

Course Title: Raymond, 4e

Chapter Number: 2

Question type: Multiple Choice

1) Which statement is **incorrect**?

- a) According to the atomic theory, all matter is composed of atoms.
- b) Protons, neutrons, and electrons are subatomic particles.
- c) Electrons have greater mass than protons.
- d) Neutrons are found in the nucleus of the atom.

Answer: c

Difficulty: easy

Learning Objective 1: LO 2.1 Describe the subatomic structure of an atom.

Section Reference 1: 2.1

2) Choose the **incorrect** statement about the proton:

- a) The proton has the atomic mass of 1 amu.
- b) The proton has the same charge as the neutron.
- c) The proton has greater mass than an electron.
- d) The proton and the neutron have approximately the same atomic mass.

Answer: b

Difficulty: easy

Learning Objective 1: LO 2.1 Describe the subatomic structure of an atom.

Section Reference 1: 2.1

3) The atom's structure characteristically has

- a) the protons and neutron within the nucleus.
- b) the electrons located outside the nucleus.
- c) mostly empty space.
- d) All of these choices are correct.

Answer: d

Difficulty: easy

Learning Objective 1: LO 2.1 Describe the subatomic structure of an atom.

Section Reference 1: 2.1

4) Which of the following is not a type of subatomic particle?

- a) alpha particle
- b) electron
- c) neutron
- d) proton

Answer: a

Difficulty: easy

Learning Objective 1: LO 2.1 Describe the subatomic structure of an atom.

Section Reference 1: 2.1

5) Subatomic particle with a positive charge is a(n) ____.

- a) electron
- b) neutron
- c) proton
- d) cation

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.1 Describe the subatomic structure of an atom.

Section Reference 1: 2.1

6) Which of the substances listed below is not an element?

- a) sodium
- b) iron
- c) air
- d) carbon

Answer: c

Difficulty: easy

Learning Objective 1: LO 2.2 Define the terms element and atomic symbol.

Section Reference 1: 2.2

7) A Nutrition Facts label on a food package indicates that one serving contains 2% of the recommended daily allowance (RDA) of iodine. If the serving size is one cup and the RDA for iodine is 0.15 mg per day, calculate the amount (in milligrams) supplied by one serving.

- a) 0.0030 mg
- b) 15 mg
- c) 20 mg
- d) 0.15 mg

Answer: a

Difficulty: medium

Learning Objective 1: LO 2.3 Define the terms trace element and Dietary Reference Intakes.

Section Reference 1: 2.3

8) Atomic number and mass number differ in that atomic number is the number of ____ and mass number is ____ in an atom's nucleus.

- a) protons/the number of neutrons
- b) neutrons/the number of protons
- c) protons/the number of electrons
- d) protons/the sum of protons and neutrons

Answer: d

Difficulty: easy

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

9) An atom of cobalt with a mass number of 60 has how many neutrons?

- a) 27
- b) 33
- c) 59
- d) 60

Answer: b

Difficulty: easy

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

10) The mass in grams of one mole of an element is the element's ____.

- a) atomic number
- b) atomic weight
- c) molar mass
- d) isotope number

Answer: b

Difficulty: easy

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

11) Mass number refers to

- a) total number of protons and electrons.
- b) total number of protons.
- c) total number of neutrons and protons.
- d) total number of neutrons and electrons.

Answer: c

Difficulty: easy

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

12)  Mg has how many protons, neutrons, and electrons?

- a) 12 protons, 23 neutrons, and 23 electrons
- b) 12 protons, 11 neutrons, and 11 electrons
- c) 23 protons, 11 neutrons, and 23 electrons
- d) 12 protons, 11 neutrons, and 12 electrons

Answer: d

Difficulty: easy

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

13) The atomic number is

- a) the number of neutrons in an atom.
- b) the number of protons in an atom.
- c) the number of protons and neutrons in an atom.
- d) the number of subatomic particles in an atom.

Answer: b

Difficulty: easy

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

14) Which is the proper notation for the oxygen isotope with atomic number 8 and a mass number of 16?

- a) $^{32}_{8}\text{O}$
- b) $^{18}_{8}\text{O}$
- c) $^{16}_{8}\text{O}$
- d) $^{8}_{8}\text{O}$

Answer: c

Difficulty: easy

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

15) An isotope of lithium contains 3 protons and 4 neutrons. What is the correct notation for this lithium isotope?

