Atomic Structure

___ 1. What is the total number of electrons in the 2p sublevel of a chlorine atom in the ground state? (1) 6; (2) 2; (3) 3; (4) 5.

___ 2. Which is the electron configuration of an atom in the excited state? (1) $1s^2,2s^1$; (2) $1s^2,2s^2,2p^1$; (3) $1s^2,2s^2,2p^5$; (4) $1s^2,2s^2,2p^2,3s^1$.

___ 3. A Ca (+2) ion differs from a Ca atom in that the Ca (2+) ion has (1) more protons; (2) fewer protons; (3) more electrons; (4) fewer electrons.

___ 4. At the end of 12 days, 1/4 of an original sample of a radioactive element remains. What is the half-life of the element? (1) 24 days; (2) 48 days; (3) 3 days; (4) 6 days.

___ 5. The total number of orbitals in the 4f sublevel is (1) 1; (2) 5; (3) 3; (4) 7.

___ 6. Which electron transition is accompanied by the emission of energy? (1) 1s to 2s; (2) 2s to 2p; (3) 3p to 3s; (4) 3p to 4p.

___ 7. What is the total number of nucleons (protons and neutrons) in an atom of selenium (atomic no.=34, atomic mass= 79)? (1) 34; (2) 45; (3) 79; (4) 113.

___ 8. What is the total number of principal energy levels that are completely filled in an atom of magnesium in the ground state? (1) 1; (2) 2; (3) 3; (4) 4.

___ 9. What is the maximum number of electrons that can occupy the 4d sublevel? (1) 6; (2) 2; (3) 10; (4) 14.

___ 10. Which sublevels are occupied in the outermost principal energy level of an argon atom in the ground state? (1) 3s and 3d; (2) 3s and 3p; (3) 2s and 3p; (4) 2p and 3d.

___ 11. Which electron configuration represents an atom in the excited state? (1) $1s^2,2s^2$; (2) $1s^2,3p^1$; (3) $1s^2,2s^2,2p^5$; (4) $1s^2,2s^2,2p^6$.

___ 12. Which element has an atom in the ground state with the most loosely bound electron? (1) He; (2) As; (3) Xe; (4) Cs.

___ 13. The half-life of C-14 is 5730 years. What fraction of a 1 gram sample of C-14 would remain after 17,190 years? (1) 1/2; (2) 1/4; (3) 1/8; (4) 1/16.

___ 14. Isotopes of an element have a different (1) number of electrons; (2) number of protons; (3) atomic number; (4) mass number.

___ 15. A neutral atom of an element has an electron configuration of 2-8-2. What is the total number of p electrons in this atom? (1) 6; (2) 2; (3) 10; (4) 12.

___ 16. A neutral oxygen atom (O) differs from an oxide ion in that the atom has (1) more electrons; (2) fewer electrons; (3) more protons; (4) fewer protons.

___ 17. Which is the electron configuration of a hydrogen atom with an atomic mass of 3 in the ground state? (1) $1s^1$; (2) $1s^2$; (3) $1s^2,2s^1$; (4) $1s^2,2s^2$.

___ 18. When an electron in an atom of hydrogen moves from the second to the first principal energy level then the result is the emission of (1) a beta particle; (2) an alpha particle; (3) quantized energy; (4) gamma rays.

___ 19. How many occupied sublevels are in an atom of carbon in the ground state? (1) 5; (2) 6; (3) 3; (4) 4.

___ 20. What is the total number of electrons in the 2nd principal energy level of a chlorine atom in the ground state? (1) 5; (2) 7; (3) 8; (4) 17.

___ 21. What is the total number of neutrons in an atom of K, whose mass is 39 and atomic number is 19? (1) 19; (2) 20; (3) 39; (4) 58.

___ 22. What total mass of a 16 gram sample of Co^{60} will remain unchanged after 15.9 years? (Half life = 5.3 years) (1) 1.0 G; (2) 2.0 G; (3) 8.0 G; (4) 4.0 G.

___ 23. The amount of hydrogen chloride that the formula HCl represents is one (1) atom; (2) gram; (3) liter; (4) molecule.

___ 24. The mass number of an atom is equal to the total number of its (1) electrons only; (2) protons only; (3) electrons and protons; (4) protons and neutrons.

___ 25. Which electron configuration represents a neutral atom of nitrogen in an excited state? (1) $1s^2,2s^2,2p^3$; (2) $1s^2,2s^2,2p^4$; (3) $1s^2,2s^1,2p^4$; (4) $1s^2,2s^1,2p^5$.

