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XII CBSE - BOARD - MARCH - 2016

CODE (57/1) SET - 1

Date: 21.03.2016

BIOLOGY - SOLUTIONS

SECTION - A

1. Male honeybees (drones) develops as a result of PARTHENOGENESIS so they are haploid and hence contain 16 chromosomes unlike the female honeybees which contains 32 chromosomes(diploid).

[1 mark for writing correct answer- word PARTHENOGENESIS.]

Topic : Reproduction in Organisms, Sub topic : Sexual Reproduction, Level : 1 _ Target-2016 _ XII-CBSE Board Exam _ Biology

2. Genetic mother in MOET is used for Superovulation.

[1 mark for writing correct answer]

Topic : Strategies in improvement of food production, Sub topic : Animal husbandary, Level : 1 _ Target-2016 _ XII-CBSE Board Exam _ Biology

3. **Biopiracy** is the term used to refer to the use of bio-resources by multinational companies and other organisations without proper authorisation from the countries and people concerned without compensatory payment.

Refer XII NCERT TEXT BOOK Pg. 214

Topic:Biotechnology and Its Applications _; Sub-Topic:Ethical Issues _ L-1 Target-2016 _ XII-CBSE Board Exam _ Biology

4. The answer is that CNG burns most efficiently, unlike petrol or diesel, in the automobiles and very little of it is left unburnt. Moreover, CNG is cheaper than petrol or diesel, cannot be siphoned off by thieves and adulterated like petrol or diesel. The main problem with switching over to CNG is the difficulty of laying down pipelines to deliver CNG through distribution points/pumps and ensuring uninterrupted supply.

Refer XII NCERT TEXT BOOK Pg. 273

Topic:Environmental Issues; Sub-Topic:Air Pollution_ L-1 _ Target-2016_ XII-CBSE Board Exam _ Biology

5. Homo habilis did not eat meat whereas Homo erectus probably ate meat.

[1/2 mark for writing food habits of each group]

Topic:Evolution; Sub-Topic:Human evolution _ L-1 Target-2016 _ XII-CBSE Board Exam _ Biology

SECTION - B

6. Papaya plants are dioecious i.e. there are separate male and female plants. Hence, only one type of gamete will be formed. So, there is no chance of fertilization with only one type of gamete. On the other hand pea plant is bisexual with both male and female reproductive organs. This forms male and female gamete which allows fertilization and formation of viable seeds.

Refer XII NCERT TEXT BOOK Pg. 11

Topic:Reproduction in organisms ; Sub-Topic:Sexual reproduction _ L-1 _Target-2016_ XII-CBSE Board Exam _Biology

7. (i) The codon is triplet. 61 codons code for amino acids and 3 codons do not code for any amino acids, hence they function as stop codons.
 (ii) One codon codes for only one amino acid, hence, it is **unambiguous** and **specific**.
 (iii) Some amino acids are coded by more than one codon, hence the code is **degenerate**.
 (iv) The codon is read in mRNA in a contiguous fashion. There are no punctuations.
 (v) The code is nearly **universal**: for example, from bacteria to human UUU would code for Phenylalanine (phe).

Refer XII NCERT TEXT BOOK Pg. 112

Topic:Molecular Basis of Inheritance; Sub-Topic:Genetic Code _ L-1 _Target-2016_ XII-CBSE Board Exam _Biology

8. **Collection of variability:** Collection and preservation of all the different wild varieties, species and relatives of the cultivated species (followed by their evaluation for their characteristics) is a pre-requisite for effective exploitation of natural genes available in the populations.

Evaluation and selection of parents: The germplasm is evaluated so as to identify plants with desirable combination of characters. The selected plants are multiplied and used in the process of hybridisation. Purelines are created wherever desirable and possible.

Cross hybridisation among the selected parents: The desired characters have very often to be combined from two different plants (parents), this is possible by cross hybridising the two parents to produce hybrids that genetically combine the desired characters in one plant.

Selection and testing of superior recombinants: This step consists of selecting, among the progeny of the hybrids, those plants that have the desired character combination. The selection process is crucial to the success of the breeding objective and requires careful scientific evaluation of the progeny. This step yields plants that are superior to both of the parents (very often more than one superior progeny plant may become available). These are self-pollinated for several generations till they reach a state of uniformity(homozygosity?), so that the characters will not segregate in the progeny.

Testing, release and commercialisation of new cultivars: The newly selected lines are evaluated for their yield and other agronomic traits of quality, disease resistance, etc. This evaluation is done by growing these in the research fields and recording their performance under ideal fertiliser application irrigation, and other crop management practices. The evaluation in research fields is followed by testing the materials in farmers' fields, for at least three growing seasons at several locations in the country, representing all the agroclimatic zones where the crop is usually grown. The material is evaluated in comparison to the best available local crop cultivar – a check or reference cultivar.

