Test Bank for Introductory Chemistry 2nd Edition by Burdge

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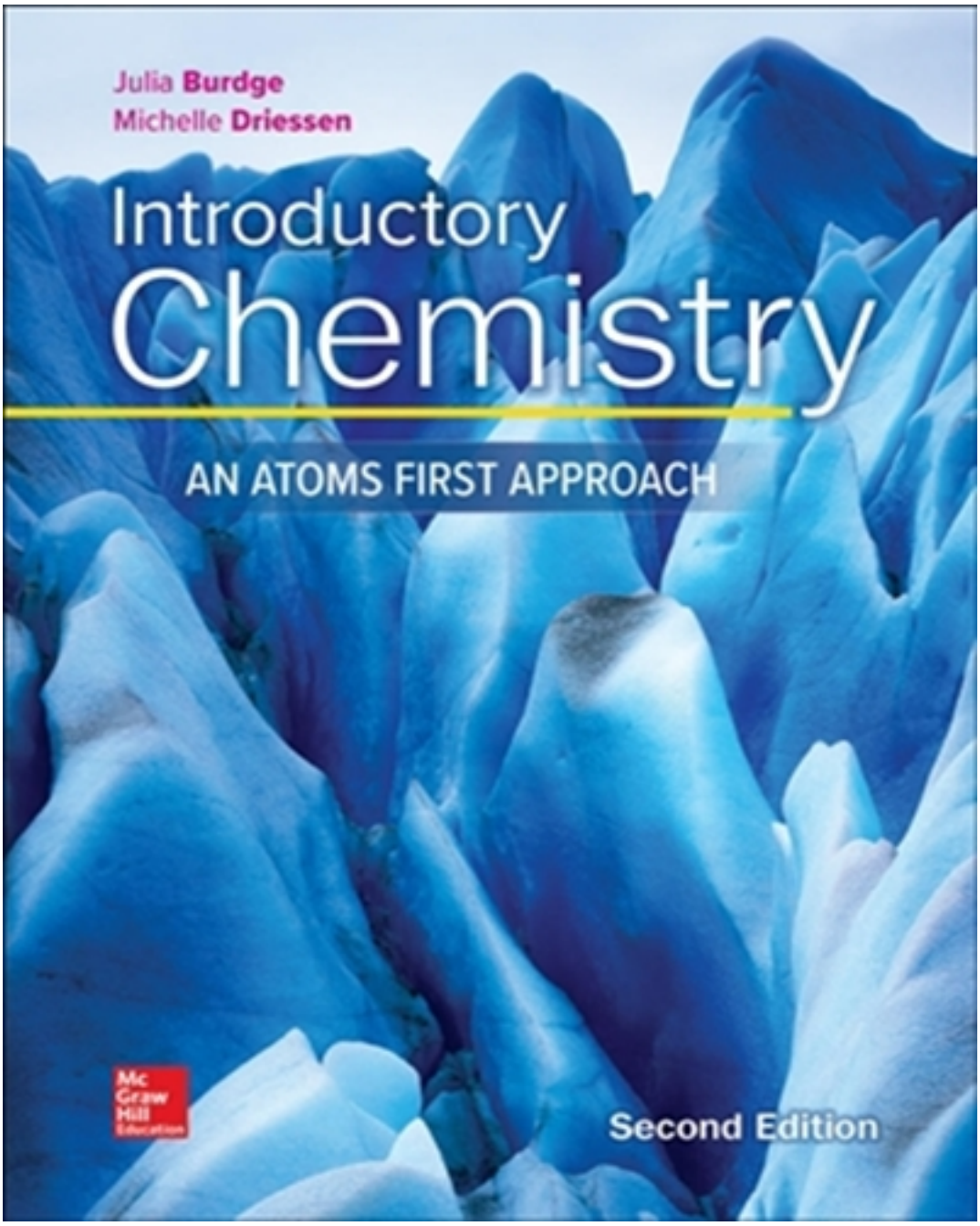


Test Bank

Introductory Chemistry, 2e **(Burdge)**
Chapter 2 Electrons and the Periodic Table

1) Visible light, radio waves, microwave radiation, infrared, ultraviolet radiation, X-rays, and gamma rays all constitute the electromagnetic spectrum. Which of the following characteristics do all of these kinds of radiation share?
A) They all have the ability to generate heat in objects.
B) They all have the same frequencies.
C) They are all the transmission of energy in the form of waves.
D) They have equal energies.
E) They have the same electron spin state.

Answer: C
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure
Bloom's: 3. Apply
Subtopic: Electromagnetic Radiation (Wave Properties)
Accessibility: Keyboard Navigation
Gradable: automatic

2) Select the arrangement of electromagnetic radiation which starts with the shortest wavelength and increases to longest wavelength.
A) radio, infrared, ultraviolet, gamma rays
B) radio, ultraviolet, infrared, gamma rays
C) gamma rays, radio, ultraviolet, infrared
D) gamma rays, infrared, radio, ultraviolet
E) gamma rays, ultraviolet, infrared, radio

Answer: E
Difficulty: 3 Hard
Topic: Quantum Theory and Atomic Structure
Bloom's: 5. Evaluate
Subtopic: Electromagnetic Radiation (Wave Properties); Scientific Notation and Significant Figures; Measurement (SI Units)
Accessibility: Keyboard Navigation
Gradable: automatic

