Chemistry A Molecular Approach 4th edition Tro Test Bank

SKU: 9780134112831-TEST-BANK

Chemistry: A Molecular Approach, 4e **(Tro)**
Chapter 2 Atoms and Elements

Multiple Choice Questions

1) In a chemical reaction, matter is neither created nor destroyed. Which law does this refer to?
A) Law of Definite Proportions
B) Law of the Conservation of Mass
C) Law of Modern Atomic Theory
D) Law of Multiple Proportions
E) First Law of Thermodynamics
Answer: B
Diff: 1 Var: 1 Page Ref: 2.3
Global: G1

2) All samples of a given compound, regardless of their source or how they were prepared, have the same proportions of their constituent elements. Which law does this refer to?
A) Law of Definite Proportions
B) Law of the Conservation of Mass
C) Law of Modern Atomic Theory
D) Law of Multiple Proportions
E) First Law of Thermodynamics
Answer: A
Diff: 1 Var: 1 Page Ref: 2.3
LO: 2.1
Global: G1

3) When two elements form two different compounds, the masses of element B that combine with 1 g of element A can be expressed as a ratio of small whole numbers. Which law does this refer to?
A) Law of Definite Proportions
B) Law of the Conservation of Mass
C) Law of Modern Atomic Theory
D) Law of Multiple Proportions
E) First Law of Thermodynamics
Answer: D
Diff: 1 Var: 1 Page Ref: 2.3
LO: 2.2
Global: G2

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4) Which of the following is an example of the law of multiple proportions?
A) A sample of chlorine is found to contain three times as much Cl-35 as Cl-37.
B) Two different compounds formed from carbon and oxygen have the following mass ratios: 1.33 g O: 1 g C and 2.66 g O: 1 g C.
C) Two different samples of table salt are found to have the same ratio of sodium to chlorine.
D) The atomic mass of bromine is found to be 79.90 amu.
E) Nitrogen dioxide always has a mass ratio of 2.28 g O: 1 g N.
Answer: B
Diff: 2 Var: 1 Page Ref: 2.3
LO: 2.2
Global: G2

5) Which of the following statements is FALSE according to Dalton's Atomic Theory?
A) Atoms combine in simple whole number ratios to form compounds.
B) All atoms of chlorine have identical properties that distinguish them from other elements.
C) One carbon atom will combine with one oxygen atom to form a molecule of carbon monoxide.
D) Atoms of sodium do not change into another element during chemical reaction with chlorine.
E) An atom of nitrogen can be broken down into smaller particles that will still have the unique properties of nitrogen.
Answer: E
Diff: 1 Var: 1 Page Ref: 2.3
Global: G2

6) Identify the equipment that Thomson utilized to do his research.
A) cathode ray tube
B) light bulb
C) oscilloscope
D) oil atomizer, light source, microscope
E) electromagnetic field generator
Answer: A
Diff: 1 Var: 1 Page Ref: 2.4
Global: G2

7) Identify the equipment that Millikan utilized to do his research.
A) cathode ray tube
B) light bulb
C) oscilloscope
D) oil atomizer, light source, microscope
E) electromagnetic field generator
Answer: D
Diff: 1 Var: 1 Page Ref: 2.4
Global: G2

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8) Identify the description of an atom.
A) neutrons and electrons in nucleus; protons in orbitals
B) neutrons in nucleus; protons and electrons in orbitals
C) protons and neutrons in nucleus; electrons in orbitals
D) protons and electrons in nucleus; neutrons in orbitals
E) electrons in nucleus; protons and neutrons in orbitals
Answer: C
Diff: 1 Var: 1 Page Ref: 2.5
Global: G2

9) Identify the **largest** subatomic particle.
A) a neutron
B) an electron
C) a proton
D) an orbital
E) a nucleus
Answer: A
Diff: 1 Var: 1 Page Ref: 2.6
Global: G1

10) Identify the **smallest** subatomic particle.
A) a neutron
B) an electron
C) a proton
D) an alpha particle
E) a nucleus
Answer: B
Diff: 1 Var: 1 Page Ref: 2.6
Global: G1

11) The mass number is equal to
A) the sum of the number of the electrons and protons.
B) the sum of the number of the neutrons and electrons.
C) the sum of the number of protons, neutrons, and electrons.
D) the sum of the number of protons and neutrons.
Answer: D
Diff: 1 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G1

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12) The atomic number is equal to
A) the number of the protons.
B) the sum of the number of the neutrons and electrons.
C) the sum of the number of protons, neutrons, and electrons.
D) the sum of the number of protons and neutrons.
Answer: A
Diff: 1 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G1

13) What does "X" represent in the following symbol?
$^{80}_{35}X$

A) mercury
B) chlorine
C) scandium
D) bromine
E) selenium
Answer: D
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

14) What does "X" represent in the following symbol?
$^{28}_{14}X$

A) silicon
B) sulfur
C) zinc
D) ruthenium
E) nickel
Answer: A
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

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15) Determine the number of protons, neutrons, and electrons in the following:
$^{40}_{18}X$

