

Chapter 2--Atoms and Elements

Student: _____

1. Which statement about electrons is true?
 - A. Electrons are found in the nucleus of the atom.
 - B. Electrons are attracted to negatively charged electrodes.
 - C. All atoms have electrons as part of their structure.
 - D. Electrons have much more mass than any atom.
 - E. Electrons are positively charged.

2. The electrical nature of matter can best be demonstrated by an atom's
 - A. radioactivity.
 - B. atomic weight.
 - C. atomic number.
 - D. behavior on photographic paper.
 - E. behavior in a cathode ray tube.

3. Which of the following is the most correct for the cathode ray experiments?
 - A. The ray bent towards the positive exterior plate, proving that the ray was made up of negative particles.
 - B. The cathode ray experiment can be considered equivalent with the discovery of electrons.
 - C. The behavior of the ray was independent of the metal chosen to make the plates in side the vacuum tube, proving that all metals contain a common particle.
 - D. All of these.
 - E. None of these.

4. The Millikan oil drop experiment was used to determine
 - A. whether the atom was radioactive.
 - B. the electron distribution in the atom.
 - C. the atomic number of an atom.
 - D. the charge of an electron.
 - E. the nuclear character of the atom.

5. When an atom loses electrons, _____ are formed.

- A. nuclei
- B. alpha particles
- C. protons
- D. neutrons
- E. ions

6. Which of the following statements concerning the atom is false?

- A. Chemical reactions involve only the electrons.
- B. The atom contains protons, neutrons and electrons.
- C. Electrons are found in orbits about the nucleus.
- D. The nucleus contains only neutrons.
- E. Most of the mass of the atom is found in the nucleus.

7. In Rutherford's gold foil experiment:

- A. the alpha particles used were attracted to the positive particles in the gold foil.
- B. Rutherford's expectations for the experiment were proven to be correct.
- C. neutrons were discovered.
- D. the alpha particles mostly bounced off the foil, with most particles undergoing sharp deflections.
- E. Rutherford concluded that there must be a compact, massive, positively charged particle inside the gold atoms.

8. Which metric prefix means 1000?

- A. pico
- B. micro
- C. milli
- D. kilo
- E. nano

9. Which metric prefix means 1×10^{-9} ?

- A. kilo
- B. nano
- C. pico
- D. micro
- E. milli

10. There are ____ milligrams in a kilogram.

- A. 1×10^{-3}
- B. 1×10^6
- C. 1×10^9
- D. 1×10^{-6}
- E. 1×10^3

11. There are ____ millimeters in a centimeter.

- A. 1×10^1
- B. 1×10^2
- C. 1×10^3
- D. 1×10^{-1}
- E. 1×10^{-2}

12. How many centimeters are in 15 feet?

- A. 3.1 cm
- B. 38 cm
- C. 71 cm
- D. 460 cm
- E. 570 cm

13. How many millimeters are in 0.457 yards?

- A. 11.6 mm
- B. 54.8 mm
- C. 139 mm
- D. 418 mm
- E. 4570 mm

14. How many liters are in 14.6 gallons?

- A. 13.8 L
- B. 17.4 L
- C. 55.3 L
- D. 58.4 L
- E. 61.9 L

15. Converting 127 pounds to kilograms yields:

- A. 50.3 kg.
- B. 57.6 kg.
- C. 280 kg.
- D. 326 kg.
- E. 1280 kg.

16. Converting 6.390 pounds to grams yields:

- A. 2516 g.
- B. 2898 g.
- C. 6390 g.
- D. 14090 g.
- E. 16230 g.

17. How many microliters are in 89.63 L?

- A. $8.963 \times 10^{10} \mu\text{L}$
- B. $8.963 \times 10^7 \mu\text{L}$
- C. $8.963 \times 10^4 \mu\text{L}$
- D. $8.963 \times 10^{-4} \mu\text{L}$
- E. $8.963 \times 10^{-7} \mu\text{L}$

18. A pond has dimensions of 24 m. by 25 m. by 3.0 m. What is the volume of the pond in liters?

- A. $1.8 \times 10^{-3} \text{ L}$
- B. $1.8 \times 10^2 \text{ L}$
- C. $1.8 \times 10^3 \text{ L}$
- D. $1.8 \times 10^4 \text{ L}$
- E. $1.8 \times 10^6 \text{ L}$

19. A piece of paper measures 8.50 in. by 11.0 in. Calculate the area of the piece of paper in square centimeters.

- A. 14.5 cm^2
- B. 93.5 cm^2
- C. 237 cm^2
- D. 466 cm^2
- E. 603 cm^2

20. Electromagnetic radiation having a wavelength of 475 nm is in the blue region of the visible spectrum.

Converting this wavelength into centimeters yields:

- A. 4.75×10^{-7} cm.
- B. 4.75×10^{-6} cm.
- C. 4.75×10^{-5} cm
- D. 1.86×10^{-4} cm.
- E. 1.86×10^{-3} cm.