Refer XII NCERT TEXT BOOK Pg. 171

Topic:Strategies for Enhancement in Food production; Sub-Topic:Plant Breeding _ L-1 _Target-2016_ XII-CBSE Board Exam _Biology

9. The majority of baculoviruses used as biological control agents are in the genus *Nucleopolyhedrovirus*. These viruses are excellent candidates for species-specific, narrow spectrum insecticidal applications. They have been shown to have no negative impacts on plants, mammals, birds, fish or even on non-target insects. This is especially desirable when beneficial insects are being conserved to aid in an overall integrated pest management (IPM) programme, or when an ecologically sensitive area is being treated.

Refer XII NCERT TEXT BOOK Pg. 187

Topic: Microbes in Human Welfare; Sub-Topic: Biocontrol Agents _ L-1 Target-2016 _ XII-CBSE Board Exam _ Biology

10. CFCs discharged in the lower part of atmosphere move upward and reach stratosphere. In stratosphere, UV rays act on them releasing Cl atoms. Cl degrades ozone releasing molecular oxygen, with these atoms acting merely as catalysts; Cl atoms are not consumed in the reaction. Hence, whatever CFCs are added to the stratosphere, they have permanent and continuing affects on Ozone levels.

Refer XII NCERT TEXT BOOK Pg. 282

Topic: Environmental Issues _; Sub-Topic: Ozone Depletion _ L-1 Target-2016 _ XII-CBSE Board Exam _ Biology

OR

India has also a history of religious and cultural traditions that emphasised protection of nature. In many cultures, tracts of forest were set aside, and all the trees and wildlife within were venerated and given total protection. Such **sacred groves** are found in Khasi and Jaintia Hills in Meghalaya, Aravalli Hills of Rajasthan, Western Ghat regions of Karnataka and Maharashtra and the Sarguja, Chanda and Bastar areas of Madhya Pradesh. In Meghalaya, the sacred groves are the last refuges for a large number of rare and threatened plants.

Refer XII NCERT TEXT BOOK Pg. 267

Topic: Biodiversity and Conservation; Sub-Topic: In Situ Conservation _ L-1 Target-2016 _ XII-CBSE Board Exam _ Biology

SECTION - C

11. (a) The hard outer layer called the **exine** is made up of sporopollenin which is one of the most resistant organic material known. It can withstand high temperatures and strong acids and alkali. No enzyme that degrades sporopollenin is so far known. [1 Mark]
- (b) Pollen grain exine has prominent apertures called **germ pores** where sporopollenin is absent. [1 Mark]
- (c) Stored pollen can be used as pollen banks, similar to seed banks, in crop breeding programmes.

[1 Mark]

Refer XII NCERT TEXT BOOK Pg. 23 - 24

Topic: Sexual reproduction in Flowering plants; Sub-Topic: Structure of Pollen grain _ L-1 Target-2016 _ XII-CBSE Board Exam _ Biology

OR

- (a) Following problems are taken to improve the reproductive health standards in India
- Providing infrastructural facilities and professional expertise to attain reproductive health.
 - Educating people about birth control methods, care of pregnant mothers, importance of breast feeding, safe and hygienic sexual practices and safeguard against STDs.
 - Introduction of sex education in schools to give proper information to the young minds about sex-related aspects.

- (iv) Help of audio-visual and print media to create awareness among people about reproduction related aspects.
 - (v) Awareness of problems due to population explosion, social evils like sex-abuse and sex-related crimes.
 - (vi) Statutory ban on amniocentesis to legally check female foeticides.
- (b) Amniocentesis is a pre-natal diagnostic test based on the chromosomal pattern of the cells in the amniotic fluid that surrounds the developing foetus in the womb.

Government imposed a statutory ban because of its misuse. It is used to diagnose the sex of the foetus and leads to female foeticide.