A) $p^+ = 18$ $n° = 18$ $e^- = 22$
B) $p^+ = 18$ $n° = 22$ $e^- = 18$
C) $p^+ = 22$ $n° = 18$ $e^- = 18$
D) $p^+ = 18$ $n° = 22$ $e^- = 40$
E) $p^+ = 40$ $n° = 22 e^- = 18$
Answer: B
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

16) Determine the number of protons, neutrons, and electrons in the following:
$^{25}_{12}X$

A) $p^+ = 12$ $n° = 25$ $e^- = 12$
B) $p^+ = 12$ $n° = 12$ $e^- = 13$
C) $p^+ = 12$ $n° = 13$ $e^- = 12$
D) $p^+ = 25$ $n° = 12$ $e^- = 13$
E) $p^+ = 12$ $n° = 13$ $e^- = 25$
Answer: C
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

17) Determine the number of protons, neutrons, and electrons in the following:
$^{65}_{29}X$

A) $p^+ = 36$ $n° = 29 e^- = 36$
B) $p^+ = 29$ $n° = 29$ $e^- = 36$
C) $p^+ = 36$ $n° = 36$ $e^- = 29$
D) $p^+ = 29$ $n° = 36$ $e^- = 29$
E) $p^+ = 29$ $n° = 36$ $e^- = 36$
Answer: D
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LO: 2.3
Global: G2

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18) What element is defined by the following information?

$p^+ = 11$ $n^\circ = 12$ $e^- = 11$

A) sodium
B) vanadium
C) magnesium
D) titanium
E) selenium
Answer: A
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

19) What element is defined by the following information?

$p^+ = 20$ $n^\circ = 20$ $e^- = 20$

A) zirconium
B) calcium
C) potassium
D) neon
E) argon
Answer: B
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

20) What element is defined by the following information?

$p^+ = 17$ $n^\circ = 20$ $e^- = 17$

A) calcium
B) rubidium
C) chlorine
D) neon
E) oxygen
Answer: C
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LO: 2.3
Global: G2

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21) Which of the following statements about subatomic particles is TRUE?
A) A neutral atom contains the same number of protons and electrons.
B) Protons have about the same mass as electrons.
C) Electrons make up most of the mass of an atom.
D) Protons and neutrons have opposite, but equal in magnitude, charges.
E) Neutrons and electrons are found in the nucleus of an atom.
Answer: A
Diff: 1 Var: 1 Page Ref: 2.6
Global: G2

22) Which of the following statements about isotopes is TRUE?
A) Isotopes of the same element differ only in the number of electrons they contain.
B) An isotope of an atom with a larger number of neutrons is larger than an isotope of the same atom that contains fewer neutrons.
C) Isotopes of the same element have the same mass.
D) Isotopes of the same element don't usually have the same properties.
E) Some elements have 3 or more naturally occurring isotopes.
Answer: E
Diff: 1 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

23) Give the symbol for silver.
A) S
B) Si
C) Ar
D) Ag
E) Sl
Answer: D
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

24) Ions differ in the number of
A) electrons.
B) neutrons.
C) protons.
D) neutrons and protons.
E) electrons and protons.
Answer: A
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G1

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25) What species is represented by the following information?

$p^+ = 12$ $n^\circ = 14$ $e^- = 10$

A) Si^{4+}
B) Mg
C) Ne
D) Si
E) Mg^{2+}
Answer: E
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

26) What species is represented by the following information?

$p^+ = 47$ $n^\circ = 62$ $e^- = 46$

A) Ag^+
B) Nd
C) Pd
D) Ag
E) Pd^+
Answer: A
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

27) What species is represented by the following information?

$p^+ = 17$ $n^\circ = 18$ $e^- = 18$

A) Cl
B) Cl^-
C) Ar
D) Ar^+
E) Kr
Answer: B
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

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28) Identify the **largest** atom or ion of carbon.
A) $p^+ = 6$ n° = 6 $e^- = 6$
B) $p^+ = 6$ n° = 7 $e^- = 6$
C) $p^+ = 6$ n° = 6 $e^- = 7$
D) $p^+ = 6$ n° = 6 $e^- = 5$
Answer: C
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

29) Predict the charge that an aluminum ion would have.
A) 5-
B) 1+
C) 1-
D) 2+
E) 3+
Answer: E
Diff: 2 Var: 1 Page Ref: 2.7
LO: 2.4
Global: G2

30) Predict the charge that an ion formed from nitrogen would have.
A) 1-
B) 6+
C) 3-
D) 3+
E) 2-
Answer: C
Diff: 2 Var: 1 Page Ref: 2.7
LO: 2.4
Global: G2

31) Which of the following statements is FALSE?
A) Halogens are very reactive elements.
B) The alkali metals are fairly unreactive.
C) Sulfur is a main group element.
D) Noble gases do not usually form ions.
E) Zn is a transition metal.
Answer: B
Diff: 1 Var: 1 Page Ref: 2.7
Global: G2

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32) Which of the following does NOT describe a metal?
A) good conductor of heat
B) good conductor of electricity
C) tends to gain electrons
D) forms ionic compounds with nonmetals
E) found on the left side of the periodic table
Answer: C
Diff: 1 Var: 1 Page Ref: 2.7
Global: G2