___ 26. How many orbitals in a sulfur atom in the ground state contain only one electron? (1) 1; (2) 2; (3) 3; (4) 4.

___ 27. How many orbitals are completely filled in an atom of nitrogen in the ground state? (1) 5; (2) 2; (3) 3; (4) 4.

___ 28. Which atom in the ground state has only one unpaired electron in its valence shell? (1) boron; (2) carbon; (3) nitrogen; (4) oxygen.

___ 29. What is the total number of electrons in the 2nd principal energy level of a calcium atom in the ground state? (1) 6; (2) 2; (3) 8; (4) 18.

___ 30. The number of protons in an atom of Cl^{36} is (1) 17; (2) 18; (3) 35; (4) 36.

___ 31. Which is the electron configuration of a noble gas atom in the excited state? (1) $1s^1$; (2) $1s^1,2s^1$; (3) $1s^2,2s^2$; (4) $1s^2,2s^2,2p^2$.

___ 32. When a chlorine atom reacts with a sodium atom to form an ion then the chlorine atom will (1) lose one electron; (2) lose two electrons; (3) gain one electron; (4) gain two electrons.

___ 33. As a substance changes from a liquid to a gas the average distance between molecules (1) decreases; (2) increases; (3) remains the same.

___ 34. An O^{2-} ion has the same electron configuration as (1) S^{2-}; (2) Ca^{2+}; (3) F^{1-}; (4) K.

___ 35. What is the maximum number of electrons that can occupy the third principal energy level? (1) 8; (2) 10; (3) 18; (4) 32.

___ 36. Element X exists in three isotopic forms. The isotopic mixture consists of 10.0% X^{10} 20.0% X^{11} and 70.0% X^{12}. What is the average atomic mass of this element? (1) 11.0; (2) 11.6; (3) 12.0; (4) 12.4.

___ 37. Which electron configuration represents an element having the highest first ionization energy? (1) $1s^1$; (2) $1s^2$; (3) $1s^2,2s^1$; (4) $1s^2,2s^2$.

___ 38. Which represents the correct electron distribution of a transition element in the ground state for the Bohr orbits K-L-M-N? (1) 2-8-8-1; (2) 2-8-8-2; (3) 2-8-18-2; (4) 2-8-18-3.

___ 39. The nucleus of a fluorine atom has a charge of (1) +1; (2) +9; (3) +19; (4) 0.

___ 40. How many sublevels are completely occupied in the second principal energy level of a sodium atom in the ground state? (1) 1; (2) 2; (3) 3; (4) 4.

___ 41. The correct formula for aluminum sulfate is (1) Al_2S_3 ; (2) Al_3S_2 ; (3) $Al_2(SO_4)_3$; (4) $Al_3(SO_4)_2$.

___ 42. An atom of which element in the ground state contains electrons with a principal quantum number (n) of 4? (1) Kr; (2) Ar; (3) Ne; (4) He.

___ 43. What is the total number of neutrons in an atom of Fluorine. Fluorine has an atomic number of 9 and a mass of 19. (1) 9; (2) 10; (3) 19; (4) 28.

___ 44. A Mg^{2+} ion has the same electron configuration as (1) Na; (2) Ar; (3) F^{1-}; (4) Ca^{2+}.

___ 45. A sample of iodine-131 contains 10 grams. Approximately how much iodine-131 will remain after 24 days? (Half life = 8 days) (1) 1.3 G; (2) 2.5 G; (3) 5.0 G; (4) 10 G.

___ 46. The characteristic spectrum of an element is produced when (1) the energy level of the nucleus is increased; (2) electrons drop back to lower energy levels; (3) electrons are raised to higher energy levels; (4) electrons are emitted by an atom.

___ 47. Which of the following sublevels represents the lowest energy level? (1) 4s; (2) 4p; (3) 4d; (4) 4f.

___ 48. What is the maximum number of electrons that can occupy the p sublevel of an atom? (1) 6; (2) 2; (3) 8; (4) 10.

___ 49. Which orbital may contain the valence electrons of a calcium atom? (1) 1s; (2) 2s; (3) 3s; (4) 4s.

___ 50. Which energy level transition represents the greatest absorption of energy? (1) 1s to 3p; (2) 2p to 3s; (3) 3s to 3p; (4) 3s to 4s.

