

Inter (Part-II) 2017

Biology	Group-I	PAPER: II
Time: 2.40 Hours	(SUBJECTIVE TYPE)	Marks: 68

SECTION-I

2. Write short answers to any EIGHT (8) questions: (16)

(i) Give the characteristics of xerophytic plants.

Ans Many xerophytic plants possess small, thick leaves to limit water loss by reducing surface area proportional to the volume. Their cuticle is thick, waxy and leathery. Stomata are on lower surface of leaves and located in depression. Some as cacti, during the driest season, shed their leaves to restrict transpiration completely, thus stems are the photosynthetic organs. In rainy season, stem stores water for use in dry conditions.

(ii) What is counter-current multiplier?

Ans Counter-current multiplier causes gradual osmotic outflow of water from the filtrate back to kidney as it passes downward in the descending loop of Henle.

(iii) State renal failure.

Ans Various factors of pathological and chemical nature may progressively the nephron, particularly its glomerular part. This results in increase in the plasma level of urea and other nitrogenous wastes. The rise in urea causes complications of increase in blood pressure, anaemia, etc.

(iv) Compare phototropism and geotropism.

Ans Phototropism is the movement of part of the plant, in response to stimulus of light and is caused by the differential growth of part of a plant-like stem, root while geotropism is the response to gravity. Roots display positive geotropism and shoots show negative geotropism.

(v) What is plantigrade? Also give examples.

Ans In this mode of locomotion, the mammals walk on their soles with palm, wrist and digits all resting more or less on ground, such as monkeys, apes, man, bear, etc.

(vi) Differentiate between ligaments and tendons.

Ans Ligaments attach bone to bone and are slightly elastic while tendons attach muscles to bones and are non-elastic.

(vii) What are test tube babies?

Ans Recent biotechnical advantages has led to many improvements in human life. One of the important aspect is the test tube babies. Parents which are unable to enjoy the normal process of fertilization and birth of their offspring due to some physiological and physical abnormalities in any of the two parents are being benefited with this method. Parental sperm and ovum is fertilized in vitro -- outside the female body and then the zygote is implanted back into the mother uterus, placenta establishes and remaining development takes place in the body of the mother leading to normal birth.

(viii) Give some advantages and disadvantages of cloning.

Ans Cloning has the advantage that all the offspring behave similarly, but should an environmental hazard develop (like an outbreak of a disease), non-resistant strains are present to lessen the impact. Also the degree to which environment influences clone development is not fully known and any cloned cell would have to go through all phases of development once again including embryo, fetus, baby and childhood (in case of human beings).

(ix) Write a note on profundal zone.

Ans In profundal zone, light is insufficient to support photosynthesis. The organisms of this zone are mainly nourished by detritus that falls from the littoral and limnetic zone and by incoming sediment. Decomposers and detritus feeders, such as, snails and certain insect larvae, bacteria, fungi and fishes, inhabit it.

(x) What is layering in ecosystem?

Ans Layering in ecosystem is the characteristic of grassland. Tall grasses (Andropogon, Panicum) form the first layer, mid-high grasses (Stipa, Sporobolus, Oryzopsis) form the second layer and third layer is formed by short grasses and forbs and warfare species (Poa, Bromus) with mosses and lichens.

(xi) Mention any four ways in which we can save energy.

Ans Here are some ways in which we can save energy:

1. Develop and use energy-efficient machines, engines and manufacturing processes.

2. Reduce wastage by re-cycling.
3. Drive less, walk and use public transport more.
4. Switch off lights and electrical appliances when they are not in use.

(xii) Give the importance of ozone layer.

Ans Ozone layer is a layer of atmosphere extending from 10 to 50 kilometers above earth, which filters most of ultra violet radiations and protects us from these harmful rays of the sun.

3. Write short answers to any EIGHT (8) questions: (16)

(i) How plants respond to various stimuli?

Ans Plants produce hormones and respond to external stimuli, growing towards sources of water and light, which they need to survive. A tropism is a growth in response to a stimulus and an auxin is a plant hormone produced in the stem tips and roots, which controls the direction of growth.

(ii) Differentiate between etiolation and chlorosis.

Ans Chlorosis is a deficiency disease in plants that lead to pale or yellow coloration of leaves due to the deficiency of certain elements such as low chlorophyll synthesis. While etiolation refers to the characteristic growth of green plants in the absence of light.

(iii) Give commercial applications of auxins.

Ans Discovery of IAA led to the synthesis of wide range of compounds by chemists. The synthetic auxins are economical than IAA to produce and often more active because plants generally do not have necessary enzymes to break them down.

