Chapter 3 Homework Answer key
48) Give the electronic configuration of each of the following
a) $C 1 s^{2} 2 s^{2} 2 p^{2}$
b) $P \quad 1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{3}$
c) $V \quad 1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 4 s^{2} 3 d^{3}$
d) $\mathrm{Sb} \quad 1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 4 s^{2} 3 d^{10} 4 p^{6} 5 s^{2} 4 d^{10} 5 p^{3}$
e) $\operatorname{Sm} 1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 4 s^{2} 3 d^{10} 4 p^{6} 5 s^{2} 4 d^{10} 5 p^{6} 6 s^{2} 4 f^{5}$
51) What additional info do we need to answer the question "Which ion has the electronic configuration $1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6 \prime}$ ?
specifically we need to know the charge

$$
\begin{array}{ll}
{\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6}\right]^{+3}=G a^{3+}} & {\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6}\right]^{3-}=p^{3-}} \\
{\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6}\right]^{+2}=C a^{2+}} & {\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6}\right]^{-}=s^{-}} \\
{\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6}\right]^{+}=K^{+}} & {\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6}\right]=C l^{-}}
\end{array}
$$

54) Give the electronic configuration of the following ions.
a) $N^{3-}\left[1 s^{2} 2 s^{2} 2 p^{6}\right]^{3-}$
b) $\mathrm{Ca}^{2+}\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6}\right]^{2+}$
c) $s^{-}\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{5}\right]^{-}$
d) $\mathrm{Cs}^{2+}\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 4 s^{2} 3 d^{10} 4 p^{6} 5 s^{2} 4 d^{10} s p^{5}\right]^{2+}$
e) $\mathrm{Cr}^{2+}\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 4 s^{2} 3 d^{2}\right]^{2+}$
f) $G d^{3+}\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 4 s^{2} 30^{10} 4 p^{6} 5 s^{2} 4 d^{10} 5 p^{6} 6 s^{2} 4 f^{4}\right]^{3+}$
55) Which atom has the electron Configuration

$$
1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 3 d^{7} 4 s^{2} ?
$$

Co
57) Which ion with $a+1$ charge has the electronic Configuration $1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 3 d^{10} 4 s^{2} 4 p^{6}$ ?
Which ion with a 2-charge has the same configuration?

$$
\begin{aligned}
& 1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 3 d^{10} 4 s^{2} 4 p^{6}=K r \\
& {\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 3 d^{10} 4 s^{2} 4 p^{6}\right]^{2-}=S e^{2-}}
\end{aligned}
$$

58) Which of the following atoms contain only 3 valence $e^{-}: L: B, N, F, N e$ ?
only Group IIIA $\Rightarrow B$
59) Which of the following has two unpaired electrons?

$m g$

si


让 $\frac{11}{28}$ Ir
$\frac{11}{23}$
$\frac{11}{18}$
$S$
a) $m g$
d) troth mg \& S
b) si
e) both si \& 5
c) s
60) Which atom would be expected to have a halffilled lop subshell?

Bi Bismuth $[x e] 6 s^{2} 5 d^{10} 6 p^{3}$
61) Which atom would be expected to have a halffilled is subshell?
$K$ Potassium [Ar] $4 s^{\prime}$
64) Write the electronic configurations for the following atoms or tons:
a) $\mathrm{B}^{3+}\left[1 s^{2}\right]^{3+}$
b) $0^{-}\left[1 s^{2} 2 s^{2} 2 p^{7}\right]^{-}$
c) $\mathrm{Cl}^{3+}\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{2}\right]^{3 t}$
d) $\mathrm{Ca}^{2+}\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6}\right]^{2+}$
e) $T: \quad\left[1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 4 s^{2} 3 d^{2}\right]$
87) Using the periodic table, classify each of the following elements as a metal or a nonmetal, and then further classify each as a main-group element, transition metal, or inner transition metal:
a) Uranium $u$ metal, Transition metal
b) Bromine Br nonmetal, Main-group
c) Strontium So metal, Main-group
d) Neon No nonmetal, Main-group
e) Gold At metal, Transition metal
f) Americium Am metal, Inner Transition Metal
g) Rhodium Rh metal, Transition metal
h) Sulfur $S$ nonmetal, main-group
i) Carbon Con metal, Main-group
j) Potassium $K$ metal, Main-group
89) Using the periodic table identify the lightest member of each of the following groups:
a) Nobel Gases Helium He
b) Alkaline Earth metals Berylium Be
c) Alkali metals Hydrogen, H
d) Chalcogens This is the first time I've seen this name in 20 years. Five learned something new. This is group 6A Oxygen, 0
91) Use the periodictable to give the name and Symbol for each of the following elements:
d) The nobel gas in the same period as germanium Krypton Kr
b) The alkaline earth metal in the Same period as Selenium Calcium Ca
c) The halogen in the same period as lithium Neon Ne
d) The chalcogen in the same period as Cadmium Tellurium $\mathrm{Te}_{\mathrm{e}}$
93) Write a symbol for each of the following neutral isotopes. Include the atomic number and mass number for each.
a) The alkali metal with 11 protons and a mass number of $23{ }_{11}^{23} \mathrm{Na} \quad \quad 11$ protons $=\mathrm{Na}$
b) The nobel gas element with 75 neutrons in its nucleus and 54 electrons in the neutral atom

$$
\begin{array}{ll}
129 & \text { neutral } e^{-}=p^{+} \\
54 & 54 e^{-}=54 p^{+}=x_{e}
\end{array}
$$

c) The isotope with 33 protons and 40 neutrons in its nucleus

$$
{ }_{33}^{73} \mathrm{As} \quad 33 p^{+}=\mathrm{As}
$$

d) The alkaline earth metal with 88 electrons and 138 neutrons

$$
{ }_{88}^{226} \mathrm{Ra}
$$

$$
88 e^{-}=88 p^{+}=R_{a}
$$

95) Using the Periodic Table, predict whether the following chbrides are ionic or covalent:

Look for the metals. metal $=$ ionic

KCl Ionic
$\mathrm{NCl}_{3} \quad$ Covalent

ICI Covalent
$\mathrm{MgCl}_{2}$ Ionic
$\mathrm{PCl}_{5} \quad$ Covalent
$\mathrm{CCl}_{4} \quad$ Covalent
97) For each of the following compounds, state whether it is ionic or covalent. If it is ionic, write the Symbols for the ions involved:
a) $\mathrm{NF}_{3}$ Covalent
b) BaO Ionic $\underset{\text { Barron } \mathrm{Ba}^{2+} \mathrm{O}^{2-}}{\text { Oxide }}$
c) $\left(\mathrm{NH}_{4}\right)_{2} \mathrm{CO}_{3}$ Ionic $\mathrm{NH}_{4}^{+} \mathrm{CO}_{3}^{2-}$
ammonium Carbonate
d) $\mathrm{Sr}\left(\mathrm{H}_{2} \mathrm{PO}_{4}\right)_{2}$ Ionic $\mathrm{Sr}^{2+} \mathrm{H}_{2} \mathrm{PO}_{t}^{-}$
strontium dihydragenphorphate
e) IB Covalent
f) $\mathrm{Na}_{2} \mathrm{O}$ Ionic $\mathrm{Na}^{+} \mathrm{O}^{2-}$ Sodium oxide
99) For each of the following pairs of ions, write the symbol for the formula of the compound they will form.

a) $\mathrm{Ca}^{2+}, \mathrm{S}^{2-}$ | $\mathrm{Ca}^{2+}$ | $\mathrm{S}^{2-}$ |
| :---: | :---: |
| $2+$ | $2^{-}$ |

b) $\mathrm{NH}_{4}^{+}, \mathrm{SO}_{4}^{2-}$

$$
\begin{aligned}
& \mathrm{NH}_{4}^{+} \\
& \mathrm{NH}_{4}^{+}
\end{aligned} \mathrm{SO}_{4}^{2-}
$$

$\left(\mathrm{NH}_{4}\right)_{2} \mathrm{SO}_{4}$
C) $\mathrm{Al}^{3+}, \mathrm{Br}^{-}$

$$
\begin{aligned}
& \mathrm{Al}^{3+} \begin{array}{l}
\mathrm{Br}^{-} \\
\\
\\
\hline 3 r^{-} \\
\hline 3 r^{-} \\
\hline
\end{array} \frac{3^{-}}{}
\end{aligned}
$$

d) $\mathrm{Na}^{+}, \mathrm{HPO}_{4}^{2-}$

$$
\begin{array}{l|ll}
\mathrm{Na}^{+} & 1+\mathrm{PO}_{4}^{2-} \\
\mathrm{Na}^{+} & \mathrm{Na}_{2} \mathrm{HPO}_{4} \\
\hline 2+ & 2-
\end{array}
$$

e) $\mathrm{Mg}^{2+}, \mathrm{PO}_{4}^{3-}$

$$
\begin{array}{l|ll}
\mathrm{mg}^{2+} & \mathrm{PO}_{4}^{3-} & \mathrm{mg}_{3}\left(\mathrm{PO}_{2}\right. \\
\mathrm{mg}_{2} & \mathrm{PO}_{4}^{3-} & \\
\mathrm{mg}^{2+} & \\
\hline 6+ & 6^{-} &
\end{array}
$$

100) For each of the following pairs of ions, write the symbol for the formula of the compound they will form.
a) $\mathrm{K}^{+}, \mathrm{O}^{2-}$

$$
\begin{array}{l|ll}
K^{+} & 0^{2-} & K_{2} O \\
K^{+} & 2+ &
\end{array}
$$

b) $\mathrm{NH}_{4}^{+}, \mathrm{PO}_{4}^{3-}$

$$
\begin{array}{l|l}
\mathrm{NH}_{4}^{+} & \mathrm{PO}_{4}^{3-} \\
\mathrm{NH}_{4}^{+} & \\
\mathrm{NH}_{4}^{+} & \\
\hline 3+ & 3-
\end{array}
$$

$$
\left(\mathrm{NH}_{4}\right)_{3} \mathrm{PO}_{4}
$$

C) $\mathrm{Al}^{3+}, \mathrm{O}^{2-}$

$$
\begin{array}{l|l}
\mathrm{Al}^{3+} & \mathrm{O}^{2-} \\
\mathrm{Al}^{3+} & \mathrm{O}^{2-} \\
& \mathrm{O}^{2-} \\
\hline 6+ & 6-
\end{array}
$$

d) $\mathrm{Na}^{+}, \mathrm{CO}_{3}^{2-}$

$$
\begin{array}{l|l}
\mathrm{Na}^{+} & \mathrm{CO}_{3}^{2-} \\
\mathrm{Na}^{+} & \mathrm{Na}_{2} \mathrm{CO}_{3}
\end{array}
$$

e) $\mathrm{Ba}^{2+}, \mathrm{PO}_{4}^{3-}$

$$
\begin{array}{l|ll}
\mathrm{Ba}^{2+} & \mathrm{PO}_{4}^{3-} & \mathrm{Ba}_{3}\left(\mathrm{PO}_{4}\right)_{2} \\
\mathrm{Ba}^{2+} & \mathrm{PO}_{4}^{3-} & \\
\mathrm{Ba}^{2+} & \\
\hline 6+ & 6- &
\end{array}
$$