3) Select the arrangement of electromagnetic radiation which starts with the lowest energy and increases to the greatest energy.
A) radio, infrared, ultraviolet, gamma rays
B) radio, ultraviolet, infrared, gamma rays
C) gamma rays, infrared, radio, ultraviolet
D) gamma rays, ultraviolet, infrared, radio
E) infrared, ultraviolet, radio, gamma rays

Answer: A
Difficulty: 3 Hard
Topic: Quantum Theory and Atomic Structure
Bloom's: 5. Evaluate
Subtopic: Electromagnetic Radiation (Wave Properties); Scientific Notation and Significant Figures; Measurement (SI Units)
Accessibility: Keyboard Navigation
Gradable: automatic

4) What is the emission of light at only specific wavelengths?
A) emission spectra
B) hydrogen spectrum
C) wave spectra
D) limited spectra
E) line spectra

Answer: E
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Electromagnetic Radiation (Wave Properties); Scientific Notation and Significant Figures; Measurement (SI Units); Atomic Spectra (Bohr Model of the Atom)
Accessibility: Keyboard Navigation
Gradable: automatic

5) List the following types of radiation from lowest frequency to highest frequency: microwave, X ray, ultraviolet, visible, and infrared
A) microwave < infrared < visible < ultraviolet < X ray
B) X ray < ultraviolet < visible < infrared < microwave
C) visible < ultraviolet < microwave < X ray < infrared
D) infrared < X ray < microwave < ultraviolet < visible
E) infrared < visible < microwave < ultraviolet < X ray

Answer: A
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 5. Evaluate
Subtopic: Electromagnetic Radiation (Wave Properties)
Accessibility: Keyboard Navigation
Gradable: automatic

6) Which of the following electron transitions would be expected to emit any light in the Bohr model of the atom?
A) $n = 1$ to $n = 3$
B) $n = 5$ to $n = 6$
C) $n = 2$ to $n = 5$
D) $n = 4$ to $n = 3$

Answer: D
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Atomic Spectra (Bohr Model of the Atom)
Accessibility: Keyboard Navigation
Gradable: automatic

7) Which of the following electron transitions would be expected to emit any light in the Bohr model of the atom?
A) $n = 1$ to $n = 4$
B) $n = 3$ to $n = 1$
C) $n = 2$ to $n = 3$
D) $n = 5$ to $n = 7$

Answer: B
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Atomic Spectra (Bohr Model of the Atom)
Accessibility: Keyboard Navigation
Gradable: automatic

8) Which of the following electron transitions would be expected to absorb any light in the Bohr model of the atom?
A) $n = 1$ to $n = 3$
B) $n = 3$ to $n = 2$
C) $n = 4$ to $n = 2$
D) $n = 6$ to $n = 5$

Answer: A
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Atomic Spectra (Bohr Model of the Atom)
Accessibility: Keyboard Navigation
Gradable: automatic

9) Which of the following electron transitions would be expected to absorb any light in the Bohr model of the atom?
A) $n = 7$ to $n = 2$
B) $n = 5$ to $n = 6$
C) $n = 1$ to $n = 3$
D) $n = 3$ to $n = 5$

Answer: C
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Atomic Spectra (Bohr Model of the Atom)
Accessibility: Keyboard Navigation
Gradable: automatic

10) The size of an atomic orbital is associated with
A) the principal quantum number (n).
B) the angular momentum quantum number (l).
C) the magnetic quantum number (m_l).
D) the spin quantum number (m_s).
E) the angular momentum and magnetic quantum numbers, together.

Answer: A
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Components of Matter
Bloom's: 2. Understand
Subtopic: Quantum Numbers; Atomic Theories
Accessibility: Keyboard Navigation
Gradable: automatic

11) Atomic orbitals developed using quantum mechanics
A) describe regions of space in which one is most likely to find an electron.
B) describe exact paths for electron motion.
C) give a description of the atomic structure, which is essentially the same as the Bohr model.
D) allow scientists to calculate an exact volume for the hydrogen atom.
E) are in conflict with the Heisenberg uncertainty principle.

Answer: A
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Components of Matter
Bloom's: 3. Apply
Subtopic: Quantum Numbers; Atomic Theories
Accessibility: Keyboard Navigation
Gradable: automatic

12) The number of orbitals in a *d* subshell is
A) 1.
B) 2.
C) 3.
D) 5.
E) 7.

Answer: D
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Accessibility: Keyboard Navigation
Gradable: automatic

13) How many orbitals can have the 3*p* description in a given atom?
A) 1
B) 2
C) 3
D) 5

Answer: C
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Quantum Numbers
Accessibility: Keyboard Navigation
Gradable: automatic

14) How many orbitals can have the 3*d* description in a given atom?
A) 1
B) 2
C) 3
D) 5

Answer: D
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Quantum Numbers
Accessibility: Keyboard Navigation
Gradable: automatic

15) How many orbitals can have the 4*s* description in a given atom?
A) 1
B) 2
C) 3
D) 5

Answer: A
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Quantum Numbers
Accessibility: Keyboard Navigation
Gradable: automatic

16) How many orbitals can have the 4*p* description in a given atom?
A) 1
B) 2
C) 3
D) 4

Answer: C
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Quantum Numbers
Accessibility: Keyboard Navigation
Gradable: automatic