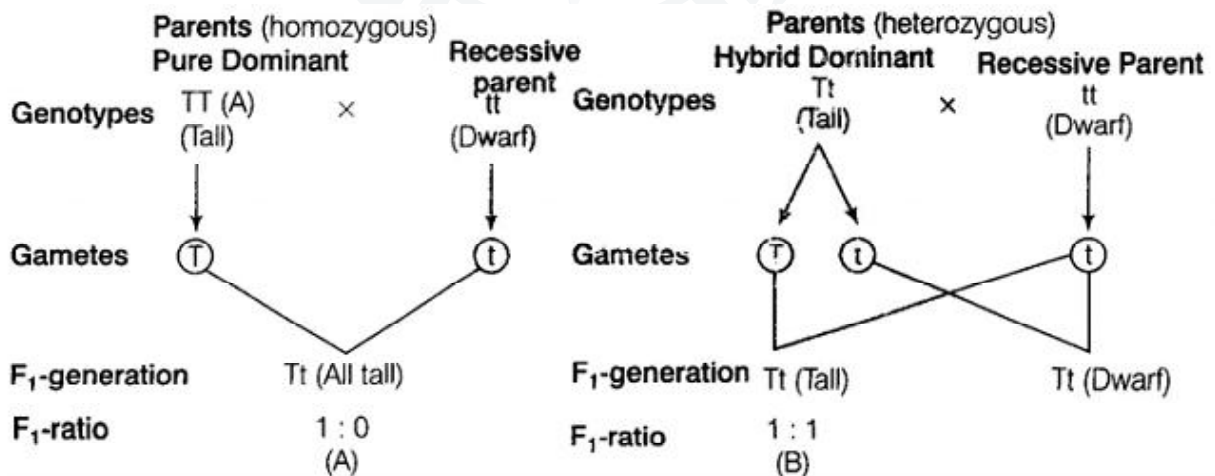
Yes, the ban is necessary because amniocentesis is misused now-a-days. It is used to determine the sex of the foetus and in many cases it led to female foeticide. It became so serious that it disturbed the male female ratio that can have a negative impact on society.

The test is actually meant to determine the genetic defects or metabolic disorders in foetus by doing a chromosomal analysis. In such extreme cases that would be incurable, a decision to abort the foetus could be taken.

[1/2 mark each correct point, atleast 6 points required]

Topic: Reproductive Health; Sub-Topic: Reproductive and Child Health Care _ L-2 _ Target-2016 _ XII- CBSE Board Exam _ Biology

12. When a progeny of F₁, is crossed with the homozygous recessive parent, it is called test Cross. Test cross between pure dominant (A) and hybrid dominant (B) individuals with recessive parent is shown below



Such a cross is useful to determine the genotype of an unknown trait, i.e., whether it is heterozygous or homozygous dominant for the trait.

[1 mark for writing correct definition of test cross and 2 marks for illustration of cross as above.]

Topic: Principles of Inheritance and Variations; Sub-Topic: Test Cross _ L-2 _ Target-2016 _ XII- CBSE Board Exam _ Biology

13. (a) The vector DNA were called as **BAC** (bacterial artificial chromosomes), and **YAC** (yeast artificial chromosomes). **[1 Mark]**
- (b) The functions are unknown for over 50 per cent of discovered genes. Less than 2 per cent of the genome codes for proteins. **[1 Mark]**
- (c) (**SNPs – single nucleotide polymorphism**, **[1 Mark]**
Refer XII NCERT TEXT BOOK Pg. 119, 120

Topic: Molecular Basis of Inheritance ; Sub-Topic: Human Genome Project _ L-1 _ Target-2016 _ XII-CBSE Board Exam _ Biology

14.

	Homology	Analogy
(i)	Homology refers to study of homologous organs.	Analogy refers to study of analogous organs
(ii)	Homologous organs have similar anatomical structure and origin.	Analogous organs have dissimilar or different anatomical structure and origin.
(iii)	Homologous organs perform different functions.	Analogous organs perform similar functions.
(iv)	Leads to divergent evolution	Lead to convergent evolution.
(v)	Egs : The thorn of bouganvillae and tendrils of cucurbita.	Egs : Potata and sweet potato, flipper's of penguin and dolphins.

[1/2 mark for writing correct answer on each side. Minimum 3 points for each side required.]

Topic : Evolution, Sub topic : Evolution of life, Level : 2 _ Target-2016 _ XII-CBSE Board Exam _ Biology

15. (a) The child who has suffered from chicken pox once may not contract the disease again as the basis of such an immunity is Acquired Antibody mediated immunity. In this case antibodies developed against chicken pox virus remain in blood circulation and provide life long immunity.
 The immunity thus developed is called as Acquired Antibody or Humoral mediated immunity.
- (b) In response to viral infections our body produces glycoproteins called interferons. Such type of barriers of innate immunity is called cytokine barrier. Interferons protect the non-infected cells from further viral infection.

[1 1/2 marks for writing correct answer of each sub question.]

Topic: Huamn health and Diseases ; Sub-Topic: Immunity _ L-2 _ Target-2016 _ XII-CBSE Board Exam _ Biology

16. (a) Traditional breeding techniques failed to keep pace with demand and to provide sufficiently fast and efficient systems for crop improvement, **[1 Mark]**
- (b) The application of these methods it is possible to achieve propagation of a large number of plants in very short durations. these plants will be genetically identical to the original plant from which they were grown, i.e., they are **somaclones**. **[1 Mark]**
- (c) Many important food plants like tomato, banana, apple, etc., have been produced on commercial scale using this method. one can remove the meristem and grow it *in vitro* to obtain virus-free plants. Scientists have succeeded in culturing meristems of banana, sugarcane, potato, etc. **[1 Mark]**