___ 51. As a sulfur atom becomes a sulfide ion the radius (1) decreases; (2) increases; (3) remains the same.

___ 52. What is the number of orbitals that make up any p sublevel? (1) 1; (2) 2; (3) 3; (4) 5.

___ 53. Which particle has a mass of approximately 1 mass unit and a unit positive charge? (1) neutron; (2) proton; (3) electron; (4) alpha particle.

___ 54. When a radioactive nucleus emits a beta particle then the atom's (1) mass number is increased by 1; (2) mass number is decreased by 1; (3) atomic number is increased by 1; (4) atomic number is decreased by 1.

___ 55. The maximum number of electrons in the 3d sublevel is (1) 6; (2) 2; (3) 8; (4) 10.

___ 56. Which two particles have the same electronic configuration? (1) Cl^{1+} and F^{1-}; (2) Cl^{1-} and S^{2-}; (3) Cl^{1-} and Ne; (4) Cl^{1-} and K.

___ 57. Which furnishes evidence that electrons in atoms are in definite energy levels? (1) electronegativities; (2) atomic radii; (3) mass defects; (4) spectral lines.

___ 58. When an atom of chlorine becomes a chloride ion then its size (1) decreases; (2) increases; (3) remains the same.

___ 59. What is the maximum number of electrons that can occupy the second principal energy level? (1) 6; (2) 8; (3) 18; (4) 32.

___ 60. The structure of an alpha particle is the same as a (1) lithium atom; (2) neon atom; (3) hydrogen nucleus; (4) helium nucleus.

___ 61. What is the total number of electrons in a Mg^{2+} ion? (1) 10; (2) 2; (3) 12; (4) 24.

___ 62. Which atom has the strongest attraction for electrons? (1) Cl; (2) F; (3) Br; (4) I.

___ 63. Which species has a negative charge? (1) a lithium ion; (2) an alpha particle; (3) an aluminum ion; (4) a beta particle.

___ 64. Which atom in the ground state has three unpaired electrons in its outermost principal energy level? (1) Li; (2) B; (3) N; (4) Ne.

___ 65. What is the total number of valence electrons in an atom of phosphorus in the ground state? (1) 5; (2) 2; (3) 3; (4) 7.

___ 66. Which particle is electrically neutral? (1) proton; (2) positron; (3) neutron; (4) electron.

___ 67. An atom that contains 35 protons, 45 neutrons, and 35 electrons has an atomic number of (1) 35; (2) 45; (3) 80; (4) 115.

___ 68. An electron has a charge identical to that of (1) a neutron; (2) a proton; (3) an alpha particle; (4) a beta particle.

___ 69. Two isotopes of the same element will have the same number of (1) neutrons and electrons; (2) neutrons and nucleons; (3) protons and nucleons; (4) protons and electrons.

___ 70. What is the number of orbitals in the first principal energy level? (1) 1; (2) 2; (3) 3; (4) 4.

___ 71. The maximum number of sublevels in the second principal energy level is (1) 1;

(2) 2; (3) 3; (4) 4.

___ 72. Which represents the electron configuration of an isotope of oxygen in the ground state? (1) $1s^2,2s^2,2p^1$; (2) $1s^2,2s^2,2p^2$; (3) $1s^2,2s^2,2p^3$; (4) $1s^2,2s^2,2p^4$.

___ 73. Which sample contains the same number of atoms as 24 grams of carbon? (1) 80. G. Ar; (2) 24 G. Mg; (3) 10. G. Ne; (4) 4.0 G. He.

___ 74. Which element requires the least amount of energy to remove its most loosely bound electron? (1) Li; (2) Mg; (3) Ba; (4) Ca.

___ 75. The maximum number of electrons possible in any principal energy level (principal quantum number = n) is equal to (1) n; (2) 2n; (3) n^2; (4) $2n^2$.

___ 76. What is the number of sublevels in the fourth principal energy level? (1) 1; (2) 2; (3) 3; (4) 4.

___ 77. How many neutrons are in the nucleus of an atom that has an atomic number of 17 and a mass number of 35? (1) 17; (2) 18; (3) 35; (4) 52.

___ 78. Which atom has the largest radius? (1) Li; (2) Be; (3) C; (4) F.

___ 79. Isotopes are atoms which have different (1) atomic masses; (2) atomic numbers; (3) atomic radii; (4) electron configurations.

___ 80. When the aluminum atom is in the ground state then how many orbitals contain only one electron? (1) 1; (2) 2; (3) 3; (4) 13.

___ 81. Van der Waals forces will increase when there is a decrease in the (1) number of molecules; (2) size of molecules; (3) distance between molecules; (4) mass of molecules.