17) Determine which sublevel designation is legitimate.
A) 1*f*
B) 2*d*
C) 3*c*
D) 4*s*

Answer: D
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Quantum Numbers
Accessibility: Keyboard Navigation
Gradable: automatic

18) Determine which sublevel designation is legitimate.
A) 1*p*
B) 2*p*
C) 3*f*
D) 4*z*

Answer: B
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Quantum Numbers
Accessibility: Keyboard Navigation
Gradable: automatic

19) Determine which sublevel designation is not legitimate.
A) 1*p*
B) 2*s*
C) 3*d*
D) 4*p*

Answer: A
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Quantum Numbers
Accessibility: Keyboard Navigation
Gradable: automatic

20) Determine which sublevel designation is not legitimate.
A) 4*s*
B) 2*d*
C) 3*s*
D) 5*p*

Answer: B
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Quantum Numbers
Accessibility: Keyboard Navigation
Gradable: automatic

21) How many orbitals are there in the $n = 4$ level of the H-atom?
A) 4
B) 6
C) 8
D) 16
E) 18

Answer: D
Difficulty: 3 Hard
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 3. Apply
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Accessibility: Keyboard Navigation
Gradable: automatic

22) Each shell (principal energy level) of quantum number *n* contains *n* subshells.

Answer: TRUE
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure
Bloom's: 2. Understand
Subtopic: Quantum Numbers
Accessibility: Keyboard Navigation
Gradable: automatic

23) For all atoms of the same element, the 2*s* orbital is larger than the 1*s* orbital.

Answer: TRUE
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure
Bloom's: 3. Apply
Subtopic: Quantum Numbers
Accessibility: Keyboard Navigation
Gradable: automatic

24) The orbital diagram for a ground-state nitrogen atom is

	1*s*	2*s*		2*p*	
A	1↓	1↓	1	1	1
B	1↓	1	1↓	1	
C	1↓	1↓	1↓	1	
D	1↓	1↓	1↓	1	1
E	1↓	1↓	1↓	1↓	1

A) A
B) B
C) C
D) D
E) E

Answer: A
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Gradable: automatic

25) The orbital diagram for a ground-state oxygen atom is

	1*s*	2*s*		2*p*	
A	1↓	1↓	1	1	1
B	1↓	1↓	1↓	1↓	
C	1↓	1↓	1↓	1	
D	1↓	1↓	1↓	1	1
E	1↓	1↓	1↓	1↓	1

A) A
B) B
C) C
D) D
E) E

Answer: D
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Gradable: automatic

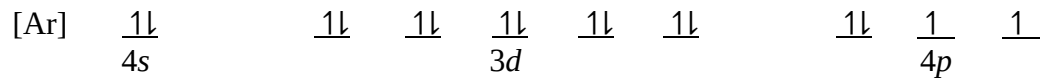
26) The orbital diagram for a ground-state carbon atom is

	1*s*	2*s*		2*p*	
A	1↓	1↓	1↓		
B	1↓	1	1	1	1
C	1↓	1↓	1	1	1
D	1↓	1↓	1	1	
E	1↓	1↓	1↓	1↓	1

A) A
B) B
C) C
D) D
E) E

Answer: D
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Gradable: automatic

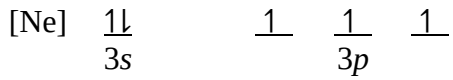
27) Which ground-state atom has an electron configuration described by the following *orbital diagram*?



A) phosphorus
B) germanium
C) selenium
D) tellurium
E) potassium

Answer: C
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Gradable: automatic

28) Which ground-state atom has an electron configuration described by the following *orbital diagram*?



A) phosphorus
B) nitrogen
C) arsenic
D) vanadium
E) sulfur

Answer: A
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Gradable: automatic

29) How many unpaired electrons does a ground-state atom of sulfur have?
A) 0
B) 1
C) 2
D) 3
E) 4

Answer: C
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Pauli Exclusion Principle
Accessibility: Keyboard Navigation
Gradable: automatic

30) Which element has the following ground-state electron configuration?

$1s^2\ 2s^2\ 2p^6\ 3s^2$
A) Na
B) Mg
C) Al
D) Si
E) Ne

Answer: B
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Hund's Rule; Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

31) Which element has the following ground-state electron configuration?

$[Kr]5s^2 4d^{10} 5p^3$
A) Sn
B) Sb
C) Pb
D) Bi
E) Te

Answer: B
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

32) Which element has the following ground-state electron configuration?

$[Kr]5s^2 4d^{10} 5p^2$
A) Sn
B) Sb
C) Pb
D) Ge
E) Te

Answer: A
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

33) The electron configuration of a ground-state Co atom is
A) [Ar]$4s^2 3d^7$.
B) $1s^2 2s^2 2p^6 3s^2 3d^9$.
C) [Ne]$3s^2 3d^7$.
D) [Ar]$4s^1 3d^5$.
E) [Ar]$4s^2 4d^7$.

Answer: A
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

34) The electron configuration of a ground-state vanadium atom is
A) [Ar]$4s^2 4d^3$.
B) [Ar]$4s^2 4p^3$.
C) [Ar]$4s^2 3d^3$.
D) [Ar]$3d^5$.
E) [Ar]$4s^2 3d^7$.