Refer XII NCERT TEXT BOOK Pg. 177

Topic: Strategies for Enhancement in Food production; Sub-Topic: Tissue culture _ L-1 _ Target-2016 _ XII-CBSE Board Exam _ Biology

17. (a) A key belief of the organic farmer is that biodiversity furthers health. The organic farmer, therefore, works to create a system where the insects that are sometimes called pests are not eradicated, but instead are kept at manageable levels by a complex system of checks and balances within a living and vibrant ecosystem. **[1 Mark]**
 e.g. The very familiar beetle with red and black markings – the Ladybird, and Dragonflies are useful to get rid of aphids and mosquitoes, respectively. An example of microbial biocontrol agents that can be introduced in order to control butterfly caterpillars is the bacteria *Bacillus thuringiensis* (often written as *Bt*). **[1 Mark]**
- (b) Contrary to the ‘conventional’ farming practices which often use chemical methods to kill both useful and harmful life forms indiscriminately, this is a holistic approach that seeks to develop an understanding of the webs of interaction between the myriad of organisms that constitute the field fauna and flora. The organic farmer holds the view that the eradication of the creatures that are often described as pests is not only possible, but also undesirable, for without them the beneficial predatory and parasitic insects which depend upon them as food or hosts would not be able to survive. **[1 Mark]**

Refer XII NCERT TEXT BOOK Pg. 186, 187

Topic: *Microbes in Human Welfare*; Sub-Topic: *Biocontrol Agents* _ L-1 _ Target-2016 _ XII-CBSE Board Exam _ Biology

18. (a) The genes encoding resistance to antibiotics such as ampicillin, chloramphenicol, tetracycline or kanamycin, etc., are considered useful selectable markers for *E. coli*. the vector requires a selectable marker, which helps in identifying and eliminating nontransformants and selectively permitting the growth of the transformants. **[1 Mark]**
- (b) Selection of recombinants due to inactivation of antibiotics is a cumbersome procedure because it requires simultaneous plating on two plates having different antibiotics. Therefore, alternative selectable markers have been developed which differentiate recombinants from non-recombinants on the basis of their ability to produce colour in the presence of a chromogenic substrate. In this, a recombinant DNA is inserted within the coding sequence of an enzyme, β -galactosidase. This results into inactivation of the enzyme, which is referred to as **insertional inactivation**. The presence of a chromogenic substrate gives blue coloured colonies if the plasmid in the bacteria does not have an insert. Presence of insert results into insertional inactivation of the β -galactosidase and the colonies do not produce any colour, these are identified as recombinant colonies. **[2 Marks]**

Refer XII NCERT TEXT BOOK Pg. 199 , 200

Topic: *Biotechnology Principles and Processes*; Sub-Topic: *Cloning Vectors* _ L-2 _ Target-2016 _ XII-CBSE Board Exam _ Biology

19. (a) Since DNA is a hydrophilic molecule, it cannot pass through cell membranes. In order to force bacteria to take up the plasmid, the bacterial cells must first be made ‘competent’ to take up DNA. This is done by treating them with a specific concentration of a divalent cation, such as calcium, which increases the efficiency with which DNA enters the bacterium through pores in its cell wall. **[2 Marks]**
- (b) In another method, suitable for plants, cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA in a method known as **biolistics** or **gene gun**. **[1 Mark]**

Refer XII NCERT TEXT BOOK Pg. 200, 201

Topic: *Biotechnology Principles and Processes*; Sub-Topic: *Competent Host* _ L-2 _ Target-2016 _ XII-CBSE Board Exam _ Biology

20. The function of the adenosine deaminase enzyme is to eliminate a molecule called deoxyadenosine, which is generated when DNA is broken down. Adenosine deaminase converts deoxyadenosine, which is toxic to lymphocytes.

Adenosine deaminase deficiency can be cured by enzyme replacement therapy, but the cure is not permanent even after infusion of genetically engineered lymphocytes into a patient as cells do not always remain alive.

[2 Marks]

Refer XII NCERT TEXT BOOK Pg. 211

Topic:Biotechnology and Its Applications ; Sub-Topic:Gene Therapy _ L-1 Target-2016 _ XII-CBSE Board Exam _Biology

21. The cattle egret and grazing cattle in close association, a sight you are most likely to catch if you live in farmed rural areas, is a classic example of commensalism. The egrets always forage close to where the cattle are grazing because the cattle, as they move, stir up and flush out from the vegetation insects that otherwise might be difficult for the egrets to find and catch.

[2 Marks]

The *mycorrhizae* are associations between fungi and the roots of higher plants. The fungi help the plant in the absorption of essential nutrients from the soil while the plant in turn provides the fungi with energy-yielding carbohydrates.