___ 82. What is the total charge on an ion that contains 10 electrons, 13 protons, and 15 neutrons? (1) -1; (2) +1; (3) -3; (4) +3.

___ 83. The element whose properties are most similar to those of tellurium is (1) Be; (2) S; (3) O; (4) Po.

___ 84. Which atom has the greatest affinity for an electron? (1) Li; (2) Br; (3) Na; (4) Cl.

___ 85. Which energy level fills after the 4s energy level is filled? (1) 4p; (2) 4d; (3) 3d; (4) 5s.

___ 86. The total number of completely filled orbitals in an atom of nitrogen in the ground state is (1) 1; (2) 2; (3) 3; (4) 5.

___ 87. 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 (1) 6; (2) 2; (3) 8; (4) 14.

___ 88. If the electronegativity difference between the elements in compound NaX is 3.1 then the atom represented by X is (1) F; (2) Cl; (3) Br; (4) I.

___ 89. Potassium forms an ion with a charge of (1) +1 by losing one electron; (2) -1 by

losing one electron; (3) +1 by gaining one electron; (4) -1 by gaining one electron.

___ 90. Which element will form an ion whose ionic radius is larger than its atomic radius? (1) K; (2) F; (3) Li; (4) Mg.

___ 91. The atom of which of the following elements requires the least amount of energy to remove the most loosely bound electrons? (1) lithium; (2) sodium; (3) potassium; (4) rubidium.

___ 92. Which particle has the greatest mass? (1) an alpha particle; (2) a beta particle; (3) an electron; (4) a neutron.

___ 93. Which electron transition results in the emission of energy? (1) 2s to 2p; (2) 2p to 3s; (3) 3d to 2p; (4) 3p to 4d.

___ 94. Which radioisotope is used for diagnosing thyroid disorders? (1) Co^{60}; (2) U^{238}; (3) Pb^{206}; (4) I^{131}.

___ 95. Cadmium and boron are commonly used in a nuclear reactor as (1) external shielding; (2) internal shielding; (3) control rods; (4) moderators.

___ 96. A radioactive isotope has a half-life of 10 years. What fraction of the original mass will remain unchanged after 50 years? (1) 1/2; (2) 1/8; (3) 1/16; (4) 1/32.

___ 97. Which emission from a radioactive source is not affected by an electric field? (1) alpha particles; (2) beta particles; (3) positrons; (4) gamma rays.

___ 98. From which sublevel or sublevels can an atom of Fe lose electrons when forming the Fe^{3+} ion? (1) the 4d, only; (2) the 3p, only; (3) both the 3d and 4s; (4) both the 3s and 4d.

___ 99. As an atom in the excited state returns to the ground state then the energy of the atom (1) decreases; (2) increases; (3) remains the same.

___ 100. If n represents the principal energy level then the maximum number of electrons possible in that principal energy level is equal to (1) n; (2) 2n; (3) n^2; (4) $2n^2$.

___ 101. Which of the following particles has the least mass? (1) alpha particle; (2) beta particle; (3) proton; (4) neutron.

___ 102. The element in Period 2 with the highest first ionization energy is (1) a noble gas; (2) a halogen; (3) an alkali metal; (4) an alkaline earth metal.

___ 103. The greatest absorption of energy occurs as an electron moves from (1) 1s to 3s; (2) 3p to 3s; (3) 4d to 4s; (4) 4s to 3p.

___ 104. Which particle has a negative charge? (1) alpha particle; (2) beta particle; (3) proton; (4) neutron.

___ 105. The amount of energy required to remove the most loosely bound electron from an atom in the gaseous phase is called (1) kinetic energy; (2) potential energy; (3) ionization energy; (4) electron affinity.

___ 106. What is the total number of electrons in an atom with an atomic number of 13 and

a mass number of 27? (1) 13; (2) 14; (3) 27; (4) 40.

___ 107. Which atom in the ground state contains only one orbital that is partially occupied? (1) Si; (2) Ne; (3) Ca; (4) Na.

___ 108. What is the maximum number of sublevels in the third principal energy level? (1) 1; (2) 2; (3) 3; (4) 4.

___ 109. The number of valence electrons in an atom with an electron configuration $1s^2,2s^2,2p^6,3s^2,3p^4$ is (1) 6; (2) 2; (3) 16; (4) 4.

___ 110. Which two particles have approximately the same mass? (1) neutron and electron; (2) neutron and deuteron; (3) proton and neutron; (4) proton and electron.