Answer: C
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

35) The ground-state electron configuration for an atom of indium is
A) [Kr]$5s^2 4p^6 4d^5$.
B) [Ar]$4s^2 3d^{10} 4p^1$.
C) [Ar]$4s^2 4p^6 3d^5$.
D) [Kr]$5s^2 5p^6 4d^5$.
E) [Kr]$5s^2 4d^{10} 5p^1$.

Answer: E
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

36) The ground-state electron configuration of a calcium atom is
A) [Ne]$3s^2$.
B) [Ne]$3s^2 3p^6$.
C) [Ar]$4s^1 3d^1$.
D) [Ar]$4s^2$.
E) [Ar]$3d^2$.

Answer: D
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

37) Select the correct electron configuration for sulfur (Z = 16).
A) $1s^2 1p^6 2s^2 2p^6$
B) $1s^2 2s^2 2p^8 3s^2 3p^4$
C) $1s^2 2s^2 2p^8 3s^2 3p^2$
D) $1s^2 2s^2 2p^6 3s^2 3p^4$
E) $1s^2 2s^2 2p^6 3s^2 3d^4$

Answer: D
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Accessibility: Keyboard Navigation
Gradable: automatic

38) Select the correct electron configuration for Te (Z = 52).
A) $[Kr]5s^2 5p^6 4d^8$
B) $[Kr]5s^2 5d^{10} 5p^4$
C) $[Kr]5s^2 4d^{10} 5p^6$
D) $[Kr]5s^2 4f^{14}$
E) $[Kr]5s^2 4d^{10} 5p^4$

Answer: E
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

39) What is the correct electron configuration for a germanium (Ge) atom?
A) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4p^2$
B) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2$
C) $1s^2 2s^2 2p^6 3s^2 3p^2$
D) $1s^2 2s^2 3s^2 3p^5$
E) None of the answers is correct.

Answer: B
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

40) The electronic structure $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$ refers to the ground state of
A) Kr.
B) Ni.
C) Fe.
D) Pd.
E) None of the answers is correct.

Answer: B
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

41) How many electrons are in the 4*p* orbitals of selenium?
A) 0
B) 2
C) 4
D) 5
E) 6

Answer: C
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Accessibility: Keyboard Navigation
Gradable: automatic

42) How many electrons are in the 4*p* orbitals of vanadium?
A) 0
B) 2
C) 4
D) 5
E) 6

Answer: A
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Accessibility: Keyboard Navigation
Gradable: automatic

43) How many electrons are in the 4*d* orbitals of Tc?
A) 1
B) 2
C) 3
D) 4
E) 5

Answer: E
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Accessibility: Keyboard Navigation
Gradable: automatic

44) How many electrons are there in the 2nd principal energy level (n = 2) of a phosphorus atom?
A) 3
B) 5
C) 6
D) 8
E) 10

Answer: D
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Accessibility: Keyboard Navigation
Gradable: automatic

45) How many electrons are there in the 3rd principal energy level (n = 3) of a phosphorus atom?
A) 3
B) 5
C) 6
D) 8
E) 10

Answer: B
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Accessibility: Keyboard Navigation
Gradable: automatic

46) What element is represented by the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$?
A) Mn
B) Ca
C) K
D) Cr
E) V

Answer: D
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

47) What element is represented by the electron configuration

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1 4d^{10}$?
A) Ag
B) Rb
C) Cd
D) Sr
E) Cu

Answer: A
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

48) What is the electron configuration for tungsten?
A) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^6$
B) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^1 4f^{14} 5d^5$
C) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^4$
D) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^7$
E) $1s^2 2s^2 2p^6 3s^2 3p^5 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^7$

Answer: C
Difficulty: 2 Medium
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Accessibility: Keyboard Navigation
Gradable: automatic

49) What is the electron configuration for silicon?
A) $1s^2 2s^2 2p^6 3s^1 3p^3$
B) $1s^2 2s^2 2p^6 3s^2 3p^2$
C) $1s^2 2s^2 2p^6 3s^4$
D) $1s^2 2s^2 2p^6 3p^4$
E) $1s^2 2s^2 2p^6 3s^2 3p^3$

Answer: B
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Accessibility: Keyboard Navigation
Gradable: automatic

50) What is the electron configuration for bromine?
A) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 4d^{10} 4p^6$
B) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^5$
C) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10} 4p^6$
D) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$
E) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$

Answer: E
Difficulty: 1 Easy
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Energy-Level Splitting (Zeff and Shielding)
Accessibility: Keyboard Navigation
Gradable: automatic

51) Which of the following elements has the largest number of unpaired electrons in the ground state?
A) K
B) V
C) S
D) Si
E) Cl

Answer: B
Difficulty: 3 Hard
Topic: Quantum Theory and Atomic Structure; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Quantum Numbers; Assigning Electrons to Atomic Orbitals (Aufbau Principle); Hund's Rule; Energy-Level Splitting (Zeff and Shielding); Diamagnetism and Paramagnetism
Accessibility: Keyboard Navigation
Gradable: automatic

52) The general electron configuration for atoms of all elements in Group 5A is
A) ns^2np^6.
B) ns^2np^5.
C) ns^2np^4.
D) ns^2np^3.
E) ns^2np^1.

