BIOLOGY CLASS-XII
REVISION CHEAT SHEET

REPRODUCTION IN HUMAN BEINGS

1. The sex organ in males are testes and ova in females.
2. Male reproductive organ consist of a pair of testes, vas deferens, a pair of epididymis, a pair of ejaculatory duct, urethra, pairs of accessory gland. Leydig cells secrete male sex hormone i.e., testosterone which is concerned with the production of male sexual characters.
3. Female reproductive part consist of a pair of ovaries, a pair of fallopian tube, uterus, vagina, external genitalia, mammary glands and accessory glands.
4. If sperms are present, fertilization of ovum takes place in the upper end of the fallopian tube.
5. Fertilization process occurs in fallopian tube. In this process, zygote is formed. Umbilical cord is produced which is attached to foetus. During this process, two hormones are produced which are estrogen and progesterone. Progesterone stops mensturation and prevents ovulation.

HEREDITY AND EVOLUTION

- **Mendel's laws of inheritance**

  The first study of inheritance was done by Gregor Mendel on garden pea (*Pisum sativum*). He used a number of contrasting characters like round / wrinkled seeds, tall/ short plants, white/ violet flowers and so on.

- Law of Dominance : Out of a pair of allelomorphic characters one is dominant (expressed) and the other is recessive/ unexpressed. The benefit of this law is that recessive (harmful) characters are not expressed in hybrid and can exist for several generations.

- Law of Segregation : The factors for each character segregate during gametogenesis. As a result, each gamete receives only one factor for each character and hence is always pure.

- Law of Independent Assortment : The two factors of each trait assort at random and independent of the factors of other trait at the time of meiosis and get randomly as well as independently arranged in the offspring.

SEX DETERMINATION

All human chromosomes are not paired. 22 pairs are called autosomes. Women have a perfect pair of sex chromosomes XX. But men have a mismatched pair XY.

EVOLUTION

It is the sequence of gradual changes which takes place in the primitive organisms over millions of years in which new species are produced.

The evidences of evolution are :

(i) Homologous organs : The organs which have same fundamental structure but different functions.

(ii) Analogous organs : The organs which have similar functions but are different in their structural detail and origin. E.g. wings of insect and wings of bird. The organ which are present in reduced form and do not perform any function in the body but correspond to the fully developed functional organs of related animals called vestigial organs

(iii) Fossils : Fossils are the remains of the past and the study of fossils is known as paleontology.
Charles Robert Darwin (1809-1882) explained the evolutionary principle in his famous book "The origin of species". The theory proposed by him is popularly known as theory of natural selection.

Speciation

The process by which new species develop from the existing species is known as speciation.

(i) Geographical isolation of a population caused by various types of barriers (such as mountain ranges, rivers and sea).

(ii) Genetic drift caused by drastic changes in the frequencies of particular genes is by chance alone.

(iii) Variations caused in individuals due to natural selection.

PRINCIPLES OF INHERITANCE AND VARIATION

- Incomplete dominance is the phenomenon where the dominant allele does not completely express itself. Example, In *Mirabilis jalapa* (four O' clock).

- In codominance, both the alleles of a gene are equally dominant i.e. the dominant character is not able to suppress the recessive character & thus both the characters appear side by side in the F_1 hybrids. F_1 generation resembles both the parents. E.g., ABO blood group in humans.

- Linkage is the phenomenon in which certain genes staying together inherit through generations without any change or separation. This is due to their location on the same chromosomes.

- The rearrangement of linked genes due to crossing over is known as recombination.

- The phenomenon that results in alteration of DNA sequence and consequently results in change of genotype and phenotype of an organism is called mutation.

  Mutagens are various chemical and physical factors that induce mutations, e.g., UV radiations, carcinogenic chemicals like nicotine, nitric oxide (NO).

MOLECULAR BASIS OF INHERITANCE

- Formation of a new DNA strand from an old DNA is called DNA replication or DNA duplication.

- Process of copying genetic information from DNA to RNA is called transcription.

- Transfer of genetic information from a polymer of nucleotides to a polymer of amino acids is called translation. This is accomplished with the help of genetic code which is a row of three consecutive nucleotides – coding for 20 amino acids.