21. How many significant figures are present in each of the following: 86.9, 3.710, and 0.0492?

- A. three, three, three
- B. three, three, four
- C. three, four, three
- D. three, four, four
- E. three, four, five

22. What is the proper answer and number of significant figures for the following calculation: 2.80×4.2 ?

- A. 11.7
- B. 11.76
- C. 12.0
- D. 1.2×10^1
- E. None of these

23. What is the proper answer and number of significant figures for the following calculation: $0.421 + 7.70/12.245$?

- A. 0.663
- B. 0.6632
- C. 1.0498
- D. 1.05
- E. 1.050

24. Which of the following is correct?

- A. ^{81}Br has 35 protons, 35 electrons and 81 neutrons.
- B. ^{34}S has 16 protons, 16 electrons and 16 neutrons.
- C. ^{40}Ar has 18 protons, 18 electrons and 12 neutrons.
- D. ^{59}Co has 27 protons, 27 electrons and 32 neutrons.
- E. ^{48}Ti has 22 protons, 22 electrons and 24 neutrons.

25. An element containing 26 protons, 26 electrons and 30 neutrons will have the symbol:

- A. ^{82}Te .
- B. ^{52}Zn .
- C. ^{56}Fe .
- D. ^{56}Zn .
- E. ^{52}Te .

26. Which element has an atomic number of 35 and mass number of 80?

- A. ^{35}Hg
- B. ^{35}Cl
- C. ^{35}Br
- D. ^{80}Hg
- E. ^{80}Br

27. Which of the following statements is not true?

- A. $^{95}_{42}\text{Mo}$ contains 53 neutrons.
- B. $^{51}_{23}\text{V}$ has an atomic number of 23.
- C. $^{12}_6\text{C}$ has the same number of protons, neutrons and electrons.
- D. $^{66}_{30}\text{Zn}$ has the same number of electrons and protons.
- E. $^{56}_{26}\text{Fe}$ has the same number of neutrons and protons.

28. Which of the following represent a pair of isotopes?



I



II



III



IV



V

- A. I and II
- B. I and III
- C. I and IV
- D. II and V
- E. III and IV

29. Which of the following is the most correct in regards to the mass spectrometer analysis of an element?

- A. A mass spectrometer provides evidence of the existence of the proton.
- B. A mass spectrometer provides evidence of the existence of the electron.
- C. A mass spectrometer provides evidence for the existence of different isotopes.
- D. A mass spectrometer provides evidence that different atoms of the same element have different atomic numbers.
- E. Both c and d are correct.

30. Which statement best describes isotopes?

- A. atoms in the same vertical family
- B. atoms with the same number of protons and different numbers of neutrons
- C. atoms with the same number of neutrons and a different number of protons
- D. atoms with the same numbers of protons and neutrons
- E. atoms in the same horizontal period

31. Which of the following statements about two isotopes is true?

- A. They will have the same atomic mass.
- B. They will have different numbers of protons.
- C. They will have very different chemical reactivity.
- D. They will have the same atomic numbers.
- E. They will have the same number of neutrons.

32. Which of the following statements concerning isotopes is true?

- A. All isotopes of a given element are radioactive.
- B. Various isotopes of the same element exhibit very different chemical reactivity.
- C. Various isotopes of the same element have the same number of protons.
- D. Every element has 3 isotopes.
- E. Various isotopes of the same element have the same mass.

33. Assume that only two isotopes of sulfur, ${}_{16}^{32}\text{S}$ and ${}_{16}^{34}\text{S}$ exist in nature. If this were true, the atomic weight of sulfur would fall most closely within which range?

- A. 16-33.5 amu
- B. 16-34 amu
- C. 16-50 amu
- D. 32-34 amu
- E. 48-50 amu

34. An element that has 32 protons and 52 neutrons has an approximate atomic weight of:

- A. 20 amu.
- B. 32 amu.
- C. 52 amu.
- D. 60 amu.
- E. 84 amu.

35. Suppose the isotopic ratio of the two boron isotopes ^{10}B (10.013 amu) and ^{11}B (11.009 amu) in a sample has been altered from the ratio found in nature and now contains 58.73% ^{10}B in the sample. Determine the atomic weight of this sample of boron.

- A. 10.511 amu
- B. 10.013 amu
- C. 11.009 amu
- D. 10.424 amu
- E. 10.498 amu

36. An element has three naturally occurring isotopes with the following masses and abundances (in parenthesis): 27.977 amu (0.9222); 28.974 amu (0.0469); 29.974 amu (0.0310). Calculate the atomic weight of the element.

