NAME_____

ATOMIC CONCEPTS REVIEW

____ 1. An atom in the ground state has two electrons in its first shell and six electrons in its second shell. What is the total number of protons in the nucleus of this atom?

A) 5 B) 2 C) 7 D) 8

____ 2. An ion that consists of 7 protons, 6 neutrons, and 10 electrons has a net charge of

A) 4– B) 3– C) 3+ D) 4+

____ 3. What is the number of electrons in an atom that has 3 protons and 4 neutrons?

A) 1 B) 7 C) 3 D) 4

____ 4. A neutron has a charge of

A) +1 B) +2 C) 0 D) –1

____ 5. Which statement compares the masses of two subatomic particles?

A) The mass of an electron is greater than the mass of a proton.
B) The mass of an electron is greater than the mass of a neutron.
C) The mass of a proton is greater than the mass of an electron.
D) The mass of a proton is greater than the mass of a neutron.

____ 6. Which sequence represents a correct order of historical developments leading to the modern model of the atom?

A) the atom is a hard sphere → most of the atom is empty space → electrons exist in orbitals outside the nucleus
B) the atom is a hard sphere → electrons exist in orbitals outside the nucleus → most of the atom is empty space
C) most of the atom is empty space → electrons exist in orbitals outside the nucleus → the atom is a hard sphere
D) most of the atom is empty space → the atom is a hard sphere → electrons exist in orbitals outside the nucleus

____ 7. Which conclusion is based on the "gold foil experiment" and the resulting model of the atom?

A) An atom is mainly empty space, and the nucleus has a positive charge.
B) An atom is mainly empty space, and the nucleus has a negative charge.
C) An atom has hardly any empty space, and the nucleus has a positive charge.
D) An atom has hardly any empty space, and the nucleus has a negative charge.

____ 8. What is the charge of the nucleus of an oxygen atom?

A) 0 B) –2 C) +8 D) +16

____ 9. In an atom of argon-40, the number of protons

A) equals the number of electrons
B) equals the number of neutrons
C) is less than the number of electrons
D) is greater than the number of electrons

____ 10. The total mass of the protons in an atom of gold-198 is approximately

A) 79 atomic mass units
B) 119 atomic mass units
C) 198 atomic mass units
D) 277 atomic mass units

____ 11. The number of neutrons in the nucleus of an atom can be determined by

A) adding the atomic number to the mass number
B) subtracting the atomic number from the mass number
C) adding the mass number to the atomic mass
D) subtracting the mass number from the atomic number

____ 12. What is the total number of neutrons in an atom of $^{7}_{3}Li$?

A) 7 B) 10 C) 3 D) 4

____ 13. An atomic mass unit is defined as exactly

A) $\frac{1}{12}$ the mass of a ^{12}C atom

B) $\frac{1}{14}$ the mass of a ^{14}N atom

C) $\frac{1}{16}$ the mass of a ^{16}O atom

D) $\frac{1}{19}$ the mass of a ^{19}F atom

____ 14. Base your answer to the following question on The total number of protons, electrons, and neutrons in each of four different atoms are shown in the table below.

Subatomic Particles in Four Different Atoms

Atom	Total Number of Protons	Total Number of Electrons	Total Number of Neutrons
A	6	6	7
D	6	6	8
X	7	7	8
Z	8	8	9

Which two atoms are isotopes of the same element?

A) A and D B) A and Z C) X and D D) X and Z

____ 15. The stability of an isotope is based on its

A) number of neutrons, only
B) number of protons, only
C) ratio of neutrons to protons
D) ratio of electrons to protons

____ 16. All the isotopes of a given atom have

A) the same mass number and the same atomic number
B) the same mass number but different atomic numbers
C) different mass numbers but the same atomic number
D) different mass numbers and different atomic numbers

____ 17. Atoms of ^{16}O, ^{17}O, and ^{18}O have the same number of

A) neutrons, but a different number of protons
B) protons, but a different number of neutrons
C) protons, but a different number of electrons
D) electrons, but a different number of protons

18. Which two notations represent different isotopes of the same element?

A) $^{6}_{4}\mathrm{Be}$ and $^{9}_{4}\mathrm{Be}$ B) $^{7}_{3}\mathrm{Li}$ and $^{7}_{3}\mathrm{Li}$ C) $^{14}_{7}\mathrm{N}$ and $^{14}_{6}\mathrm{C}$ D) $^{32}_{15}\mathrm{P}$ and $^{32}_{16}\mathrm{S}$

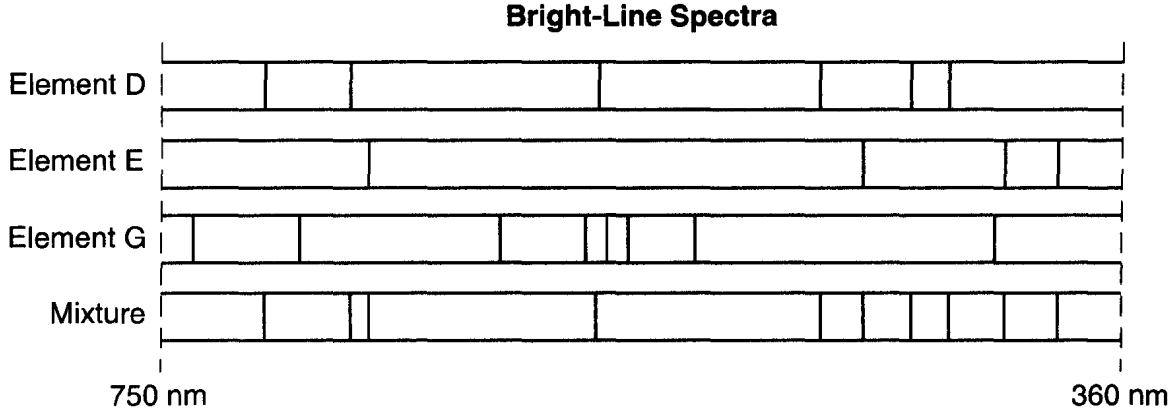
19. The atomic mass of titanium is 47.88 atomic mass units. This atomic mass represents the

A) total mass of all the protons and neutrons in an atom of Ti
B) total mass of all the protons, neutrons, and electrons in an atom of Ti
C) weighted average mass of the most abundant isotope of Ti
D) weighted average mass of all the naturally occurring isotopes of Ti

20. 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?