___ 111. The element with atomic number 10 has an electron configuration that is the same as (1) Na; (2) Na^{1+}; (3) Cl; (4) Cl^{1-}.

___ 112. During which process would the ratio of U^{238} to Pb^{206} be used? (1) diagnosing thyroid disorders; (2) dating geologic formations; (3) detecting brain tumors; (4) treating cancer patients.

___ 113. Which substance may be used as both the coolant and moderator in a reactor? (1) boron; (2) cadmium; (3) heavy water; (4) solid graphite.

___ 114. An isotope of which element may be used as a fuel in a fission reaction? (1) hydrogen; (2) carbon; (3) lithium; (4) plutonium.

___ 115. Which 1 mole sample of atoms requires the least energy to form a mole of positive ions? (1) Ge; (2) Ca; (3) Ga; (4) K.

___ 116. The atomic number of an atom is always equal to the total number of (1) neutrons in the nucleus; (2) protons in the nucleus; (3) neutrons plus protons in the atom; (4) protons plus electrons in the atom.

___ 117. Which electron configuration represents an atom in the excited state? (1) $1s^2,2s^2,2p^6,3p^1$; (2) $1s^2,2s^2,2p^6,3s^2,3p^1$; (3) $1s^2,2s^2,2p^6,3s^2,3p^2$; (4) $1s^2,2s^2,2p^6,3s^2$.

___ 118. Which principal energy level can hold a maximum of 18 electrons? (1) 5; (2) 2; (3) 3; (4) 4.

___ 119. The total number of d orbitals in the third principal energy level is (1) 1; (2) 5; (3) 3; (4) 7.

___ 120. What is the number of hours required for K^{42} to undergo 3 half-life periods (halflife=12.4 hrs)? (1) 6.2 hours; (2) 12.4 hours; (3) 24.8 hours; (4) 37.2 hours.

___ 121. Usually the term "kernal" includes all parts of the atom except the (1) neutrons; (2) protons; (3) valence electrons; (4) orbital electrons.

___ 122. Which nuclear emission moving through an electric field would be deflected toward the positive electrode? (1) alpha particle; (2) beta particle; (3) gamma radiation; (4) proton.

___ 123. What is the electron configuration for Be^{2+} ions? (1) $1s^1$; (2) $1s^2$; (3) $1s^2,2s^1$;

(4) $1s^2,2s^2$.

___ 124. Which particle can not be accelerated by the electric or magnetic fields in a particle accelerator? (1) neutron; (2) proton; (3) alpha particle; (4) beta particle.

Name:_____

Atomic Theory Test 3.1

Multiple Choice

___ 1. What is the total number of electrons in the 2p sublevel of a chlorine atom in the ground state? (1) 6; (2) 2; (3) 3; (4) 5.

___ 2. Rutherford's model of the atom postulated the existence of (1) neutrons; (2) protons; (3) electron orbits; (4) all of the above; (5) all of the above except 3.

___ 3. Bohr's model of the atom was based, in part, on which of the following experiments? (1) the deflection of cathode rays by an electric field; (2) the deflection of cathode rays by a magnetic field; (3) atomic spectra of hydrogen; (4) scattering of alpha particles.

___ 4. Which is the electron configuration of an atom in the excited state? (1) $1s^2, 2s^1$; (2) $1s^2, 2s^2, 2p^1$; (3) $1s^2, 2s^2, 2p^5$; (4) $1s^2, 2s^2, 2p^2, 3s^1$; (5) none of the above.

___ 5. The quantum theory of light states that (1) light is composed of discrete particles called photons; (2) light is composed of discrete particles called protons; (3) light is composed of electromagnetic radiation and travels as waves; (4) light is neither waves nor particles.

___ 6. The atomic number of an element is (1) equal to the number of isotopes of that element; (2) is equal to the number of protons in the nucleus of an atom of that element; (3) is equal to the number of neutrons in the nucleus of an atom of that element; (4) is equal to the number of particles that can be found in the nucleus of an atom of that element.

___ 7. What element would professor Erbie Terbium be working with in an experiment if that element had an atomic mass number of 72 and an atomic number of 32? (1) Ge; (2) Ca; (3) O; (4) S; (5) none of the above.

___ 8. An analysis was carried out on an unknown element by Snoopy and Linus. They found that the element reacted with hot water to form a basic solution which turned phenolphthalein red. It was also determined that the element could be represented by the electron dot symbol X⁝ . Which of the following is most likely the element? (1) K; (2) Mg; (3) Al; (4) Si.

