

1) Given a list of atomic model descriptions:

- A*: electron shells outside a central nucleus  
*B*: hard, indivisible sphere  
*C*: mostly empty space

Which list of atomic model descriptions represents the order of historical development from the earliest to most recent?

- 1) *A, B, C*                      3) *B, C, A*  
 2) *A, C, B*                      4) *B, A, C*

2) An element that consists of 7 protons, 9 neutrons, and 5 electrons has a net charge of

- 1) 2-    2) 2+    3) 3+    4) 3-

3) Which statement correctly describes the charge of the nucleus and the charge of the electron cloud of an atom?

- 1) The nucleus is positive and the electron cloud is positive.  
 2) The nucleus is positive and the electron cloud is negative.  
 3) The nucleus is negative and the electron cloud is positive.  
 4) The nucleus is negative and the electron cloud is negative.

4) According to the wave-mechanical model of the atom, electrons are located in

- 1) orbitals  
 2) circular paths  
 3) a small, dense nucleus  
 4) a hard, indivisible sphere

5) In all atoms of bismuth, the number of electrons must equal the

- 1) number of protons  
 2) number of neutrons  
 3) sum of the number of neutrons and protons  
 4) difference between the number of neutrons and protons

6) Compared to the charge of a proton, the charge of an electron has

- 1) a greater magnitude and the same sign  
 2) a greater magnitude and the opposite sign  
 3) the same magnitude and the same sign  
 4) the same magnitude and the opposite sign

7) The mass of an electron is

- 1) equal to the mass of a proton  
 2) equal to the mass of a neutron  
 3) greater than the mass of a proton  
 4) less than the mass of a neutron

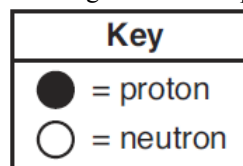
8) Which particles have approximately the same mass?

- 1) an electron and an alpha particle  
 2) an electron and a proton  
 3) a neutron and an alpha particle  
 4) a neutron and a proton

9) The part of an atom that has an overall positive charge is called

- 1) an electron                      3) the first shell  
 2) the nucleus                      4) the valence shell

10) The diagram below represents the nucleus of an atom.



What are the atomic number and mass number of this atom?

- 1) The atomic number is 9 and the mass number is 19.  
 2) The atomic number is 9 and the mass number is 20.  
 3) The atomic number is 11 and the mass number is 19.  
 4) The atomic number is 11 and the mass number is 20.

11) Subatomic particles can usually pass undeflected through an atom because the volume of an atom is composed of

- 1) an uncharged nucleus  
 2) largely empty space  
 3) neutrons  
 4) protons

12) Experiments with gold foil indicated that atoms

- 1) usually have a uniform distribution of positive charges  
 2) usually have a uniform distribution of negative charges  
 3) contain a positively charged, dense center  
 4) contain a negatively charged, dense center

13) The gold foil experiment led to the conclusion that each atom in the foil was composed mostly of empty space because most alpha particles directed at the foil

- 1) passed through the foil  
 2) remained trapped in the foil  
 3) were deflected by the nuclei in gold atoms  
 4) were deflected by the electrons in gold atoms

14) What is the total charge of the nucleus of a nitrogen atom?

- 1) -3    2) 0    3) +5    4) +7

- 15) All phosphorus atoms have the same
- 1) atomic number
  - 2) mass number
  - 3) number of neutrons plus the number of electrons
  - 4) number of neutrons plus the number of protons
- 16) The notation for the nuclide  ${}^{137}_{55}\text{Cs}$  gives information about
- 1) mass number, only
  - 2) atomic number, only
  - 3) both mass number and atomic number
  - 4) neither mass number nor atomic number
- 17) Which quantity can vary among atoms of the same element?
- 1) mass number
  - 2) atomic number
  - 3) number of protons
  - 4) numbers of electrons
- 18) In which list are the elements arranged in order of increasing atomic mass?
- 1) Cl, K, Ar
  - 2) Fe, Co, Ni
  - 3) Te, I, Xe
  - 4) Ne, F, Na
- 19) An atom of helium-4 differs from an atom of lithium-7 in that the atom of helium-4 has
- 1) one more proton
  - 2) one more neutron
  - 3) two less protons
  - 4) two less neutrons
- 20) The table below gives information about the nucleus of each of four atoms.

**Nuclei of Four Atoms**

Atom	Number of Protons	Number of Neutrons
A	6	6
D	6	7
E	7	7
G	7	8

How many different elements are represented by the nuclei in the table?