[1 Mark]

Refer XII NCERT TEXT BOOK Pg. 236, 237

Topic:Organisms and Populations; Sub-Topic:Population Interaction _ L-2 Target-2016 _ XII-CBSE Board Exam _Biology

22. In primary succession in water, the pioneers are the small phytoplanktons, they are replaced with time by free-floating angiosperms, then by rooted hydrophytes, sedges, grasses and finally the trees. The climax again would be a forest. With time the water body is converted into land. In secondary succession the species that invade depend on the condition of the soil, availability of water, the environment as also the seeds or other propagules present. Since soil is already there, the rate of succession is much faster and hence, climax is also reached more quickly.

Topic:Ecosystem; Sub-Topic:Succession of Plants _ L-1 Target-2016 _ XII-CBSE Board Exam _Biology

SECTION - D

23. (a) In India females are still considered to be a weaker gender as compared to males. So often the blame of being childless is given to females.
- Values like (i) Both the males and females are equal and so the females alone should not be blamed for inability to give birth to the child.
- (ii) Males are heterogametic and so they determine the gender of the child and not the female who is homogametic.
- (b) The reasons of infertility in young people can be-
- (i) Physical- congenital diseases like cryptorchidism, blocked fallopian tube or vas deferens, etc
- (ii) Use of steroidal drugs,
- (iii) Immunological reaction like in mumps infection
- (iv) Even psychological.
- (c) 'Assisted Reproductive Technology' (ART) is the collection of certain special techniques. The primary aim of the ART programme is to assist infertile couples to have children through certain special techniques (like ZIFT, IUT, GIFT, ICSI, AI, etc.) where corrective treatment is not possible.

[1/2 mark for each valid point , Atleast 8 points required.]

Topic:Reproductive Health; Sub-Topic: Infertility _ L-2 Target-2016 _ XII-CBSE Board Exam _Biology

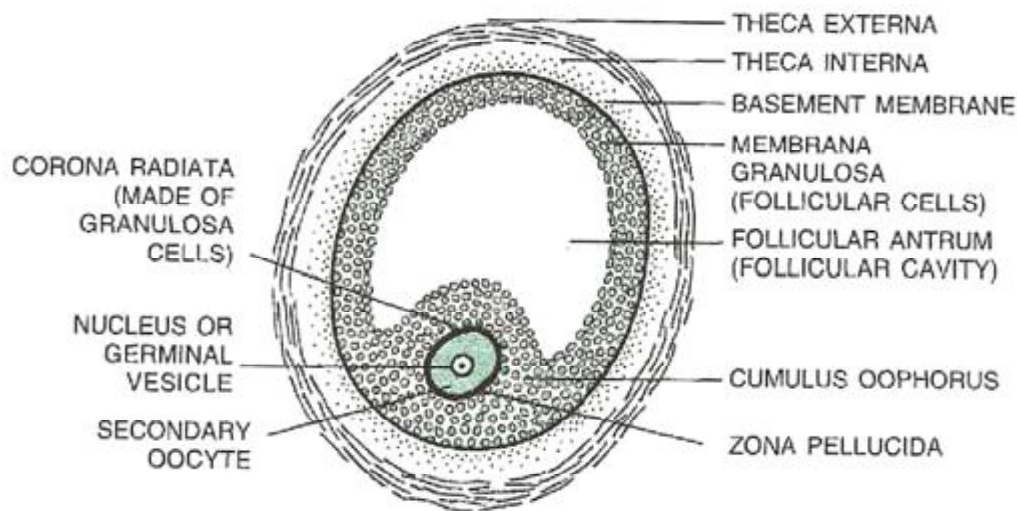
SECTION - E

24. (a) Menstrual Phase (1-5 days)

Endometrium breaks down, the cells of endometrium, secretions, unfertilised ovum constitute menstrual flow. The menstrual cycle starts with the menstrual phase, when menstrual flow occurs and it lasts for 3-5 days. It results due to breakdown of endometrial lining of the uterus and its blood vessels.

Pituitary hormones FSH and LH are low i.e towards baseline and also the Ovarian hormones Oestrogen and Progesteron production is reduced

- (b) Follicular phase is also referred to as proliferative phase as the follicular cells in the ovary undergo growth and proliferation to transform into mature Graafian follicle and the ruptured endometrium undergoes proliferation during this phase.
- (c) (i) FSH and LH reach their peak level around the mid-cycle (14th day). The peak level of LH surge causes the rupture of Graafian follicle and release of ovum (ovulation).
 (ii) LH influences the remaining parts of Graafian follicle to transform into corpus luteum.
 (iii) Corpus luteum secretes large quantity of progesterone in the luteal phase. Progesterone is required for the growth and maintenance of endometrium of uterus for implantation.
 (iv) In the absence of fertilisation, the high levels of progesterone exert negative feed back on the pituitary. This stops the secretion of LH and corpus luteum degenerates leading to Menstruation.



