Q. 1 Bohr's theory of hydrogen atom is based upon several assumptions. Do any of these assumptions contradict classical physics?

Ans. First two postulates contradict classical physics; According to Bohr's 1st postulate, an electron in the allowed orbits does not radiate energy. But according to classical theory, an accelerated electron radiates energy due to its circular motion around the nucleus. Bohr's 2nd postulate states that only those stationary orbits are allowed for which orbital angular momentum is an integral multiple of $h/2\pi$. But in classical theory the idea of continuity of energy is found instead of discreteness.

Q. 2 What is meant by a line spectrum? Explain, how line spectrum can be used for the identification of elements?

Ans. A spectrum, consisted of sharply defined spectral lines emitted from an isolated atom, is called line spectrum. Each line in it represents a transition between two of its energy levels. As the differences between energy levels of the atom do not resemble with those of the atom of any other element, hence it can be used for identification purposes.

Q. 3 Can the electron in the ground state of hydrogen absorb a photon of energy 13.6 eV and greater than 13.6 eV?

Ans. Yes. 13.6 eV is the minimum energy required for ionization of hydrogen atom in its ground state. An electron in the ground state can absorb a photon of energy equal to ionization energy. Any extra amount of energy will become the K.E energy of the escaping electron.

Q. 4 How can the spectrum of hydrogen contain so many lines when hydrogen contains one electron?

Ans. There are infinite energy levels around the nucleus of hydrogen atom. Although hydrogen atom contains one electron but its transition can take place from different energy levels. For each transition the electron will emit a spectral line which will have different energy from other spectral line.

Q. 5 Is energy conserved when an atom emits a photon of light?

Ans. Yes, energy is conserved when an atom emits a photon of light. When an atom is excited, the electron from some external source absorbs the energy. The same energy is emitted in the form of photon when it de-excites.

Q. 6 Explain why a glowing gas gives only certain wavelengths of light and why that gas is capable of absorbing the same wavelengths? Give a reason why it is transparent to other wavelengths?

Ans. The gas can absorb or emit only those wavelengths whose corresponding energies match the difference between any two of its energy levels. So it will not absorb any wavelength whose energy does match with difference between any two of its energy levels. Hence it will be transparent to all other wavelength.

Q. 7 What do you mean when we say that the atom is excited?

Ans. Actually, when electron absorbs energy it goes to the higher energy level. This electron is called as excited electron. Since electron is the part of atom hence we can say that atom is excited.

Q. 8 Can X-rays be reflected, refracted, diffracted and polarized just like any other waves? Explain.

Ans. Yes. They are high energy electromagnetic waves. Since reflection, refraction, diffraction and polarization are wave phenomena. Hence X-rays will reflect, refract, diffract, and polarize just like any other electromagnetic radiation, if suitable conditions are provided.

Q. 9 What are the advantages of lasers over ordinary light?

Ans. The laser light is more intense, monochromatic, unidirectional and coherent. The ordinary light lacks these properties. Hence, a laser beam is more power full than an ordinary light beam.

Q.10 Explain why laser action could not occur without population inversion between atomic levels?

Ans. With out population inversion all the incident photons will used in raising the electrons from their ground states to the metastable states. So there will be no photons for induced emission which is the basis of laser action. Hence laser action will not occur with out population inversion between the atomic levels.