

Assignment- Atomic Structure

1. Which orbital is non – directional?
2. What is the meaning of quantization of energy?
3. Why is energy of 1s electron lower than 2s electron?
4. Which quantum number determines- (i) energy of electron, (ii) Orientation of orbitals.
5. What is nodal surface or nodes?
6. How many spherical nodal surfaces are there in 4s – sub-shell?
7. Arrange the electrons represented by the following sets of quantum number in decreasing order of energy-
 - i. $n = 4, l = 0, m = 0, s = +1/2$
 - ii. $n = 3, l = 1, m = 1, s = -1/2$
 - iii. $n = 3, l = 2, m = 0, s = +1/2$
 - iv. $n = 3, l = 0, m = 0, s = -1/2$
8. What designations are given to the orbitals having –
 - (i) $n = 2, l = 1$
 - (ii) $n = 2, l = 0$
 - (iii) $n = 4, l = 3$
 - (iv) $n = 4, l = 2$
 - (v) $n = 4, l = 1$?
9. Calculate the energy required for the process: $\text{He}^+ \rightarrow \text{He}^{2+} + e^-$.
Given, the ionization energy for H-atom in ground state is $2.18 \times 10^{-18} \text{ J.atom}^{-1}$
10. Discuss the drawbacks of- (i) Rutherford model, (ii) Bohr model.
11. Calculate the frequency and energy associated with violet light of wavelength 400 nm.
12. Define the terms frequency wavelength & wave number.
13. Write a note on the Spectral Lines for Atomic Hydrogen.
14. Calculate the wave number for the shortest wavelength transition in the Balmer series of atomic hydrogen.
15. What is the wavelength of light emitted when the electron in a hydrogen atom undergoes transition from $n=4$ to $n=2$?
16. What is meant by quantization of energy?
17. Draw the shapes of p orbitals.
18. The quantized energy of electron in hydrogen atom for the nth energy level is given by $E_n = -1.312/n^2 \times 10^6 \text{ J/mol}$. Calculate the minimum energy required to remove the electron completely from hydrogen atom when its quantized energy level n equals 2. What should be the wavelength of light that can be used to cause this transition? ($h = 6.6 \times 10^{-34} \text{ J.s}$, $C = 3 \times 10^8 \text{ m/s}$)
19. Explain why electronic energy is negative.
20. Calculate the wavelength of an electron moving with a velocity of $2 \times 10^7 \text{ m/s}$.
21. A moving electron has $2.275 \times 10^{-25} \text{ joules}$ of kinetic energy. What is the de Broglie wavelength?
22. Write short notes on: (a) Heisenberg's uncertainty principle, (b) Pauli's Exclusion principle, (c) Hund's rule of maximum multiplicity.
23. Which quantum no. determines (i) energy of an electron, (ii) orientation of orbital?
24. Which shell would be the first to have 'g' sub shell
25. Explain why atoms with half-filled and full-filled orbitals have extra stability. Write down the electronic configuration of: Si(14), Cr (24), Cu(29), Xe (54)
26. Write the electronic configuration of Cu^+ , Ca^{2+} , Ni^{2+} , Cr^{3+} . Also indicate the no. of unpaired electrons present in each case.
27. Write the designation for orbital with the following quantum numbers: a) $n = 4; l = 1$ b) $n = 2; l = 0$ c) $n = 5; l = 2$
28. The pair of ions having same electronic configuration is-
 - (a) Cr^{3+} and Fe^{3+}
 - (b) Fe^{3+} and Mn^{2+}
 - (c) Fe^{3+} and Ni^{2+}
 - (d) Sc^{3+} and Cr^{3+}
29. Which of the following sets of quantum numbers represents the highest energy of an atom?
 - (a) $n=4, l=0, m=0, s = +1/2$
 - (b) $n=3, l = 0, m = 0, s = +1/2$
 - (c) $n = 3, l=1, m=1, s = +1/2$
 - (d) $n=3, l = 2, m=1, s = +1/2$