33) Which of the following does NOT describe a nonmetal?
A) tends to gain electrons
B) found in the upper right hand corner of the periodic table
C) poor conductor of electricity
D) nonmetals are generally unreactive
E) poor conductor of heat
Answer: D
Diff: 1 Var: 1 Page Ref: 2.7
Global: G2

34) Semiconductors are
A) metalloids.
B) noble gases.
C) nonmetals.
D) metals.
Answer: A
Diff: 1 Var: 1 Page Ref: 2.7
Global: G2

35) Which of the following statements is FALSE?
A) Anions are usually larger than their corresponding atom.
B) Metals tend to form cations.
C) Atoms are usually larger than their corresponding cation.
D) The halogens tend to form 1+ ions.
E) Nonmetals tend to gain electrons.
Answer: D
Diff: 1 Var: 1 Page Ref: 2.7
Global: G2

36) Identify the green-yellowish gas that is used as a disinfecting agent.
A) chlorine
B) bromine
C) iodine
D) fluorine
Answer: A
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Global: G2

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37) Identify the instrument that is used to determine the mass of a molecule.
A) mass spectrometer
B) nuclear magnetic resonance spectrometer
C) infrared spectrometer
D) gas chromatograph
E) ultraviolet spectrophotometer
Answer: A
Diff: 1 Var: 1 Page Ref: 2.8
Global: G2

38) The atomic mass for cadmium is
A) 48
B) 112.41
C) 40.08
D) 20
E) 64.411
Answer: B
Diff: 2 Var: 1 Page Ref: 2.8
LO: 2.5
Global: G2

39) Calculate the atomic mass of silver if silver has 2 naturally occurring isotopes with the following masses and natural abundances:

Ag-107	106.90509 amu	51.84%
Ag-109	108.90476 amu	48.46%

A) 107.90 amu
B) 108.00 amu
C) 107.79 amu
D) 108.32 amu
E) 108.19 amu
Answer: E
Diff: 2 Var: 1 Page Ref: 2.8
LO: 2.5
Global: G4

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40) Calculate the atomic mass of gallium if gallium has 2 naturally occurring isotopes with the following masses and natural abundances:

Ga-69	68.9256 amu	60.11%
Ga-71	70.9247 amu	39.89%

A) 69.72 amu
B) 69.93 amu
C) 70.00 amu
D) 69.80 amu
E) 70.68 amu
Answer: A
Diff: 2 Var: 1 Page Ref: 2.8
LO: 2.5
Global: G4

41) Silver has an atomic mass of 107.868 amu. The Ag-109 isotope (108.905 amu) is 48.16%. What is the amu of the other isotope?
A) 106.905 amu
B) 106.908 amu
C) 106.903 amu
D) 106.911 amu
Answer: A
Diff: 3 Var: 1 Page Ref: 2.8
LO: 2.5
Global: G4

42) Gallium has an atomic mass of 69.723 amu. The Ga-69 (68.926 amu) is 60.11%. What is the amu of the other isotope?
A) 70.924 amu
B) 70.928 amu
C) 70.932 amu
D) 70.920 amu
Answer: A
Diff: 3 Var: 1 Page Ref: 2.8
LO: 2.5
Global: G4

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43) Calculate the atomic mass of element "X", if it has 2 naturally occurring isotopes with the following masses and natural abundances:

X-45	44.8776 amu	32.88%
X-47	46.9443 amu	67.12%

A) 46.26 amu
B) 45.91 amu
C) 46.34 amu
D) 46.84 amu
E) 44.99 amu
Answer: A
Diff: 3 Var: 1 Page Ref: 2.8
LO: 2.5
Global: G4

44) Identify how the atomic mass of an element is determined.
A) average of ions
B) average of isotopic masses
C) average of radioactive particles
D) average of crude weights
E) average of protons
Answer: B
Diff: 1 Var: 1 Page Ref: 2.8
Global: G1

45) What mass (in mg) does 2.63 moles of nickel have?
A) 44.8 mg
B) 2.23×10^4 mg
C) 129 mg
D) 3.56×10^5 mg
E) 1.54×10^5 mg
Answer: E
Diff: 3 Var: 1 Page Ref: 2.9
LO: 2.7
Global: G4

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46) How many moles of Kr are contained in 398 mg of Kr?
A) 4.75×10^{-3} moles Kr
B) 33.4 moles Kr
C) 2.11×10^{-4} moles Kr
D) 2.99×10^{-3} moles Kr
E) 1.19×10^{-4} moles Kr
Answer: A
Diff: 3 Var: 1 Page Ref: 2.9
LO: 2.7
Global: G4

47) How many moles of Cs are contained in 595 kg of Cs?
A) 2.23×10^{2} moles Cs
B) 4.48×10^{3} moles Cs
C) 7.91×10^{4} moles Cs
D) 1.26×10^{3} moles Cs
E) 5.39×10^{2} moles Cs
Answer: B
Diff: 3 Var: 1 Page Ref: 2.9
LO: 2.7
Global: G4