(iv) How sex determination occurs in yeast?

Ans Many species of eukaryotic microorganisms like yeast do not have sex chromosome. These depend on genic system for determination of sex. In this system, the sexes are specified by simple allelic differences at a small number of gene loci, e.g., a and α are the two mating types (sexes) of yeast, controlled by MAT a and MAT α alleles, respectively.

(v) Describe sex influenced traits.

Ans Sex influenced trait controlled by an allele that is expressed as dominant in one sex but recessive in the other.

This difference in expression is due to hormonal difference between the sexes. Pattern baldness is a sex influenced trait.

(vi) What is Bombay phenotype?

Ans The expression of ABO blood type antigens by I^A or I^B gene depends upon the presence of another gene H. The recessive allele h cannot insert sugar molecule to glycoprotein. Therefore, hh individuals lack the site of attachment for antigen A or antigen B. Thus A and B antigens cannot adhere to their RBC and fall away. Their RBC lack A and B antigens although they do not lack I^A and I^B genes. They are phenotypically like O, but are not genotypically O. Their phenotype is called Bombay phenotype.

(vii) Define the term totipoten.

Ans Tissue culture is the growth of a tissue in an artificial liquid culture medium. German botanist Gottlieb Haberlandt said in 1902 that plant cells are totipotentive. Therefore, a single cell can become a complete plant.

(viii) Compare ex-vivo gene therapy with in-vivo gene therapy.

Ans Ex-vivo gene therapy involves the transfer of genes in cultured cells (e.g., bone marrow cells) which are then reintroduced into the patient. While the direct delivery of genes into the cells of a particular tissue is referred to as in-vivo gene therapy.

(ix) Elaborate the uses of plasmids.

Ans Plasmids are natural extra-chromosomal circular DNA molecules which carry genes for antibiotic resistance and fertility etc. One of the plasmids discovered earlier pSC 101 has antibiotic resistance gene for tetracycline, whereas pBR 322 has antibiotic resistance genes for tetracycline as well as ampicillin.

(x) How primary succession differs from secondary succession?

Ans During primary succession, an ecosystem is forged from bare rock, sand or clear glacial pool where there is no trace of previous life. While during secondary succession, a new ecosystem develops after an existing ecosystem is disturbed as in case of forced fire or an abandoned farm field.

(xi) Define hydrosere and xerosere.

Ans Primary succession starting in a pond is called hydrosere and that on a dry soil or habitat is called xerosere.

(xii) Write down the significance of root nodules in plants.

Ans Root nodules occur on the roots of plants that associate with symbiotic nitrogen-fixing bacteria. Under nitrogen-limiting conditions, capable plants form a symbiotic relationship with a host-specific strain of bacteria known as rhizobia.

4. Write short answers to any SIX (6) questions: (12)

(i) Define growth.

Ans Growth is the permanent and irreversible increase in size that occurs as an organism matures.

(ii) What do you mean by lateral meristem?

Ans Lateral meristems are cylinders of dividing cells. They are present in dicots and gymnosperms. Vascular and cork cambium are the examples of lateral meristem. They play an important role in the increase in diameter of stem and root and in secondary growth are determinate *i.e.*, they grow to certain size and then stop *e.g.*, leaves, flowers and fruits; while others are indeterminate *i.e.*, they grow by meristems that continually replenish themselves, remaining youthful *e.g.*, vegetative root and stem.

(iii) Define one-gene, one-polypeptide hypothesis.

Ans The theory that each gene is responsible for the synthesis of a single polypeptide. It was originally stated as the one gene-one enzyme hypothesis by the US geneticist George Beadle in 1945 but later modified when it was realized that genes also encoded non-enzyme proteins and individual polypeptide chains.

(iv) What do you mean by mutations?

Ans A change in the tiny part of the DNA is called mutation.

(v) Define nucleotide and nucleoside.

Ans Nucleotide:

Nucleotides are organic molecules that serve as the monomer units for forming the nucleic acid polymers deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), both of which are essential biomolecules in all life-forms on Earth.

Nucleoside:

A nucleoside is a nitrogenous base and a 5-carbon sugar.

(vi) Define meiosis and mitosis.

Ans Meiosis:

Meiosis is the special type of cell division in which the number of chromosomes in daughter cells is reduced to half, as compared to the parent cell.

Mitosis:

Mitosis is the type of cell division, which ensures the same number of chromosomes in the daughter cells as that in the parent cells.

(vii) What do you mean by non-disjunction?

