Chapter 4 Practice

4.1 The Electromagnetic Spectrum

1. Find the frequency and energy for a photon of light with a wavelength of 370 nm.

2. A photon of light has an energy of 1.83×10^{-18} J. What is the wavelength of this light? Does this light fall in the IR, the visible, or the UV region of the electromagnetic spectrum?

4.2 Color, Line Spectra, and the Bohr Model

3. How did the Bohr model describe electrons within an atom? How did this model explain line spectra?

4.3 The Quantum Model and Electron Orbitals

4. What is the Heisenberg uncertainty principle? How does this principle affect our description of electrons?

5. The Bohr model described electrons in *orbit*. Quantum mechanics describes electrons in *orbitals*. What is the difference between these two terms?

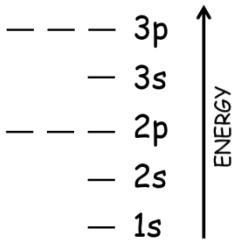
6. How many electrons can occupy each orbital?

7. Complete this table, showing the sublevels in each energy level and the number of electrons each can hold. (Leave the gray boxes empty.)

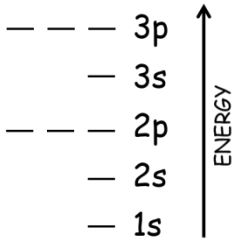
Sublevels (electrons)				
	s (2 electrons)			
Energy Level	**1**	**2**	**3**	**4**

4.4 Describing Electron Configurations

8. Complete the sketch below to show the filling sequence for fluorine, then write the electron configuration for this atom.

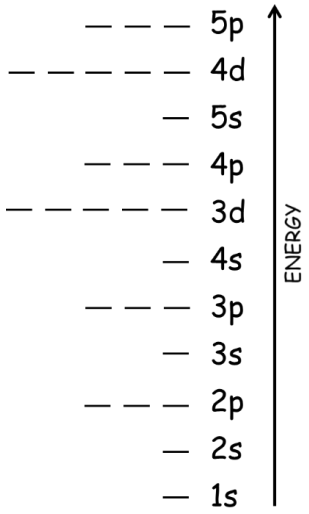


9. Complete the sketch below to show the filling sequence for silicon, then write the electron configuration for this atom.



10. Write the electron configurations for each of the following atoms.

N	Ne	K
P	Ar	Rb



11. Write electron configurations for the following, using the noble gas shorthand:

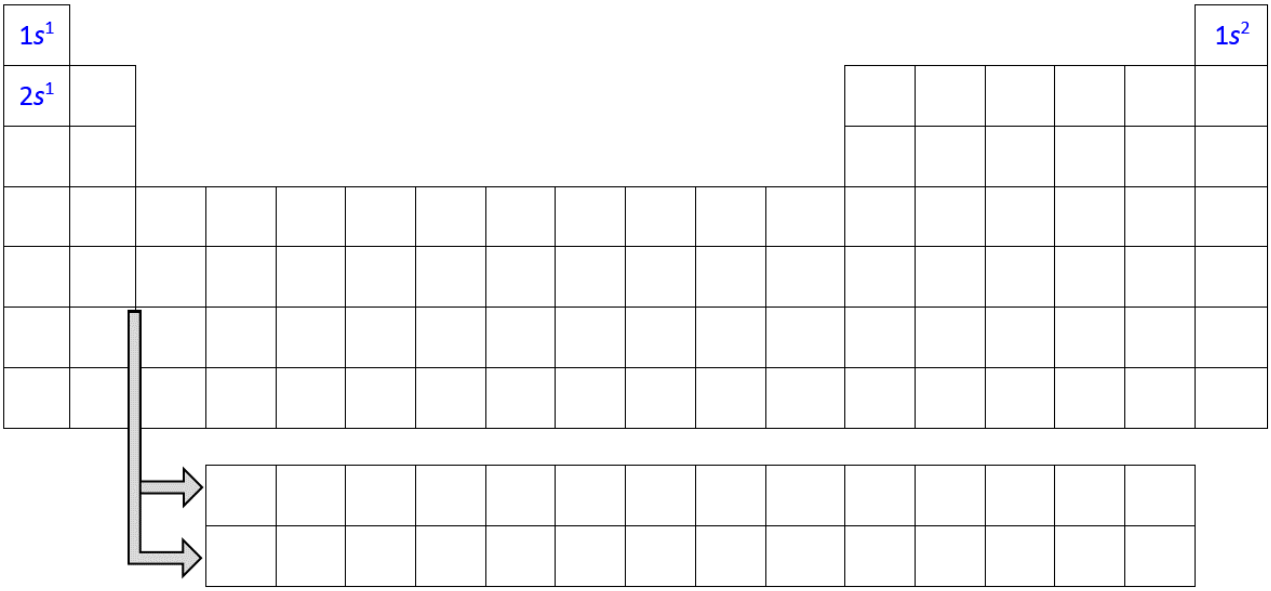
Ca	Cd	Ra

12. Indicate the number of electrons in each ion, then write the electron configuration for each, using the noble gas shorthand.

Br^-	Se^{2-}	Rb^+
Mg^{2+}	Al^{3+}	F^-

4.5 Electron Configuration and the Periodic Table

13. In the table below, label the electron configuration of the outermost shells. The first few are done for you. (Note: For larger atoms, some exceptions to the filling order occur. Don't worry about these—the key idea here is to learn the main pattern.)



14. Which of these is a *d*-block element?	Ca	B	Np	Au
15. Which of these has 7 valence electrons?	Br	O	O^{2-}	Ne
16. Which atom has an electron configuration that is $4s^2 3d^6$?	Ru	Fe	Ca	P
17. Which of these has an electron configuration of [Ne]?	Na	F	Li^+	Na^+
18. Which of these has 8 valence electrons?	Br	O	O^{2-}	Ne
19. Which two sublevels form an atom's *valence*?	*s*	*p*	*d*	*f*

20. How many valence electrons do neutral alkaline earth metals have?	1	2	3	4
21. How many valence electrons do noble gases have?	5	6	7	8

22. What is the maximum number of electrons in the highest energy level of an atom? Which sublevels do these occupy?