PRACTICE PROBLEMS

1) Which of the following statements about atoms is FALSE?
A) Atoms compose all matter.
B) Atoms are responsible for the sensation of smell.
C) Atoms are the basic building block of nature.
D) An atom is the smallest identifiable unit of an element.
E) All of the above statements are true.

2) Which statement below accurately describes the contributions of Democritus?
A) ancient Greek philosopher who proposed that matter was not continuous
B) created the modern periodic table
C) proposed the modern Atomic Theory
D) discovered the existence of electrons
E) none of the above

3) Which statement below accurately describes the contributions of Dalton?
A) ancient Greek philosopher who proposed that matter was continuous
B) created the modern periodic table
C) proposed the modern Atomic Theory
D) discovered the existence of electrons
E) none of the above

4) Which of the following is NOT part of Dalton's Atomic Theory?
A) Each element is composed of tiny indestructible particles called atoms.
B) All atoms of a given element have the same mass and other properties that distinguish them from the atoms of other elements.
C) Atoms combine in simple, whole-number ratios to form compounds.
D) Most of the atom's mass and all of its positive charge is contained in a small core called the nucleus.
E) All of the above are part of the atomic theory.

5) Which statement below accurately describes the contributions of Thomson?
A) ancient Greek philosopher who proposed that matter was continuous
B) created the modern periodic table
C) proposed the modern Atomic Theory
D) discovered the existence of electrons
E) none of the above

6) Which of the statements about the discovery of electrons is FALSE?
A) Because atoms are neutral, the existence of a negatively charged particle implied there must be a positively charged component of an atom.
B) Thomson proposed that electrons were small particles held within a positively charged sphere.

C) Rutherford proved the plum-pudding model correct.
D) The negatively charged electron is located outside the nucleus.
E) All of the above statements are true.

7) Which statement below is NOT consistent with the nuclear theory of the atom as proposed by Rutherford?
A) Most of the atom's mass and all of its positive charge is contained in a small core called the nucleus.
B) Electrical charge is a fundamental property of protons and electrons in which like charges repel and opposite charges attract.
C) Most of the volume of the atom is empty space occupied by tiny, negatively charged electrons.
D) There are as many electrons outside the nucleus as there are protons inside the nucleus in a neutral atom.
E) All of the above statements are consistent.

8) Which statement reflects the results of Rutherford's gold foil experiments?
A) Almost all of the alpha particles were deflected back in the direction from which they came.
B) Almost all of the alpha particles sputtered gold atoms off of the surface of the foil.
C) Almost all of the alpha particles were deflected while passing through the foil.
D) Almost all of the alpha particles passed directly through the foil.
E) none of the above

9) An atom containing 7 protons, 8 neutrons, and 7 electrons:
A) is charge-neutral.
B) is an ion.
C) is an oxygen atom.
D) cannot exist.
E) none of the above

10) The atomic mass unit is defined as:
A) the mass of the hydrogen atom containing only one proton.
B) the mass of electrons found in a carbon atom containing six protons and neutrons.
C) 1/12 the mass of a carbon atom containing six protons and six neutrons.
D) 1/14 the mass of a nitrogen atom containing 7 protons and 7 neutrons.
E) mass of one carbon atom containing six protons and neutrons.
11) Which of the following elements has an atomic number of 4?
A) H
B) C
C) He
D) Be
E) none of the above

12) How many electrons are in Br⁻?
A) 4
B) 7
C) 34
D) 36
E) none of the above

13) The number of protons in the nucleus of an atom:
A) is called the atomic number.
B) is given the symbol "Z."
C) identifies the atom as a particular element.
D) is the same for all isotopes of an element.
E) all of the above

14) A specific isotope of an element is known to have 15 protons and 16 neutrons. Which symbol would properly represent this isotope?

A) $^{15}_{31}$Ga

B) $^{31}_{15}$P

C) $^{16}_{15}$X

D) $^{31}_{16}$S

E) none of the above

15) A fictional element has two naturally occurring isotopes with the natural abundances shown here:

ISOTOPE	ABUNDANCE
16	50.0%
18	50.0%

Which statement is TRUE for this element?
A) The atomic mass would be 16.
B) The atomic mass would be less than 16.
C) The atomic mass would be 18.
D) The atomic mass would be more than 18.
E) The atomic mass would be 17.