- A. 28.09 amu
- B. 66.94 amu
- C. 86.93 amu
- D. 28.98 amu
- E. 83.93 amu

37. Calculate the number of grams in 0.928 moles of nitrogen molecules (N_2).

- A. 14.0 g
- B. 28.0 g
- C. 13.0 g
- D. 26.0 g
- E. 30.2 g

38. Calculate the number of moles represented by 21.7 g Fe.

- A. 1210 moles
- B. 0.835 moles
- C. 1.20 moles
- D. 2.57 moles
- E. 0.389 moles

39. How many grams of argon (Ar) contain the same number of atoms as 27 g of aluminum (Al)?

- A. 18 g
- B. 27 g
- C. 31 g
- D. 40 g
- E. 67 g

40. How many grams of carbon (C) contain the same number of atoms as 40 g of neon (Ne)?

- A. 6 g
- B. 12 g
- C. 18 g
- D. 24 g
- E. 30 g

41. How many atoms are in a 10.0 g sample of titanium (Ti)?

- A. 1.16×10^{27}
- B. 1.26×10^{23}
- C. 2.20×10^{23}
- D. 2.86×10^{23}
- E. 5.06×10^{26}

42. How many hydrogen atoms are in a 27.0 g sample of water (H₂O)?

- A. 1.50
- B. 2.99
- C. 4.98×10^{-24}
- D. 1.81×10^{24}
- E. 2.93×10^{26}

43. Which sample contains the fewest atoms?

- A. 10 g of C
- B. 10 g of Ne
- C. 10 g of F
- D. 10 g of N
- E. 10 g of O

44. Which sample contains the fewest atoms?

- A. 50 g Xe
- B. 25 g Ca
- C. 50 g Li
- D. 125 g Fe
- E. 225 g C

45. Which sample contains the greatest number of atoms?

- A. 50 g Ba
- B. 50 g Br
- C. 50 g Ca
- D. 50 g Ti
- E. 50 g P

46. Which sample contains the fewest number of atoms?

- A. 216 g Cr
- B. 435 g Ni
- C. 512 g Mn
- D. 619 g Pt
- E. 642 g Rb

47. Which sample contains the same number of atoms as 175.0 g of cadmium (Cd)?

- A. 225 g Pb
- B. 175 g Hg
- C. 307 g Au
- D. 142 g Ir
- E. 305 g Sn

48. Which element can be classified as a lanthanide?

- A. Th
- B. Ti
- C. Tl
- D. Tc
- E. Tb

49. Which element can be classified as a halogen?

- A. He
- B. H
- C. O
- D. Cl
- E. La

50. Which element can be classified as a noble gas?

- A. Cl
- B. No
- C. Ne
- D. P
- E. S

51. Which element can be classified as a transition metal?

- A. Ar
- B. N
- C. F
- D. Co
- E. Rb

52. Which element can be classified as an alkaline earth metal?

- A. Al
- B. Mg
- C. Ag
- D. Au
- E. Na

53. Which element is highly reactive?

- A. Cu
- B. Kr
- C. C
- D. Al
- E. K

54. Which element is the least reactive and is found uncombined in nature?

- A. Au
- B. Fe
- C. Ne
- D. N
- E. Cu

55. Three elements that are likely to have similar chemical and physical properties are:

- A. B, C, Si
- B. Ca, Co, Cr
- C. Cu, Ag, Au
- D. H, He, Ne
- E. Pb, Bi, Po

56. The metric prefix _____ means one millionth.

57. There are _____ centiliters in a liter.

58. ^{14}O , ^{16}O , ^{18}O are called _____.

59. Radioactive atoms emit alpha and _____ particles.

60. Write the atomic symbol for an atom that contains 24 protons, 24 electrons and 26 neutrons.

61. Give an example of an Alkali Metal.

62. Give an example of an Alkaline Earth Metal.

63. Match the following:

- | | | |
|---------------------|----------------------------------|-------|
| 1. electron | sodium (Na) | _____ |
| 2. ion | 12.01 amu | _____ |
| 3. atomic weight | copper (Cu) | _____ |
| 4. alkali metal | chlorine (Cl) | _____ |
| 5. transition metal | charged chemical species | _____ |
| 6. neutron | cerium (Ce) | _____ |
| 7. nucleus | smallest subatomic particle | _____ |
| 8. halogen | found in the nucleus | _____ |
| 9. lanthanide | 44.0 g/mol | _____ |
| 10. molar mass | contains most of the atom's mass | _____ |

64. Discuss what role Rutherford's gold foil experiment had in leading to the modern model of the atom.

65. Give an example of an isotope symbol and describe what the features of the symbol specify.

66. Does the metric system of measurement have any advantage over the "English" system of measurement? Explain why or why not.

