Question Set 10

GIVE REASONS

(1, 2 or 3 marks)

Chapter 1 : Reproduction in Lower and Higher Plants

(1) Dichogamy favours cross pollination.

Ans. (1) Maturation of anther (stamen) and stigma (carpel) at different times is called dichogamy.

(2) Dichogamy is of two types, viz, protandry and protogyny.

(3) Maturity of anthers before that of gynoecium is protandry and maturity of carpel before maturity of pollen grains is protogyny.

(4) As this forms barrier for self-pollination, dichogamy favours cross pollination.

(2) Pollination is prerequisite for fertilization in plants.

Ans. (1) Fertilization is fusion of male and female gametes.

(2) Pollination is transfer of pollen grains which carry non-motile male gametes.

(3) Pollen grains are transferred from anther to stigma of flower where they germinate.

(4) Both male and female gametes are non-motile and they are produced at two different sites.

(5) Therefore the pollination process is necessary for act of fertilization in plants.

(3) Parthenocarpic fruits are without seeds.

Ans. (1) In parthenocarpy, fruit is developed without fertilization.

(2) When fertilization takes place ovules in the ovary are transformed into seeds.

(3) In parthenocarpy, for fruit development chemical stimulus from placental tissue transforms or stimulates ovary into fruit but it is seedless.

(4) Nucellar polyembryony is significant in horticulture.

Ans. (1) Polyembryony is a phenomenon where we get many embryos in the seed.

(2) Polyembryony increases chances of survival of plants as there are multiple seedlings formed.

(3) Nucellar embryos are formed from diploid parental tissue.

(4) Thus genetically uniform type of seedlings are obtained which are similar to parents.

Chapter 2 : Reproduction in Lower and Higher Animals

(1) Testes are located outside the body cavity in scrotal sacs.

Ans. (1) During early foetal life, the testes develop in the lumbar region of the abdominal cavity just below the kidney but during seventh month of embryonic development, they descend permanently into the respective scrotal sacs through a passage called inguinal canal.

(2) For the development of the sperm, lesser temperature than the body temperature is required.

(3) If the testes remain in the abdominal cavity, then the sperm production does not take place.

(4) This may result in impotency. Therefore, testes are located outside the body cavity.

(2) Proliferative phase is also called follicular phase.

Ans. (1) Proliferative phase means there is proliferation of endometrial cells in the uterus. Follicular means there is growth of ovarian follicles in the ovaries. Both these phases are simultaneous.

(2) The follicular phase of ovaries is due to effect of FSH from adenohypophysis.

(3) The ovarian follicles grow due to FSH and start secreting estrogen.

(4) This estrogen from ovaries bring proliferative effect on the uterus.

(3) Human female has restricted reproductive life.

Ans. (1) In human female, the reproductive period is about 30 – 33 years.

(2) There is menarche at the age of about 13 and menopause at the age of 45 – 50.

(3) During this span of 30 years, ovaries secrete sex hormones like estrogen and progesterone. After menopause this secretion is suspended.

(4) Due to changes in hormonal level, human females cannot produce eggs later. Moreover, eggs in her ovaries are utilized by the age of 45.

(5) Human female, therefore, has restricted reproductive period.

(4) The middle part of the human sperm is characterized by the presence of a number of mitochondria.

Ans. (1) Mitochondria provide energy required by sperms for their agile movement.

(2) The agile movement of sperms helps them to reach the vicinity of the ovum at the time of fertilization.

(3) Owing to this, the middle part of the human sperm is characterised by the presence of a number of mitochondria.

(5) Though fertilization takes place in the ampulla of fallopian tube, implantation of embryo takes place after reaching the uterus only. ***(July '22)***

Ans. Embryo is surrounded by zona pellucida cells. Therefore the embryonic phagocytic trophoblast cells are not exposed. Inside the embryo, developmental cleavages are going on till it reaches uterus. Therefore, implantation takes place only after embryo descends down to uterus.

(6) Corpus luteum persists in the ovary after fertilization.