- a) ^7_3Li
- b) ^3_4Li
- c) ^4_3Li
- d) ^9_3Li

Answer: a

Difficulty: medium

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

16) Two atoms that are isotopes of an element contain

- a) the same number of electrons and neutrons.
- b) the same number of protons and neutrons.
- c) the same number of protons and a different number of neutrons.
- d) different numbers of protons.

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

17) Which of the following is an isotope of iodine-131?

- A $(^{133}_{53}\text{I})$
- B $(^{131}_{52}\text{Te})$
- C $(^{131}_{52}\text{I})$
- D $(^{131}_{53}\text{I})$

Answer: a

Difficulty: medium

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

18) An isotope of sodium contains 11 protons and 12 neutrons.

- a) The atom also contains 11 electrons.
- b) The atom also contains 12 electrons.
- c) The atom also contains 23 electrons.
- d) There are no other factors related to the 11 protons and 12 neutrons.

Answer: a

Difficulty: medium

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

19) Atoms of elements belonging to the same group have an identical number of

- a) total electrons.
- b) energy levels.
- c) inner electrons.
- d) valence electrons.

Answer: d

Difficulty: easy

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

20) Which group contains the alkali metals?

- a) 1A
- b) 2A
- c) 3A
- d) 8A

Answer: a

Difficulty: easy

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

21) Which statement is correct?

- a) Cr is in period 6B.
- b) Fe is a transition metal.
- c) Mg is an alkali metal.
- d) Cl is an inert gas.

Answer: b

Difficulty: easy

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

22) Which of the following is the correct order of elements in increasing atomic radius: K, Mg, B?

- a) $K < Mg < B$
- b) $B < Mg < K$
- c) $Mg < K < B$
- d) $B < K < Mg$

Answer: b

Difficulty: medium

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

23) The periodic table of the elements does not list whole numbers for atomic weights. Why?

- a) The atomic weights are not predictable.

- b) The atomic weights include protons and neutrons at 1 amu each, but they also include electrons, which weigh a lot less than one.
- c) The atomic weight is the weighted average of the masses of the known isotopes of an element.
- d) The atomic weights do not include isotopes.

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

24) Where are the metals located on the periodic table of the elements?

- a) On the right side of the metalloid line (not including the metalloids).
- b) On the last group of the periodic table.
- c) On the left side of the metalloid line (not including the metalloids).
- d) In the two sections separated from the rest of the table.

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

25) The higher up within a group or family on the periodic table,

- a) the heavier the nucleus.
- b) the more the element is likely to conduct electricity.
- c) the more nonmetallic in character.
- d) the more the element is likely to be a semimetal.

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

26) Boron, which occurs in nature as $^{10}_5\text{B}$ (amu = 10.013) and $^{11}_5\text{B}$ (amu = 11.009), has an atomic weight of 10.81. Which of the following statements is true?

- a) isotope $^{11}_5\text{B}$ predominates
- b) isotope $^{10}_5\text{B}$ predominates
- c) both isotopes have equal percentages in nature
- d) the atomic weight of 10.013 amu is nearest the correct value for boron

Answer: a

Difficulty: hard

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

27) Glucose molecules produced during photosynthesis contain higher levels of carbon-12 than carbon -13 because

- a) carbon -12 reacts slightly slower than carbon-13.
- b) carbon-12 has more electrons than carbon -13.
- c) carbon-12 reacts slightly faster than carbon-13.
- d) carbon-13 has more number of protons than carbon -12.

Answer: c

Difficulty: hard

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

28) What is the relationship of a metal atom to the right of another metal atom in the same period?

- a) The atom to the right is usually the smaller in diameter.
- b) The atom to the right is usually the smaller in atomic weight.
- c) The atom to the right is usually the smaller in atomic number.
- d) The atom to the right is more likely to have fewer isotopes.

Answer: a

Difficulty: hard

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

29) How many atoms of sodium are there in 0.200 moles sodium atoms?

- a) 6.02×10^{24} atoms
- b) 6.02×10^{23} atoms
- c) 1.20×10^{23} atoms
- d) 1.20×10^{24} atoms

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

30) How many carbon(C) atoms are present in 30 moles of carbon?

