Name _____ Honors Chemistry ___/___/___

Chapter 2 Practice Test

Part I: Match the name on the right with the correct statement on the left. You will use some names more than once. (1 point each)

1. **K** He used math to explain the location and energy of the electrons in an atom.
2. **J** His theory was the basis for putting electrons into energy levels.
3. **K** His model is called the quantum mechanics model.
4. **B** He designed his atomic model after the solar system.
5. **N** He performed the Gold Foil Experiment.
6. **A** He believed that matter is continuous.
7. **D** He is the Father of the Atomic Theory.
8. **N** He discovered the nucleus.
9. **B** His model put electrons into energy levels.
10. **C** He discovered the neutron.
11. **K** His model of the atom is the Electron Cloud Model.
12. **K** He designed a mathematical equation for the model of the atom.
13. **N** He discovered that the atom is mostly empty space.
14. **G** He used a cathode ray tube to make his discovery.
15. **J** He deduced the relationship between the energy and frequency of radiation.
16. **L** He discovered the wave nature of the electron.
17. **M** He determined the charge of the electron.
18. **G** He discovered the electron.
19. **I** He used the term "atomos" to describe an indivisible part at the base of all matter.
20. **G** His model is called the Plum Pudding model.

A. Aristotle
B. Bohr
C. Chadwick
D. Dalton
E. Einstein
F. Stoney
G. Thomson
H. Heisenberg
I. Democritus
J. Planck
K. Schrödinger
L. de Broglie
M. Millikan
N. Rutherford

Part II: Choose the best answer for each question or statement. (2 points each)

21. One of the outermost electrons in a strontium atom in the ground state can be described by which of the following sets of four quantum numbers?
(A) 5, 2, 0, ½ (B) 5, 1, 1, ½ (C) 5, 1, 0, ½ (D) 5, 0, 1, ½ **(E) 5, 0, 0, ½**

22. Which type of radiation continues in a straight line when passed through an electric field?
(A) alpha **(B) gamma** (C) beta (D) proton (E) positron

23. For the types of radiation given, which of the following is the correct order of **increasing** ability to penetrate a piece of lead?
(A) Alpha particles < gamma rays < beta particles **(B) Alpha particles < beta particles < gamma rays**
(C) Beta particles < alpha particles < gamma rays (D) Beta particles < gamma rays < alpha particles
(E) Gamma rays < alpha particles < beta particles

24. Correct statements about alpha particles include which of the following?
I. They have a mass number of 4 and a charge of +2.
II. They are more penetrating than beta particles.
III. They are helium nuclei.
(A) I only (B) III only (C) I and II **(D) I and III** (E) II and III

25. If 87.5 percent of a sample of pure ^{131}I decays in 24 days, what is the half-life of ^{131}I?
(A) 6 days **(B) 8 days** (C) 12 days (D) 14 days (E) 21 days

26. $^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{141}_{55}Cs + 3\,{}^{1}_{0}n + X$
Neutron bombardment of uranium can induce the following reaction represented above. Nuclide X is which of the following?
(A) $^{92}_{35}Br$ (B) $^{94}_{35}Br$ (C) $^{91}_{37}Rb$ **(D)** $^{92}_{37}$**Rb** (E) $^{94}_{37}Rb$

27. Experiments performed to reveal the structure of atoms led scientists to conclude that an atom's
(A) positive charge is evenly distributed throughout its volume
(B) negative charge is mainly concentrated in its nucleus
(C) mass is evenly distributed throughout its volume
(D) volume is mainly unoccupied
(E) positive and negative charges are concentrated in the nucleus

28. What is the maximum number of electrons that occupy the n = 3 level?
(A) 6 (B) 8 (C) 10 **(D) 18** (E) 32

29. Which set of quantum numbers (n, l, ml, ms) is **NOT** permitted by the rules of quantum mechanics?
(A) 1, 0, 0, +½ (B) 2, 1, –1, –½ **(C) 3, 3, 1, –½** (D) 4, 3, 2, +½ (E) 4, 1, -1, +½

30. How many unpaired electrons are in an iron atom in its ground state?
(A) 6 (B) 5 **(C) 4** (D) 2 (E) 0

31. An electron in an atom will emit energy (light) when it moves from energy level:
(A) 2s to 2p (B) 1s to 2s (C) 2p to 3s **(D) 2p to 1s** (E) 3d to 4f

32. How many orbitals in a ground state oxygen atom are completely filled?
(A) 1 (B) 2 **(C) 3** (D) 4 (E) 5

Use these answers for questions 33 - 35.
(A) Wave nature of matter (B) Pauli exclusion principle (C) Hund's rule
(D) Aufbau Principle (E) Heisenberg uncertainty principle

33. **D** Electrons are placed in orbitals, subshells and shells in order of increasing energy.