[1 mark for writing correct answer of each subquestion and 2 marks for diagram with correct labelling]

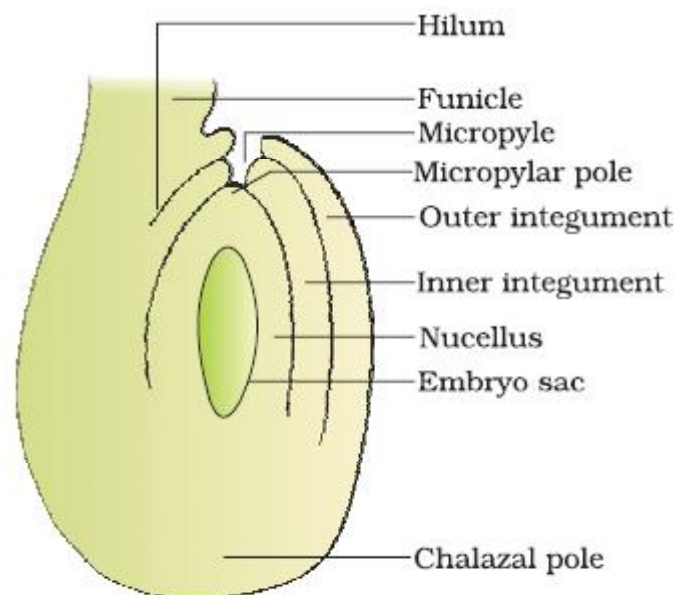
Topic : Human Reproduction, Sub topic : Menstrual cycle and Graafian follicle, Level : 2 _Target-2016_ XII-CBSE Board Exam_ Biology

OR

- (a) Flowering plants have developed many devices to discourage selfpollination and to encourage cross-pollination. In some species, pollen release and stigma receptivity are not synchronised. Either the pollen is released before the stigma becomes receptive or stigma becomes receptive much before the release of pollen. In some other species, the anther and stigma are placed at different positions so that the pollen cannot come in contact with the stigma of the same flower. Both these devices prevent autogamy. The third device to prevent inbreeding is self-incompatibility. This is a genetic mechanism and prevents self-pollen (from the same flower or other flowers of the same plant) from fertilising the ovules by inhibiting pollen germination or pollen tube growth in the pistil. Another device to prevent self-pollination is the production of unisexual flowers. If both male and female flowers are present on the same plant such as castor and maize (monoecious), it prevents autogamy but not geitonogamy. In several species such as papaya, male and female flowers are present on different plants, that is each plant is either male or female (dioecy). This condition prevents both autogamy and geitonogamy.

[3 Marks]

(b)



[2 Marks]

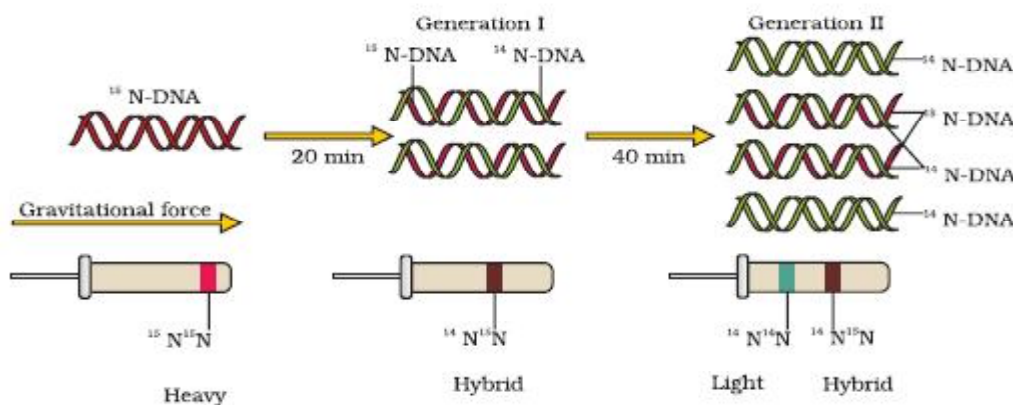
Refer XII NCERT TEXT BOOK Pg. 25, 31

Topic:Sexual Reproduction in Flowering plants; Sub-Topic:Megasporangium, Outbreeding Devices _ L-1 _ Target-2016_ XII-CBSE Board Exam_ Biology

25. Matthew Meselson and Franklin Stahl performed the following experiment in 1958:

- (i) They grew *E. coli* in a medium containing $^{15}\text{NH}_4\text{Cl}$ (^{15}N is the heavy isotope of nitrogen) as the only nitrogen source for many generations. The result was that ^{15}N was incorporated into newly synthesised DNA (as well as other nitrogen containing compounds). This heavy DNA molecule could be distinguished from the normal DNA by centrifugation in a cesium chloride (CsCl) density gradient (Please note that ^{15}N is not a radioactive isotope, and it can be separated from ^{14}N only based on densities).

