Additional Conceptual Short Questions with Answers

1. The total energy of the hydrogen orbits are negative. Why?

Ans. The negative sign show that the electron is bound to the nucleus by electrostatic force of attraction and that energy must be supplied to detach an electron from the nucleus.

2. Name the different types of emission spectrum:

Ans. These are three kinds of spectra which are:

(1) Continuous spectra, e.g. radiation spectrum of black body.

(2) Band spectra, e.g. molecular spectra.

(3) Line or discrete spectra, e.g. atomic spectra of hydrogen.

3. Calculate the speed of electron in the first orbit of hydrogen atom.

Ans. As expression for speed is

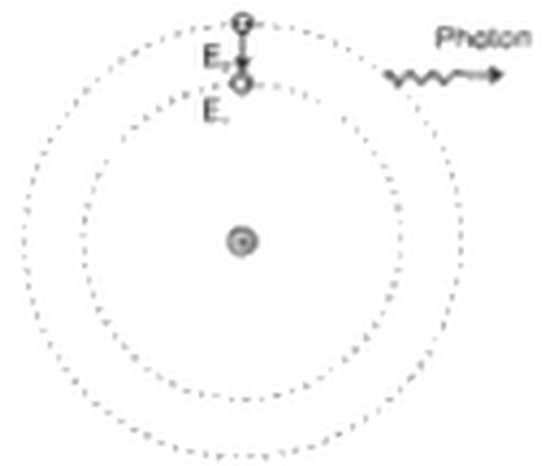
$$V_n = \frac{2\pi K e^2}{nh}$$

As electron lies in the first orbit i.e. n = 1

$$\text{Thus } V_1 = \frac{2\times 3.14\times 9\times 10^{9}\times (1.6\times 10^{-19})^2}{6.63\times 10^{-34}} = 2.18\text{x } 10^{6} ms^{-1}$$

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

Ans. When the atoms of an element are Photon excited by absorbing the energy from incident photons, the excited atoms must return to their normal state by the emission of energy, absorbed during excitation. This energy released forms a spectrum which consists of sharply defined spectral lines. Such a spectrum is called line spectrum.



Each element gives its own characteristics lines of definite wavelength. Thus, an element can be easily identified by observing its spectrum.

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

Ans. When the energy is supplied to the atom of hydrogen atom, it will be excited, then it. single electron will jump from its ground level to some higher energy level. Now when it de-excites, it will emit one spectral line, if it jumps direct from higher energy state to ground state. The electron does not necessarily return to the ground state in a single jump, but may return by several jumps. Thus, hydrogen spectrum contains many lines.

6. What is the basic difference between X-rays and Gamma rays?

Ans. X-rays are produced by stopping high energy electrons on heavy atoms whereas y-rays are produced due to radioactive decay of nuclei. Thus, the source of origin for both is different.

7. Name the reverse process of X-ray production?

Ans. The reverse process of X-rays production is "Photo electric effect"

Self-Assessment Paper 1

Q. No.2 Write Short Answers any SIX of the following questions.

1. Bohr theory of hydrogen atom consists of several assumptions, do any of the assumption contradicts the classical theory?

2. What is the difference between spontaneous and stimulated emission?

3. Write down four uses of laser light.

4. What do you mean when you say that atom become excited?

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

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

7. What is meant by line spectrum? Explain. How the line spectrum is used for identification of elements

8. Define spectroscopy.

Q.No.3 Extensive Question.

Q. (a) What are LASERS. Discuss and laser principle and population inversion for laser production.

(b) Compute the potential difference through which an electron must be accelerate in order that the short-wave limit of the continuous x-ray spectrum shall be exactly 0.1nm.

Self-Assessment Paper 2

Q.No.2 Write Short Answers any SIX of the following questions.

1. Write the postulates of Bohr's atom model?

2. Explain why a glowing gas emits certain wavelengths of light and why that gas is capable of absorbing the same wavelengths? Give the reason, why it is transparent for the other wavelengths?

3. Name the pumping gas and lasing gas in He-Ne laser, also give their percentage in it.

4. Define (a) Population inversion (b) Metastable state

5. Write down the some uses of LASER.

6. Can x-rays be reflected, refracted, diffracted and polarized just like any other waves? Explain.

7. What are the advantages of laser over the ordinary light?

Q.No.3 Extensive Questions.

Q. (a) State postulates of Bohr's Model of hydrogen atom. Derive expression for quantized energies of electrons in any orbit of hydrogen atom.

(b) Calculates the longest wavelength of radiation for the Paschen series.