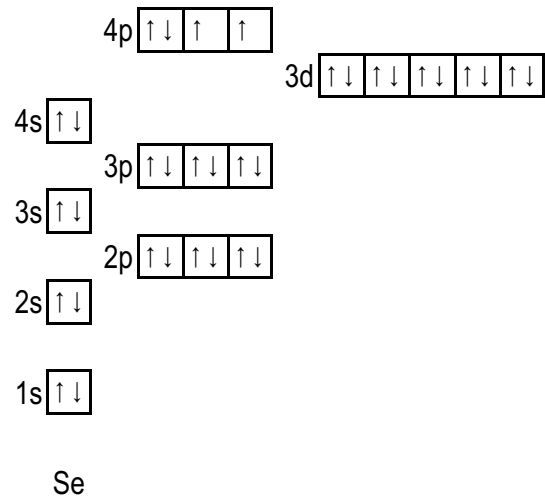
cadmium atom



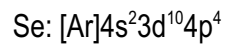
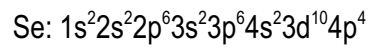
Cd



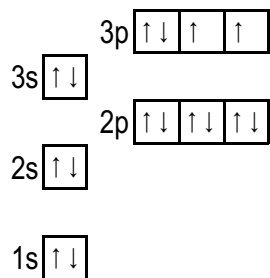
selenium atom



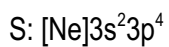
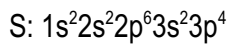
Se



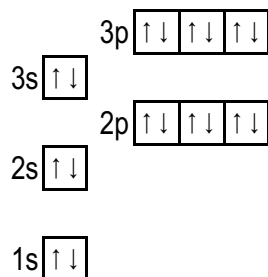
sulfur atom



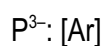
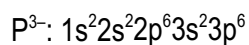
S



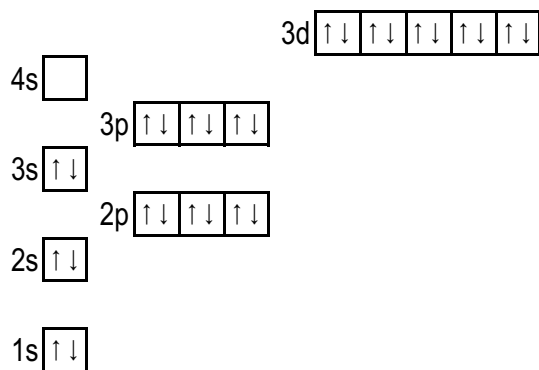
1. (b) phosphide ion



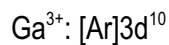
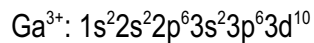
P^{3-}



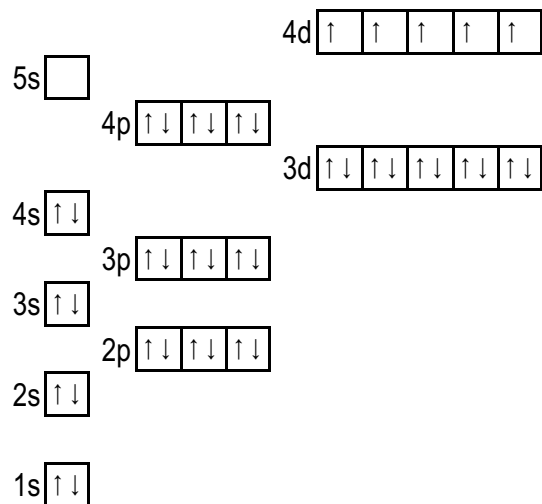
gallium ion



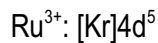
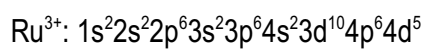
Ga^{3+}



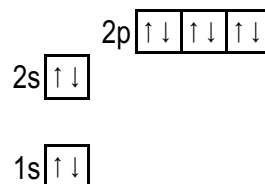
ruthenium ion



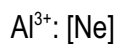
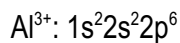
Ru^{3+}



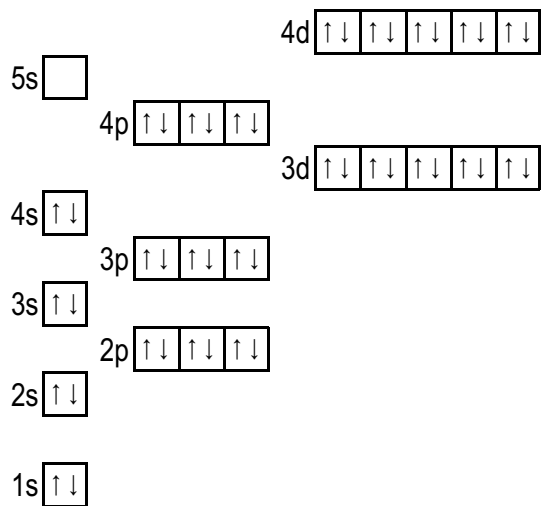
aluminum ion



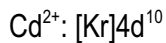
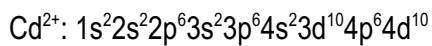
Al^{3+}



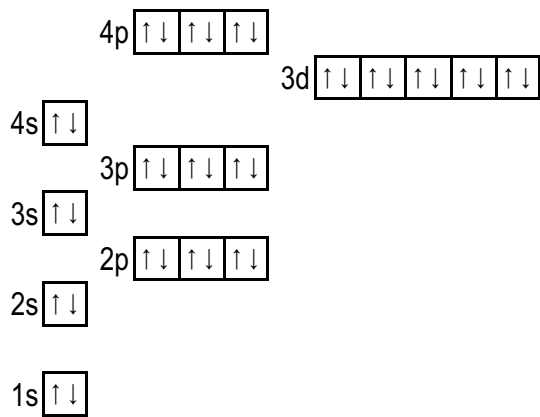
cadmium ion



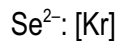
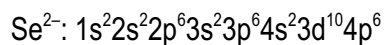
Cd^{2+}



