



STD. XII - CBSE BOARD TEST

(57/2) (SET - 1)

Date: 23.03.2015

BIOLOGY - SOLUTIONS

SECTION A

1. Number of chromosomes in drones = 16
Type of cell division – Mitosis
2. **Cistron** - A segment of DNA coding for a polypeptide or a section of DNA that contains the genetic code for a single polypeptide and functions as a hereditary unit.
3. Retroviruses have no DNA. However the DNA of the infected host cell does possess viral DNA. It is possible by reverse transcriptase enzyme by retrovirus (Teminism).

$$\text{DNA} \xrightleftharpoons[\text{Reverse transcription (Teminism)}]{\text{Transcription}} \text{RNA}$$
4. Children cured by enzyme – replacement therapy for adenosine deaminase deficiency need periodic treatment because the functional ADA which is given to the patient by injection is not immortal.
5. Advantages of the use of unleaded petrol in automobiles as fuel.
 - (a) It helps in keeping catalyst (like platinum – palladium and rhodium) active.
 - (b) Reduces emission of the pollutants

SECTION B

6.
 - (i) Majority of moss plants shows cross fertilization.
 - (ii) Process of fertilization takes place by chemotaxis (with the help of chemical like malic acid) along with presence of water.
 - (iii) Since in this process, loss of male gametes are huge, moss plants produce very large number of male gametes.
 - (iv) These gametes are called antherozoids or male gametes or sperms.
7.
 - (a) The homologous structures are
 - (i) Forelimbs of whales and bats
 - (iv) Thorns of *Bougainvillea* and tendrils of *Cucurbita*.
 - (b) They represent divergent evolution.



- 8.
- (a) The plants raised through micropropagation termed as somaclones because most of the time they are raised by somatic cell with the help of cellular totipotency.
- (b) **Advantages of micropropagation :**
- (i) Useful for obtaining large number of genetically identical plants (clones) within short time period.
 - (ii) Due to micropropagation, multiplication of plants becomes season independent.
 - (iii) Rare plants can be conserved by this technique.
 - (iv) Storage becomes easy as micropropagules require little space.
 - (v) Commercial production of potato, banana, orchids etc., is possible.
9. Different steps involved during primary treatment phase of sewage.
- Basically physical removal of particles large and small from the sewage through filtration and sedimentation.
- (i) Initially floating debris is removed by sequential filtration.
 - (ii) Then the grit (soil and small pebbels) are removed by sedimentation. All solids that settle from the primary sludge and the supernatant forms the effluent.
 - (iii) The effluent from the primary settling tanks is taken for secondary treatment.
10. Mutualism – The interaction confers benefits on both the interacting species is mutualism. (or)
An association of 2 or more species in which both or all species gets equally benefited is known as mutualism.
Examples where the organisms involved are commercially exploited in agriculture.
- (i) *Rhizobium* : (N_2 fixing bacteria) with root nodules in leguminous crops.
 - (ii) Mycorrhiza : Symbiotic association of fungi with roots of higher plants (agricultural plants)
 - (iii) *Anabaena azollae* in *Azolla* used in Paddy fields.

OR

List of techniques where the principle of *ex-situ* conservation of biodiversity has been employed.

- (a) Zoological parks
- (b) Botanical gardens
- (c) Wildlife safari parks
- (d) Tissue culture technique
- (e) Seed banks
- (f) Cryopreservation

SECTION C

11. **Apomixis :** When offspring is produced by a single parent without the involvement of gamete formation it is called as apomixis or asexual reproduction.

Its significance :

- (i) Fastest method (rapid method)
- (ii) Cheap method (less expensive)
- (iii) Production of clones possible
- (iv) Can preserve stock of desired variety
- (v) Easier method

It can be commercially used as :

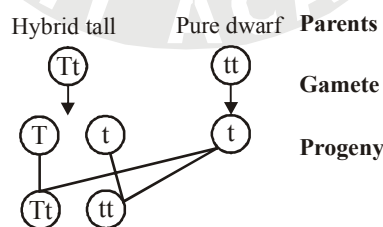
- (i) It is good for the multiplication of seedless plants like Banana, Sugarcane, Pineapple, seedless Orange and Grape.
- (ii) Potato crop requires more than one year with the help of seeds, however it takes only 3 to 4 months with the help of tubers. so it becomes faster method.
- (iii) Disease free plants can be cultured by micropropagation and micrografting hence it is possible to recover variety of banana from infected banana plants.
- (iv) Good quality and better yield varieties can be preserved for a long duration in offsite collection, botanical gardens etc.