48) How many iron atoms are contained in 354 g of iron?
A) 2.62×10^{25} Fe atoms
B) 2.13×10^{26} Fe atoms
C) 4.69×10^{24} Fe atoms
D) 3.82×10^{24} Fe atoms
E) 9.50×10^{22} Fe atoms
Answer: D
Diff: 3 Var: 1 Page Ref: 2.9
LO: 2.6
Global: G4

49) How many phosphorus atoms are contained in 158 kg of phosphorus?
A) 3.07×10^{27} phosphorus atoms
B) 2.95×10^{27} phosphorus atoms
C) 3.25×10^{28} phosphorus atoms
D) 1.18×10^{24} phosphorus atoms
E) 8.47×10^{24} phosphorus atoms
Answer: A
Diff: 3 Var: 1 Page Ref: 2.9
LO: 2.6
Global: G4

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50) Calculate the mass (in kg) of 4.87×10^{25} atoms of Zn.
A) 5.29 kg
B) 1.89 kg
C) 8.09 kg
D) 1.24 kg
E) 1.09 kg
Answer: A
Diff: 3 Var: 1 Page Ref: 2.9
LO: 2.6
Global: G4

51) Calculate the mass (in ng) of 2.33×10^{20} atoms of oxygen.
A) 6.19×10^{6} ng
B) 1.62×10^{7} ng
C) 2.25×10^{3} ng
D) 3.73×10^{6} ng
E) 4.69×10^{7} ng
Answer: A
Diff: 3 Var: 1 Page Ref: 2.9
LO: 2.6
Global: G4

52) How many xenon atoms are contained in 2.36 moles of xenon?
A) 3.92×10^{24} xenon atoms
B) 2.55×10^{23} xenon atoms
C) 1.42×10^{24} xenon atoms
D) 7.91×10^{25} xenon atoms
E) 1.87×10^{26} xenon atoms
Answer: C
Diff: 2 Var: 1 Page Ref: 2.9
LO: 2.8
Global: G4

Algorithmic Questions

1) Identify the discovery that Millikan made.
A) the mass of a proton
B) the charge of a proton
C) the charge of a single electron
D) the mass of a beta particle
E) molecules
Answer: C
Diff: 1 Var: 36 Page Ref: 2.4
Global: G1

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2) Identify the discovery that Thomson made.
A) a neutron
B) an electron
C) the charge of a single electron
D) an alpha particle
E) anions
Answer: B
Diff: 1 Var: 36 Page Ref: 2.4
Global: G1

3) Identify the radioactive particle.
A) a beta particle
B) an anion
C) a molecule
D) an electron
E) a mole
Answer: A
Diff: 1 Var: 50+ Page Ref: 2.5
Global: G2

4) Rutherford proposed the
A) atomic bomb.
B) hydroelectric.
C) First Law of Conservation.
D) theory of explosives.
E) nuclear theory.
Answer: E
Diff: 1 Var: 35 Page Ref: 2.5
Global: G1

5) Identify the charges of the protons, neutrons, and electrons.
A) protons +1, neutrons 0, electrons -1
B) protons 0, neutrons -1, electrons 0
C) protons -1, neutrons -1, electrons 0
D) protons 0, neutrons 0, electrons 0
E) protons +1, neutrons +1, electrons +1
Answer: A
Diff: 1 Var: 50+ Page Ref: 2.6
Global: G1

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6) Identify the element that has an atomic number of 40.
A) neon
B) calcium
C) zirconium
D) bromine
E) gold
Answer: C
Diff: 2 Var: 50 Page Ref: 2.6
LO: 2.3
Global: G2

7) Give the symbol for potassium.
A) K
B) P
C) Po
D) Ka
E) Pt
Answer: A
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G2

8) An atom of ^{13}C contains _____ protons.
A) 6
B) 19
C) 7
D) 9
E) 13
Answer: A
Diff: 2 Var: 17 Page Ref: 2.6
LO: 2.3
Global: G4

9) An atom of ^{25}Mg contains _____ electrons.
A) 25
B) 37
C) 13
D) 23
E) 12
Answer: E
Diff: 2 Var: 17 Page Ref: 2.6
LO: 2.3
Global: G4

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10) The atomic number of an atom of ^{130}Xe is
A) 184.
B) 54.
C) 76.
D) 122.
E) 130.
Answer: B
Diff: 2 Var: 17 Page Ref: 2.6
LO: 2.3
Global: G2

11) How many electrons are in each neutral atom of magnesium?
A) 12
B) 13
C) 14
D) 12.3
E) 24.3
Answer: A
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G4

12) How many neutrons are in manganese-54?
A) 25
B) 30
C) 29
D) 29.4
E) 54.9
Answer: C
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G4

13) How many protons are in nickel?
A) 28
B) 30
C) 31
D) 30.7
E) 58.7
Answer: A
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G4

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14) An ion has 26 protons, 29 neutrons, and 23 electrons. The symbol for the ion is _____.
A) $^{55}Fe^{3+}$
B) $^{55}Fe^{3-}$
C) $^{52}Cu^{3+}$
D) $^{52}Cu^{3-}$
E) $^{55}V^{3-}$
Answer: A
Diff: 2 Var: 10 Page Ref: 2.6
LO: 2.3
Global: G2

