11.1 - Structure of the Atom

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- (1999) State Bohrs postulates of the atomic model.
- (1999) Show that for an electron in a hydrogen atom, the possible radii of an electron orbit are given by:
  - $r_n = a_0 n^2$, $n = 1$, 2 , 3 , ...
- (2000) In the Bohr model of the hydrogen atom, an electron circles the nucleus in an orbit of radius r
  - Explain what keeps the electron in the orbit and why it does not spiral towards the nucleus.
  - What are the assumptions put forward by Bohr about the orbits of the electron in the hydrogen atom?
- (2007) Develop an expression for electrical energy spent in the decomposition of water.
- (2007) In a hydrogen atom model an electron of mass m and charge e rotates about a heavy nucleus of charge e in a circular orbit of radius r . Develop an expression for the angular momentum of the electron in terms of m , e , r , π and ϵ_0- the permitting of free space.
- (2007) The four lowest energy levels in a mercury atom are -10.4 eV, -5.5 eV, -3.7 eV and -1.6 eV.
  - Determine the ionization energy of mercury in joules.
  - Calculate the wavelength of the radiation emitted when an electron jumps from -1.6 eV to -5.5 eV energy levels.
  - What will happen if a mercury atom in its excited state is bombarded with electrons having an energy of 11 eV.
- (2013) Given that Rydbergs constant is approximately 1.1×10^7 m^{-1} Calculate the corresponding range of frequency for emitted radiation in the:
  - Lyman series.
  - Balmer series.
- (2015) Why are the energy levels labelled with negative energies?
- (2016) The first member of the Balmer series of hydrogen spectrum has wavelength of 6563×10^{-10} m. Calculate the wavelength of its second member.

- (2017) Use the Rydberg constant, $R_H = 1.0974 \times 10^7$ m^{-1} to calculate the shortest wavelength of the Balmer series.
- (2017) Use the Bohr's theory for hydrogen atom to determine the:
  - Radius of the first orbit of the hydrogen atom in A units.
  - Velocity of the electron in the first orbit.
- (2017) What is ionization potential of an atom?
- (2017) Show that the ionization potential of hydrogen is 13.6 eV.
- (2017) How can you account for the chemical behavior of atoms on the basis of the atomic electrons and shells?
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- (2018) Given: Mass of proton = 1.0080 u, Mass of neutron = 1.0087 u and Mass of alpha particle = 4.0026 u.
  - State any three limitations of Bohrs model of the hydrogen atom.
- (2018) Why hydrogen spectrum contains a larger number of spectral lines although its atom has only one electron?
- (2018) State any three limitations of Bohrs model of the hydrogen atom.
- (2018) Distinguish between ionization energy and excitation energy.
- (2018) Why hydrogen spectrum contains a larger number of spectral lines although its atom has only one electron?
- (2019) Based on Balmer series of hydrogen spectra determine the wavelength of the series limit of Paschen series.
- (2019) Why hydrogen atom is stable in the ground state?
- (2019) According to Bohrs theory, the angular momentum of an electron is an integral multiple of $h/2\pi$. Express this statement. by using a mathematical equation in which angular momentum is represented by the letter Land orbit by the letter n ,