Answer: D
Difficulty: 1 Easy
Topic: Components of Matter; Chemical Periodicity
Bloom's: 3. Apply
Subtopic: Periodic Classification of the Elements; Elements and the Periodic Table
Accessibility: Keyboard Navigation
Gradable: automatic

53) Which of these choices is the general electron configuration for the outermost electrons of elements in the alkaline earth group?
A) ns^1
B) ns^2
C) ns^2np^4
D) ns^2np
E) $ns^2np^6\ (n-1)d^6$

Answer: B
Difficulty: 2 Medium
Topic: Electron Configuration; Chemical Periodicity
Bloom's: 3. Apply
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements
Accessibility: Keyboard Navigation
Gradable: automatic

54) The general electron configuration for atoms of the halogen group is
A) ns^2np^6.
B) ns^2np^5.
C) $ns^2np^6\ (n-1)d^7$.
D) ns^1.
E) ns^2np^7.

Answer: B
Difficulty: 1 Easy
Topic: Components of Matter; Electron Configuration; Chemical Periodicity
Bloom's: 3. Apply
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements; Elements and the Periodic Table
Accessibility: Keyboard Navigation
Gradable: automatic

55) The general electron configuration for noble gas atoms is
A) ns^2np^6.
B) ns^2np^5.
C) ns^2np^4.
D) ns^2np^3.
E) ns^2.

Answer: A
Difficulty: 1 Easy
Topic: Electron Configuration; Chemical Periodicity
Bloom's: 3. Apply
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements
Accessibility: Keyboard Navigation
Gradable: automatic

56) Each of the noble gases has a completely filled *p* subshell except for which one?
A) Xenon
B) Neon
C) Radon
D) Argon
E) Helium

Answer: E
Difficulty: 2 Medium
Topic: Electron Configuration; Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements
Accessibility: Keyboard Navigation
Gradable: automatic

57) An element with the general electron configuration for its outermost electrons of ns^2np^1 would be in which element group?
A) 2A
B) 3A
C) 4A
D) 5A
E) 8A

Answer: B
Difficulty: 1 Easy
Topic: Electron Configuration; Chemical Periodicity
Bloom's: 4. Analyze
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements
Accessibility: Keyboard Navigation
Gradable: automatic

58) In what group of the periodic table is the element with the electron configuration $[Ar]4s^23d^{10}4p^3$?
A) 1A
B) 2A
C) 3A
D) 4A
E) 5A

Answer: E
Difficulty: 2 Medium
Topic: Electron Configuration; Chemical Periodicity
Bloom's: 4. Analyze
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements
Accessibility: Keyboard Navigation
Gradable: automatic

59) Consider the element with the electron configuration [Kr]$5s^2 4d^7$. This element is
A) a halogen.
B) a transition metal.
C) a nonmetal.
D) an actinide element.
E) a noble gas.

Answer: B
Difficulty: 2 Medium
Topic: Electron Configuration; Chemical Periodicity; Transition Metals and Coordination Compounds
Bloom's: 4. Analyze
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements; Properties of Transition Metals
Accessibility: Keyboard Navigation
Gradable: automatic

60) Consider the element with the electron configuration [Kr]$5s^2 4d^{10} 5p^5$. This element is
A) a halogen.
B) a transition metal.
C) an alkali metal.
D) an actinide element.
E) a noble gas.

Answer: A
Difficulty: 2 Medium
Topic: Electron Configuration; Chemical Periodicity
Bloom's: 4. Analyze
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements
Accessibility: Keyboard Navigation
Gradable: automatic

61) Consider the element with the electron configuration [Xe]$6s^2 4f^7$. This element is
A) a halogen.
B) a lanthanide element.
C) a nonmetal.
D) an actinide element.
E) a noble gas.

Answer: B
Difficulty: 2 Medium
Topic: Electron Configuration; Chemical Periodicity
Bloom's: 4. Analyze
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements
Accessibility: Keyboard Navigation
Gradable: automatic

62) How many *valence electrons* does a carbon atom have?
A) 1
B) 2
C) 3
D) 4
E) 6

Answer: D
Difficulty: 1 Easy
Topic: Electron Configuration; Chemical Periodicity
Bloom's: 4. Analyze
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements
Accessibility: Keyboard Navigation
Gradable: automatic

63) How many *valence electrons* does a tin (Sn) atom have?
A) 2
B) 4
C) 14
D) 36
E) 50

Answer: B
Difficulty: 1 Easy
Topic: Electron Configuration; Chemical Periodicity
Bloom's: 4. Analyze
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements
Accessibility: Keyboard Navigation
Gradable: automatic

64) An element with the electron configuration [noble gas]$ns^2(n-1)d^8$ has _____ valence electrons.
A) 2
B) 6
C) 8
D) 10
E) None of the answers is correct.

Answer: D
Difficulty: 2 Medium
Topic: Electron Configuration; Chemical Periodicity
Bloom's: 4. Analyze
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements
Accessibility: Keyboard Navigation
Gradable: automatic

65) An element with the electron configuration [noble gas]$ns^2(n-1)d^{10}np^3$ has _____ valence electrons.
A) 2
B) 3
C) 5
D) 10
E) 15

Answer: C
Difficulty: 2 Medium
Topic: Electron Configuration; Chemical Periodicity
Bloom's: 4. Analyze
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Periodic Classification of the Elements
Accessibility: Keyboard Navigation
Gradable: automatic

66) How does atomic radius change as you move across the periodic table?
A) Atomic radius decreases moving from left to right across a period and increases from top to bottom.
B) Atomic radius increases moving left to right across a period and decreases from top to bottom.
C) Smaller nuclear charge lowers energy; more electrons in an orbital lowers energy.
D) Atomic radius increases diagonally across the periodic table.
E) None of the answers is correct.