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10. There are ____ milligrams in a kilogram.

A. 1×10^{-3}

B. 1×10^6

C. 1×10^9

D. 1×10^{-6}

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11. There are ____ millimeters in a centimeter.

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- E. ^{48}Ti has 22 protons, 22 electrons and 24 neutrons.

25. An element containing 26 protons, 26 electrons and 30 neutrons will have the symbol:

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28. Which of the following represent a pair of isotopes?



I



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III



IV



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- A. I and II
- B. I and III
- C. I and IV
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- B. 16-34 amu
- C. 16-50 amu
- D.** 32-34 amu
- E. 48-50 amu

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- A. 1210 moles
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- B. 1.26×10^{23}**
- C. 2.20×10^{23}
- D. 2.86×10^{23}
- E. 5.06×10^{26}

42. How many hydrogen atoms are in a 27.0 g sample of water (H₂O)?

- A. 1.50
- B. 2.99
- C. 4.98×10^{-24}
- D. 1.81×10^{24}**
- E. 2.93×10^{26}

43. Which sample contains the fewest atoms?

- A. 10 g of C
- B. 10 g of Ne**
- C. 10 g of F
- D. 10 g of N
- E. 10 g of O

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- A. Th
- B. Ti
- C. Tl
- D. Tc
- E.** Tb

49. Which element can be classified as a halogen?

- A. He
- B. H
- C. O
- D.** Cl
- E. La

50. Which element can be classified as a noble gas?

- A. Cl
- B. No
- C.** Ne
- D. P
- E. S

51. Which element can be classified as a transition metal?

- A. Ar
- B. N
- C. F
- D.** Co
- E. Rb

52. Which element can be classified as an alkaline earth metal?

- A. Al
- B.** Mg
- C. Ag
- D. Au
- E. Na

53. Which element is highly reactive?

- A. Cu
- B. Kr
- C. C
- D. Al
- E.** K

54. Which element is the least reactive and is found uncombined in nature?

- A. Au
- B. Fe
- C. Ne
- D. N
- E. Cu

55. Three elements that are likely to have similar chemical and physical properties are:

- A. B, C, Si
- B. Ca, Co, Cr
- C. Cu, Ag, Au
- D. H, He, Ne
- E. Pb, Bi, Po

56. The metric prefix _____ means one millionth.

micro

57. There are _____ centiliters in a liter.

100

58. ^{14}O , ^{16}O , ^{18}O are called _____.

isotopes

59. Radioactive atoms emit alpha and _____ particles.

beta

60. Write the atomic symbol for an atom that contains 24 protons, 24 electrons and 26 neutrons.

$^{50}_{24}\text{Cr}$

61. Give an example of an Alkali Metal.

Li, Na, K, Rb, Cs, Fr

62. Give an example of an Alkaline Earth Metal.

Be, Mg, Ca, Sr, Ba, Ra

63. Match the following:

1. electron	sodium (Na)	<u>4</u>
2. ion	12.01 amu	<u>3</u>
3. atomic weight	copper (Cu)	<u>5</u>
4. alkali metal	chlorine (Cl)	<u>8</u>
5. transition metal	charged chemical species	<u>2</u>
6. neutron	cerium (Ce)	<u>9</u>
7. nucleus	smallest subatomic particle	<u>1</u>
8. halogen	found in the nucleus	<u>6</u>
9. lanthanide	44.0 g/mol	<u>10</u>
10. molar mass	contains most of the atom's mass	<u>7</u>

64. Discuss what role Rutherford's gold foil experiment had in leading to the modern model of the atom.

The results of Rutherford's gold foil experiment indicated that the majority of the mass and the positive charge of an atom must be concentrated in a very small volume, which he called the nucleus. The results also indicated that the most of the volume of an atom is occupied by the electrons surrounding the nucleus.

65. Give an example of an isotope symbol and describe what the features of the symbol specify.



This isotope symbol is for the atom Sulfur-32. The subscript on the left side of the atomic symbol is the atomic number which indicates the atom has 16 protons in its nucleus. The atomic symbol is S which is defined by the atomic number. The superscript of 32 is the atomic mass number of this atom and indicates there are 16 protons and 16 neutrons in the atom.

66. Does the metric system of measurement have any advantage over the "English" system of measurement? Explain why or why not.

The metric system has the advantage of being based on a decimal system with conversions from one unit to another by multiplying or dividing by 10. The "English" system is based on fraction conversions with no common conversion factor between units.