- (ii) Then they transferred the cells into a medium with normal $^{14}\text{N}\text{H}_4\text{Cl}$ and took samples at various definite time intervals as the cells multiplied, and extracted the DNA that remained as double-stranded helices. The various samples were separated independently on CsCl gradients to measure the densities of DNA.
- (iii) Thus, the DNA that was extracted from the culture one generation after the transfer from ^{15}N to ^{14}N medium [that is after 20 minutes; *E. coli* divides in 20 minutes] had a hybrid or intermediate density. DNA extracted from the culture after another generation [that is after 40 minutes, II generation] was composed of equal amounts of this hybrid DNA and of 'light' DNA. **[3 Marks]**



[2 Marks]

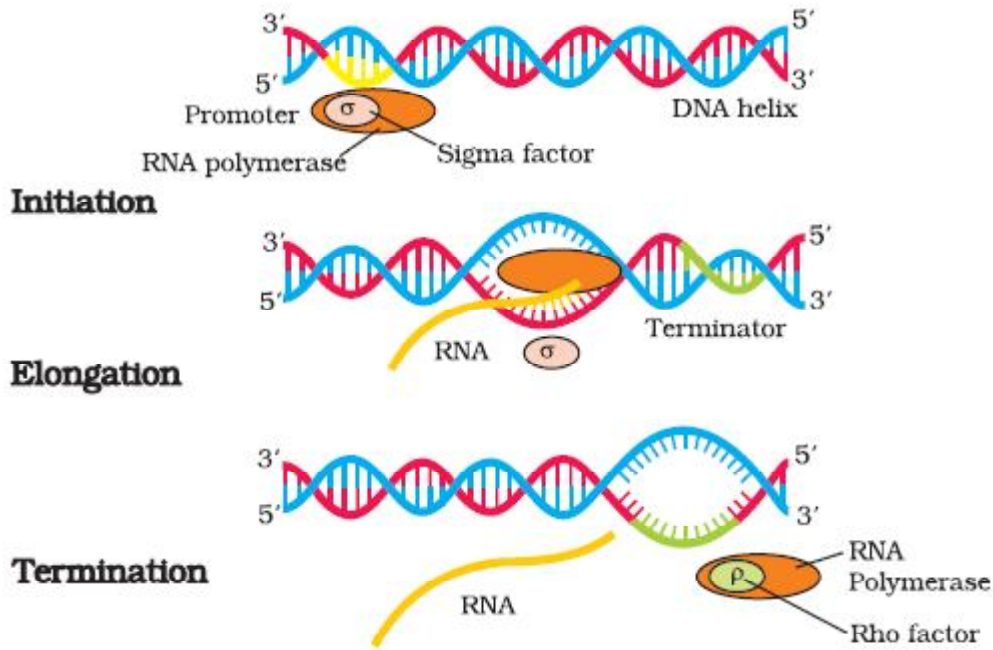
Refer XII NCERT TEXT BOOK Pg. 105

Topic: *Molecular basis of Inheritance*; Sub-Topic: *DNA Replication _L-1_ Target-2016_ XII-CBSE Board Exam _Biology*

OR

- (a) In bacteria, there are three major types of RNAs: mRNA (messenger RNA), tRNA (transfer RNA), and rRNA (ribosomal RNA). All three RNAs are needed to synthesise a protein in a cell. The mRNA provides the template, tRNA brings amino acids and reads the genetic code, and rRNAs play structural and catalytic role during translation. There is single DNA-dependent RNA polymerase that catalyses transcription of all types of RNA in bacteria. RNA polymerase binds to promoter and initiates transcription (**Initiation**). It uses nucleoside triphosphates as substrate and polymerises in a template depended fashion following the rule of complementarity. It somehow also facilitates opening of the helix and continues elongation. Only a short stretch of RNA remains bound to the enzyme. Once the polymerases reaches the terminator region, the nascent RNA falls off, so also the RNA polymerase. This results in **termination** of transcription.