A) (0.1978)(10.01) + (0.8022)(11.01)
B) (0.8022)(10.01) + (0.1978)(11.01)
C) (0.1978)(10.01)/(0.8022)(11.01)
D) (0.8022)(10.01)/(0.1978)(11.01)

21. Base your answer to the following question on Given the bright-line spectra of three elements and the spectrum of a mixture formed from at least two of these elements:



Which elements are present in this mixture?

A) E and D, only B) E and G, only C) D and G, only D) D, E, and G

22. Which electron configuration represents an excited state for a potassium atom?

A) 2-8-7-1 B) 2-8-7-2
C) 2-8-8-1 D) 2-8-8-2

23. The bright-line spectrum of sodium is produced when energy is

A) absorbed as electrons move from higher to lower electron shells
B) absorbed as electrons move from lower to higher electron shells
C) released as electrons move from higher to lower electron shells
D) released as electrons move from lower to higher electron shells

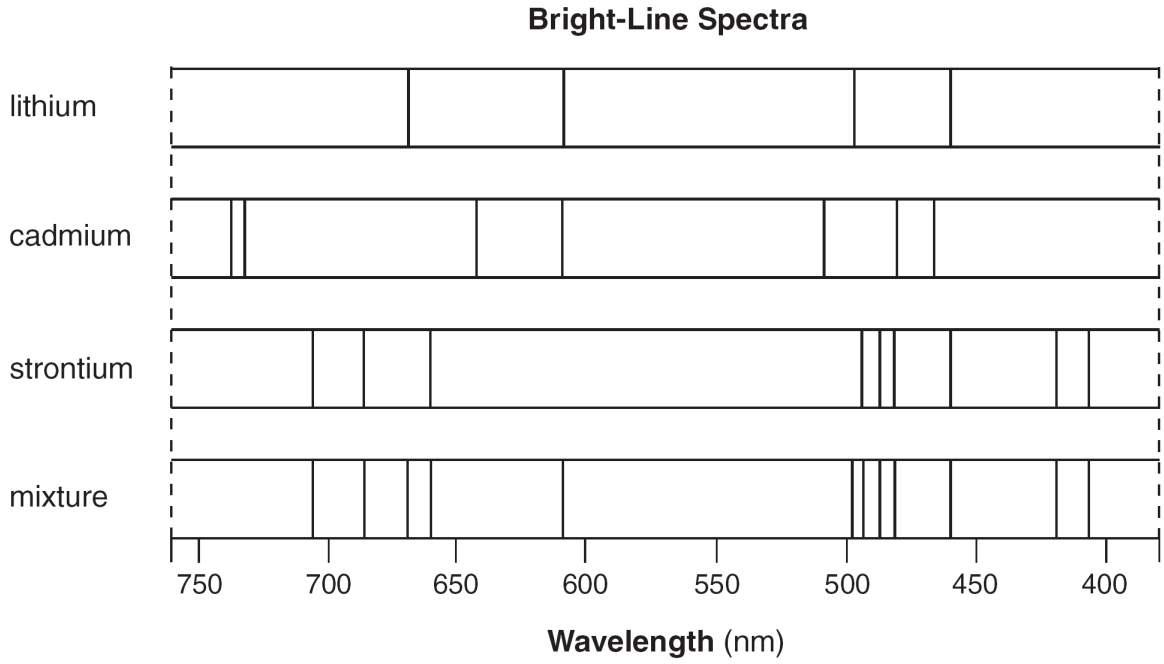
24. In the electron cloud model of the atom, an orbital is defined as the most probable

A) charge of an electron
B) conductivity of an electron
C) location of an electron
D) mass of an electron

25. The wave-mechanical model of the atom is required to explain the

A) mass number and atomic number of an atom
B) organization of atoms in a crystal
C) radioactive nature of some atoms
D) spectra of elements with multielectron atoms

____ 26. Base your answer to the following question on the information below.
The bright-line spectra for three elements and a mixture of elements are shown below.



Explain, in terms of both electrons and energy, how the bright-line spectrum of an element is produced.

____ 27. Explain, in terms of protons and neutrons, why U-235 and U-238 are different isotopes of uranium.

____ 28. Base your answer to the following question on Copper has two naturally occurring isotopes. Information about the two isotopes is shown in the table below.

Naturally Occurring Isotopes of Copper

Isotope	Atomic Mass (atomic mass units, u)	Percent Natural Abundance (%)
Cu-63	62.93	69.17
Cu-65	64.93	30.83

In the space in your answer booklet, show a numerical setup for calculating the atomic mass of copper.

Base your answers to questions **29** and **30** on the information below.

In the gold foil experiment, a thin sheet of gold was bombarded with alpha particles. Almost all the alpha particles passed straight through the foil. Only a few alpha particles were deflected from their original paths.

____ 29. Explain, in terms of charged particles, why some of the alpha particles were deflected.

____ 30. State one conclusion about atomic structure based on the observation that almost all alpha particles passed straight through the foil.