12. During a monohybrid cross involving a tall pea plant with a dwarf pea plant, the offspring populations were tall and dwarf in equal ratio as it would be monohybrid test cross as given below:

In test cross, a cross is made between unknown dominant genotype and the recessive parent.

For example:

When F_1 hybrid (Tt) heterozygous is crossed with dwarf plant (tt).



The progenies obtained were tall and dwarf plant in the ratio 1:1.

13. The significance of satellite DNA in DNA fingerprinting technique :

- (i) Satellite DNA consists of very large arrays of tandemly repeating, non-coding DNA.
- (ii) Depending on base composition (A : T rich or G : C rich), length of segment and number of repetitive units, the satellite DNA is classified into many categories such as micro-satellites, mini-satellites etc.
- (iii) These sequences normally do not code for any proteins, but they form a large portion of human genome.
- (iv) These sequence show high degree of polymorphism and form the basis of DNA finger printing.
- (v) Since DNA from every tissue (such as blood, hair-folicle, skin, etc.,) from an individual show the same degree of polymorphism, they become very useful in identification tool in forensic applications.
- (vi) As polymorphisms are inheritable from parents to children, DNA fingerprinting is basis of paternity testing in case of dispute.

14. **Hardy-Weinberg Principle:** States that allele frequencies in a population are stable and is constant from generation to generation, i.e., gene pool is constant. This is called genetic equilibrium or Hardy-Weinberg equilibrium.

(i) It can be expressed by following equation

$$p^2 + 2pq + q^2 = 1$$

where, p and q are frequencies of different alleles.

(ii) Any fluctuation in genetic equilibrium leads to evolution.

15.

(a) Injection Tetanus toxoid

(b) Contains antitoxins

(c) Clostridium tetany bacteria, Artificial passive immunity

16. Dairy farm management processes include:

(i) Selection of good breeds having high yielding potential and resistance to the diseases.

(ii) Cattle should be housed-well, should have sufficient water and should be kept in disease-free conditions.

(iii) Cattle should be fed in scientific manner, with good quality and quantity of fodder.

(iv) Stringent cleanliness and hygiene of both the cattle and handlers are very important, while milking, storage and transport of milk.

(v) Regular inspection and keeping proper records of all the activities of dairy is mandatory.

(vi) Regular visits of a veterinary doctor is necessary.

17. *Streptococcus* : Streptokinase – [Clot buster for removing clots from the blood vessels of patients who have undergone myocardial infarction leading to heart attack]

Monoascus : Blood – Cholesterol lowering agents

Trichoderma : Cyclosporin A (an immunosuppressive agent in organ transplant patients)

OR

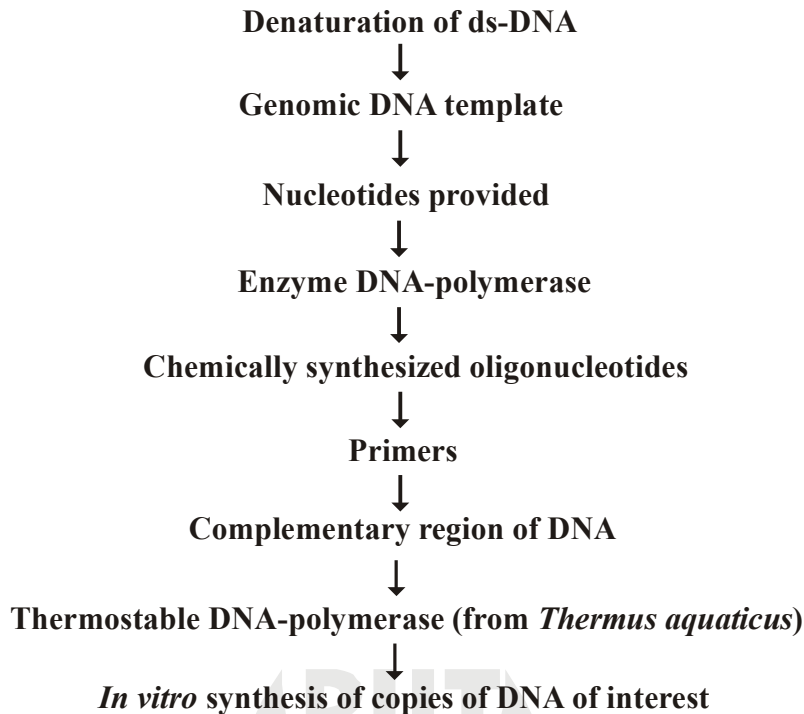
Methanogens : Certain bacteria which grow anaerobically on cellulosic material, producing large amount of methane along with CO₂ and H₂ are collectively called methanogens. eg. *Methanobacterium*