34. **E** States that the more accurately you know a particle's position, the less accurately you can know its momentum and vice versa.

35. **B** Indicates that no two electrons in an atom may have the same four quantum numbers.

Part III: Write the best answer for each of the following statements. (2 points each)

36. **6** The number of unpaired electrons in chromium.

37. **As** The element whose electron configuration ends in $4p^3$.

38. **50** The maximum number of electrons that can occupy the fifth energy level.

39. **10** The maximum number of electrons that can occupy a single d sub-shell.

40. **2** The number of unpaired electrons in silicon.

Part IV: Fill in all missing information. Assume all atoms are neutral. (0.5 points each)

Isotope	#p	#n	#e-	mass #	atomic #	symbol
Bromine-79	**35**	**44**	**35**	**79**	**35**	**79 Br 35**
Rhodium-103	**45**	**58**	**45**	**103**	**45**	**103 Rh 45**
Strontium-88	**38**	**50**	**38**	**88**	**38**	**88 Sr 38**
Nickel-62	**28**	**34**	**28**	**62**	**28**	**62 Ni 28**
Cerium-136	**58**	**78**	**58**	**136**	**58**	**136 Ce 58**

Part V: Average atomic mass (3 points each)
1. The element gallium is found to contain two naturally occurring isotopes. One isotope, gallium-69, has a mass of 68.9256 and the other, gallium-71, has a mass of 70.9247. Determine the percent abundance of each isotope. Your answer must have **four significant digits**. You must show all work.

Gallium-69 = **60.26%**
Gallium-71 = **39.74%**

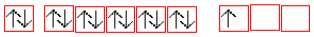
2. Determine the average atomic weight of lead, given the following isotopes, their masses, and their abundances. **Your answer must have five significant digits.** You must show all of your work.

Isotope	Mass (amu)	Abundance %
lead-204	203.9730	1.4
lead-206	205.9744	24.1
lead-207	206.9759	22.1
lead-208	207.9766	52.4

207.22 amu

Part VI: Write electron configurations and orbital diagrams for each of the following. (2 points each)

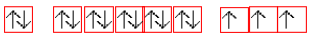
In: **[Kr] $5s^2$ $4d^{10}$ $5p^1$**



La: **[Xe] $6s^2$ $5d^1$**

V: **[Ar] $4s^2$ $3d^3$**

As: **[Ar] $4s^2$ $3d^{10}$ $4p^3$**



Part VII: Write the complete reaction for the following nuclear decays. (2 points each)

- $^{238}_{92}$U produces an alpha particle and two beta particles

$^{238}_{92}\mathbf{U} \rightarrow {}^{4}_{2}\mathbf{He} + {}^{0}_{-1}\mathbf{e} + {}^{0}_{-1}\mathbf{e} + {}^{234}_{92}\mathbf{U}$

- $^{13}_{7}$N produces a positron

$^{13}_{7}\mathbf{N} \rightarrow {}^{0}_{1}\mathbf{e} + {}^{13}_{6}\mathbf{C}$

- $^{210}_{82}$Pb produces two beta particles

$^{210}_{82}\mathbf{Pb} \rightarrow {}^{0}_{-1}\mathbf{e} + {}^{0}_{-1}\mathbf{e} + {}^{210}_{84}\mathbf{Po}$

Part VIII: Half Life (2 points each)

1. Americium- 242 has a half life of 16.0 hours. If I have a 60.0 milligram sample now. How much remains after 80 hours?

1.88 milligrams

2. Iron-59 has a half life of 44.53 days. How much a 25.0 gram sample remains after exactly one year?

0.0850 grams