The RNA polymerase is only capable of catalysing the process of elongation. It associates transiently with **initiation-factor** (σ) and **termination-factor** (ρ) to initiate and terminate the transcription, respectively. Association with these factors alter the specificity of the RNA polymerase to either initiate or terminate. In bacteria, since the mRNA does not require any processing to become active, and also since transcription and translation take place in the same compartment (there is no separation of cytosol and nucleus in bacteria), many times the translation can begin much before the mRNA is fully transcribed. Consequently, the transcription and translation can be coupled in bacteria. **[2 Marks]**



[1 Mark]

- (b) It is subjected to a process called **splicing** where the introns are removed and exons are joined in a defined order. hnRNA undergo two additional processing called as capping and tailing. In **capping** an unusual nucleotide (methyl guanosine triphosphate) is added to the 5'-end of hnRNA. In **tailing**, adeny late residues (200-300) are added at 3'-end in a template independent manner. It is the fully processed hnRNA, now called mRNA, that is transported out of the nucleus for translation. [2 Marks]

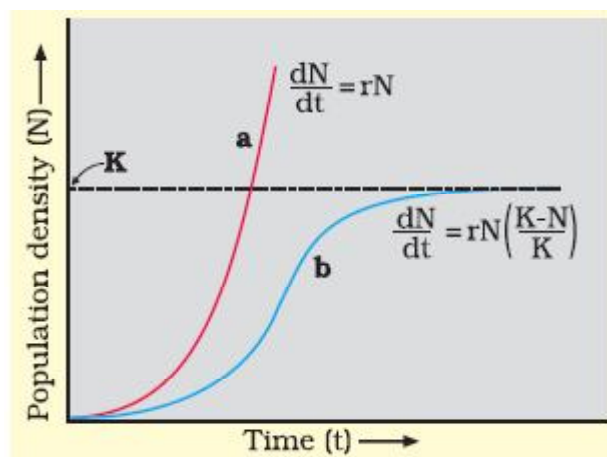
Refer XII NCERT TEXT BOOK Pg. 109 to 111

Topic: Molecular Basis of Inheritance; Sub-Topic: Transcription _ L-2 _ Target-2016_ XII-CBSE Board Exam _ Biology

26. (a) **Exponential growth:** Resource (food and space) availability is obviously essential for the unimpeded growth of a population. Ideally, when resources in the habitat are unlimited, each species has the ability to realise fully its innate potential to grow in number, as Darwin observed while developing his theory of natural selection. Then the population grows in an exponential or geometric fashion.

Logistic Growth: A population growing in a habitat with limited resources show initially a lag phase, followed by phases of acceleration and deceleration and finally an asymptote, when the population density reaches the carrying capacity. A plot of N in relation to time (t) results in a sigmoid curve.

[2 Marks]



[1 Mark]

- (b) Any species growing exponentially under unlimited resource conditions can reach enormous population densities in a short time. A population growing in a habitat with limited resources show initially a lag phase, followed by phases of acceleration and deceleration and finally an asymptote, when the population density reaches the carrying capacity. A plot of N in relation to time (t) results in a sigmoid curve. [1 Mark]
- (c) Human population growth is represented by sigmoid curve. Since resources for growth for most animal populations are finite and become limiting sooner or later, the logistic growth model is considered a more realistic one. [1 Mark]

Refer XII NCERT TEXT BOOK Pg. 229 to 231

Topic: Organism and populations; Sub-Topic: Population Characters _ L-1_ Target-2016_ XII-CBSE Board Exam _Biology

OR

- (a) Biotic components of pond ecosystem comprise producers, consumers and decomposers.
Producers : Green plants are the producers of pond ecosystem. They synthesise organic compounds from simple inorganic substances such as water, carbon dioxide and minerals in the presence of sunlight. There are two types of producers in a pond.
- (i) Large plants growing along the bank or floating in shallow water like *Eichhornia*, *Pistia*, *Wolffia*; marginal and emergent plants like *Ipomoea*, *Typha*, *Phragmites*, etc. submerged plants like *Potamogeton*, *Vallisneria*, etc., and filamentous algae like *Spirogyra*, *Chara*, *Oedogonium*, etc.
- (ii) Microscopic plants or phytoplankton include *Oscillatoria*, *Anabaena*, *Eudorina*, *Clostridium* and *Volvox*. The phytoplankton are more important as producers than larger plants in the pond.

Consumers : Animals are the consumers that utilise the food produced by the green plants. These include small crustaceans (*Cyclops*, *Daphnia*), insects and fishes.

Zooplankton like *Paramecium*, *Mysids*, small crustaceans, insects and fishes are herbivores are primary consumers. They feed on phytoplankton. The primary consumers like crustaceans are eaten by small fishes and aquatic insects. They are called **secondary consumers**. Large fishes eat insects and small fishes. They are called **tertiary consumers**.

Decomposer : Bacteria and fungi are the decomposers of the pond ecosystem. They decompose the excreta of animals and bodies of plants and animals, and release simple inorganic and organic substance into environment. They are also known as **saprotrophs** or **reducers**.

The simpler substances released by the decomposers are reused by the producers. Thus, there is a **cyclic exchange of materials** between the living components and the abiotic component of the pond ecosystem.

- (b) **Grazing Food Chain** i.e. GFC is the major conduit for energy flow in pond.

[5 Marks]

Topic: Ecosystem; Sub-Topic: Food Chain _ L-2_ Target-2016_ XII-CBSE Board Exam _Biology