___ 9. How many neutrons are in the nucleus of an atom of $^{190}_{76}Os$? (1)76; (2) 190; (3) 266; (4) 114; (5) none of the above.

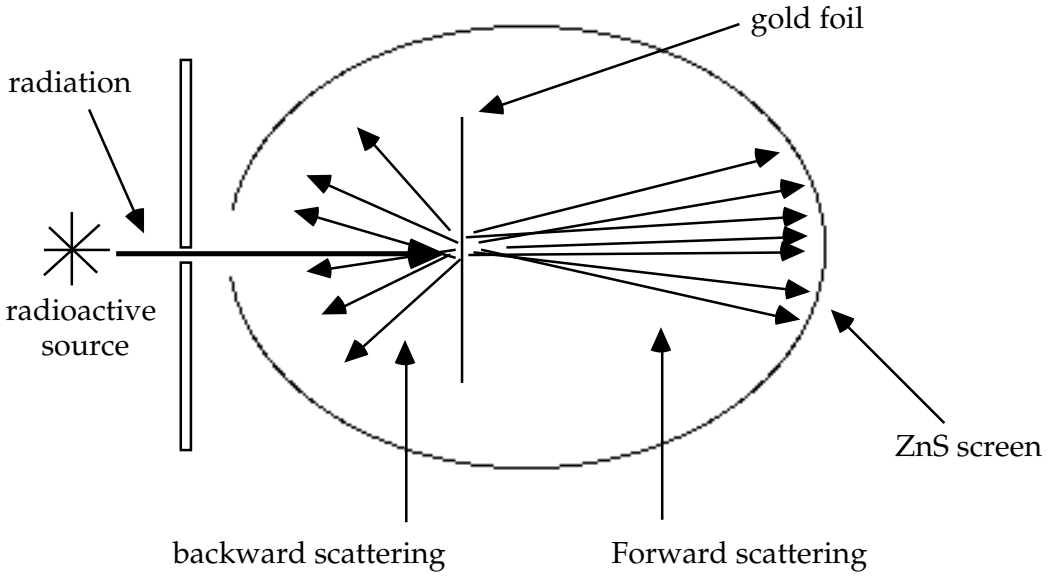
___ 10. Which of the following best describes the nature of light? (1) it has properties of waves only; (2) it has properties of particles only; (3) it has properties of waves and particles; (4) it has properties of wave propagated anti-bosons.

___ 11. Four radio stations operate on frequencies of 800 kHz, 600 kHz, 1270 kHz, and 1350 kHz. Which radio station is broadcasting at the highest energy photons? (1) 800kHz; (2) 600kHz; (3) 1270kHz; (4) 1350 kHz.

___ 12. How many s orbitals can exist in the 3rd. energy level? (1) 1; (2) 2; (3) 3; (4) 4; (5) 5; (1,2) 6;

(1,3) 7; (1,4) 0.

___ 13. A sketch of Rutherford's equipment setup and observations is reproduced below. Which observation let him to conclude that the atom contained a nucleus?



(1) backward scattering only; (2) forward scattering only; (3) both forward and backward scattering

___ 14. Which of the following suggested that Thompson's model of the atom was not quite correct? (1) atomic absorption spectra; (2) decay of radioactive atoms; (3) the deflection of cathode rays in an electric field; (4) the scattering of alpha particles.

___ 15. Which of the following led Thompson to conclude that the atom contained negative particles. (1) the deflection of cathode rays by an electric field; (2) scattering of alpha particles; (3) atomic absorption spectra; (4) none of the above since Thompson did not discover negative particles in the atom.

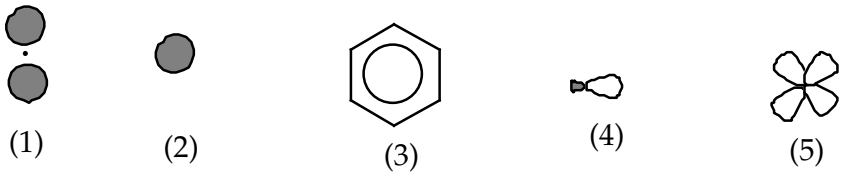
___ 16. Sally Sue was working with an unknown element that was known to have the following electron dot notation: $\cdot\dot{\underset{\cdot}{\underset{\cdot}{X}}}\cdot$. Which of the following elements could it be? (1) H; (2) K; (3) Ca; (4) Al; (5) N; (1,2) S; (1,3) none of the above.