(i) Cellulosic material like cow dung $\xrightarrow[\text{Bacterial (Decomposer microbes)}]{\text{Anaerobic}}$ Monomers / Soluble Compounds

(ii) Monomers $\xrightarrow[\text{Microbes}]{\text{Fermentative}}$ Organic acids

(iii) Organic acids $\xrightarrow[\text{Bacteria}]{\text{Methanogenic}}$ Biogas
(CH₄, CO₂, H₂, N₂, H₂S)

18.



19.

- Potential applications of genetically modified plants.
- (i) Bt plants (like Bt cotton, Bt rice, tomato, potato) – To provide resistance to insect with the need for insecticides, in effect created a bio-pesticide.
 - (ii) Pest resistant plants
 - (iii) Crops more tolerant to abiotic stresses (cold, draught, salt, heat)
 - (iv) Helped to reduce post harvest losses
 - (v) Increased efficiency of mineral usage by plants
 - (vi) enhanced nutritional value of food (eg. Vitamin ‘A’ enriched rice).

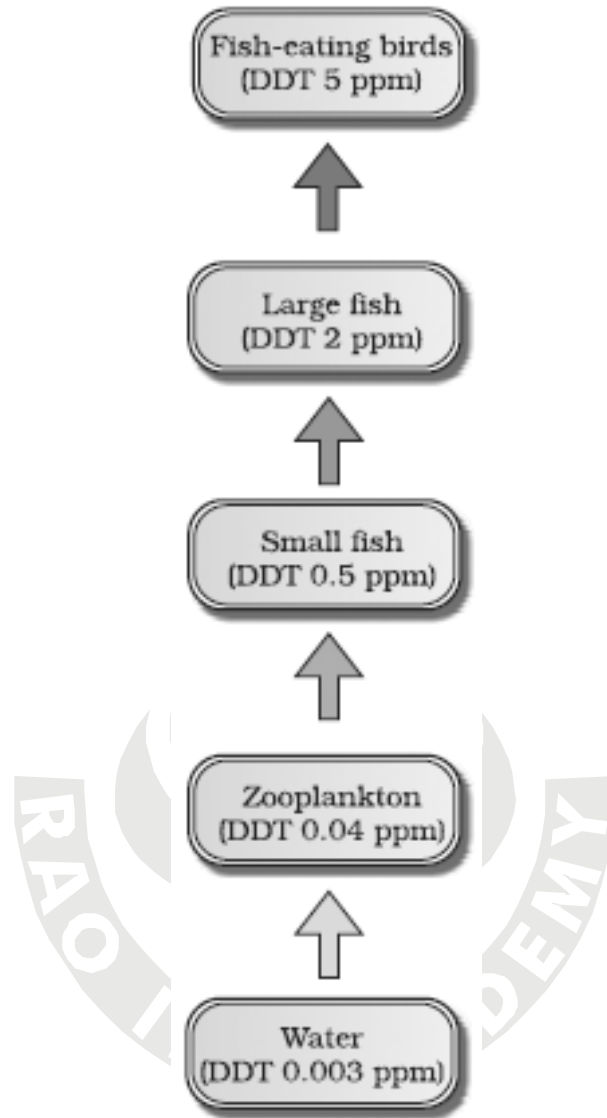
20.

- (i) In 1983, Eli Lilly an American company prepared two DNA sequences corresponding to A and B, chains of human insulin.
- (ii) Introduced them in plasmids of *E.coli* to produce insulin chains.
- (iii) Chains A and B were produced separately, extracted and combined by creating disulfide bonds to form human insulin.

21.

Organisms	Suspend (Sub types)
Snails	Aestivation (summer sleep)
Seeds	Dormancy
Bears	Hibernation (winter sleep)
Zooplankton	Diapause
Fungi and Bacteria	Spore formation

22.



