

CHAPTER - 20.

(1)

QUESTIONS:

Note:- The answers to the questions are given below:

Q. 20.1 :- Following assumptions of Bohr's theory contradict classical physics.

- (a) An electron revolving in an orbit around a nucleus does not radiate or absorb energy.
- (b) An electron can have only distinct energy states or energy levels.

Q. 20.2 :- Line spectrum :- "The spectrum of gaseous atoms often contain a number of sharp bright lines of emitted radiation or a number of dark lines on a continuous background due to absorption." Such a spectrum is called a line spectrum and occur when atoms make transitions between definite energy levels.

As different elements emit line spectra of different set of wavelengths, so line spectra can be used to identify the elements.

Q. 20.3 :- Since ground state energy of an electron is equal to its ionization energy, so an electron in the ground state of hydrogen atom can only absorb a photon of energy of 13.6 eV (and not greater than this energy), which will

ionize the hydrogen atom.

Q. 20.4 :- A hydrogen atom has only one electron but there are infinite number of energy states. The transition of electron between every two of these states give a new wavelength and hence a new line in the spectrum. So a large number of different energy transitions are possible. Therefore, a large no. of different lines are possible to be emitted.

Q. 20.5 :- Yes, the energy is conserved when an atom emits a photon of light. This is so because the energy absorbed by an atom during its 'excitation' is exactly equal to the energy emitted during its de-excitation process.

Q. 20.6 :- The atoms of a glowing gas emit the wavelengths of radiations (or colours) which lie in its spectrum. The same wavelengths (or colours) it can absorb because these wavelengths are only suitable for excitation of its atoms when passed through the gas. The other wavelengths of energy are not acceptable by the gas atoms to excite them. So it is transparent to other wavelengths.

(a) atom are not in their allotted orbits but these may have gone to higher energy levels by absorbing energy from outside the atom. Then the atom is said to be in excited state.

Q. 20.8 :- As x-rays are similar in nature to ordinary light i.e. both are electromagnetic waves/radiations, so x-rays can be reflected, refracted, diffracted and polarized like any other waves.

Q. 20.9 :- Advantages of Laser :-

- (1) The laser light is intense and phase coherent, so it does not spread as compared to ordinary light.
- (2) The energy of laser can be focussed at a point to get enough heat for welding which is not possible for ordinary light.
- (3) A laser beam is used as surgical tool for welding detached retina which ordinary light can not do.
- (4) Laser can induce fusion reaction which is impossible by using ordinary light.

Q. 20.10 :- Population inversion is the process in which electrons are lifted from ground state to a highly excited state by absorbing high

energy photons called exciting photons. Since laser action is a de-excitation process for which excitation of electrons is must. So laser action can not take place without population inversion between atomic levels.