- 1) 1
- 2) 2
- 3) 3
- 4) 4

- 21) The stability of an isotope is related to its ratio of
- 1) neutrons to positrons
  - 2) neutrons to protons
  - 3) electrons to positrons
  - 4) electrons to protons
- 22) Which notations represent different isotopes of the element sodium?
- 1)  ${}^{32}\text{S}$  and  ${}^{34}\text{S}$
  - 2)  $\text{S}^{2-}$  and  $\text{S}^{6+}$
  - 3)  $\text{Na}^+$  and  $\text{Na}^0$
  - 4)  ${}^{22}\text{Na}$  and  ${}^{23}\text{Na}$

- 23) If two atoms are isotopes of the same element, the atoms must have
- 1) the same number of protons and the same number of neutrons
  - 2) the same number of protons and a different number of neutrons
  - 3) a different number of protons and the same number of neutrons
  - 4) a different number of protons and a different number of neutrons
- 24) The most common isotope of chromium has a mass number of 52. Which notation represents a different isotope of chromium?
- 1)  ${}^{52}_{24}\text{Cr}$
  - 2)  ${}^{54}_{24}\text{Cr}$
  - 3)  ${}^{24}_{52}\text{Cr}$
  - 4)  ${}^{24}_{54}\text{Cr}$
- 25) Chlorine-37 can be represented as
- 1)  ${}^{17}_{35}\text{Cl}$
  - 2)  ${}^{20}_{37}\text{Cl}$
  - 3)  ${}^{35}_{20}\text{Cl}$
  - 4)  ${}^{37}_{17}\text{Cl}$
- 26) Which two nuclides are isotopes of the same element?
- 1)  ${}^{20}_{11}\text{Na}$  and  ${}^{20}_{10}\text{Ne}$
  - 2)  ${}^{39}_{19}\text{K}$  and  ${}^{40}_{20}\text{Ca}$
  - 3)  ${}^{39}_{19}\text{K}$  and  ${}^{42}_{19}\text{K}$
  - 4)  ${}^{14}_6\text{C}$  and  ${}^{14}_7\text{N}$
- 27) What information is necessary to determine the atomic mass of the element chlorine?
- 1) the atomic mass of each artificially produced isotope of chlorine, only
  - 2) the relative abundance of each naturally occurring isotope of chlorine, only
  - 3) the atomic mass and the relative abundance of each naturally occurring isotope of chlorine
  - 4) the atomic mass and the relative abundance of each naturally occurring and artificially produced isotope of chlorine
- 28) A 100.00-gram sample of naturally occurring boron contains 19.78 grams of boron-10 (atomic mass = 10.01 atomic mass units) and 80.22 grams of boron-11 (atomic mass = 11.01 atomic mass units). Which numerical setup can be used to determine the atomic mass of naturally occurring boron?
- 1)  $(0.1978)(10.01) + (0.8022)(11.01)$
  - 2)  $(0.8022)(10.01) + (0.1978)(11.01)$
  - 3)  $(0.1978)(10.01)/(0.8022)(11.01)$
  - 4)  $(0.8022)(10.01)/(0.1978)(11.01)$
- 29) The average isotopic mass of chlorine is 35.5. Which mixture of isotopes (shown as percents) produces this average mass?
- 1) 50%  ${}^{12}\text{C}$  and 50%  ${}^{13}\text{C}$
  - 2) 50%  ${}^{35}\text{Cl}$  and 50%  ${}^{37}\text{Cl}$
  - 3) 75%  ${}^{35}\text{Cl}$  and 25%  ${}^{37}\text{Cl}$
  - 4) 75%  ${}^{12}\text{C}$  and 25%  ${}^{13}\text{C}$

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- 30) The table below gives the atomic mass and the abundance of the two naturally occurring isotopes of bromine.

**Naturally Occurring Isotopes  
of Bromine**

<b>Isotopes</b>	<b>Atomic Mass (u)</b>	<b>Natural Abundance (%)</b>
Br-79	78.92	50.69
Br-81	80.92	49.31

Which numerical setup can be used to calculate the atomic mass of the element bromine?

- 1)  $(78.92 \text{ u})(50.69) + (80.92 \text{ u})(49.31)$
  - 2)  $(78.92 \text{ u})(49.31) + (80.92 \text{ u})(50.69)$
  - 3)  $(78.92 \text{ u})(0.5069) + (80.92 \text{ u})(0.4931)$
  - 4)  $(78.92 \text{ u})(0.4931) + (80.92 \text{ u})(0.5069)$
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