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Ans. Corpus luteum is kept functional by the hormone human chorionic gonadotropin (hCG) which is secreted by placenta and chorionic villi. It maintains the corpus luteum and stimulates secretion of progesterone from it.

Chapter 3 : Inheritance and Variation

(1) Law of segregation is universally applicable.

Ans. (1) According to the law of segregation, the members of the allelic pair remain together without mixing with each other.

(2) They segregate or separate when the gametes are formed.

(3) Thus the gametes that are formed receive only one of the two factors.

(4) Now it is known that the organisms are diploid and the gametes produced by them are haploid.

(5) The law of segregation therefore is universally applicable.

(2) Law of dominance is not universal.

Ans. (1) There are many traits in many organisms which show dominance. For example, widow's peak in human beings is a dominant trait. Yellow seed colour and round seed shape are dominant traits in pea plant.

(2) However, there are characters which are either co-dominant, such as genes for human blood group A and B are incompletely dominant as in flower colour of *Mirabilis jalapa*.

(3) Therefore the law of dominance is not universally applicable.

(3) Possibility of female becoming a haemophilic is extremely rare.

Ans. (1) Haemophilia is caused due to X-linked recessive gene. Females have double X-chromosomes.

(2) Even if she has haemophilic gene on one of her X-chromosome, the dominant gene on other X-chromosome, suppresses its expression. Female, therefore, does not become haemophilic.

(3) If she inherits haemophilic gene on both of her X-chromosomes, this combination becomes lethal. Such embryo is aborted. If born, she dies soon. This makes the possibility of female becoming a haemophilic extremely rare.

(4) Human female is referred to as carrier of colour blindness.

Ans.(1) Females possess double X-chromosomes in her gametes.

(2) If one X-chromosome is carrying recessive gene for colour blindness, her other dominant X hides the expression of colour blindness and hence she does not become a patient.

(3) But such female can carry the defective gene to her progeny. Thus she is called carrier of colour blindness.

(4) A female having one recessive gene on X-chromosome is a carrier female, while a female possessing both recessive genes on both the X-chromosomes will be colour blind which is very rare.

Chapter 4 : Molecular Basis of Inheritance

(1) Eukaryotic DNA is condensed and supercoiled.

Ans. (1) In a typical mammalian cell, length of DNA double helix is approximately 2.2 metres.

(2) The size of typical nucleus is approximately 10^{-6} m.

(3) Such a long DNA molecule has to be fitted in small nuclear space.

(4) Therefore, DNA is highly condensed, coiled and supercoiled so that it can be accommodated in the nucleus.

(2) In bacteria, m-RNA does not require any processing.

Ans. In bacteria, m-RNA does not require any processing because it has no introns and it is synthesized in cytoplasm.

(3) During translation, complementarity principle is not applicable.

Ans. During translation, complementarity principle is not applicable as, genetic information is transferred from a polymer of nucleotides to a polymer of amino acids.

(4) On injecting a mixture of heat-killed S-bacteria and live R-bacteria, the mice died.

Ans. (1) Griffith obtained live S-strain bacteria from the blood of the dead mice.

(2) In a mixture of live R-bacteria and heat killed S-bacteria, live R-strain bacteria picked up something (transforming principle) from the heat-killed S bacterium and got changed into S-type.

(3) Transforming principle allowed R-type bacteria to synthesize capsule and thus they became virulent.

(4) Hence, on injecting a mixture of heat-killed S-bacteria and live R-bacteria, the mice died.

Chapter 5 : Origin and Evolution of Life

(1) Birds are glorified reptiles.

Ans. Huxley, the evolutionary biologist gave this statement after studying the characters of birds and reptiles. The fossil bird, Archaeopteryx was discovered which showed characters of both Reptilia and Aves. It showed transformation of reptilian characters

into bird characters. Hence, birds are said to be glorified reptiles with feathery exoskeleton wings, beak and other glorious characteristics.

(2) Analogous organs do not have significant role in evolution.