16) A fictional element has two isotopes, each making up 50% of the population. Isotope 1 has a mass of 80.0 amu, Isotope 2 has a mass of 85.0 amu. Calculate the atomic mass of the fictional

element.
A) 82.5 amu
B) 42.5 amu
C) 40 amu
D) 165 amu
E) none of the above

17) A fictional element has two isotopes and an atomic mass of 87.08 amu. If the first isotope is 86 amu and the second isotope has a mass of 90 amu. Which isotope has the greatest natural abundance?
A) 86 amu
B) 90 amu
C) There are equal amounts.
D) Not enough information provided.
E) none of the above

18) A scientist has a sample of an unknown gas. In order to identify the gas, he looks at the spectrum of visible light emitted from it when it is heated. This is shown in the figure. Also shown in the figure are the emission spectra of five pure, gaseous elements. Which of the five elements is the unknown gas?
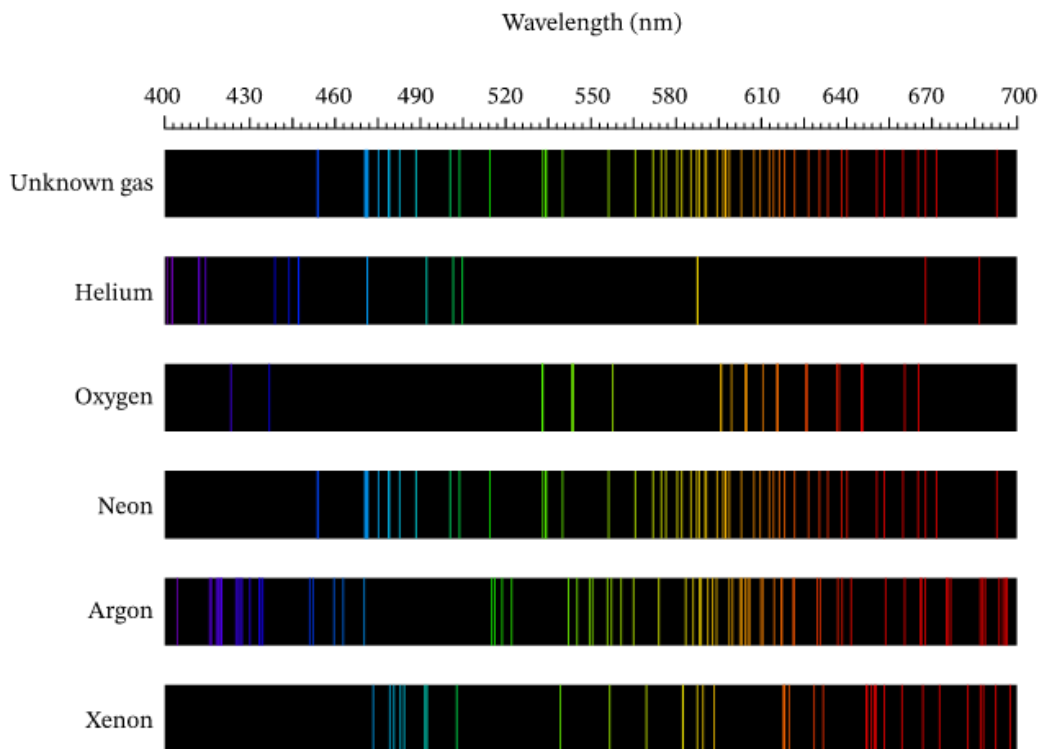
A) He
B) O
C) Ne
D) Ar
E) Xe

19) How much more energy per photon is there in green light of wavelength 532 nm than in red light of wavelength 635 nm? (Ans: 6.1×10^{-20} J *more* energy than a photon of red light)

20) Calculate the de Broglie wavelength of the "particle" in the following two cases:
(a) a 25-g bullet traveling at 612 m/s (Ans: 4.3×10^{-35} m)
(b) an electron ($m = 9.109 \times 10^{-31}$ kg) moving at 63.0 m/s (Ans: 1.16×10^{-5} m)

What does these two wavelengths mean in terms of de Broglie's idea? (Ans: de Broglie's hypothesis is applicable to all matter. However, the wavelength associated with an object of ordinary size, such as a bullet is so tiny and unobservable)

MCQ Answers:

1. E	2. A	3. C	4. D	5. D	6. C
7. B	8. D	9. A	10. C	11. D	12. D
13. E	14. B	15. E	16. A	17. A	18. C