___ 17. Which of the following is not part of Rutherfords model of the atom? (1) the atom contained a dense nucleus; (2) the nucleus contain all positive material (protons); (3) the nucleus containd proton-electron pairs (neutrons); (4) the electrons orbited the nucleus in p-type orbitals; (5) the diameter of the nucleus was 1 X 10^{-12} cM; (1,2) the number of protons equals the number of electrons.

___ 18. Which of the following has a charge of +2? (1) electron; (2) neutron; (3) photon; (4) proton; (5) alpha particle.

___ 19. Who was responsible for the discovery of the wave property of the electron? (1) Dalton; (2) Thompson; (3) Rutherford; (4) Bohr; (5) Summerfeld; (1,2) deBroglie; (1,3) Schrodiger; (1,4) Dirak.

___ 20. Which of the following best represents a p orbital?

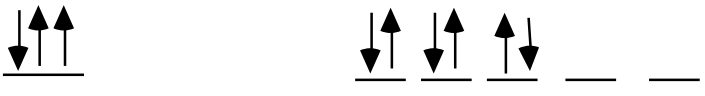


(1) (2) (3) (4) (5)

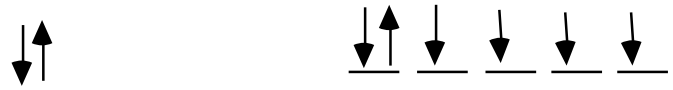
___ 21. Which of the following gives the correct electronic configuration for the element iron? (1) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^6$; (2) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^8$; (3) $1s^2, 2s^2, 2p^6, 2d^{10}, 3s^2, 3p^2$; (4) $1s^2, 2s^2, 2p^4, 3s^2, 3p^4, 4s^2, 3d^{10}$; (5) none of the above.

___ 22. Which of the following gives the correct electronic configuration for the element sulfur? (1) $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$; (2) $1s^2, 2s^2, 2p^6, 2d^4$; (3) $1s^2, 2s^2, 3s^2, 3p^4$; (4) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^8$; (5) none of the above.

___ 23. Which of the following best describes the orbital notation for the last two sublevels being filled for the element iron?

(1) 

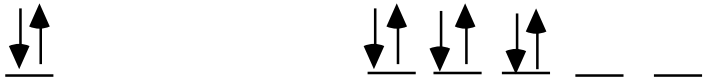
s^3 d^6

(2) 

s^2 d^6

(3) 

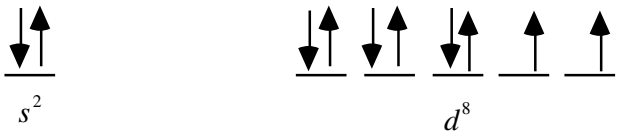
p^6 s^3

(4) 

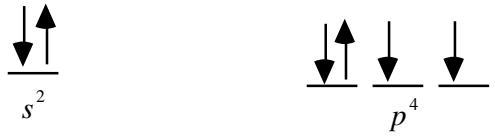
s^2 d^6

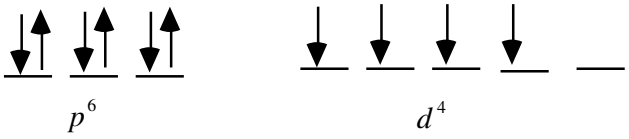
(5) none of the above

___ 24. Which of the following best describes the orbital notation for the last two sublevels being filled for the element sulfur?

(1) 

(2) 

(3) 

(4) 

(5) none of the above

___ 25. Which of the following gives the correct dot notation for iron?

(1) Fe• (2) Fe: (3) Fe: (4) Fe:

(5) •Fe: (1,2) :Fe• (1,3) :Fe• (1,4) :Fe:

___ 26. Which of the following gives the correct dot notation for sulfur?

(1) S• (2) S: (3) S: (4) •S:

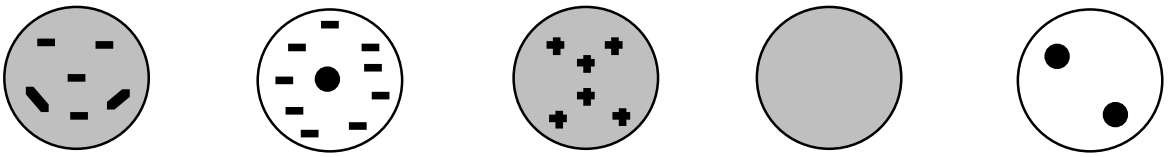
(5) •S: (1,2) :S• (1,3) :S• (1,4) :S:

___ 27. Three sets of observations were presented in class that indicated that Bohr's model of the atom was not quite correct. One of these was the order that the electrons filled the orbits in Bohr's model. Which element is the first one to have an electronic configuration that is inconsistent with what is predicted by Bohr's model of the atom? (1) S; (2) Cl; (3) Ar; (4) K; (5) Ca; (1,2) Sc; (1,3) none of the above.