Answer: A
Difficulty: 1 Easy
Topic: Chemical Periodicity
Bloom's: 3. Apply
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

67) Which of these atoms has the smallest radius?
A) Al
B) P
C) As
D) Te
E) Na

Answer: B
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

68) Which of these atoms has the largest radius?
A) B
B) Ga
C) Br
D) Si
E) Cl

Answer: B
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

69) Which of the elements listed below has the greatest atomic radius?
A) B
B) Al
C) S
D) P
E) Si

Answer: B
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

70) Which one of these ions has the smallest radius?
A) Cl^{-}
B) K^{+}
C) S^{2-}
D) Na^{+}
E) O^{2-}

Answer: D
Difficulty: 3 Hard
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

71) Arrange P, S, and O in order of increasing atomic radius.
A) S < O < P
B) P < S < O
C) O < S < P
D) O < P < S
E) The answer cannot be determined from the data given.

Answer: C
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

72) Arrange these ions in order of increasing ionic radius: K^+, P^{3-}, S^{2-}, Cl^-.
A) $K^+ < Cl^- < S^{2-} < P^{3-}$
B) $K^+ < P^{3-} < S^{2-} < Cl^-$
C) $P^{3-} < S^{2-} < Cl^- < K^+$
D) $Cl^- < S^{2-} < P^{3-} < K^+$
E) $Cl^- < S^{2-} < K^+ < P^{3-}$

Answer: A
Difficulty: 3 Hard
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

73) Which of the following elements has the largest atomic size?
A) S
B) Ca
C) Ba
D) Po
E) Rn

Answer: C
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

74) Which of the following elements has the smallest atomic size?
A) Na
B) Ar
C) K
D) Ca
E) Kr

Answer: B
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

75) Select the element that will lose an electron most easily, based on the periodic trend.
A) Li
B) Na
C) K
D) He

Answer: C
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 3. Apply
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

76) Select the element that will lose an electron most easily, based on the periodic trend.
A) Na
B) Mg
C) Ar
D) P

Answer: A
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 3. Apply
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

77) Select the element that will gain an electron most easily, based on the periodic trend.
A) Ca
B) Mg
C) O
D) P

Answer: C
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 3. Apply
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

78) Select the element that will gain an electron most easily, based on the periodic trend.
A) Rb
B) Al
C) S
D) Na

Answer: C
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 3. Apply
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

79) Which of these elements has the greatest metallic character?
A) Br
B) F
C) Ge
D) Mn
E) Sc

Answer: E
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

80) Which of these elements has the greatest metallic character?
A) Br
B) Se
C) Ni
D) As
E) Si

Answer: C
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

81) Select the element with the greatest metallic character.
A) Li
B) Ca
C) Al
D) Pb
E) Cs

Answer: E
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

82) Select the element with the least metallic character.
A) Sn
B) Sr
C) Tl
D) Ge
E) Ga

Answer: D
Difficulty: 2 Medium
Topic: Chemical Periodicity
Bloom's: 5. Evaluate
Subtopic: Trends in Physical Properties (Atomic Radius, Ionization Energy, Ionic Radius, Electron Affinity)
Accessibility: Keyboard Navigation
Gradable: automatic

83) Using the periodic table, predict the charge on the common ion of calcium.
A) +1
B) +2
C) −1
D) −2

Answer: B
Difficulty: 2 Medium
Topic: Electron Configuration
Bloom's: 4. Analyze
Subtopic: Electron Configurations of Cations and Anions
Accessibility: Keyboard Navigation
Gradable: automatic

84) Using the periodic table, predict the charge on the common ion of selenium.
A) +1
B) +2
C) −1
D) −2

Answer: D
Difficulty: 2 Medium
Topic: Electron Configuration
Bloom's: 4. Analyze
Subtopic: Electron Configurations of Cations and Anions
Accessibility: Keyboard Navigation
Gradable: automatic

85) Using the periodic table, predict the charge on the common ion of rubidium.
A) +1
B) +2
C) −1
D) −2

Answer: A
Difficulty: 2 Medium
Topic: Electron Configuration
Bloom's: 4. Analyze
Subtopic: Electron Configurations of Cations and Anions
Accessibility: Keyboard Navigation
Gradable: automatic

86) Using the periodic table, predict the charge on the common ion of bromine.
A) +1
B) +2
C) −1
D) −2

Answer: C
Difficulty: 2 Medium
Topic: Electron Configuration
Bloom's: 4. Analyze
Subtopic: Electron Configurations of Cations and Anions
Accessibility: Keyboard Navigation
Gradable: automatic

87) The Lewis dot symbol consists of the symbol for the element surrounded by dot(s). What does the symbol represent?
A) electron configuration
B) valence electrons
C) atomic number
D) atomic mass
E) nucleus and core electrons

Answer: E
Difficulty: 2 Medium
Topic: Chemical Bonding; Molecular Shape
Bloom's: 2. Understand
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Accessibility: Keyboard Navigation
Gradable: automatic

