STRUCTURE OF ATOM

ONE MARK QUESTIONS

1. State Heisenberg's uncertainty principle.
2. What is meant by " Energy of an electron in a hydrogen atom is quantized"?
3. Explain the dual nature of light.
4. Why is the concept of orbit replaced by the concept of orbital?
5. State (n+*l*) rule.
6. Give reason: In the building up of atoms, 4s is filled before 3d
7. Why are half filled and completely filled orbitals more stable?
8. Electronic configuration in Copper is [Ar] $4s^1$, $3d^{10}$ and not [Ar] $4s^2$, $3d^9$
9. With the help of Pauli's exclusion principle and the concept of atomic numbers for orbitals, show that an M shell cannot accommodate more than 18 electrons.
10. Draw the shapes (boundary surfaces) of the following orbitals.

    (i) $2p_y$ (ii) $3d_{x^2-y^2}$

TWO MARKS QUESTIONS

1. Define
   i) Photoelectric effect
   ii) Black body radiation
2. Differentiate
   i) Absorption and Emission spectrum
   ii) Orbit and orbital
3. Which is more stable i) Mn^{2+} or Mn^{3+} ii) Fe^{2+} or Fe^{3+}? Give reason.
4. Among the following pairs of orbitals which orbital will experience the larger effective nuclear charge? (i) 2s and 3s, (ii) 4d and 4f, (iii) 3d and 3p.
5. Based on Bohr Bury rules arrange the following orbital's in the increasing order of energy.
   (i) 5f , 4d , 7s , 7p (ii) 5p , 4d , 5d , 4f , 6s
6. Discuss the similarities and differences (two each) between a 1s and a 2s orbital.
7. a) How many electrons in an atom may have the following quantum number?
   (i) n = 4 m_s = +1/2 (ii) n = 3 , *l* = 0
   b) What are the atomic numbers of elements whose outermost electrons are represented by
   (i) $3s^1$ (ii) $2p^3$ (iii) $3d^6$
8. What are the possible values of *l* and m for a) n=3 b) n=2

9. List the quantum numbers of
   a) unpaired electrons in F , Ni^{2+} b) valence electrons in P , Ca
10. Electrons are emitted with zero velocity from a metal surface when it is exposed to radiation of wavelength 6800A^o.Calculate the threshold frequency and work function of the metal.
11. The speed of an electron moving at 600m/s is measured to an accuracy of 0.005%. What would be the minimum error in determining its position?
12. Calculate the uncertainty in the velocity of a cricket ball if the mass is 150g. Uncertainty in the position is 1 angstrom.

THREE MARKS QUESTIONS

1. i) When would the wavelength associated with an electron be equal to the wavelength associated with a proton?
   ii) Two particles A and B are in motion. If the momentum of A is half of that of B and if the wavelength of A is 4.5 x 10^2 nm, what is the wavelength of B?
2. i) Show that the wavelength related to a 250g ball moving with a speed of 100 m/s is too short to be observed.
   ii) Calculate the speed of an electron if its de Broglie wavelength is twice its displacement in one second.
3. A photon of wavelength 4×10^{-7} m strikes on metal surface, the work function of the metal being 2.13 eV. Calculate
   (i) the energy of the photon (eV),
   (ii) the kinetic energy of the emission, and
   (iii) the velocity of the photoelectron (1 eV= 1.6020×10^{-19}J).
4. Calculate the energy absorbed, frequency and wavelength when an electron with energy 217.9 x 10^{-21} J jumps to an energy level with energy 544.8 x 10^{-20}J.
5. Calculate the energy and radius of the first orbit of He^+ ion.

****