

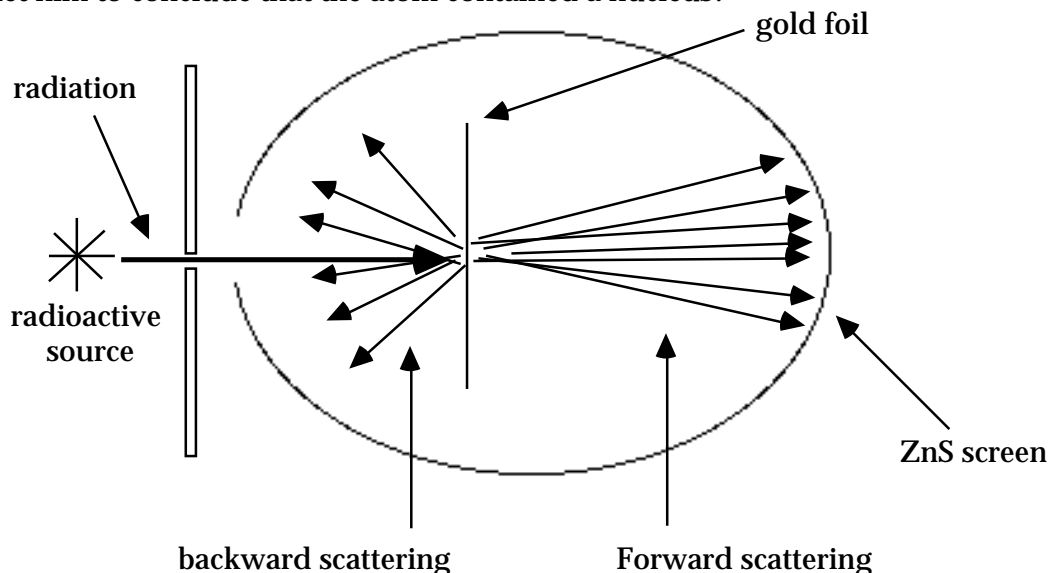
Atomic Theory Test 3.1

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 Terbiium 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^{\dagger} . 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 $^{190}_{76}\text{Os}$? (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;

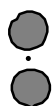
(1,3) 7; (1,4) 0.

- ___ 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: $\cdot \ddot{X} \cdot$. 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 Rutherford's model of the atom? (1) the atom contained a dense nucleus; (2) the nucleus contain all positive material (protons); (3) the nucleus contained proton-electron pairs (neutrons); (4) the electrons orbited the nucleus in p-type orbitals; (5) the diameter of the nucleus was 1×10^{-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) Sommerfeld; (1,2) deBroglie; (1,3) Schrodinger; (1,4) Dirak.

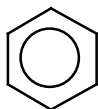
___ 20. Which of the following best represents a p orbital?



(1)



(2)



(3)



(4)

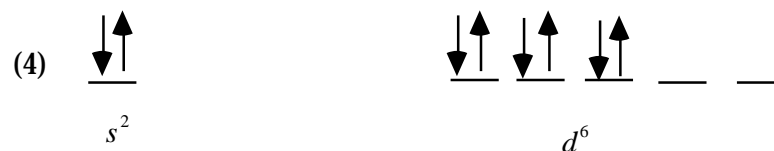


(5)

___ 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.

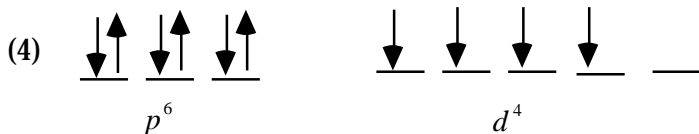
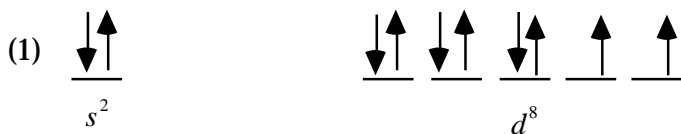
___ 22. Which of the following gives the correct electronic configuration for the element sulfur? (1) $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$; (2) $1s^2, 2s^2, 2p^6, 2d^4$; (3) $1s^2, 2s^2, 3s^2, 3p^4$; (4) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^8$; (5) none of the above.

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



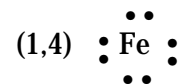
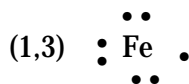
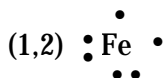
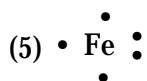
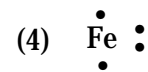
(5) none of the above

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

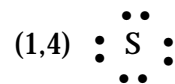
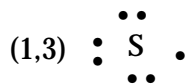
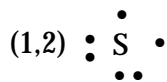
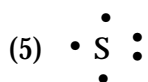


(5) none of the above

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

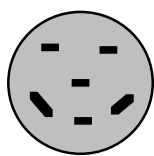


___ 26. Which of the following gives the correct dot notation for sulfur?

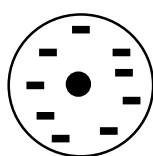


___ 27. Three sets of observations were presented in class that indicated that Bohr's model of the atom was not quite correct. One of these was the order that the electrons filled the orbits in Bohr's model. Which element is the first one to have an electronic configuration that is inconsistent with 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.

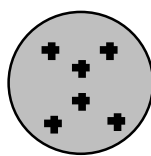
- ___ 28. The splitting of the spectral lines under various conditions was damaging to which of the following theories? (1) Thompson's; (2) Rutherford's; (3) Bohr's; (4) Quantum model; (5) Heisenberg's.
- ___ 29. Under the Quantum model of the atom, the "attributes" of an electron is described by four 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?



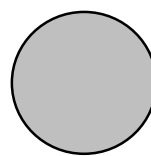
(1)



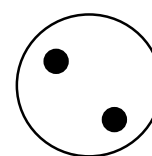
(2)



(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.

One step beyond (extra credit)

- ___ 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.

Extra Credit

Ronald Reagan's campaign plea