___ 28. The splitting of the spectral lines under various conditions was damaging to which of the following theories? (1) Thompson's; (2) Rutherford's; (3) Bohr's; (4) Quantum model; (5) Heisenberg's.

___ 29. Under the Quantum model of the atom, the "attributes" of an electron is described by four quantum numbers. Which quantum number describes the major energy level that the electron will be found in? (1) Principle; (2) Secondary or Azimuthal; (3) Magnetic; (4) Spin; (5) Nuclear; (1,2) none of the above.

___ 30. Which of the following models best describes the picture of the atom as it existed around 1900, after the work of Thompson?



(1) (2) (3) (4) (5)

___ 31. Which of the answers in question 30 best represents the model of the atom around 1913, after Rutherford's famous experiments?

___ 32. In what energy level should we first see g orbitals? (1) 1; (2) 2; (3) 3; (4) 4; (5) 5; (1,2) 6; (1,3) 7.

<u>One step beyond (extra credit)</u>

___ 33. The Pauli exclusion principle states that no two electrons in an atom can not have the same set of quantum numbers. This principle coupled with the fact that the universe was created with only two spins limits the number of electrons per orbital to two. However, if the universe had been created with three spins, the shape of the periodic chart would have been very different. Assuming all other factors remain unchanged, how many elements would be in the second period (second row) of the periodic chart in a universe with three spins? (1) 14; (2) 12;(3) 10; (4) 8; (5) 6; (1,2) 4 ; (1,3) 2; (1,4) none of the above.

___ 34. P-type orbitals are allowed in all energy levels except the first energy level. Which element would be the first inert element in a universe that allowed p-type orbitals in all energy levels? (1) Mg; (2) Na; (3) F; (4) O; (5) N; (1,2) B; (1,3) C; (1,4) Be; (1,5) Li; (2,3) Ne; (2,4) He; (2,5) H.

<u>Extra Credit</u>

Ronald Reagon's campaign plea

Name:_____

Atomic Theory, test#3

1. Bohr's model of the atom is a good model and is still used extensively in science when the more sophisticated Quantum model is not needed. However, three sets of experimental observations were presented in class which indicate that Bohr's model of the atom is lacking. List these observations and explain why they indicate that Bohr's model of the atom is not correct.
   (1)

   (2)

   (3)

2 Give the electronic configuration for each of the following:

   a) $_{27}Fe^{59}$:

   b) $_{66}Dy^{162}$:

3. What is meant by the term isoelectric (isoelectronic)? Give an example of isoelectric species?

4. An electron in the third energy level could have any one of eighteen different sets of quantum numbers, 10 sets where l=2. Give all sets of quantum numbers that have l=2. (As an example of what is wanted here all quantum numbers sets for l=0 are given.)

	n	l	m	s
	3	0	0	+1/2
	3	0	0	-1/2
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____

5. Which of the following sets of elements are the largest?

a) Si, P, S; b) Si, Ge, Sn c) Sn, Ge, Si, P, S, Cl

6. To what energy level would the electron in the hydrogen ion have to move to so that the hydrogen atom would have a size of 1 mM.

7. Calculate the energy change that would result from an electron in a Li atom changing from n=5 to n=2? Would the wavelength of light associated with this change be visible? (Note: the visible spectrum ranges from about380 nM to 760 nM.) Would energy be absorbed by this change or emitted? (You may assume that the equations developed by Bohr for hydrogen hold for lithium.)

   Absorbed or Emitted (circle one)

   Energy Change Calculations:

   Wavelength Calculations

<u>One step beyond (Extra Credit)</u>

How much energy would be needed to cause the hydrogen atom to assume the size referenced in question 6?

<u>Twlight Zone (Extra Credit)</u>

An unknown element was analyzed to determine its identity. From the data below determine the identity of this element. If the data is inconclusive give the possibilities of the element.

1. The ion X^{2+} a was found to have no unparied electrons
2. The ion X^{32} was found to have two unpaired electrons.
3. The element was representative, a weak conductor of electricity, and had a metallic luster.