Ans. Analogous organs lead to convergent evolution, i.e. different organisms show same superficial structural similarities due to similar functions or habitat. But anatomically and structurally they are different. These organs do not help to trace the common ancestry. Therefore, they are said to have no significant role in evolution.

(3) *Australopithecus* is described as a man with ape brain.

Ans. (1) *Australopithecus* can be considered as a connecting link between ape and man due to the following ape-like and man-like characteristics shown by it :

(2) The ape-like characteristics of *Australopithecus* : (i) The jaws and teeth were larger than those of modern man. (ii) The face was prognathous, i.e. it had a muzzle like slope. (iii) The chin was absent. (iv) The eye-brow ridges projected over the eyes. (v) Their cranial capacity ranged from 450 – 600 c.c.

(3) The man-like characteristics of *Australopithecus* : (i) It walked nearly or completely straight due to erect posture. (ii) The vertebral column had a distinct lumbar curve with broad basin-like pelvic girdle. (iii) Dentition was man-like with the smoothly rounded parabolic dental arch. (iv) A simian gap was absent. *Australopithecus* is therefore, rightly described as a man with ape brain.

Chapter 6 : Plant Water Relation

(1) Water is significant molecule that connects physical world with biological process.

Ans. (1) Water is an important constituent of cell. About 90 – 95% of protoplasm is water.

(2) Water in liquid state is best solvent in which various minerals and food molecules are dissolved and transported.

(3) Water acts as the thermal buffer has high specific heat.

(4) Water molecules have high adhesive and cohesive forces of attraction.

(5) It can rise in capillaries due to high surface tension and adhesive forces. e.g. Ascent of sap in plants.

(6) Due to all these important factors it is a significant molecule connecting physical world with biological processes.

(2) Transpiration is called a necessary evil.

Ans.

(1) The loss of water in the form of water vapour is called transpiration.

(2) About 90 – 93% of transpiration occurs through stomata, small apertures located in the epidermis of leaves.

(3) For this process stomata must remain open and then only gaseous exchange by diffusion takes place.

(4) Gaseous exchange is necessary for respiration and photosynthesis. If stomata remain closed then it will affect productivity of plant.

(5) The process is necessary evil because water which is important for plant is lost in the process.

(6) At the same time it helps in absorption of water and its translocation. Hence it cannot be avoided.

(7) So Curtis has rightly called it as necessary evil.

Chapter 7 : Plant Growth and Mineral Nutrition

(1) 2, 4-D is used as herbicide.

Ans. (1) 2, 4-D is a synthetic auxin which kills dicot weeds.

(2) Our most of the food crops are cereals, i.e. monocot plants.

(3) Weeds are unwanted plants which otherwise lower the productivity hence to kill them. Selective herbicide is used.

(2) In morphogenesis of plants cytokinin auxin ratio is important.

Ans. (1) Auxins and cytokinins are growth promoting substances which stimulate cell division and cell enlargement.

(2) A high cytokinin promotes shooting in plants.

(3) A low ratio of cytokinin to auxin induces root development.

(4) A high ratio of cytokinin to auxin induces growth of buds and shoot development.

(5) Thus cytokinin and auxin ratio and their interactions control morphogenesis in plants.

(3) Some deficiency symptoms of mineral are visible in young leaves while some appear in older leaves.

Ans. (1) When mineral element is present below a certain critical concentration it is said to be deficient.

(2) Symptoms are indicated in the form of certain morphological changes on the mobility of element.

(3) These symptoms depend on the mobility of element inside the plant body.

(4) When the element is relatively immobile like S and Ca then the symptoms appear first in young leaves.

(5) When the elements are actively mobilised inside plant body, they are transported to young tissues then the symptoms are visible in older, i.e. senescent leaves e.g. N, Mg, K.

(4) Nitrogen is a limiting nutrient in the agricultural system.

Ans. (1) Nitrogen is a major nutrient for plant growth.

(2) Proper carbon/nitrogen ratio in soil is necessary for plant growth.

(3) It is a component of proteins in the form of amino acids.

(4) Proteins are synthesised from photosynthetic products sugars.

