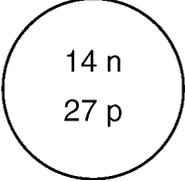
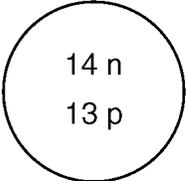
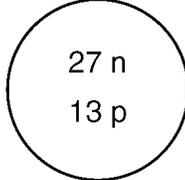
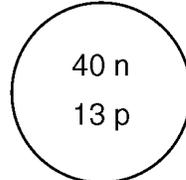


- Which subatomic particles are located in the nucleus of a neon atom?
  - electrons and positrons
  - electrons and neutrons
  - protons and neutrons**
  - protons and electrons
- Which subatomic particle has a negative charge?
  - proton
  - electron**
  - neutron
  - positron
- Which statement concerning elements is true?
  - Different elements must have different numbers of isotopes.
  - Different elements must have different numbers of neutrons.
  - All atoms of a given element must have the same mass number.
  - All atoms of a given element must have the same atomic number.**
- An experiment in which alpha particles were used to bombard thin sheets of gold foil led to the conclusion that an atom is composed mostly of
  - empty space and has a small, negatively charged nucleus
  - empty space and has a small, positively charged nucleus**
  - a large, dense, positively charged nucleus
  - a large, dense, negatively charged nucleus
- A sample composed only of atoms having the same atomic number is classified as
  - a compound
  - a solution
  - a element**
  - an isomer
- An atom is electrically neutral because the
  - number of protons equals the number of electrons**
  - number of protons equals the number of neutrons
  - ratio of the number of neutrons to the number of electrons is 1:1
  - ratio of the number of neutrons to the number of protons is 2:1
- What is the atomic number of an element that has six protons and eight neutrons?
  - 6**
  - 2
  - 8
  - 14
- The total mass of the protons in an atom of gold-198 is approximately
  - 79 atomic mass units**
  - 119 atomic mass units
  - 198 atomic mass units
  - 277 atomic mass units
- What is the total number of neutrons in an atom of  ${}^7_3\text{Li}$ ?
  - 7
  - 10
  - 3
  - 4**
- Atoms of different isotopes of the same element differ in their total number of
  - electrons
  - neutrons**
  - protons
  - valence electrons
- A neutral atom with 6 electrons and 8 neutrons is an isotope of
  - carbon**
  - silicon
  - nitrogen
  - oxygen
- Atoms of  ${}^{16}\text{O}$ ,  ${}^{17}\text{O}$ , and  ${}^{18}\text{O}$  have the same number of
  - neutrons, but a different number of protons
  - protons, but a different number of neutrons**
  - protons, but a different number of electrons
  - electrons, but a different number of protons
- Which diagram represents the nucleus of an atom of  ${}^{27}_{13}\text{Al}$ ?
  - 
  - 
  - 
  - 
- Which two nuclides are isotopes of the same element?
  - ${}^{20}_{11}\text{Na}$  and  ${}^{20}_{10}\text{Ne}$
  - ${}^{39}_{19}\text{K}$  and  ${}^{40}_{20}\text{Ca}$
  - ${}^{39}_{19}\text{K}$  and  ${}^{42}_{19}\text{K}$
  - ${}^{14}_6\text{C}$  and  ${}^{14}_7\text{N}$

## Do Now Unit 3 Atomic Theory

15. The atomic mass of element  $A$  is 63.6 atomic mass units. The only naturally occurring isotopes of element  $A$  are  $A$ -63 and  $A$ -65. The percent abundances in a naturally occurring sample of element  $A$  are closest to
- A) 31%  $A$ -63 and 69%  $A$ -65  
B) 50%  $A$ -63 and 50%  $A$ -65  
**C) 69%  $A$ -63 and 31%  $A$ -65**  
D) 100%  $A$ -63 and 0%  $A$ -65
16. Compared to an electron in the first electron shell of an atom, an electron in the third shell of the same atom has
- A) less mass                      B) less energy  
C) more mass                      **D) more energy**
17. What is the total number of electrons in the second energy shell of a calcium atom in the ground state?
- A) 6      B) 2      **C) 8**      D) 18
18. Which principal energy level can hold a maximum of 18 electrons?
- A) 5      B) 2      **C) 3**      D) 4
19. Which electron configuration could represent a strontium atom in an excited state?
- A) 2-8-18-7-1                      **B) 2-8-18-7-3**  
C) 2-8-18-8-1                      D) 2-8-18-8-2
20. When compared with the energy of an electron in the first shell of a carbon atom, the energy of an electron in the second shell of a carbon atom is
- A) less                                  **B) greater**  
C) the same
21. During a flame test, ions of a specific metal are heated in the flame of a gas burner. A characteristic color of light is emitted by these ions in the flame when the electrons
- A) gain energy as they return to lower energy levels  
B) gain energy as they move to higher energy levels  
**C) emit energy as they return to lower energy levels**  
D) emit energy as they move to higher energy levels
22. When electrons in an atom in an excited state fall to lower energy levels, energy is
- A) absorbed, only  
**B) released, only**  
C) neither released nor absorbed  
D) both released and absorbed
23. In the modern wave-mechanical model of the atom, the orbitals are regions of the most probable location of
- A) protons                              B) neutrons  
**C) electrons**                              D) positrons
24. What is the total number of protons in the nucleus of an atom of potassium-42?
- A) 15      **B) 19**      C) 39      D) 42

25. Base your answer to the following question on the information below.

The accepted values for the atomic mass and percent natural abundance of each naturally occurring isotope of silicon are given in the data table below.