88) The Lewis dot symbol consists of the symbol for the element surrounded by dot(s). What does the dot or dots represent?
A) electron configuration
B) valence electrons
C) atomic number
D) atomic mass
E) core electrons

Answer: B
Difficulty: 1 Easy
Topic: Chemical Bonding; Molecular Shape
Bloom's: 2. Understand
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Accessibility: Keyboard Navigation
Gradable: automatic

89) How many dots does the Lewis dot symbol for argon have around it?
A) 1
B) 2
C) 4
D) 6
E) 8

Answer: E
Difficulty: 1 Easy
Topic: Chemical Bonding; Molecular Shape
Bloom's: 3. Apply
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Accessibility: Keyboard Navigation
Gradable: automatic

90) How many dots does the Lewis dot symbol for sodium have around it?
A) 1
B) 2
C) 0
D) 3
E) 7

Answer: A
Difficulty: 1 Easy
Topic: Chemical Bonding; Molecular Shape
Bloom's: 3. Apply
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Accessibility: Keyboard Navigation
Gradable: automatic

91) How many dots does the Lewis dot symbol for magnesium have around it?
A) 1
B) 2
C) 0
D) 3
E) 7

Answer: B
Difficulty: 1 Easy
Topic: Chemical Bonding; Molecular Shape
Bloom's: 3. Apply
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Accessibility: Keyboard Navigation
Gradable: automatic

92) How many dots does the Lewis dot symbol for chlorine have around it?
A) 1
B) 2
C) 5
D) 7
E) 17

Answer: D
Difficulty: 1 Easy
Topic: Chemical Bonding; Molecular Shape
Bloom's: 3. Apply
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Accessibility: Keyboard Navigation
Gradable: automatic

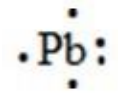
93) How many dots does the Lewis dot symbol for carbon have around it?
A) 4
B) 2
C) 6
D) 3
E) 7

Answer: A
Difficulty: 1 Easy
Topic: Chemical Bonding; Molecular Shape
Bloom's: 3. Apply
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Accessibility: Keyboard Navigation
Gradable: automatic

94) How many dots does the Lewis dot symbol for oxygen have around it?
A) 4
B) 2
C) 6
D) 3
E) 7

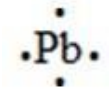
Answer: C
Difficulty: 1 Easy
Topic: Chemical Bonding; Molecular Shape
Bloom's: 3. Apply
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Accessibility: Keyboard Navigation
Gradable: automatic

95) The Lewis dot symbol for the a lead atom is
A)

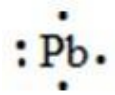


B)

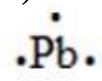
C)



D)



E)

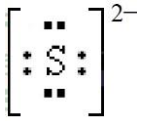


Answer: C
Difficulty: 1 Easy
Topic: Chemical Bonding; Molecular Shape
Bloom's: 4. Analyze
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Gradable: automatic

96) The Lewis dot symbol for the S^{2-} ion is

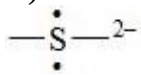
A)

B)



C) S^{2-}

D)



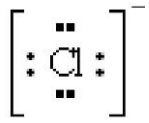
E)

Answer: B
Difficulty: 2 Medium
Topic: Chemical Bonding; Molecular Shape
Bloom's: 4. Analyze
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Gradable: automatic

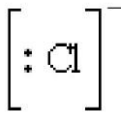
97) The Lewis dot symbol for the chloride ion is

A)

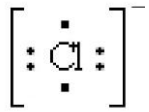
B)



C)

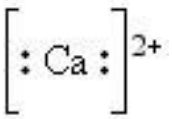
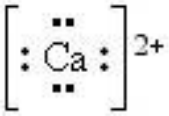


D)



E) Cl^-

Answer: B
Difficulty: 2 Medium
Topic: Chemical Bonding; Molecular Shape
Bloom's: 4. Analyze
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Gradable: automatic

98) The Lewis dot symbol for the calcium ion is
A) 
B) —Ca—
C) 
D) Ca^{2+}
E) Ca

Answer: D
Difficulty: 2 Medium
Topic: Chemical Bonding; Molecular Shape
Bloom's: 4. Analyze
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Gradable: automatic

99) Select the element whose Lewis symbol is correct.
A) ·Fr·
B) ·Ra·
C) ·Pb·
D) :Te:
E) ·He·

Answer: B
Difficulty: 2 Medium
Topic: Chemical Bonding; Molecular Shape
Bloom's: 4. Analyze
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Gradable: automatic

100) Select the element whose Lewis symbol is correct.
A) ·Ga·
B) ·Al·
C) :Br·
D) ·Tl·
E) Al·

Answer: C
Difficulty: 2 Medium
Topic: Chemical Bonding; Molecular Shape
Bloom's: 4. Analyze
Subtopic: Lewis Dot Symbols; Writing Lewis Dot Structures
Gradable: automatic

101) A magnesium ion, Mg^{2+}, has
A) 12 protons and 13 electrons.
B) 24 protons and 26 electrons.
C) 12 protons and 10 electrons.
D) 24 protons and 22 electrons.
E) 12 protons and 14 electrons.

Answer: C
Difficulty: 2 Medium
Topic: Components of Matter; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Electron Configurations of Cations and Anions; Structure of the Atom
Accessibility: Keyboard Navigation
Gradable: automatic

102) An aluminum ion, Al^{3+}, has
A) 13 protons and 13 electrons.
B) 27 protons and 24 electrons.
C) 16 protons and 13 electrons.
D) 13 protons and 10 electrons.
E) 10 protons and 13 electrons.