- a) 1.20×10^1 C atoms
- b) 1.80×10^{23} C atoms
- c) 3.60×10^2 C atoms
- d) 6.02×10^{23} C atoms

Answer: b

Difficulty: medium

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

31) The number of moles of calcium (Ca) represented by 7.39 g of calcium is

- a) 40.0 moles of Ca.
- b) 18.6 moles of Ca.
- c) 0.184 mole of Ca.
- d) 296 moles of Ca.

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

32) Iron has the atomic weight of 55.9. What is the number of atoms in one mole of iron?

- a) 55.9 atoms
- b) 1×10^{24} atoms
- c) 6.02×10^{23} atoms
- d) 12 dozen atoms

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

33) A sample of magnesium weighs 10 grams. How many moles of magnesium are there in the sample?

- a) 10 moles
- b) 6×10^{23} moles
- c) 60×10^{23} atoms

d) 0.4 moles

Answer: d

Difficulty: medium

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

34) What is the number of atoms present in a 20.gram sample of lithium?

- a) 1.38×10^2
- b) 1.20×10^{25}
- c) 1.70×10^{24}
- d) 4.00×10^{24}

Answer: c

Difficulty: hard

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

35) Sulfur has ____ electrons and ____ valence electrons.

- a) 16, 6
- b) 32, 4
- c) 16, 0
- d) 32, 6

Answer: a

Difficulty: easy

Learning Objective 1: LO 2.7 Describe the difference between the Bohr model and the quantum mechanical model of the atom, define the term valence electron, and describe electron dot structures.

Section Reference 1: 2.7

36) The maximum number of electrons that a particular energy level n can hold is ____.

- a) n^2
- b) $2n$
- c) $2n^2$
- d) $n-1$

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.7 Describe the difference between the Bohr model and the quantum mechanical model of the atom, define the term valence electron, and describe electron dot structures.

Section Reference 1: 2.7

37) Which form of ionizing radiation is most penetrating?

- a) alpha
- b) beta
- c) gamma
- d) positron

Answer: c

Difficulty: easy

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

38) An alpha particle is identical to which of the following?

- a) the nucleus of a hydrogen atom
- b) an electron
- c) a beta radiation
- d) the nucleus of a helium-4-atom

Answer: d

Difficulty: easy

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

39) In an alpha therapy, Radium-223 is used as a radioactive α -emitter. The correct nuclear equation for this emission event is?

- a. ${}_{88}^{223}\text{Ra} \longrightarrow {}_{89}^{223}\text{Ac} + {}_{-1}^0\text{e}$
- b. ${}_{88}^{223}\text{Ra} \longrightarrow {}_{89}^{223}\text{Rn} + {}_2^4\text{He}$
- c. ${}_{88}^{223}\text{Ra} \longrightarrow {}_{88}^{223}\text{Ra} + {}_{-1}^0\text{e}$
- d. ${}_{88}^{223}\text{Ra} \longrightarrow {}_{87}^{223}\text{Fr} + {}_1^0\text{e}$

Answer: b

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

40) Which of the following statements is true about a beta particle?

- a) it has the same mass as a helium nucleus
- b) when ejected from the nucleus formed has same mass as the original isotope
- c) when ejected from the nucleus of a radioisotope, the nucleus formed has one more proton
- d) it is the same as a gamma radiation

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

41) When a radioactive isotope emits a(n) ____, its atomic number increases.

- a) alpha particle
- b) beta particle
- c) gamma ray
- d) positron

Answer: b

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

42) If radium, $^{226}_{88}\text{Ra}$, were to emit an alpha particle, what would be the other product?

a) $^{226}_{86}\text{Rn}$

b) $^{222}_{86}\text{Ra}$

c) $^{230}_{90}\text{Th}$

d) $^{226}_{89}\text{Ac}$

Answer: b

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

43) Scandium-40 enters into a reaction in which a positron is emitted. Which is the correct equation for this reaction?