Ans Non-disjunction is a chromosome abnormality during meiosis in which the chromosomes fail to segregate during anaphase and telophase. The chromosomes do not finish with equal distribution of chromosomes among daughter nuclei. This results either increase or decrease in the number of chromosomes causing serious physical, social and mental disorders. This non-disjunction may be in autosomes or sex chromosome.

(viii) Define theory of special creation. Who proposed it?

Ans According to the theory of special creation, all living things came into existence in their present forms, especially and specifically created by Nature. Carolus Linnaeus proposed the above theory.

(ix) What do you mean by non-random mating?

Ans Non-random mating occurs when the probability that two individuals in a population will mate is not the same for all possible pairs of individuals.

SECTION-II

NOTE: Attempt any Three (3) questions.

Q.5.(a) Give four major homeostatic functions of liver. (4)

Ans Major Homeostatic Functions of the Liver

Functions	Major effects on homeostasis
Synthesis: Nitrogenous wastes: NH ₃ , urea, uric acid.	Supports kidney in waste disposal.

Plasma proteins: like a) prothrombin, fibrinogen b) albumin, etc.	a) Blood clotting, b) maintain osmotic balance of blood.
Bile	Emulsifies fats in small intestine.
Lipids, cholesterol, lipoproteins.	Regulate blood chemistry, store energy and help to maintain cell membranes.
Storage: Iron.	Oxygenation of tissues as constituent of haemoglobin.
Glycogen.	Energy reserves.
Conversion: Excess glucose in blood to glycogen, lactic acid to glycogen and stored glycogen to glucose.	Energy storage and use.
Recycling: Contents of old red blood cells (e.g., iron and other constituents of haemoglobin).	Oxygenation of tissue.

(b) **What is succession? Describe process of succession on a dry soil.** (1,3)

Ans Succession is a sequence of changes in the community structure of an ecosystem over a period of time. Succession is a kind of "community relay" in which assemblages of plants and animals replace the earlier ones in a sequence that is at least somewhat predictable. The precise changes occurring during succession are as diverse as the environments in which succession occurs, but certain general stages can be recognized.

Succession on a Dry Soil:

Succession on dry land takes two major forms, primary succession and secondary succession. During primary succession, an ecosystem is forged from bare rock, sand or clear glacial pool where there is no trace of previous life.

The formation of an ecosystem from scratch is a process often requiring thousands of years. During secondary succession, a new ecosystem develops after an existing ecosystem is disturbed as in case of forced fire or an abandoned farm field. Secondary succession happens much more rapidly than primary succession because the previous community has left its mark in the form of improved soil and

seeds. Primary succession starting in a pond is called hydrosere and that on a dry soil or habitat is called xerosere. Plants growing in xeric condition are called xerophytes, which are able to withstand prolonged periods of water shortage. Succulent plants such as the cacti have water stored in large parenchyma tissue, others have leaf modification.

Q.6.(a) Give importance of skeleton.

(4)

Ans Importance of Skeleton:

(i) Support and shape:

Bones support soft tissues and serve as attachment sites for most muscles and provide shape to the body.

(ii) Protection:

Bones protect critical internal organs, such as brain, spinal cord, heart and lungs.

(iii) Movement:

Skeletal muscles attached to the bones help in moving the body.

(iv) Mineral homeostasis:

Bones serve as store for calcium, phosphorus, sodium and potassium. Through negative feedback mechanisms, bones can release or take up minerals to maintain homeostasis.

(v) Blood cell production:

Red and white blood cells are produced in bone marrow, a connective tissue found within certain bones.

(b) Describe types of chromosomes on the basis of centromere.

(4)

Ans Types of Chromosomes:

Typically, a chromosome is made of two chromatids, a centromere (primary constriction), and a secondary constriction.

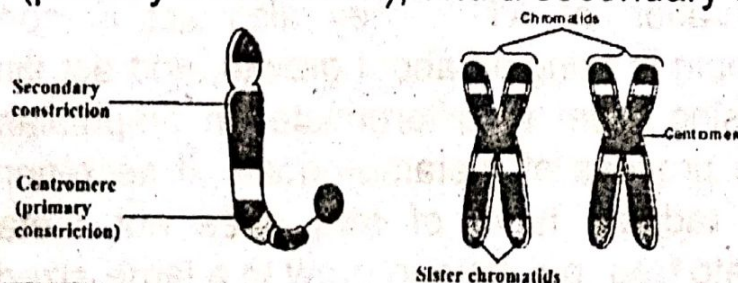


Fig. Structure of a chromosome.

Chromosomes may widely differ in appearance. They vary in size, staining properties, the location of centromere, the relative length of the two arms on either side of centromere, and

the position of constricted regions along the arms. The particular array of chromosomes that an individual possesses is called its karyotype. Karyotypes show marked differences among species and sometimes even among individuals of the same species.

