

Name of the Student: _____

Question No. 1. Encircle the correct option.**(20)**

- i. The hydrogen spectrum in the visible region was studied by
 - a. Balmer
 - b. Lyman
 - c. Rydberg
 - d. Brackett
- ii. When electron jumps from lower level to higher level it
 - a. Absorb energy
 - b. emits energy
 - c. neither emits nor absorbs energy
 - d. Both a & b
- iii. The radiations which have greater frequency than violet are called
 - a. X-rays
 - b. ultra violet radiations
 - c. infrared radiations
 - d. visible radiations
- iv. The energy required to ionize the atom is called
 - a. Ionization potential
 - b. excitation potential
 - c. ionization energy
 - d. excitation energy
- v. X-rays are
 - a. Longitudinal rays
 - b. electromagnetic rays
 - c. visible rays
 - d. all of these
- vi. Laser can not be produced with out
 - a. population inversion
 - b. creation of meta stable state
 - c. Induced emission
 - d. all of these
- vii. The ratio of Helium and Neon in helium-neon laser is
 - a. 85:15
 - b. 80:20
 - c. 75:25
 - d. 15:85
- viii. Normally an electron stays in an excited state for a time of
 - a. 10^{-3} s
 - b. 10^{-5} s
 - c. 10^{-6} s
 - d. 10^{-8} s
- ix. The continuous spectrum of x-rays is due to
 - a. primary electrons
 - b. ejected electrons
 - c. bremsstrahlung
 - d. None of these
- x. The radiations emitted from hydrogen filled discharge tube shows
 - a. Band spectrum
 - b. line spectrum
 - c. continuous spectrum
 - d. none of these
- xi. The electric potential energy of an electron in an orbit of radius r_n
 - a. $K e / r_n^2$
 - b. $K e^2 / r_n^2$
 - c. $- K e^2 / r_n^2$
 - d. $- K e^2 / r_n$
- xii. Bohr proposed his model of hydrogen atom in
 - a. 1813
 - b. 1820
 - c. 1913
 - d. 1914
- xiii. which is the example of continuous spectra
 - a. black body radiation
 - b. atomic spectra
 - c. molecular spectra
 - d. none of these
- xiv. when an electron jumps from higher orbits to the first orbit of hydrogen atom, the set of lines emitted is called
 - a. Balmer series
 - b. Lyman series
 - c. Paschen series
 - d. Bracket series
- xv. The x-ray photon moves with
 - a. speed of light
 - b. greater than speed of light
 - c. less than speed of light
 - d. speed of sound
- xvi. The energy of the 4th orbit in hydrogen atom is
 - a. -0.85 eV
 - b. - 2.51 eV
 - c. - 3.50 eV
 - d. - 13.6 eV
- xvii. The properties of laser light are
 - a. coherent
 - b. monochromatic
 - c. plane wave front
 - d. all of these
- xviii. When electron jumps from lower orbit to higher orbit
 - a. it absorbs energy
 - b. it emits energy
 - c. neither absorbs nor emits energy
 - d. none of these
- xix. Ionization energy for the hydrogen atom is
 - a. 13.6 eV
 - b. - 13.6 eV
 - c. 13.0 eV
 - d. -13.0 eV
- xx. The radius of first orbit of hydrogen atom is
 - a. 5.3×10^{-10} m
 - b. 5.3×10^{-11} m
 - c. 5.3×10^{-12} m
 - d. 5.3×10^{-13} m

Question No. 2 Write short answers of any six of following short questions.**2x6=12**

- i. Bohr's theory of hydrogen atom is based upon several assumptions. Do any of these assumptions contradict classical physics?
- ii. Can the electron in the ground state of hydrogen absorb a photon of energy 13.6 eV and greater than 13.6 eV?
- iii. 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?
- iv. What do we mean when we say that the atom is excited?
- v. What are advantages of laser light over ordinary light?
- vi. Prove that electron does not reside inside the nucleus with the help of Uncertainty principle.
- vii. Can x-rays be reflected, refracted, diffracted and polarized just like other waves? Explain.
- viii. Explain why laser action could not occur without population inversion between atomic levels.

Question No. 3

- a. What are X-rays? How they are produced? Also give their properties. **(5)**
- b. The wavelength of K X-rays from copper is 1.377×10^{-10} m. What is the energy difference between the two levels from which this transition results? **(3)**

OR**Question No. 4**

- a. Define laser. Also describe the technique to produce it. **(5)**
- b. Electrons in an x-ray tube are accelerated through a potential difference of 3000 V. if these electrons were slowed down in target, what will be the minimum wavelength of x-rays produced? **(3)**