15) Isotopes differ in the number of
A) gamma particles.
B) electrons.
C) compounds.
D) neutrons.
E) neutrons and protons.
Answer: D
Diff: 1 Var: 50+ Page Ref: 2.6
LO: 2.3
Global: G1

16) Identify a cation.
A) an atom that has lost an electron
B) an atom that has gained an electron
C) an atom that has lost a proton
D) an atom that has gained a neutron
Answer: A
Diff: 1 Var: 9 Page Ref: 2.6
Global: G1

17) Identify an anion.
A) an atom that has lost an electron
B) an atom that has gained an electron
C) an atom that has lost a proton
D) an atom that has gained a neutron and a proton
Answer: B
Diff: 1 Var: 9 Page Ref: 2.6
Global: G1

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18) How many electrons does the Se^{2-} ion possess?
A) 32
B) 36
C) 4
D) 0
E) 34
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.6
LO: 2.3
Global: G4

19) How many protons does the As^{3-} ion possess?
A) 30
B) 36
C) 4
D) 8
E) 33
Answer: E
Diff: 2 Var: 50+ Page Ref: 2.6
LO: 2.3
Global: G4

20) What is the chemical symbol for thallium?
A) Ti
B) Tl
C) Tm
D) Th
E) Tr
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.6
LO: 2.3
Global: G2

21) What is the chemical symbol for molybdenum?
A) Ma
B) Au
C) Mo
D) K
E) Mb
Answer: C
Diff: 2 Var: 50+ Page Ref: 2.6
LO: 2.3
Global: G2

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22) What is the chemical symbol for carbon?
A) Co
B) Cr
C) C
D) Ca
E) Cb
Answer: C
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G2

23) Which element has the chemical symbol, Rn?
A) radium
B) radon
C) rhenium
D) rhodium
Answer: B
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G2

24) Which element has the chemical symbol, Sn?
A) samarium
B) lead
C) tin
D) tungsten
E) selenium
Answer: C
Diff: 2 Var: 50+ Page Ref: 2.6
LO: 2.3
Global: G2

25) An atom that has an atomic number of 38 and a mass number of 88 is an isotope of an atom that has
A) an atomic number of 39 and a mass number of 88.
B) an atomic number of 38 and a mass number of 86.
C) 50 neutrons and 38 protons.
D) 50 protons and 38 neutrons.
Answer: B
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G2

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26) Which of the following represent isotopes?

A: $^{79}_{34}X$ B: $^{79}_{35}X$ C: $^{78}_{34}X$ D: $^{81}_{36}X$

A) A and D
B) A and C
C) B and D
D) C and D
E) all of the above
Answer: B
Diff: 2 Var: 40 Page Ref: 2.6
LO: 2.3
Global: G2

27) What does "X" represent in the following symbol?
$^{65}_{29}X$

A) dysprosium
B) nickel
C) terbium
D) silicon
E) copper
Answer: E
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G2

28) How many protons (p) and neutrons (n) are in an atom of $^{227}_{89}Ac$?

A) 89 p, 138 n
B) 89 p, 227 n
C) 138 p, 89 n
D) 227 p, 89 n
Answer: A
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G4

29) How many protons (p) and neutrons (n) are in an atom of calcium-46?
A) 20 p, 26 n
B) 20 p, 46 n
C) 26 p, 20 n
D) 46 p, 20 n
Answer: A
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G4

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30) What is the element symbol for an atom that has 29 protons and 36 neutrons?
A) Cu
B) Kr
C) N
D) Tb
Answer: A
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G2

31) How many electrons are in a neutral atom of chlorine-37?
A) 1
B) 17
C) 18
D) 37
Answer: B
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G4

32) Identify the chemical symbol of element Q in $^{18}_{8}\text{Q}$.

A) Ar
B) F
C) Ne
D) O
Answer: D
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G2

33) An atom of ^{131}I contains _____ neutrons.
A) 53
B) 184
C) 78
D) 124
E) 131
Answer: C
Diff: 2 Var: 17 Page Ref: 2.6
LO: 2.3
Global: G4

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34) The mass number of an atom of ^{79}Br is _____.
A) 35
B) 114
C) 44
D) 79
E) 72
Answer: D
Diff: 2 Var: 17 Page Ref: 2.6
LO: 2.3
Global: G2

35) What is the identity of element Q if the ion Q^{2+} contains 36 electrons?
A) Ge
B) Se
C) Kr
D) Sr
Answer: D
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G2

36) Give the number of neutrons in $^{31}P^{3-}$.
A) 18
B) 12
C) 19
D) 15
E) 16
Answer: E
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G4

37) Give the number of electrons in K^{+}.
A) 36
B) 80
C) 35
D) 45
E) 48
Answer: A
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G4

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38) Give the number of protons in P^{3-}.
A) 18
B) 12
C) 19
D) 15
E) 16
Answer: D
Diff: 2 Var: 5 Page Ref: 2.6
LO: 2.3
Global: G4

39) How many electrons are in the ion, Ni^{2+}?
A) 26
B) 28
C) 30
D) 59
E) 52
Answer: A
Diff: 2 Var: 50+ Page Ref: 2.6
LO: 2.3
Global: G4