HEALTH AND DISEASES

- **AIDS :** Acquired Immuno Deficiency Syndrome, was first recognized in USA in 1981. It is caused by HIV (Human immunodeficiency virus), a retro virus having 2-strands of single stranded RNA (RNAss), with reverse transcriptase enzyme.
- **Vaccination :** It is the inoculation/injection of weak or attenuated antigens, or a toxin, or a protein, into the body. The introduction of antigens stimulates the production of antibodies and memory cells, which protect the body against that antigen/disease.
- The study of cancer is called 'Oncology'. Cancer is the unregulated and uncontrolled proliferation of cells, or the breakdown of regulatory mechanism that governs normal cell division.
- Immunity is the resistance against pathogens, foreign materials and cancer etc. It is of 2-types.
  (a) Innate Immunity : This immunity is by birth, and develops by virtue of genes.
  (b) Acquired Immunity : It can be acquired before birth (from mother through placenta) or after birth. There is an antigen-antibody reaction in this type of immunity.

Antigens : 'Antigen' is an acronym for antibody generating material.
Antibodies : These are pure proteins (γ-globulins). Since they participate in the immune system, they are also known as immunoglobulins (Ig).
Drugs : Drugs are chemicals that alter the functioning of the body.
(i) Sedatives and tranquillizers - *eg.* Barbiturates (used in sleeping pills), Valium,
(ii) Opiate narcotics (opioids) - *eg.* Opium, Morphine, Pathedine and Heroin etc.

BIOTECHNOLOGY

- Biotechnology is the application of techniques using live organisms to get desired product of human welfare. It includes recombinant DNA, gene cloning, gene therapy.
- rDNA technology is hybridization of DNA from different sources to achieve desired genotype and phenotype in an organism.
- Restriction endonucleases can break DNA at specific sites. They are appropriately called molecular scissors or biological scissors.
- Vectors are cloning vehicles required to transfer DNA of interest from one organism to another.
- Plasmids are extra-chromosomal, circular, double stranded autonomously replicating DNA sequence in a bacterial cell.
- *Bt* cotton is the first genetically modified crop of the country.

ORGANISMS AND POPULATIONS

- Population is a group of individuals of a particular species, which can potentially interbreed and live in a well defined geographical area, and also share or compete for similar resources.
- **Birth** or **Natality rate** – It is the number of births per thousand in a population per year.
- **Death** or **Mortality rate** – It is the number of deaths occurring in a population of one thousand per year.
- The growth of population with time shows specific and predictable patterns. The 2 common patterns are
  - **Exponential growth**

$$\frac{dN}{dt} = (b - d) \times N$$

If $(b - d) = r$, then $\frac{dN}{dt} = rN$

Here 'r' is called 'Intrinsic rate of natural increase' or Biotic potential (maximum capacity of reproduction), which indicates the impact of biotic and abiotic factors in population growth.

  - **Logistic growth**

$$\frac{dN}{dt} = rN\left(\frac{K - N}{K}\right)$$

K = Nature's carrying capacity in that habitat
(K – N)/ K or 1– N/ K = environmental resistance

- **Population Interactions**

S. No.	Name of interaction	Species A	Species B
1	**Parasitism**	+	–
2	**Commensalism**	+	**0**
3	**Mutualism**	+	+
4	**Predation**	+	–
5	**Competition**	–	–
6	**Amensalism**	–	**0**

ECOSYSTEM

- Ecosystem is the functional unit of nature where living organisms interact with each other and with their environment.
- Productivity refers to the rate of biomass production i.e. the rate at which sunlight is captured by producers for the synthesis of energy rich organic compounds.
- Primary productivity is the amount of biomass produced per unit area over a time period by plants during photosynthesis.
- Gross primary productivity (GPP) – It is the rate of production of biomass or accumulation of energy by green plants per unit area per unit time. GPP depends on the chlorophyll content.
- Net primary productivity = Gross primary productivity – Respiration losses. (or GPP–R = NPP)
- Food chain is the sequence of different organisms which are arranged in a way that energy of food components is passed from one type of organism to other organisms such that the organisms of one order or trophic level are the food of the organisms of next order or trophic level.
- Food web refers to a group of inter- related food chains in a particular community.

BIODIVERSITY AND CONSERVATION

- Biodiversity means diversity or heterogeneity at all levels of biological organization, *i.e.*, from macromolecules of the cells to the biomass.
  The important levels of biodiversity are
  (i) Genetic diversity,
  (ii) Species diversity
  (iii) Ecological diversity
- **Biosphere reserves** – They represent natural biomes which contain unique biological communities.
- **National Parks** – They are reserved for the betterment of wild life, (both fauna and flora).
- **Sanctuaries** – In sanctuaries protection is given to fauna only. Activities like harvesting of timber, collection of forest products and private ownership rights are permitted so long as they do not interfere with the well being of the animals.