SECTION D

23. Some of the measures taken for reproductive health are

- (i) The family planning programmes were initiated in India in 1951 and were periodically assessed over the past decades. The programmes were improved and covered reproduction-related areas under the popular name **Reproductive and Child Helathcare (RCH) programmes**.

Major tasks of RCH programme are

- (a) Creating awareness among the people about reproduction related aspects.
 (b) Providing facilities and support for building up a reproductively healthy society.

Governmental and non-governmental agencies have taken various important steps to create awareness among people about reproduction-related aspects.

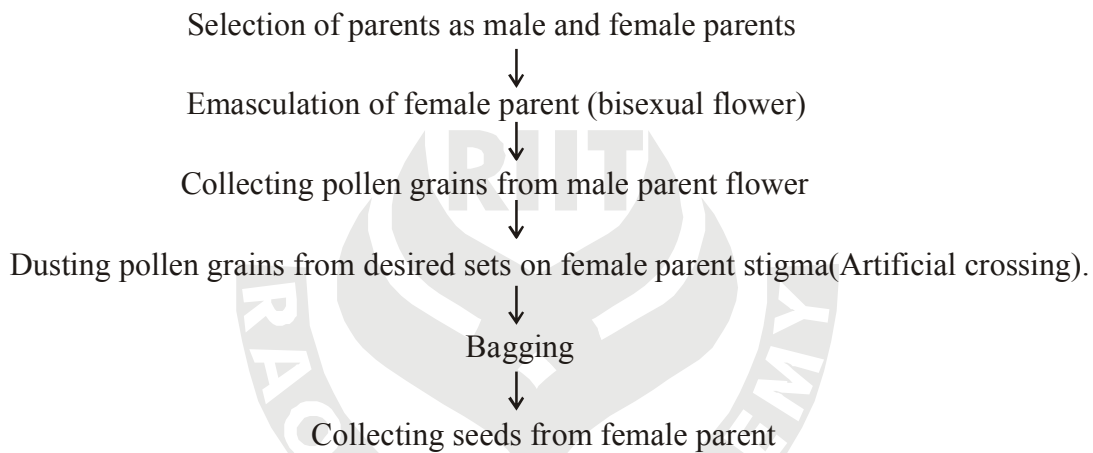
- (ii) In schools, introducing sex education is a good step to provide right information for adolescents to discourage them from believing in myths and misconceptions about sex-related issues. Adolescents should be informed about reproductive organs, adolescence and related changes, safe and hygienic sexual practices **Sexually Transmitted Diseases (STDs), AIDS**, etc.

- (iii) Married couple or those in marriageable age group should be educated about available birth control options, care of pregnant mothers, postnatal care of the mother and child importance of breast feeding, equal opportunities for the male and the female child, etc. This will lead to the formation of socially conscious healthy families of desired size.
- (iv) Successful implementation of action plans like providing medical assistance and care to reproduction-related problems, pregnancy, delivery, STDs., abortions, contraception, menstrual problems, infertility, etc., needs strong support and infrastructural facilities.

SECTION E

24. (a)

Plant Hybridization



(b) **Importance of such experiment :**

This experiment gives hybrid plants in which new characters from both parents can be mixed and brought into single plant:

OR

Pituitary hormones - FSH, LH

Ovarian hormones - Oestrogen, Progesterone

The roles of hormones during menstrual cycle in a human female are:

FSH – Causes development of follicles in the ovaries from primary follicle to Graafian follicle.

LH – LH surge leads to ovulation [On 14th day of cycle]

LH sustains corpus luteum to secrete progesterone

Oestrogen – Secreted by secondary follicle tertiary follicle and Graafian follicle. Its responsible for development of secondary sexual characters in females.

Progesterone– Increases thickness of endometrium and also maintains it during pregnancy. If fertilisation does not take place the levels of progesterone start declining which leads to menstruation.

25. (a) **Mendelian disorders** are mainly determined by alteration or mutation in the single gene. These disorders are transmitted in next generation according to the principle of inheritance and can be studied by pedigree analysis. They may be dominant or recessive.

Some common Mendelian disorders are haemophilia, cystic fibrosis, sickle-cell anaemia, colour blindness, phenylketonuria, thalassemia, etc.

Thalassemia : Haemoglobin is a conjugated protein consisting of α and β chains. Each chain consists of α and β subunits.

It is a group of autosomal inherited disorder characterized by decreased synthesis of either α or β globin chain of HbA.

Beta and alpha thalassemia is caused by deficient synthesis of β and α subunits respectively.