40) How many electrons are in the ion, S^{2-}?
A) 14
B) 18
C) 30
D) 34
E) 23
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.6
LO: 2.3
Global: G4

41) In which of the following sets do all species have the same number of electrons?
A) Cl^-, Ar, Ca^{2+}
B) C, N^{3-}, O^{2-}
C) K^+, Rb^+, Cs^+
D) Br, Br^-, Br^+
Answer: A
Diff: 2 Var: 50+ Page Ref: 2.6
LO: 2.3
Global: G2

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42) In which of the following sets do all species have the same number of protons?
A) F^-, Ne, Mg^{2+}
B) C, N^{3-}, O^{2-}
C) Sr^{2+}, Ba^{2+}, Ra^{2+}
D) S, S^{2-}, S^{2+}
Answer: D
Diff: 2 Var: 50+ Page Ref: 2.6
LO: 2.3
Global: G2

43) Predict the charge that a strontium ion would have.
A) 6-
B) 2-
C) 4-
D) 2+
E) 1+
Answer: D
Diff: 2 Var: 50+ Page Ref: 2.7
LO: 2.4
Global: G2

44) Predict the charge that an ion formed from tellerium would have.
A) 1-
B) 6-
C) 3-
D) 4-
E) 2-
Answer: E
Diff: 2 Var: 50+ Page Ref: 2.7
LO: 2.4
Global: G2

45) Predict the charge that the ion formed from chlorine would have.
A) 1-
B) 2+
C) 1+
D) 4-
E) 3-
Answer: A
Diff: 2 Var: 50+ Page Ref: 2.7
LO: 2.4
Global: G2

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46) Predict the charge of the **most** stable ion of sodium.
A) 1+
B) 3-
C) 4+
D) 5+
E) 6+
Answer: A
Diff: 2 Var: 50+ Page Ref: 2.7
LO: 2.4
Global: G2

47) Which of the following elements is a metal?
A) Sb
B) O
C) Br
D) Ag
E) He
Answer: D
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

48) Which of the following elements is a metalloid?
A) As
B) O
C) I
D) Co
E) Xe
Answer: A
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

49) Which of the following elements is a noble gas?
A) As
B) C
C) F
D) Co
E) He
Answer: E
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

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50) Which of the following elements is a halogen?
A) Po
B) S
C) I
D) Sn
E) Kr
Answer: C
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

51) Which of the following elements is a nonmetal?
A) Pu
B) C
C) Br
D) K
E) Be
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

52) Which of the following elements is a alkali metal?
A) U
B) C
C) F
D) K
E) Ca
Answer: D
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

53) Which of the following elements is an alkaline earth metal?
A) La
B) P
C) I
D) Rb
E) Ba
Answer: E
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

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54) Which of the following elements is a transition metal?
A) Tc
B) P
C) F
D) Cs
E) Ca
Answer: A
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

55) Sodium belongs to the _____ group of the periodic table.
A) alkali metal
B) transition element
C) noble gas
D) nonmetal
Answer: A
Diff: 2 Var: 48 Page Ref: 2.7
Global: G2

56) Iodine belongs to the _____ group of the periodic table.
A) alkali metal
B) metal
C) halogen
D) noble gas
Answer: C
Diff: 2 Var: 40 Page Ref: 2.7
Global: G2

57) Helium belongs to the _____ group of the periodic table.
A) alkali metal
B) metal
C) transition metal
D) noble gas
Answer: D
Diff: 2 Var: 48 Page Ref: 2.7
Global: G2

58) Beryllium belongs to the _____ group of the periodic table.
A) alkali metal
B) alkaline earth metal
C) transition element
D) nonmetal
Answer: B
Diff: 2 Var: 48 Page Ref: 2.7
Global: G2

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59) Which of the following elements has chemical properties similar to tellurium?
A) bromine
B) lithium
C) nitrogen
D) sulfur
E) helium
Answer: D
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

60) Which of the following elements is a gas at room temperature?
A) oxygen
B) boron
C) bromine
D) sodium
E) barium
Answer: A
Diff: 1 Var: 50+ Page Ref: 2.7
Global: G2

61) Which of the following elements is a liquid at room temperature?
A) radon
B) boron
C) mercury
D) lithium
E) calcium
Answer: C
Diff: 1 Var: 50+ Page Ref: 2.7
Global: G2

62) Which of the following elements is a solid at room temperature?
A) chlorine
B) helium
C) mercury
D) oxygen
E) barium
Answer: E
Diff: 1 Var: 50+ Page Ref: 2.7
Global: G2

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63) Which of the following elements is NOT a solid at room temperature?
A) Mn
B) Cr
C) Hg
D) Mg
E) Na
Answer: C
Diff: 1 Var: 50+ Page Ref: 2.7
Global: G2

64) Which of the following elements is classified as a metalloid?
A) sodium
B) germanium
C) iodine
D) gold
E) calcium
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

65) Which of the following elements is a **good** conductor of heat and electricity?
A) carbon
B) chlorine
C) xenon
D) aluminum
Answer: D
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

66) Which one of the following elements is a **poor** conductor of heat and electricity?
A) chromium
B) iodine
C) copper
D) aluminum
E) nickel
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