(5) Nitrogen exists in atmosphere but it is inert, non-reactive.

(6) Plants need nitrogen in a reactive form usually nitrate in soil. This supply need to be maintained through biological and physical nitrogen fixation.

(7) Otherwise productivity is affected hence it is limiting nutrient in the agricultural ecosystem.

Chapter 8 : Respiration and Circulation

(1) It is advantageous to breathe through nostrils than through mouth.

Ans. Breathing through nose is better than breathing through the mouth because of the following reasons :

(1) The nostrils are smaller than the mouth so air exhaled through the nose creates a backflow of air into the lungs.

(2) As we exhale more slowly through the nose than we do through the mouth, the lungs have more time to extract oxygen from the air that we have already taken in.

(3) The hairs inside nostrils filter any dust particles and microbes in the air and it only lets the clean air pass through.

(4) The air gets warm and humidified in nostrils as it passes into our bodies.

(5) Moreover breathing through the mouth can dry the oral cavity and lead to bad breath, gum disease and tooth decay.

(2) Valves are present in veins.

Ans. (1) Veins carry blood to the heart.

(2) At that time the backward flow of the blood should be prevented.

(3) Therefore, valves are present in veins.

(3) Human heart is called myogenic and autorhythmic.

Ans. (1) The heart shows auto rhythmicity because the impulse for its rhythmic movement develops inside the heart. Such heart is called myogenic.

(2) Some of the cardiac muscle fibres become autorhythmic (self-excitable) and start generating impulse during development.

(3) These autorhythmic fibres perform two important functions, viz. acting as a pacemaker and setting the rhythm for heart.

(4) They also form conducting system for conduction of nerve impulses throughout the heart muscles.

(4) Left ventricle has thicker wall than the right ventricle.

Ans. (1) Left ventricle pumps oxygenated blood to all parts of the body. Therefore, there is greater pressure from the blood in left ventricle.

(2) Right ventricle sends deoxygenated blood to lungs for oxygenation. This does not put more pressure and lungs are in vicinity of the heart.

(3) Due to these functional differences between the two ventricles, left ventricle has thicker wall than that of the right ventricle.

(5) Arteries are thicker than veins.

Ans. (1) Arteries have relatively thick walls to enable them to withstand the high pressure of blood ejected from the heart.

(2) Arteries expand when the pressure increases as the heart pushes blood out but then recoil (shrink) when the pressure decreases when the heart relaxes between heartbeats.

(3) This expansion and recoiling occurs to maintain a smooth blood flow.

(4) Veins, on the other hand, have thinner walls and larger lumen veins have no need for thick walls as they need not have to withstand high pressure like arteries.

(5) Moreover, as veins transport relatively low pressure blood, they are commonly equipped with valves to promote the unidirectional flow of blood towards the heart.

Chapter 9 : Control and Coordination

(1) Injury to medulla oblongata is fatal.

Ans. (1) Medulla oblongata is the region of the brain that controls all the involuntary activities.

(2) Vital activities such as heartbeats, respiration, vasomotor activities, peristalsis etc. are under the control of medulla oblongata.

(3) When medulla oblongata is injured, all these vital functions are instantly stopped.

(4) Therefore, injury to medulla oblongata causes sudden death.

(2) A drunken person cannot maintain balance of the body.

Ans. (1) Cerebellum is the primary centre for controlling equilibrium and balance of the body.

(2) Alcohol has an adverse effect on the neurons of cerebellum.

(3) Consciousness of brain is also controlled by cerebellum.

(4) When a person is drunk, the alcohol in his or her blood affects the activities of cerebellum and hence the person cannot maintain the balance of the body.

(3) Pituitary may be considered as the coordinator of endocrine orchestra but not master endocrine gland.

Ans. (1) The pituitary gland was formerly considered as a master endocrine gland, because all other endocrine glands are under the control of pituitary hormones.

(2) But now it is known that the pituitary gland itself is under the control of hypothalamus through hypothalamo-hypophysial axis.

(3) Through various releasing factors and release inhibiting factors, the secretions of pituitary are regulated by hypothalamus.