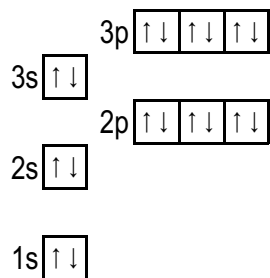
selenide ion



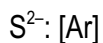
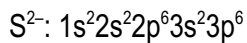
Se^{2-}



sulfide ion



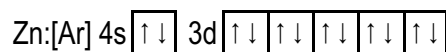
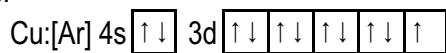
S^{2-}



2. $\text{O}^{2-}: 1s^2 2s^2 2p^6$
 $\text{F}^-: 1s^2 2s^2 2p^6$
 $\text{Ne}: 1s^2 2s^2 2p^6$
 $\text{Na}^+: 1s^2 2s^2 2p^6$
 $\text{Mg}^{2+}: 1s^2 2s^2 2p^6$

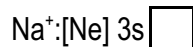
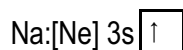
“Isoelectronic” means “same electron configuration.”

3. (a) Pd:[Kr]5s²4d⁸
 (b) The filled 4d subshell increases stability.
4. Copper atoms have one unpaired electron in the 3d subshell resulting in paramagnetism. Zinc atoms have no unpaired electrons.

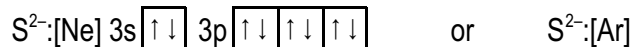
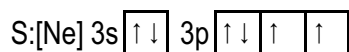


5. Alkaline earth metals and noble gases are not paramagnetic because all the electrons in their atoms are paired up.

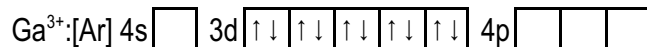
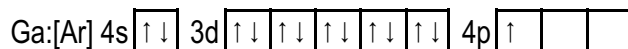
6. (a) When sodium forms an ion, the atom will lose the one electron from the 3s orbital because this leaves an octet in the outer shell (Na⁺ is isoelectronic with neon).



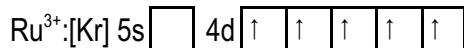
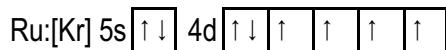
- (b) When sulfur forms an ion, the atom will gain two electrons into the 3p subshell because this results in an octet in the outer shell (S²⁻ is isoelectronic with argon).



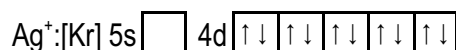
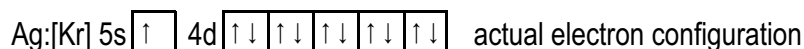
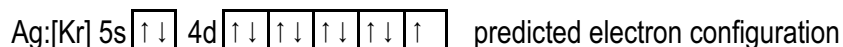
- (c) When gallium forms an ion, the atom loses its three outer-shell electrons (4s²4p¹) because outer-shell electrons are most easily lost.



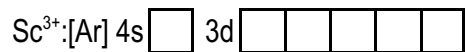
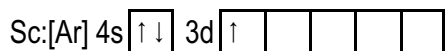
- (d) When ruthenium forms an ion, the atom loses its two outer-shell electrons (5s²) because outer-shell electrons are most easily lost. The atom also loses one 4d electron resulting in a more stable half-filled d-subshell.



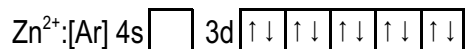
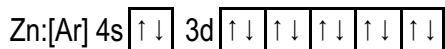
- (e) Although the predicted electron configuration for silver has two electrons in the outer 5s orbital, the actual electron configuration for silver atoms has only one electron in the outer 5s and a more stable filled 4d subshell. A silver atom loses its one outer-shell electron (5s¹) because outer-shell electrons are most easily lost.



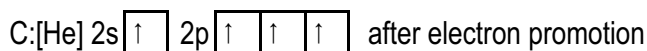
- (f) When scandium forms an ion, the atom loses its two outer-shell electrons ($4s^2$) because outer-shell electrons are most easily lost. The atom also loses the one 3d electron resulting in a more stable outer octet (Sc^{3+} is isoelectronic with argon).



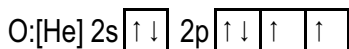
- (g) When zinc forms an ion, the atom loses its two outer-shell electrons ($4s^2$) because outer-shell electrons are most easily lost. The atom does not lose any 3d electrons because this filled d-subshell creates stability.



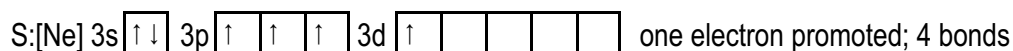
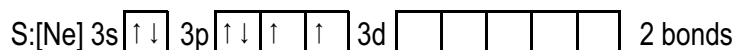
7. Carbon atoms have only two unpaired electrons. Promotion of one of the 2s electrons into the vacant 2p orbital results in four unpaired electrons and therefore four covalent bonds.



8. Oxygen atoms have two unpaired electrons in the 2p subshell allowing for two covalent bonds.



Although sulfur atoms also have only two unpaired electrons in the 3p subshell, the vacant 3d subshell allows electron promotion to occur and more bonds to form.



Note that oxygen's bonding electrons are in the second energy level and there is no d-subshell to promote electrons to (2d does not exist). Electron promotion only occurs within the same energy level or shell.