Answer: D
Difficulty: 2 Medium
Topic: Components of Matter; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Electron Configurations of Cations and Anions; Structure of the Atom
Accessibility: Keyboard Navigation
Gradable: automatic

103) An oxide ion, O^{2-}, has
A) 8 protons and 10 electrons.
B) 10 protons and 8 electrons.
C) 8 protons and 9 electrons.
D) 8 protons and 7 electrons.
E) 10 protons and 7 electrons.

Answer: A
Difficulty: 2 Medium
Topic: Components of Matter; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Electron Configurations of Cations and Anions; Structure of the Atom
Accessibility: Keyboard Navigation
Gradable: automatic

104) A sulfide ion, S^{2-}, has
A) 16 protons and 16 electrons.
B) 32 protons and 16 electrons.
C) 16 protons and 14 electrons.
D) 16 protons and 18 electrons.
E) 32 protons and 18 electrons.

Answer: D
Difficulty: 2 Medium
Topic: Components of Matter; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Electron Configurations of Cations and Anions; Structure of the Atom
Accessibility: Keyboard Navigation
Gradable: automatic

105) How many protons and electrons are present in one Br^- ion?
A) 35 protons, 35 electrons
B) 80 protons, 81 electrons
C) 35 protons, 34 electrons
D) 35 protons, 36 electrons
E) 80 protons, 34 electrons

Answer: D
Difficulty: 2 Medium
Topic: Components of Matter; Electron Configuration
Bloom's: 4. Analyze
Subtopic: Electron Configurations of Cations and Anions; Structure of the Atom
Accessibility: Keyboard Navigation
Gradable: automatic

106) An isoelectronic series is
A) a series that has two or more species that have identical nuclear charges, but have different electron configurations.
B) a series that has the same ionization potentials.
C) a series that can have only up to three species and have similar electron configuration and similar nuclear charges.
D) a series that has two or more species that have identical electron configurations, but different nuclear charges.
E) a series that has the same nuclear charge.

Answer: D
Difficulty: 2 Medium
Topic: Electron Configuration
Bloom's: 2. Understand
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle)
Accessibility: Keyboard Navigation
Gradable: automatic

107) Which of these species make an *isoelectronic pair*: Cl^{-}, O^{2-}, F, Ca^{2+}, Fe^{3+}?
A) Ca^{2+} and Fe^{3+}
B) O^{2-} and F
C) F and Cl^{-}
D) Cl^{-} and Ca^{2+}
E) None of the species are part of an isoelectronic series.

Answer: D
Difficulty: 2 Medium
Topic: Electron Configuration
Bloom's: 5. Evaluate
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Electron Configurations of Cations and Anions
Accessibility: Keyboard Navigation
Gradable: automatic

108) Which of these pairs consists of *isoelectronic* species?
A) Mn^{2+} and Ar
B) Zn^{2+} and Cu^{2+}
C) Na^{+} and K^{+}
D) Cl^{-} and S
E) K^{+} and Cl^{-}

Answer: E
Difficulty: 2 Medium
Topic: Electron Configuration
Bloom's: 5. Evaluate
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Electron Configurations of Cations and Anions
Accessibility: Keyboard Navigation
Gradable: automatic

109) Which ion is *isoelectronic* with Ar?
A) Fe^{2+}
B) F^{-}
C) Br^{-}
D) Ga^{3+}
E) Ca^{2+}

Answer: E
Difficulty: 2 Medium
Topic: Electron Configuration
Bloom's: 5. Evaluate
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Electron Configurations of Cations and Anions
Accessibility: Keyboard Navigation
Gradable: automatic

110) Which one of these ions is *not* isoelectronic with Kr?
A) As^{3+}
B) Se^{2-}
C) Rb^{+}
D) Sr^{2+}
E) Br^{-}

Answer: A
Difficulty: 2 Medium
Topic: Electron Configuration
Bloom's: 5. Evaluate
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Electron Configurations of Cations and Anions
Accessibility: Keyboard Navigation
Gradable: automatic

111) Which of these choices is the electron configuration for the aluminum ion?
A) $1s^2 2s^2 2p^6 3s^2$
B) $1s^2 2s^2 2p^6 3s^2 3p^2$
C) $1s^2 2s^2 2p^6 3s^2 3p^1$
D) $1s^2 2s^2 2p^6$
E) $1s^2 2s^2 2p^6 3s^2 3p^4$

Answer: D
Difficulty: 3 Hard
Topic: Electron Configuration
Bloom's: 5. Evaluate
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Electron Configurations of Cations and Anions
Accessibility: Keyboard Navigation
Gradable: automatic

112) Which of these choices is the electron configuration for the chloride ion?
A) $[Ne]3s^2 3p^4$
B) $[Ne]3s^2 3p^7$
C) [Ar]
D) $[Ar]4s^1$
E) $[Ne]3s^2 3p^5$

Answer: C
Difficulty: 2 Medium
Topic: Electron Configuration
Bloom's: 5. Evaluate
Subtopic: Assigning Electrons to Atomic Orbitals (Aufbau Principle); Electron Configurations of Cations and Anions
Accessibility: Keyboard Navigation
Gradable: automatic