Quiz #1-MA, MB

Name:

Student ID:

Question 1

Give the electron configurations for the following ions: Se^{2-}, I^-, and Ni^{2+}.

Solution:

Se^{2-}: From Table 2.2, the electron configuration for an atom of selenium is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^4$. In order to become an ion with a minus two charge, it must acquire two electrons—in this case another two 4p. Thus, the electron configuration for an Se^{2-} ion is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6$.

I^-: From the periodic table, Figure 2.8, the atomic number for iodine is 53, which means that it has fifty three electrons and an electron configuration of $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^5$. In order to become an ion with a minus one charge, it must acquire one electron—in this case another 5p. Thus, the electron configuration for an I^- ion is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6$.

Ni^{2+}: From Table 2.2, the electron configuration for an atom of nickel is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$. In order to become an ion with a plus two charge, it must lose two electrons—in this case the two 4s. Thus, the electron configuration for a Ni^{2+} ion is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8$.

Question 2

Write the unabbreviated electron configurations of the following elements: iron, barium and neptunium

solution:

iron **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$**

barium **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$**

neptunium **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 5f^5$**

Question 3

Predict the electron configurations of S, K ,Ti, Sn.

solution:

S: $1s^2 2s^2 2p^6 3s^2 3p^4$

K: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

Ti: $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$

Sn: $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^2$

Question 4

Explain why hydrogen fluoride (HF) has a higher boiling temperature than hydrogen chloride (HCl) (19.4 vs. –85°C), even though HF has a lower molecular weight.

Solution

The intermolecular bonding for HF is hydrogen, whereas for HCl, the intermolecular bonding is van der Waals. Since the hydrogen bond is stronger than van der Waals, HF will have a higher melting temperature.

Question 5

What type(s) of bonding would be expected for bronze (a copper-tin alloy)?

(A) Ionic bonding

(B) Metallic bonding

(C) Covalent bonding with some van der Waals bonding

(D) van der Waals bonding

Solution

The correct answer is B. For bronze, the bonding is metallic because it is a metal alloy.

Question 6

Match the noble gas with its electron configuration:

solution

c	Argon	**a.** $1s^2$
a	Helium	**b.** $1s^2 2s^2 2p^6$
b	Neon	**c.** $1s^2 2s^2 2p^6 3s^2 3p^6$
d	Krypton	**d.** $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6$

Question 7

What type(s) of bonding would be expected for rubber?

(A) Ionic bonding

(B) Metallic bonding

(C) Covalent bonding with some van der Waals bonding

(D) van der Waals bonding

Solution

The correct answer is C. For rubber, the bonding is covalent with some van der Waals bonding. (Rubber is composed primarily of carbon and hydrogen atoms.)

Question 8

Compute the %IC of the interatomic bond for each of the following compounds: CdS, and FeO.

Solution:
The percent ionic character is a function of the electron negativities of the ions X_A and X_B according to Equation 2.16. The electronegativities of the elements are found in Figure 2.9.
For CdS, $X_{Cd} = 1.5$ and $X_S = 2.4$, and therefore,

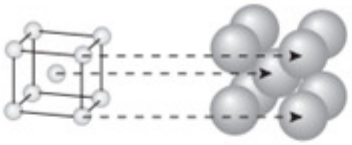
$$\%IC = \left[1 - \exp(-0.25)(2.4-1.5)^2\right] \times 100 = 18.3\%$$

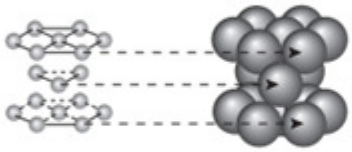
For FeO, $X_{Fe} = 1.7$ and $X_O = 3.5$, and therefore,

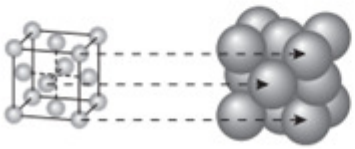
$$\%IC = \left[1 - \exp(-0.25)(3.5-1.7)^2\right] \times 100 = 55.5\%$$

Question 9

Label each of the following arrangements of atoms with the correct name.

a)  Body-centered cubic

b)  Hexagonal closed-packed

c)  Face-centered cubic

Question 10

Circle the letter of each metal whose atoms form a face-centered cubic pattern.

a. zinc c. iron α b. copper d. aluminum --- answer b and d