a) $^{40}_{21}\text{Sc} \rightarrow ^{34}_{21}\text{Sc} + ^0_1\beta^+$

b) $^{40}_{21}\text{Sc} \rightarrow ^{36}_{21}\text{Sc} + ^0_1\beta^+$

c) $^{40}_{21}\text{Sc} \rightarrow ^{36}_{20}\text{Ca} + ^0_1\beta^+$

d) $^{40}_{21}\text{Sc} \rightarrow ^{40}_{20}\text{Ca} + ^0_1\beta^+$

Answer: d

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

44) Which equation below correctly depicts nitrogen-13 emitting a positron?

a) $^{13}_7\text{N} \rightarrow ^{13}_6\text{C} + ^0_1\beta^+$

b) $^{13}_7\text{N} \rightarrow ^7_7\text{N} + ^0_1\beta^+$

c) $^{13}_7\text{N} \rightarrow ^{14}_6\text{C} + ^0_1\beta^+$

d) $^{13}_7\text{N} \rightarrow ^{13}_8\text{O} + ^0_1\beta^+$

Answer: a

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

45) The dosage unit related to the amount of energy absorbed by an object exposed to nuclear radiation is ____.

- a) curie
- b) rad
- c) rem
- d) Becquerel

Answer: b

Difficulty: easy

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

46) The unit commonly used to measure the amount of tissue damage that is produced by an exposure to ionizing radiation is ____.

- a) rem
- b) rad
- c) curie
- d) Becquerel

Answer: a

Difficulty: easy

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

47) Radioisotopes with short half-lives are used in diagnostic tests because

- a) they have high energy.
- b) they are inexpensive.
- c) they do not pose health risks by being present long after use.
- d) they have less penetration ability.

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

48) Most elements have radioisotopes. What is a radioisotope?

- a) An isotope that has a different atomic number.
- b) An isotope that releases nuclear radiation.
- c) An isotope that releases electrical radiation.
- d) Any isotope that can absorb nuclear particles.

Answer: b

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

49) What is the minimum protection against exposure to beta particles?

- a) None, beta particles are of low energy and cannot penetrate skin.
- b) Gloves, a lab coat, or over a meter's distance from the source.
- c) A thin sheet of plastic or metal.
- d) A sheet of lead.

Answer: c

Difficulty: medium

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

50) Gamma rays require a thick slab of concrete or lead to block them because they

- a) have the lowest energy.
- b) are so energetic that they have a very high penetrating power.
- c) are large in size.
- d) are small in size.

Answer: b

Difficulty: medium

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

51) The quality factor (QF) for alpha particles is 20. What is the radiation dose in rems for this patient if he absorbed 13 rads of alpha particles?

- a) 20 rems
- b) 13 rems
- c) 23 rems
- d) 260 rems

Answer: d

Difficulty: easy

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

52) If one starts with 10.0 grams of a radioactive substance, how much will remain after 3 half lives?

- a) 1.25 g
- b) 2.50 g
- c) 3.33 g
- d) 5.00 g

Answer: a

Difficulty: hard

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

53) Iron-59 has a half-life of 45 days. How much of a 50.0-gram sample would remain after 180 days?

- a) 1.00 g
- b) 3.13 g
- c) 25.0 g
- d) There is no way to determine the results.

Answer: b

Difficulty: hard

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

54) A 35 mg dose of iodine-131 with a half-life of 8 days is administered to a patient. How long will it take for the iodine to decay so that there are only about 2 mg remaining?

- a) 8 days
- b) 16 days
- c) 32 days
- d) 64 days

Answer: c

Difficulty: hard

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

55) Whereas x-ray works well for bones, the value of a CT scan is that

- a) it provides a 3 dimensional view of bones.
- b) it provides images of the inside of the body.
- c) it provides a clear picture of gamma rays produced within the tissue.
- d) it provides images used in studies, such as monitoring sugar usage.

Answer: a

Difficulty: medium

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

56) Whereas x-ray works well for bones, the value of MRI imaging is that

- a) it provides a 3 dimensional view of bones.
- b) it provides images of the inside of the body.
- c) it provides a clear picture of gamma rays produced within the tissue.
- d) it provides images used in studies, such as monitoring sugar usage.

Answer: b

Difficulty: hard

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

57) A patient who has undergone a PET scan that used fluorine-18 tagged glucose is likely to emit which of the following a few hours after the procedure?