The α globin chain is coded by a gene on chromosome 16 and the gene for β globin chain is located on chromosome 11.

It results in deficiency of one chain and the relative excess of the other chain. Clinically, person suffers from anaemia (inability to synthesize Hb). Jaundice, variation in size and shape of RBCs. Massive blood transfusion is needed (Massive blood transfusion-the need to reinfuse one or two times the patient's normal blood volume). In a normal adult this is equivalent to 10-20 units. So thalassemia is a quantitative abnormality of polypeptide globin chain synthesis.

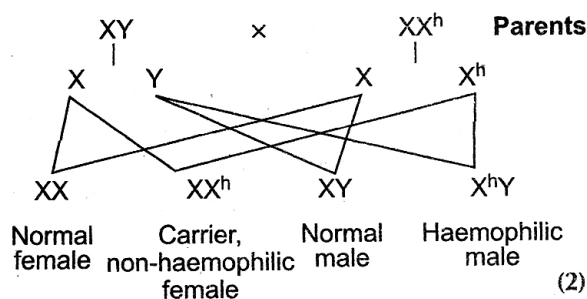
Haemophilia is a sex linked recessive disease, which is transmitted from unaffected carrier female to some of the male offsprings.

- In this disease, a single protein that is a part of cascade of proteins involved in the clotting of blood is affected.
- Due to this, in an affected individual, a small cut results in non-stop bleeding.
- The heterozygous female (carrier) may transmit the disease to sons. The possibility of a female becoming a haemophilic is extremely rare because mother of such a female has to be at least carrier and father should be haemophilic.

(b) Normal parents give rise to a haemophilic child. So, the genotypes of them should be

Father – XY (normal)

Mother – XX^h (carrier/heterozygous non-haemophilic)



OR

m-RNA :

- (i) Carries genetic code in the form of codons.
- (ii) Carries amino acid sequence of polypeptide chain from DNA to ribosome.

t-RNA :

- (i) Carries activated amino acids on the site of protein synthesis.

r-RNA :

- (i) Helps in binding mRNA with ribosomes
- (ii) Helps in reading mRNA codons by ribosome
- (iii) Helps in removing empty tRNA from ribosome.

26.

- (a) The different attributes that a population has and not an individual organism.

- (i) Birth rates
- (ii) Death rates
- (iii) Sex-ratio
- (iv) Age distribution and age pyramid
- (v) Population density / Population size.

- (b) **Population density :** Is a measurement of population per unit area or unit volume. or

Number of individuals in a population relative to space. or

Population density is a measure of the number of organisms that make up a population in a defined area.

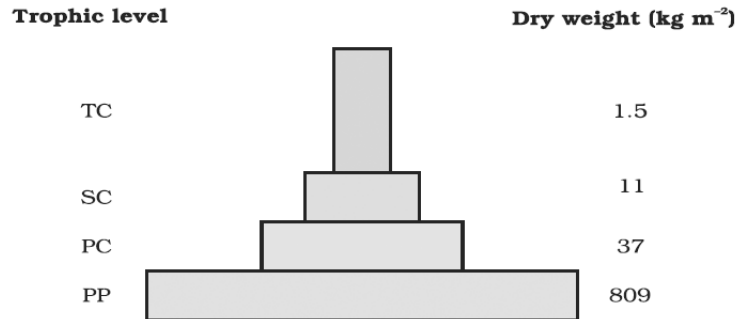
Different ways the population density can be measured.

- (i) Measuring in numbers.
eg. Human population
- (ii) Measuring Biomass or Percent cover
eg. A single banyan tree with many *Parthenium* plants along with it.
- (iii) Relative densities
eg. The number of fish caught per trap.
- (iv) Indirect counting
eg. Tiger censuses, with pug marks and fecal pellets.

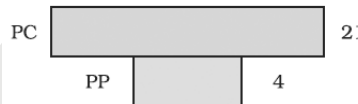
OR

Pyramid of Biomass can be upright and inverted

- (i) In case of pyramid of biomass of grass land ecosystem, producers are always more in biomass than herbivores and herbivores are more in biomass than the carnivores.



- (ii) However the pyramid of biomass in small standing crop of phytoplankton supports large standing crop of zooplankton.



- (iii) Pyramid of energy is always upright, can never be inverted because when energy flows from a particular trophic level to the next trophic level, some energy is always lost as heat at each step.