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67) All of the following elements are nonmetals EXCEPT
A) barium.
B) nitrogen.
C) oxygen..
D) argon.
E) flourine.
Answer: A
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

68) Identify the cation.
A) O^{2-}
B) Sr^{2+}
C) Br
D) Kr
E) I_2
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

69) Identify the anion.
A) Te^{2-}
B) Ba^{2+}
C) I
D) Ne
E) F_2
Answer: A
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

70) Which of the following elements is NOT a metal?
A) Mg
B) Na
C) He
D) Au
E) Mn
Answer: C
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

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71) Which of the following elements is in Group 4?
A) Hf
B) Ca
C) Bi
D) Ne
E) Cd
Answer: A
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

72) Which of the following elements is in Period 4?
A) Zr
B) Ca
C) Bi
D) He
E) Ag
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

73) List the element that is in the **highest** percentage by mass in our bodies.
A) nitrogen
B) phosphorus
C) oxygen
D) silicon
E) sodium
Answer: C
Diff: 2 Var: 50+ Page Ref: 2.7
Global: G2

74) The average atomic mass for silver is _____.
A) 28.09
B) 14
C) 107.87
D) 47
Answer: C
Diff: 2 Var: 4 Page Ref: 2.8
LO: 2.3
Global: G2

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75) The atomic number for iron is _____.
A) 192.22
B) 77
C) 55.85
D) 26
Answer: D
Diff: 2 Var: 4 Page Ref: 2.8
LO: 2.3
Global: G2

76) Which of the following contains the **most** atoms? You shouldn't need to do a calculation here.
A) 10.0 g Mg
B) 10.0 g Li
C) 10.0 g Ca
D) 10.0 g Kr
E) 10.0 g Ba
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.9
LO: 2.8
Global: G2

77) Which of the following contains the **fewest** atoms? You shouldn't need to do a calculation here.
A) 10.0 g Mg
B) 10.0 g Li
C) 10.0 g Ar
D) 10.0 g Rb
E) 10.0 g Cs
Answer: E
Diff: 2 Var: 50+ Page Ref: 2.9
LO: 2.8
Global: G2

78) How many Li atoms are contained in 97.9 g of Li?
A) 5.90×10^{25} Li atoms
B) 7.09×10^{21} Li atoms
C) 8.49×10^{24} Li atoms
D) 4.27×10^{22} Li atoms
E) 4.18×10^{24} Li atoms
Answer: C
Diff: 3 Var: 5 Page Ref: 2.9
LO: 2.8
Global: G4

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79) Calculate the mass (in g) of 2.1×10^{24} atoms of W.
A) 3.9×10^{2} g
B) 2.4×10^{2} g
C) 3.2×10^{2} g
D) 1.5×10^{2} g
E) 6.4×10^{2} g
Answer: E
Diff: 3 Var: 5 Page Ref: 2.9
LO: 2.8
Global: G4

80) How many gold atoms are contained in 3.75 moles of gold?
A) 1.23×10^{24} gold atoms
B) 2.26×10^{24} gold atoms
C) 2.26×10^{23} gold atoms
D) 9.03×10^{25} gold atoms
E) 6.50×10^{25} gold atoms
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.9
LO: 2.6
Global: G4

81) What mass (in g) does 0.990 moles of Kr have?
A) 83.5 g
B) 119 g
C) 52.8 g
D) 60.0 g
E) 35.6 g
Answer: A
Diff: 2 Var: 5 Page Ref: 2.9
LO: 2.7
Global: G4

82) How many moles of potassium are contained in 200 g of potassium?
A) 5.11 moles
B) 0.956 moles
C) 13.3 moles
D) 10.53 moles
E) 6.46 moles
Answer: A
Diff: 2 Var: 5 Page Ref: 2.9
LO: 2.8
Global: G4

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83) How many moles are in 2.16×10^{24} atoms of magnesium?
A) 35.9 moles
B) 3.59 moles
C) 0.359 moles
D) 7.18 moles
E) 0.90 moles
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.9
LO: 2.6
Global: G4

84) How many atoms are in 7.50 moles of Ca?
A) 4.52×10^{24} atoms
B) 1.52×10^{24} atoms
C) 5.02×10^{23} atoms
D) 3.01×10^{24} atoms
E) 7.53×10^{23} atoms
Answer: A
Diff: 2 Var: 50+ Page Ref: 2.9
LO: 2.6
Global: G4

85) How many atoms are in 2.50 moles of N?
A) 4.52×10^{24} atoms
B) 1.51×10^{24} atoms
C) 5.02×10^{23} atoms
D) 3.01×10^{24} atoms
E) 7.53×10^{23} atoms
Answer: B
Diff: 2 Var: 5 Page Ref: 2.9
LO: 2.8
Global: G4

86) How many atoms of carbon are in 4.00 moles of C?
A) 7.22×10^{24} atoms
B) 2.41×10^{24} atoms
C) 8.00×10^{23} atoms
D) 3.01×10^{24} atoms
E) 6.50×10^{23} atoms
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.9
LO: 2.6
Global: G4