- a) x-rays
- b) alpha particles
- c) gamma radiation
- d) beta particles

Answer: c

Difficulty: hard

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

Question type: True/false

58) Trace elements and vitamins are required for the body to function properly

Answer: true

Difficulty: easy

Learning Objective 1: LO 2.3 Define the terms trace element and Dietary Reference Intakes.

Section Reference 1: 2.3

59) An atom contains 12 protons and 12 neutrons, and a different atom contains 10 protons and 12 neutrons. These two atoms are not isotopes.

Answer: true

Difficulty: Hard

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

60) The isotope of hydrogen that is a radioisotope has a mass number of 3.

Answer: true

Difficulty: Hard

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

61) Calcium is a transition metal as is indicated by its location in the periodic table.

Answer: false

Difficulty: easy

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

62) Emission of a beta particle increases the number of protons in an atom's nucleus.

Answer: true

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

63) The emission of an alpha particle only decreases the atomic mass of the atom.

Answer: false

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

64) The higher the quality factor (QF) of a radiation, the less harmful the exposure to the radiation.

Answer: false

Difficulty: easy

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

Question type: text-entry

65) The element that is essential for human nutrition and is responsible for formation of bones and teeth is ____.

Answer: calcium

Difficulty: easy

Learning Objective 1: LO 2.2 Define the terms element and atomic symbol.

Section Reference 1: 2.2

66) The atomic number is equal to the number of ____ found in a specific element.

Answer: protons

Difficulty: easy

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

67) Complete the following table:

Isotope	Nuclear Symbol	Atomic Number	Mass Number	# of protons	# of neutrons	# of electrons
magnesium-28			28			12
		35	81			35
	$^{45}_{21}\text{Sc}$					

Answer:

Isotope	Nuclear Symbol	Atomic Number	Mass Number	# of protons	# of neutrons	# of electrons
magnesium-28	$^{28}_{12}\text{Mg}$	12	28	12	16	12
bromine-81	$^{81}_{35}\text{Br}$	35	81	35	46	35
scandium-45	$^{45}_{21}\text{Sc}$	21	45	21	24	21

Difficulty: hard

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

68) Complete the following table:

Subatomic Particle	Relative Mass	Relative Charge	Location
proton			
	0	-1	
	1	0	

Answer:

Subatomic Particle	Relative Mass	Relative Charge	Location
proton	1 amu	+1	nucleus
electron	0	-1	electron cloud/outside nucleus
neutron	1	0	nucleus

Difficulty: hard

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

69) Beryllium and magnesium can be predicted to have similar properties because they are in the same ____ on the periodic table.

Answer: family/group

Difficulty: medium

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

70) Given the following elements: calcium, selenium, and chlorine, arrange the three elements in order of:

increasing atomic size: _____ < _____ < _____

increasing metallic character _____ > _____ > _____

Answer: increasing atomic size: Cl < Se < Ca

increasing metallic character Ca > Se > Cl

Difficulty: medium

Learning Objective 1: LO 2.5 Explain how elements are arranged in the periodic table and define the term atomic weight.

Section Reference 1: 2.5

71) The number of ____ is the same in one mole of sodium as in one mole of zinc.

Answer: atoms

Difficulty: medium

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

72) In a living thing, light can be produced without heat in a process called ____.

Answer: bioluminescence

Difficulty: easy

Learning Objective 1: LO 2.7 Describe the difference between the Bohr model and the quantum mechanical model of the atom, define the term valence electron, and describe electron dot structures.

Section Reference 1: 2.7

73) An alpha particle is essentially a(n) ____ nucleus.

Answer: helium-4

Difficulty: easy

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

74) ____ radiation is electromagnetic radiation much like x-rays.

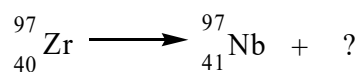
Answer: gamma

Difficulty: easy

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

75) What type of radiation will be emitted in the reaction below?



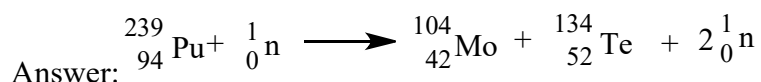
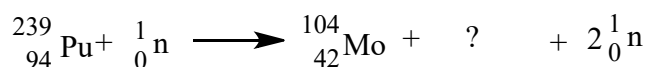
Answer: beta particle

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

76) Complete the equation below.