The chromosomes are called telocentric, acrocentric, sub-metacentric and metacentric depending upon the location of centromere between the middle and tip of the chromosomes.

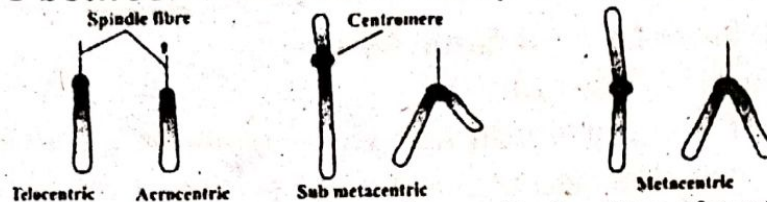


Fig. Shapes of chromosomes depend upon the location of centromeres.

These chromosomes acquire different shapes at the time of anaphase during cell division. The usual shapes are i, j and v.

Q.7.(a) Explain the structure and function of thyroid gland. (4)

Ans Thyroid gland:

Structure:

In mammals, it consists of two lobes situated below the larynx. It produces thyroxine (or tetraiodo-thyronine: T₄), tri-iodothyronine or T₃ (which has a structure similar to thyroxine with 3 iodine atoms rather than 4) and calcitonin hormone. The thyroid is active continuously but produces higher levels of secretions during periods of rapid growth and sexual maturation and in stress situations such as cold and hunger.

Function:

Thyroxine and tri-iodothyronine, the two hormones act in essentially the same way. They act on the basal metabolic rate by stimulating the breakdown of glucose and release of heat and generation of ATP. They also act in conjunction with somatotropin in bringing about growth, and act directly on brain cells causing them to differentiate. In amphibians, they bring about the process of metamorphosis. If secretion of thyroid is deficient, tadpole larva of frog does not metamorphose to develop into frog, but instead grow to a large-sized tadpole.

Excess thyroxine produces a condition called Graves' disease, with exophthalmic goiter and increase in the basal metabolic rate. This can lead to cardiac failure if prolonged. The

cause of Graves' disease is the production of an abnormal body protein which continuously stimulates the thyroid to excessive secretion.

(b) What is pollution? Explain the phenomenon of air pollution. (4)

Ans Pollution:

"The befouling of the environment by anything produced by humans which is or may be harmful to human life and other living organisms is called environmental pollution."

Air or Atmospheric Pollution:

"The befouling of the air by anything that may be harmful to living organisms is air pollution".

Air is not always as clean as it must be. Harmful substances such as sulphur dioxide, carbon monoxide, oxides of nitrogen, lead compounds and chlorofluorocarbons are the fastest growing sources of air pollution produced by the activities of man. These harmful substances are known as pollutants.

Q.8.(a) Explain sexually transmitted diseases in human. (4)

Ans Unhealthy attitudes and low moral values sometimes lead to serious complication. The carrier may transmit this disease to their healthy partners.

(i) **Gonorrhoea:**

It is caused by a gram positive bacterium *Neisseria gonorrhoeae*, mainly affecting the mucous membrane of urinogenital tract. New born infants may acquire serious eye infections if they pass through the infected birth canal. It is highly contagious through sexual contacts.

(ii) **Syphilis:**

It is caused by a spirochaete, *Treponema pallidum*. It damages the reproductive organs, eye bones joints, central nervous system, heart and skin. Sexual contact is the major source of its dissimulation.

(iii) Genital Herpes:

It is caused by a herpes simplex type 2 virus, most frequently transmitted by sexual contact causing infection of the genitalia. It produces genital soreness and ulcers in the infected areas. In infected pregnant women, virus can be transmitted to infant during birth, causing damage to eyes and CNS of the infant.

AIDS (Acquired Immune Deficiency Syndrome):

Sexual contact is one of the major sources of its spread.

(b) Explain in detail diabetes mellitus and its types. (4)

Ans **Diabetes Mellitus:**

Diabetes mellitus is a hereditary disease. It is actually a heterogenous group of disorders which are characterized by elevated blood sugar level. Diabetics are unable to metabolise blood sugar in their body. They pass glucose in their urine. Diabetes is the leading cause of kidney failure, adult blindness, lower limb amputation and heart disease.

Types of Diabetes Mellitus:

There are two major types of diabetes: Type I is IDDM or insulin dependent diabetes mellitus. Type II is NIDDM or non-insulin dependent diabetes mellitus.