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87) How many atoms are in 5.00 moles of O?
A) 4.52×10^{23} atoms
B) 1.51×10^{24}atoms
C) 5.02×10^{23}atoms
D) 3.01×10^{24} atoms
E) 3.01×10^{23} atoms
Answer: D
Diff: 2 Var: 50+ Page Ref: 2.9
LO: 2.6
Global: G4

88) What mass (in kg) does 4.41 moles of copper have?
A) 0.352 kg
B) 0.122 kg
C) 0.820 kg
D) 0.280 kg
E) 0.632 kg
Answer: D
Diff: 2 Var: 5 Page Ref: 2.9
LO: 2.7
Global: G4

89) Which of the following does NOT contain the same number of atoms as 3.30 moles of K?
A) 3.30 moles of K
B) 1.50 moles of Hf
C) 3.30 moles of Os
D) 3.30 moles of Co
E) 3.30 moles of Au
Answer: B
Diff: 2 Var: 50+ Page Ref: 2.9
LO: 2.6
Global: G4

90) Which of the following is equal to exactly 1 mole of atoms?
A) 6.00 grams of carbon
B) 30.69 grams of nickel
C) 12.01 grams of carbon
D) 12.31 grams of magnesium
E) 34.00 grams of selenium
Answer: C
Diff: 2 Var: 50+ Page Ref: 2.9
LO: 2.8
Global: G4

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91) Which of the following is equal to exactly Avogadro's number of atoms?
A) 8.00 grams of oxygen
B) 35.38 grams of zinc
C) 12.01 grams of carbon
D) 11.99 grams of sodium
E) 34.00 grams of selenium
Answer: C
Diff: 2 Var: 50+ Page Ref: 2.9
LO: 2.7
Global: G4

92) How many argon atoms are contained in 7.66×10^5 mmol of argon?
A) 4.61×10^{26} Ar atoms
B) 4.61×10^{29} Ar atoms
C) 3.83×10^{26} Ar atoms
D) 7.86×10^{21} Ar atoms
E) 3.24×10^{26} Ar atoms
Answer: A
Diff: 2 Var: 50+ Page Ref: 2.9
LO: 2.8
Global: G4

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Matching Questions

Match the following.

A) Mg
B) Si
C) C
D) Fe
E) K

1) magnesium
Diff: 1 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

2) carbon
Diff: 1 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

3) potassium
Diff: 1 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

4) iron
Diff: 1 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

5) silicon
Diff: 1 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

Answers: 1) A 2) C 3) E 4) D 5) B

Short Answer Questions

1) Describe an atom and what it is made up of according to modern atomic theory.
Answer: An atom is made up of a nucleus surrounded by electrons. The nucleus contains protons (positively charged particles) and neutrons (neutral particles) and is where most of the mass of an atom comes from, but is a tiny fraction of an atom's volume. The nucleus is surrounded by negatively charged electrons, the same number as there are protons in the nucleus. An atom is therefore neutral overall.
Diff: 2 Var: 1 Page Ref: 2.3
Global: G1|G8

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2) The atomic number is equal to the number of _____.
Answer: protons
Diff: 1 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

3) Why do the isotopes of the same element have the same atomic size?
Answer: Isotopes only differ in the number of neutrons contained within the nucleus. Since the size of an atom is determined by the electrons, isotopes of the same element should be the same size.
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2|G8

4) Why doesn't a mass spectrum of silver have a peak at 107.9 amu?
Answer: The average atomic mass of silver is 107.9 amu, but there are no atoms of silver that weigh 107.9 amu. One isotope weighs more and another weighs less.
Diff: 2 Var: 1 Page Ref: 2.6
Global: G2|G8

5) Are anions typically larger or smaller than their corresponding atom? Why?
Answer: Anions are larger than their corresponding atom because the anion contains more electrons than the atom. Since electrons repel one another AND determine the size of the atom or ion, adding electrons to the atom to form an anion makes it larger.
Diff: 2 Var: 1 Page Ref: 2.6
Global: G2|G8

6) Give the name of the element whose symbol is Na.
Answer: sodium
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2

7) Describe the difference between ions and isotopes.
Answer: Ions have the loss or gain of electrons; isotopes differ in the number of neutrons.
Diff: 2 Var: 1 Page Ref: 2.6
LO: 2.3
Global: G2|G8

8) Give an example of an halogen.
Answer: F, Br, I, or Cl
Diff: 2 Var: 1 Page Ref: 2.7
Global: G2

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9) What group of elements in the periodic table are the **most** unreactive and why?
Answer: The noble gases are the most unreactive since they do not combine with other elements to form compounds.
Diff: 2 Var: 1 Page Ref: 2.7
Global: G2|G8

10) Why do elements in the same group tend to have similar chemical properties?
Answer: Since elements in the same group tend to react similarly, they form the ions with the same charge.
Diff: 2 Var: 1 Page Ref: 2.7
Global: G2|G8

11) Give the name of the instrument that is used to measure masses of atoms and the percent abundance of isotopes.
Answer: mass spectrometer
Diff: 2 Var: 1 Page Ref: 2.8
Global: G2

12) The number 6.022×10^{23} is called _____.
Answer: Avogadro's number
Diff: 1 Var: 1 Page Ref: 2.9
Global: G2

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