1. Discuss in brief the approach to Human Growth and Development.

**Ans:** Growth and development are processes intrinsic to all living organisms. Since both these processes proceed hand in hand, one may tend to consider them a single biological phenomenon. However, these are not identical but qualitatively different processes. Growth broadly refers to increase in overall size of the body and specific body parts. Development commonly denotes increase in complexity and functional ability. The process of growth begins with the fertilized ovum and continues up to adulthood when an individual attains his/her adult size, shape and maturity. Thus, growth and development (including maturation) are fundamental processes that shape an individual's progression from birth to adulthood. Some biological changes continue even beyond adult life till death of an individual. The whole process of human growth passes through various phases namely: prenatal phase, infancy, childhood, adolescence, adulthood and senescence. Though scientific investigations of human growth probably started sometime in the 18th century, but the idea of growth perhaps goes back to prehistoric or early historic period where rock paintings and sculptures showed humans in different ages and sex. In the subsequent 19th century studies on human growth continued under motivation from political, racial, medical and scientific considerations. The 20th century witnessed significant advancements in the methodologies, treatment and interpretation of growth data and several long duration interdisciplinary longitudinal growth studies were carried out that provided baseline information about child growth. The anthropological approach to human growth and development integrates research about people from all parts of the world, from past as well as contemporary cultures. The study of growth and development is very important in biology as it also throws light on the mechanism of evolution. The complex process of human growth and development is mainly regulated in predetermined trajectories by the genetic potential of an individual. Though growth in body size is limited by hereditary factors, it is also influenced by extraneous factors such as nutrition, ethnicity, environment, climatic conditions, disease, etc. An individual's growth may slow down during childhood under the influence of environmental insults such as disease and poor nutrition. However, upon improvement in conditions, one is able to return to or nearly approach one's regular course of growth. Thus, we can also say that growth, development and maturation are integrated and these are largely maintained by a constant interaction between genes, hormones, nutrients and some other factors. To study the process of growth we make observations through measurements, which may be linear (e.g., height, sitting height, head breadth), circumferential (e.g., head circumference, mid-upper arm circumference) or pondreal (e.g., weight), These measurements can be plotted in the form of graphs to obtain two types of curves namely the distance curve and the velocity curve. The former indicates the overall growth at some point of time while the latter denotes the amount gained in a unit of time or the rate of growth. There are several methods of studying human growth, such as cross-sectional (in which the individuals are measured only once), longitudinal (wherein individuals are measured more than once), and mixed longitudinal (wherein some individuals get included and some leave an ongoing longitudinal study).

The study of growth and development is very important in biology as it throws light on the mechanism of evolution. Though growth and development are different terms, sometimes these are used interchangeably. Anthropometric technique is the most popular techniques of studying growth and employed by many researchers. Growth can be studied by three methods, i.e., cross-sectional, longitudinal and mixed longitudinal. The cross-sectional method is economical and less time consuming but longitudinal method is expensive and time consuming. That is why most of the investigators employ cross-sectional method for their research work. Growth is determined by plotting distance and velocity curves which indicate the continuous growth rate and the rate of growth, respectively, between two age groups. There are different stages in growth, i.e., pre-natal and post-natal. The latter includes infancy, childhood, adolescence, adulthood and senescence. There are genetic and non-genetic factors which affect the rate of growth. Non-genetic factors include nutrition, ecology, socio-economic condition, race, psychological disturbance, etc.

2. Enlist growth reference charts and discuss them in brief.

**Ans:** A growth chart is used by pediatricians and other health care providers to follow a child's growth over time. Growth charts have been constructed by observing the growth of large numbers of normal children over time. The height, weight, and head circumference of a child can be compared to the expected parameters of children of the same age and sex to determine whether the child is growing appropriately. Growth charts can also be used to predict the expected adult height and weight of a child because, in general, children maintain a fairly constant growth curve. When a child deviates from his or her previously established growth curve, investigation into the cause is generally warranted. For instance, a decrease in the growth velocity may indicate the onset of a chronic illness such as inflammatory bowel disease.

Sample growth chart for use with American boys from birth to age 36 months. Growth charts can also be compiled with a portion of the population deemed to have been raised in more or less ideal environments, such as nutrition that conforms to pediatric guidelines, and no maternal smoking. Charts from these sources end up with slightly taller but thinner averages.

Growth charts are different for boys and girls, due in part to pubertal differences and disparity in final adult height. In addition, children with diseases such as Down syndrome and Turner syndrome follow distinct growth curves which deviate significantly from children without these conditions. As such, growth charts have been created to describe the expected growth patterns of several genetic conditions. Since there are differences in normal growth rates between breastfed and formula-fed babies,[2] the World Health Organization growth charts, which better reflect the growth pattern of the healthy, breastfed infant are considered the standard for U.S. children under age two.