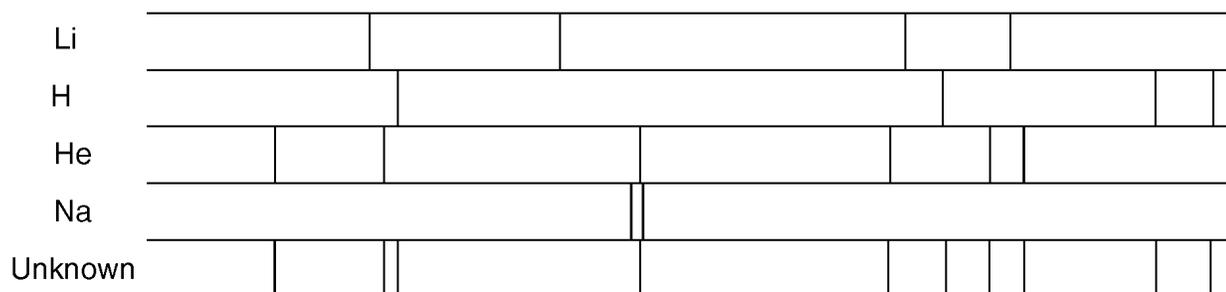
**Naturally Occuring Isotopes of Silicon**

<b>Isotope</b>	<b>Atomic Mass (atomic mass unit)</b>	<b>Percent Natural Abundance (%)</b>
Si – 28	27.98	92.22
Si – 29	28.98	4.69
Si – 30	29.97	3.09

Show a correct numerical setup for calculating the atomic mass of Si.

26. Base your answer to the following question on the diagram below, which shows bright-line spectra of selected elements.

**Bright-Line Spectra**



Explain how a bright-line spectrum is produced, in terms of *excited state*, *energy transitions*, and *ground state*.

27. Base your answer to the following question on the information below.

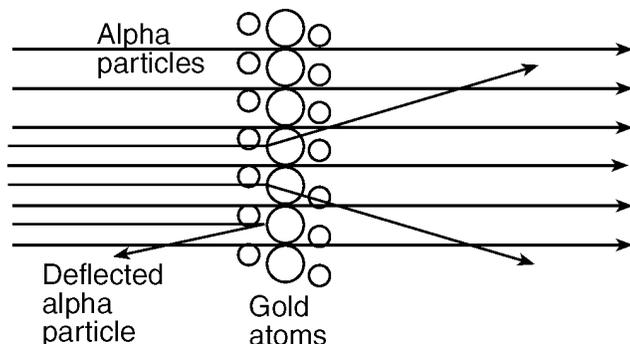
In the modern model of the atom, each atom is composed of three major subatomic (or fundamental) particles.

What is the sign of the net charge of the nucleus?

28. Base your answer to the following question on the information and diagram below.

One model of the atom states that atoms are tiny particles composed of a uniform mixture of positive and negative charges. Scientists conducted an experiment where alpha particles were aimed at a thin layer of gold atoms.

Most of the alpha particles passed directly through the gold atoms. A few alpha particles were deflected from their straight-line paths. An illustration of the experiment is shown below.



How should the original model be revised based on the results of this experiment?

29. Base your answer to the following question on the information below.

An atom has an atomic number of 9, a mass number of 19, and an electron configuration of 2–6–1.

Explain why the number of electrons in the second and third shells show that this atom is in an excited state.

30. In living organisms, the ratio of the naturally occurring isotopes of carbon, C-12 to C-13 to C-14, is fairly consistent. When an organism such as a woolly mammoth died, it stopped taking in carbon, and the amount of C-14 present in the mammoth began to decrease. For example, one fossil of a woolly mammoth is found to have  $1/32$  of the amount of C-14 found in a living organism.

State, in terms of subatomic particles, how an atom of C-13 is different from an atom of C-12.

# Answer Key

## Do Now Unit 3 Atomic Theory

1. C
  2. B
  3. D
  4. B
  5. C
  6. A
  7. A
  8. A
  9. D
  10. B
  11. A
  12. B
  13. B
  14. C
  15. C
  16. D
  17. C
  18. C
  19. B
  20. B
  21. C
  22. B
  23. C
  24. B
  25.  $(27.98)(0.9222) + (28.98)(0.0469) + (29.97)(0.0309)$
  26. Examples: –Excited state to ground state releases energy.  
–energy released — excited to ground  
–An electron absorbs energy and moves to a higher shell (energy level). As the electron returns to a lower shell (energy level), it releases energy in the form of a bright-line spectrum.
  27. positive or (+)
  28. Examples:  
– The atom has a positively charged nucleus; negative electrons surround the outside.  
– The positive charges are in the nucleus; electrons are not mixed in the nucleus.  
– nucleus smaller than atom
  29. *Examples:* – The third shell has one electron before the second shell is completely filled – The electron configuration is not 2-7, which is the ground state for an atom with atomic number 9
  30. A C-13 atom has seven neutrons and a C-12 atom has six neutrons.
-