(4) Pituitary in turn controls growth, secretion and maintenance of glands such as adrenal cortex, thyroid and gonads.

(4) We must use iodized salt.

Ans. (1) Iodine is needed for synthesis of thyroid hormone.

(2) If there is deficiency of iodine in the diet, it causes enlargement of thyroid gland leading to simple goitre.

(3) This disease is common in hilly areas hence it is also called endemic goitre.

(4) Addition of iodine to table salt prevents this disease.

(5) Therefore we must use iodised salt.

(5) Cerebellum is well developed in humans.

Ans. (1) Our posture is upright and mode of locomotion is bipedal.

(2) While standing, walking and running, our body has to be in a state of balance.

(3) Cerebellum controls balancing, posture, body equilibrium and orientation.

(4) Thus to control static as well as dynamic equilibrium of the body, cerebellum is well developed..

Chapter 10 : Human Health and Diseases

(1) Innate immunity is also known as non-specific immunity.

Ans. Innate immunity is non-specific because it does not depend on previous exposure to foreign substances. It is inborn capacity of the body to resist the pathogen that causes the disease. It is natural immunity and hence it remains non-specific, trying to protect the body in case of any invasion of foreign body.

(2) Vaccination is important for preventing pneumonia.

Ans. Vaccinations for pneumonia are available against *Haemophilus influenza*e and *Streptococcus pneumoniae.* If given earlier in life, they reduce the chances of catching pneumococcal infections. The deaths can be prevented which are common due to lung infections. Since it is a common and chronic disease for all age groups, for the prevention one must take vaccination.

(3) Prevention is better than cure for AIDS.

Ans. Till this time, there is no preventive vaccination for AIDS. There is also no cure for AIDS. The medicines are also costly and may not give complete cure. The only way to remain away from AIDS is the complete awareness about it. Thus it should be prevented by not allowing HIV to enter our body. Once HIV finds the entrance, the cure is impossible. Therefore, it is said that prevention is better than cure for AIDS.

Chapter 11 : Enhancement of Food Production

(1) Biogas plants are more often built in rural areas.

Ans. (1) Biogas is a non-conventional and renewable source of energy obtained by microbial fermentation.

(2) Cattle dung (the main substrate), domestic wastes, agricultural wastes, agro industrial wastes forestry wastes etc. are utilized as substrates for production of biogas.

(3) Biogas is eco-friendly and does not cause pollution, can be used as domestic fuel.

(4) As the raw material for its production is readily available, the biogas plants are more often built in rural areas.

(2) Healthy root nodules are pink in colour.

Ans. (1) *Rhizobium* has symbiotic relationship with roots of leguminous plants.

(2) It infects root cortex and form root nodules.

(3) Root nodules are the site of nitrogen fixation.

(4) Enzyme nitrogenase which catalyzes nitrogen fixation, gets inhibited by oxygen.

(5) But root nodule contain a pigment called leghaemoglobin which acts as oxygen scavanger and protects nitrogenase from getting inhibited.

(6) Leghaemoglobin is pink in colour.

(7) Hence, healthy root nodules are pink in colour.

(3) We include mushrooms in our diet.

Ans. (1) Mushrooms are directly used as food.

(2) They produce large, fleshy fruiting bodies which are edible.

(3) They are low calorie, sugar free, fat free, but rich in proteins, vitamins, minerals and amino acids.

(4) Hence, we include mushrooms in our diet.

(4) Honey bees are best pollinators.

Ans. (1) About 80% of insect pollination is carried by honey bees.

(2) They pollinate various crops like sunflower, mustard, safflower, chilly, cabbage, cucumber, legumes, fruits like apple, mango, citrus, etc.

(3) They increase the productivity of crops.

(4) Hence, honey bees are important pollinators.

Chapter 12 : Biotechnology

(1) Bacteria have restriction enzymes.

Ans. (1) Restriction endonucleases or restriction enzymes in bacteria help them to recognize and destroy various viral DNAs that might enter the cell.