Difficulty: hard

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

77) The least penetrating form of ionizing radiation is the ____ particle.

Answer: alpha

Difficulty: easy

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

78) The time required for one half of a sample to undergo radioactive decay is the ____.

Answer: half-life

Difficulty: easy

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

79) 0.04 mSv is the same as ____ millirads.

Answer: 4 mrad.

Difficulty: hard

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

Show all necessary calculations. Round answers to the correct number of significant figures.

80) Calculate the number of moles in 2.61 grams of silicon.

Answer: 0.0929 mol

Difficulty: medium

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

81) Calculate the number of atoms in 2.61 grams of silicon.

Answer: 5.59×10^{22} atoms

Difficulty: medium

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

82) Define the term mole. Explain the relationship between mole and atomic weight.

Answer: A mole is a counting unit that represents 6.02×10^{23} items. The atomic weight is the mass in grams of 1 mol of a substance.

Difficulty: medium

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

83) What is the mass in grams of 5.82×10^{15} moles of Ba?

Answer: 7.99×10^{17} grams

Difficulty: hard

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

84) 12.5 grams of gold contains how many gold atoms?

Answer: 3.82×10^{22} atoms

Difficulty: hard

Learning Objective 1: LO 2.6 Define the terms mole and molar mass.

Section Reference 1: 2.6

85) Draw the electron dot structure for a selenium (Se) atom.

Answer: $\cdot \ddot{\text{Se}} \cdot$

Difficulty: easy

Learning Objective 1: LO 2.7 Describe the difference between the Bohr model and the quantum mechanical model of the atom, define the term valence electron, and describe electron dot structures.

Section Reference 1: 2.7

86) Write the nuclear equation for the alpha emission of bismuth-210.

Answer:
$$\begin{array}{ccccc} 210 & & 4 & & 206 \\ 83 & \text{Bi} & \longrightarrow & 2 & \text{He} + 81 & \text{Tl} \end{array}$$

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

87) Write the nuclear equation for the beta emission of iodine-131.

Answer:
$$\begin{array}{ccccc} 131 & & 0 & & 131 \\ 53 & \text{I} & \longrightarrow & -1 & \beta + 54 & \text{Xe} \end{array}$$

Difficulty: medium

Learning Objective 1: LO 2.8 Describe the four common types of radiation emitted by radioisotopes and write balanced nuclear equations.

Section Reference 1: 2.8

88) Technetium-99 is injected into a patient in order to monitor heart function. Technetium-99 is a gamma emitter with a half-life of 6 hours. A patient receives an injection of 21 mg of Technetium-99 on a Tuesday at 9:00 a.m.

Calculate the number of hours and the number of half-lives that occur between 9:00 a.m. on Tuesday and 11:00 p.m. on Wednesday.

Answer: 38 hours= 6.3 half-lives

Difficulty: hard

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9

Question type: Essay

89) Define the term element. Give one example of an element that is a metal, an element that is a nonmetal, and an element that is a semimetal.

Answer: An element is a substance composed of only one kind of atom. It cannot be broken down into simpler substances. Examples of a metal, a nonmetal, and a semimetal will vary.

Difficulty: medium

Learning Objective 1: LO 2.2 Define the terms element and atomic symbol.

Section Reference 1: 2.2

90) Distinguish between the terms atomic number, mass number, and atomic weight.

Answer: Atomic number is the number of protons in an atom's nucleus. Mass number is the sum of protons and neutrons in an atomic nucleus. Atomic weight is the average of atoms of an element as it is found in nature.

Difficulty: medium

Learning Objective 1: LO 2.4 Explain what atomic number and mass number indicate about an atom's nucleus and describe how isotopes of an element differ from one another.

Section Reference 1: 2.4

91) Describe two ways to protect oneself from exposure to radiation when working in an environment that contains radioactive sources.

Answer: Distance and shielding are two means of protecting oneself from exposure to radiation.

Difficulty: hard

Learning Objective 1: LO 2.9 Explain the terms half-life and background radiation, describe how shielding can provide protection from radiation, and give examples of how radiation is used for the diagnosis and treatment of disease.

Section Reference 1: 2.9