Type I:

Type I is also called Juvenile diabetes because it usually occurs in early age before 40. It arises due to deficiency of pancreatic hormone insulin that normally routes blood glucose to cells for use. Type I is an auto immune disorder. The immune system backfires and manufactures auto antibodies against body's own cells. Sometimes, specific viral infections activate auto immune response. T-cells of immune system attack pancreas and destroy insulin producing β -cells. As a result, pancreas does not produce insulin. Diabetics of type I must receive exogenous (from outside source) insulin to survive.

Progress is being made in understanding the genetic basis of this disease. The insulin gene is located on short arm

of chromosome 11. Polymorphism and genetic variations within this locus is responsible for diabetes type I susceptibility. But today, it is no more just a recessive single gene trait, rather it is a multifactorial (polygenic with environmental influence) inheritance associated with several alleles.

Types II:

Diabetes mellitus type II is non-insulin dependent. It accounts for 90% of all diabetic patients. These persons produce some endogenous insulin themselves, but their body cells gradually fail to respond to insulin and cannot take up glucose from blood. They develop a sort of insulin resistance. It occurs among people over the age of 40, and is more common among the obese. Obesity increases insulin resistance. As exercise reduces obesity. It indirectly increases insulin sensitivity and improves glucose tolerance.

There, definitely exists a genetic component in the form of an underlying tendency to develop diabetes under certain environmental conditions. About 2% - 5% of type II diabetics get the disease early in life, before 25 years of age. It is called maturity onset diabetes of the young (MODY). MODY can be inherited as an autosomal dominant trait. About 50% of cases of MODY are caused by mutations in glucokinase gene. Glucokinase enzyme usually converts glucose to glucose - 6 - phosphate in pancreas. MODY can also be caused by mutations in any of the four other genes which encode transcription factors involved in pancreatic development and insulin regulation. But these four MODY genes do not play any significant role in adult - onset type II.

Q.9.(a) Describe the role of nucleus in development. (4)

Ans **Role of Nucleus in Development:**

Most gene controlled substances, which can easily be identified are found in the cytoplasm, and are probably produced in it. Through experiment, it is found that production of developmentally active substances by the nucleus itself, or

its immediate neighborhood, is, however, available in some cases. One of such examples is in the unicellular alga, *Acetabularia*. It consists of rhizoid, which is attached to the ground, from which arises a long stalk with an umbrella-shaped cap at its top. On the basis of structure and shape of the cap, two species of *Acetabularia* have been identified; *Acetabularia mediterranea*, which has regular shaped cap, and *A. crenulata*, which has irregular shaped cap.

There is only a single nucleus, although they may attain the size of several centimeters or more. Haemmerling showed that if the cap is removed, a new one is regenerated. He cut off the nucleus containing rhizome from an alga of one species (*A. mediterranea*) and grafted a similar piece containing the nucleus of another species (*A. crenulata*). When the cap was now removed, it was seen that the new regenerated one had the characters of *A. crenulata*. So nucleus lying at the base of the alga and not the stalk to which the regenerate was attached determined the structure of cap. It means that irrespective of the fact to which species the cytoplasm belong, the genes were able to express according to the type of nucleus.

(b) Describe the factors affecting gene frequency of a population. (4)

Ans Factors affecting gene frequency:

Many factors can alter gene frequency. Out of these five affect the proportion of homozygotes and heterozygotes enough to produce significant deviations from the proportion claimed by Hardy Weinberg principle. They are reflected in the table below:

Factors for Evolutionary Change

Factor	Description
Mutation	The ultimate source of all changes; individual mutations occur so rarely that mutation alone does not change allele frequency much.
Migration	A very potent agent of change, migration locally

	acts to prevent evolutionary changes by preventing populations that exchange members from diverging from one another. Emigration and immigration of members of a population, cause disturbance in the gene pool.
Genetic drift	It is the change in frequency of alleles at a locus that occurs by chance. In small populations, such fluctuations may lead to the loss of particular alleles. This may occur in a small population when a few individual fail to reproduce and then genes are lost from the population.
Non-random mating	Inbreeding is the most common form, it does not alter allele frequency, but lessens the proportion of heterozygote individuals. Individuals with certain genotypes sometimes mate with one another more commonly than would be expected on a random basis. This is called non-random mating, causing the frequencies of particular genotypes to differ greatly from those predicted by the Hardy-Weinberg principle.
Selection	Some individuals leave behind more progeny than others, and the rate at which they do so is affected by their inherited characteristics. This is called selection. Selection can be artificial selection or natural selection. In artificial selection, the breeders select for the desired characters. In natural selection, the environment plays this role, thus affecting the proportions of gene in a population.