

Chapter 8 exercises

Q1. Practice exercise page 302

Which substances would you expect to have the greatest lattice energy,

MgF₂, CaF₂, ZrO₂

Answer:

According to the lattice energy $E_{el} = k \times Q_1 \times Q_2 / d$, the lattice energy increase as the charge of ion increases. ZnO₂ has higher lattice energy because the charge of Zn is 4 higher than Mg and Ca.

Q2. Practice exercise page 303

Predict the charges on the ions formed when magnesium reacts with nitrogen.

Answer:

atomic number of Mg = 12

electronic configuration is 1S² 2S² 2P⁶ 3S²

[Mg] 3S² loss two electrons to form Mg²⁺ ion

atomic number of N = 7

electronic configuration is 1S² 2S² 2P³

[N] 2P³ gains 3 electrons to form N³⁻

Q3. Practice exercise page 264 (chapter 7)

Which of the following atoms is largest: S²⁻, S, O²⁻ ?

Answer:

S²⁻ is larger than S because S gain 2 electrons to form an ion S²⁻ with large ionic radii,

S below O in the group 6A with larger atomic number.

than the largest one is S²⁻.

Q4. Practice exercise page 264 (chapter 7)

Which of the following ions is largest, Rb^+ , Sr^{2+} , Y^{3+} .

Answer:

the atomic number of the following Rb (37), Sr (38), Y (39)

the isoelectric series of ions Rb^+ , Sr^{2+} , Y^{3+} having 36 electrons

As the nuclear charge increase the ionic radii decreases, therefore, the Rb^+ the largest one.

Q5. Practice exercise page 305

Compare the Lewis symbol for neon with the Lewis structure for methane CH_4 . in what important way are the electrons arrangements about neon and carbon alike? In what important respect are the different?

Answer:

atomic number of Ne is 10 \rightarrow electronic configuration $1s^2 2s^2 2p^6 \rightarrow [\text{Ne}] 2p^6$

atomic number of C is 6 \rightarrow electronic configuration $1s^2 2s^2 2p^2 \rightarrow [\text{C}] 2p^2$

Both atoms have an octet of electrons about them. However, the electrons about neon are unshared electron pairs, whereas, those about carbon with four hydrogen atoms.

Q6. Practice exercise page 310

Which of the following about is the most polar S – Cl, S – Br, Se – Cl, Se – Br

Answer:

(S) is the common to the S – Cl and S – Br and Cl is above Br therefore, Br is more electronegativity. S – Cl is more polar than S - Br

Se is the common to the Se – Cl and SE – Br, therefore, Se – Cl is more polar.

The Se is lower than S in periodic table which has more atomic number shows a

decrease in electronegativity . Se – Cl more polar

Q7. Practice exercise page 311

The dipole moment of chlorine monofluoride $\text{ClF}_{(g)}$, is 0.88 D. The length of the molecule is 1.63 Å.

a) Which atom is expected to have the partial negative charge?

b) What is the charge on that atom in unit of e.

Answer:

a) Fluoride above the chloride in periodic table, it becomes more electronegativity.

b) $\mu = Q \times r$

$$1 \text{ D} = 3.34 \times 10^{-30} \text{ C-m}$$

$$0.88 \text{ D} = (0.88 \text{ D}) \times (3.34 \times 10^{-30}) / (1 \text{ D}) = 3.9392 \times 10^{-30} \text{ C-m}$$

$$Q = (2.9392 \times 10^{-30}) / (1.63 \times 10^{-10}) = 1.803 \times 10^{-20} \text{ C}$$

$$1 \text{ e} = 1.6 \times 10^{-19} \text{ C}$$

$$\text{Dipole of ClF in e} = (1.803 \times 10^{-20}) (1 \text{ e} / 1.6 \times 10^{-19}) = 0.113 \text{ e}$$

8.17

Write the electron configuration for each following ions, and determine which one possess noble-gas configuration. a) Sr^{2+} ,b) Ti^{2+} , c) Se^{2+} , d) Ni^{2+} , e) Br^- , f) Mn^{3+} .

Answer:

a) Sr (38) $[\text{Ar}] 4\text{S}^2 3\text{d}^{10} 4\text{p}^6 5\text{S}^2$

Sr^{2+} (36) $[\text{Ar}] 4\text{S}^2 3\text{d}^{10} 4\text{p}^6 = [\text{Kr}]$

b) Ti (22) $[\text{Ar}] 4\text{S}^2 3\text{d}^2$ Ti^{2+} (20) $[\text{Ar}] 4\text{S}^2$

c) Se(34) $[\text{Ar}] 4\text{S}^2 3\text{d}^{10} 4\text{p}^4$ Se^{2+} (32) $[\text{Ar}] 4\text{S}^2 3\text{d}^{10} 4\text{p}^2$

d) Ni (28) $[\text{Ar}] 4\text{S}^2 3\text{d}^8$ Ni^{2+} (26) $[\text{Ar}] 4\text{S}^2 3\text{d}^6$

e) Br (35) $[\text{Ar}] 4\text{S}^2 3\text{d}^{10} 4\text{p}^5$ Br^- (36) $[\text{Ar}] 4\text{S}^2 3\text{d}^{10} 4\text{p}^6 = [\text{Kr}]$