

Multiple Choice – 1 pt. each

- 1) What is the total number of valence electrons in an atom with the electron configuration 2-8-5?
a) 2 b) 5 c) 8 d) 15
- 2) A Ca^{2+} ion differs from a Ca^0 atom in that the Ca^{2+} ion has
a) more electrons b) more protons c) fewer protons d) fewer electrons
- 3) Which particles are referred to as nucleons (subatomic particles located in the nucleus)?
a) protons and neutrons c) neutrons, only
b) protons and electrons d) neutrons and electrons
- 4) What is the mass number of an atom that contains 19 protons, 19 electrons, and 20 neutrons?
a) 39 b) 19 c) 58 d) 20
- 5) What term refers to the region of an atom where an electron is most likely to be found?
a) quantum b) spectrum c) orbital d) orbit
- 6) The nucleus of an atom consists of 8 protons and 6 neutrons. The total number of electrons present in a neutral atom of this element is
a) 6 b) 8 c) 2 d) 14
- 7) What is the maximum number of electrons that can occupy the third principle energy level?
a) 18 b) 8 c) 10 d) 3
- 8) Atoms of ^{16}O , ^{17}O , and ^{18}O have the same number of
a) protons, but a different number of electrons c) protons, but a different number of neutrons
b) electrons, but a different number of protons d) neutrons, but a different number of protons
- 9) All atoms of an element have the same
a) number of neutrons c) atomic number
b) atomic mass d) mass number
- 10) The atomic number is always equal to the total number of
a) neutrons in the nucleus c) neutrons plus protons in the atom
b) protons in the nucleus d) protons plus electrons in the atom
- 11) How many protons are in the nucleus of an atom of beryllium?
a) 2 b) 4 c) 9 d) 5
- 12) Which subatomic particle is negative?
a) proton b) neutron c) electron d) nucleus
- 13) Which of the following particles has the least mass?
a) neutron b) proton c) electron d) hydrogen nucleus
- 14) A sample of element X contains 90% X-35 atoms, 8.0% X-37 atoms, and 2.0% X-38 atoms. The average atomic mass will be closest to which value?
a) 35 b) 36 c) 37 d) 38

- 15) What is the total number of electrons in an Mg^{+2} ion?
a) 10 b) 24 c) 2 d) 12
- 16) Which of the following electron configurations represents an atom in the excited state?
a) 2-8 b) 2-8-1 c) 2-6-1 d) 2-1
- 17) Which principal energy level of an atom contains an electron with the lowest energy?
a) 3 b) 4 c) 1 d) 2
- 18) The atomic mass of an element is defined as the weighted average mass of that element's
a) naturally occurring isotopes c) radioactive isotopes
b) least abundant isotope d) most abundant isotope
- 19) Compared to the entire atom, the nucleus of the atom is
a) smaller and contains most of the atom's mass c) larger and contains most of the atom's mass
b) smaller and contains little of the atom's mass d) larger and contains little of the atom's mass
- 20) What is the nuclear charge in an atom of boron?
a) +11 b) +6 c) +5 d) +12
- 21) What subatomic particle was discovered in the cathode ray tube experiment?
a) proton b) electron c) neutron d) gravitron

Short Answer

22) In 1909, a team of British scientists led by Ernest Rutherford, carried out the Gold Foil Experiment to determine the arrangement of particles in the atom. In this experiment, alpha particles were used to bombard gold foil.

- a) Most of the alpha particles passed through the gold foil undeflected. What conclusion was made about the structure of the atom based on this observation? **(1 pt.)**
- b) A few of the alpha particles were deflected back at the source and toward the screen. What did this observation reveal about the structure of the atom? **(1 pt.)**

23) An element has two isotopes. 90% of the isotopes have a mass number of 20 amu, while 10% have a mass number of 22 amu. Calculate the atomic mass of the element. Show all work with units. **(3 pts.)**

24) Complete the chart below: (9 pts.)

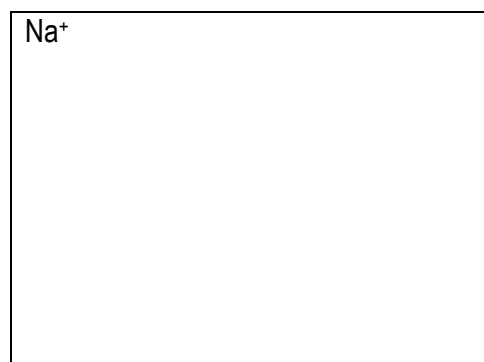
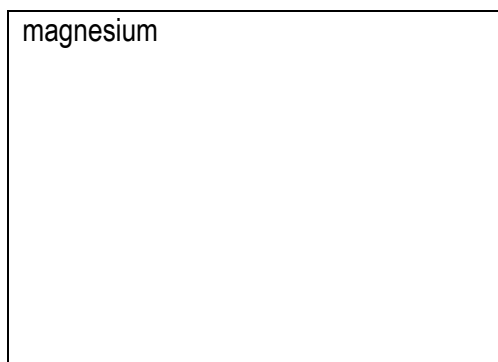
Substance	Atom or Ion?	# protons	# neutrons	# electrons	Atomic #	Mass number
Mg ⁺²						
Rb						
Cl ⁻						

25) What is the electron configuration for a neutral sulfur atom? (1 pt.)

26) What is the electron configuration for S²⁻? (1 pt.)

27) Based on the two given substances in question 25 and 26, how can you tell the difference between an atom and an ion? (2 pts.)

28) Draw **Bohr Diagrams** for the following substances (1 pt. each):



29) What is the total number of valence electrons in an atom of Mg-26 in the ground state? (1 pt.)

30) What is the total number of kernel electrons in an atom of Mg-26 in the ground state? (1 pt.)

31) Write a possible electron configuration that could represent magnesium in the excited state. (1 pt.)

Atomic Theory Exam

Name _____

Answer Key

1. b
2. d
3. a
4. a
5. c
6. b
7. a
8. c
9. c
10. b
11. b
12. c
13. c
14. a
15. a
16. c
17. c
18. a
19. a
20. c
21. b

22. a) Atom is mostly empty space

b.) Dense, positive core

23. 20.2 amu

24.

Substance	Atom or Ion?	# protons	# neutrons	# electrons	Atomic #	Mass number
Mg ⁺²	Ion	12	12	10	12	24
Rb	Atom	37	48	37	37	85
Cl ⁻	Ion	17	18	18	17	35

25. 2-8-6

26. 2-8-8

27. Same number of protons, different number of electrons

28.

29. 2

30. 10

31. Answers will vary. 2-7-3, 2-8-1-1, 1-8-4, etc. First number in configuration can't be greater than 2, second number in configuration can't be greater than 8, last number in configuration can't be greater than 8, total number of electrons must equal 12.