**12.** C

# UNIT 2 Chemical Reactions and Radioactivity

## Chapter 4 Atomic theory explains the formation of compounds.

## Section 4.1 Atomic Theory and Bonding

### Comprehension

### The atom and the subatomic particles

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**1.** **(a)** atomic number
**(b)** symbol
**(c)** name
**(d)** average atomic mass
**(e)** common ion charge
**(f)** other ion charge

**2.** (a) 35
**(b)** 79.9
**(c)** 1–
**(d)** 35
**(e)** bromine
**(f)** 45

**3.**

| Element Name | Atomic Number | Ion Charge | Number of Protons | Number of Electrons | Number of Neutrons |
|---|---|---|---|---|---|
| potassium | 19 | 1+ | 19 | 18 | 20 |
| phosphorus | 15 | 0 | 15 | 15 | 16 |
| **lithium** | 3 | 0 | **3** | **3** | **4** |
| **calcium** | **20** | 2+ | 20 | **18** | **20** |
| nitrogen | **7** | 3– | **7** | **10** | **7** |
| **boron** | 5 | 0 | **5** | **5** | **6** |
| argon | **18** | **0** | **18** | 18 | **22** |
| **aluminum** | 13 | **3+** | **13** | 10 | **14** |
| chlorine | **17** | 0 | **17** | **17** | **19** |
| **sodium** | **11** | **1+** | 11 | 10 | **12** |

### Applying Knowledge

### Bohr diagrams

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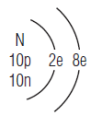
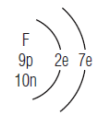
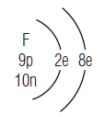
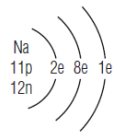
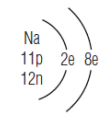
**1.** **(a)** a diagram that shows how many electrons are in each shell surrounding the nucleus

**2.**

| Atom/Ion | Atomic Number | Number of Protons | Number of Electrons | Number of Neutrons | Number of Electron Shells |
|---|---|---|---|---|---|
| neon atom | **10** | **20** | **10** | **10** | **2** |
| fluorine atom | **9** | **9** | **9** | **10** | **2** |
| fluorine ion | **9** | **9** | **10** | **10** | **2** |
| sodium atom | **11** | **11** | **11** | **12** | **3** |
| sodium ion | **11** | **11** | **10** | **12** | **2** |

**3.**

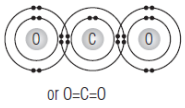
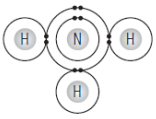
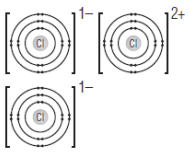
| neon atom | fluorine atom | fluorine ion | sodium atom | sodium ion |
|---|---|---|---|---|
|  |  |  |  |  |







**4.**

| carbon dioxide ($CO_2$) | ammonia ($NH_3$) | calcium chloride ($CaCl_2$) |
|---|---|---|
|  |  |  |





### Illustrating Concepts

### Lewis diagrams

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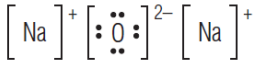
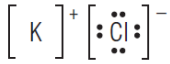
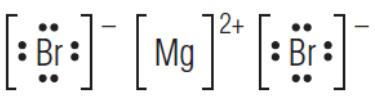
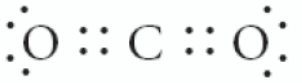
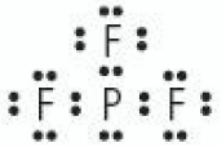
**1.** **(a)** a diagram that illustrates chemical bonding by showing only an atom's valence electrons and the chemical symbol
**(b)** pair of electrons in the valence shell that is not used in bonding
**(c)** pair of electrons involved in a covalent bond

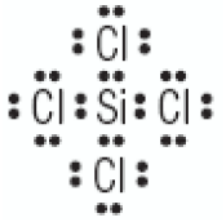
**2.** **(a)** 
**(b)** 
**(c)** 
**(d)** 

**3.** **(a)** 
**(b)** 

(c) 

4. (a) 

(b) 

(c) 

5. (a) 

(b) 

(c) 

## Assessment

## Atomic theory and bonding

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**1.** C **2.** A **3.** B **4.** E **5.** D **6.** B **7.** D **8.** D **9.** D **10.** A **11.** B **12.** B **13.** A **14.** A **15.** C **16.** B