(2) They cut the phosphodiester back bone at highly specific sites on both strands of DNA.

(3) Thus, these enzymes restrict the potential growth of the virus and protect bacteria.

(4) Hence, bacteria produce restriction enzymes.

(2) All the fragments of a genome are cloned for storing them in genomic library.

Ans. (1) Genomic DNA is fragmented at the time of preparing genomic library.

(2) It is not known which fragment has the desired gene.

(3) Therefore all the fragments have to be cloned to store the copies of each separately.

(4) Screening for the desired gene is later done through complementation or using DNA probes.

(5) Therefore, all the fragments of a genome are cloned for storing them in genomic library.

(3) The establishment of genomic library is more meaningful in prokaryotes than in eukaryotes.

Ans. (1) The prokaryotic genome does not contain repetitive DNA.

(2) Eukaryotic DNA genome contains introns, regulatory genes and repetitive DNA.

(3) Hence, the establishment of genomic library is more meaningful in prokaryotes than in eukaryotes.

(4) Flavr savr tomato has longer shelf life.

Ans. (1) Flavr savr is genetically modified type of tomato.

(2) It is developed by inserting antisense gene which retards ripening.

(3) Due to the presence of this gene a cell wall degrading enzyme called polygalactouronase is produced in lesser amounts.

(4) Owing to the above reasons, Flavr savr tomato has longer shelf life.

Chapter 13 : Organisms and Population

(1) Predators in nature are called prudent.

Ans. (1) Predators control the prey population but if a predator overexploits its prey, then the prey might become extinct.

(2) If prey species is not available, the predator will also starve and become extinct. Predators, therefore, do not kill the prey unnecessarily. They act as prudent.

(2) Adaptation is an important attribute of the organism.

Ans. (1) Organisms adapt to their surrounding environment by showing physiological, behavioural or morphological changes which are called adaptations.

(2) Due to adaptations, organisms can survive and reproduce in its environment. Therefore, adaptation is said to be an important attribute of the organisms.

(3) Temperature is said to be the most ecologically relevant environmental factor.

Ans. (1) Temperature fluctuations on the earth are quite marked.

(2) The distribution of plants and animals on the earth depends upon temperature range.

(3) For the organisms ambient temperature affects their enzyme kinetics of the cell.

(4) Entire metabolism, activity and other physiology of the organism is dependent on temperature. Therefore, it is said to be the most ecologically relevant environmental factor.

Chapter 14 : Ecosystems and Energy Flow

(1) Food chains do not exist in isolation, but are always interconnected to form food web.

Ans. (1) Food chains start from producers and end with consumers.

(2) But beyond secondary carnivores, the amount of energy available is too less.

(3) Thus, there is no tertiary carnivore that feeds exclusively on secondary carnivore.

(4) The secondary carnivore, however, many times will feed on herbivores directly.

(5) Therefore, food chains do not exist in isolation, but are always interconnected to form food web, so that the stability of ecosystem is maintained.

(2) The pyramid of energy is always upright.

Ans. (1) When the energy is moving from one trophic level to the next one, there is loss of some energy in the form of heat.

(2) Therefore, the energy is always more on the lower trophic levels as compared to the higher trophic levels.

(3) Due to this reason, the pyramid of energy is always upright and never inverted.

(1) Global warming is caused by greenhouse effect.

Ans. (1) Carbon dioxide along with methane, nitrogen oxides and CFCs can absorb infrared radiations reflected from the earth's surface.

(2) The blanket formed by these gases in the atmosphere traps the reflected infrared rays and produces heat on the earth's surface which results in greenhouse effect.

(3) The greenhouse effect in turn causes global warming.

(2) Water hyacinth is called 'Terror of Bengal'.

Ans. (1) Water hyacinth (*Eichhornia crassipes*) is native plant of amazon basin which was introduced in India for its beautiful, purple flowers.

(2) It has become an invasive species.

(3) This plant is a nuisance as it grows excessively and covers entire water body in which it is present.

(4) It grows faster than our ability to remove it, so it is commonly called 'Terror of Bengal'.