

*KENDRIYA VIDYALAYA SANGATHAN*

**(DELHI REGION)**

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**QUESTION BANK BASED ON HOTS**

**CLASS - XII**

**BIOLOGY**  
**2008-2009**

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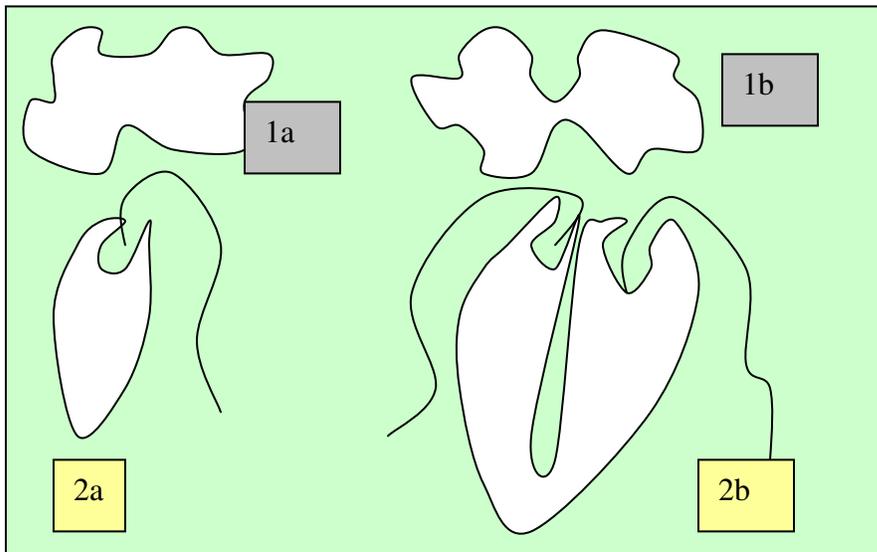
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## BIOLOGY - XII

### 01

### REPRODUCTION IN ORGANISMS HOTS (Questions)

1. What is the terminology for the concept of group immortality?
2. Life span of May fly is 01 day while that of Banyan tree can be 200 yrs. What message do you get from this data concerning BMR (Basic Metabolic Rate)?
3. In a pond you see green colour long filaments, which is a type of algae consisting of single layer aggregation of vertically arranged cells. What sort of strategy can this type of cellular aggregation adopt for multiplication?
4. Differentiate the following diagrams based on the process going on :-



5. “Any organic material kept in moist and dark conditions gets infected with fungus, although there was no sign of fungus prior to it.” How fungus does make it possible, although it is a microbe?
6. Potato is a food source but small potatoes are generally called as potato seeds, so they are directly used for cropping purposes. How a farmer does get a new plant from such a potato seed?
7. Central dogma of reproduction “Like produces like” i.e. kids resemble the parents. Recently it was in the news that a south Indian farmer has been able to get nearly 200 types of mangoes from a single mango tree. How could this have been possible?
8. Like produces 100 % like itself is valid for \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ types of multiplication strategies ?

9. It is a common observation that we see small plantlets of Dalbergia sissoo (Shisham) growing in a circle within a diameter of 05 m around the parent plant. What justification can you give for this observation (in reference to sexual or vegetative modes of reproduction)?
10. With the onset of rainy season one can see the green cover of grass appearing quickly, there after its spreading is not as fast as its appearance. Justify this observation?
11. The principle of life states that every form of life has to die; still Amoeba is called as immortal. Give specific reason for it?
12. When multiplication of species can occur with the help of asexual methods, then why the organisms adopt to sexual methods of multiplication?
13. 'In single celled organisms, the offspring's are the similar to one another and are the exact copies of the parent'. Can these offspring's be called as genetically identical to the parent? Would it be correct to call them clones?
14. What is the terminology used for asexual multiplications when a single celled organism divides into two equal halves or when it divides into two unequal parts?
15. Sporulation is common in lower organisms. What type of spores will be formed if such an organism resides in an aquatic habitat and secondly in dry habitat?
16. Both vegetative and asexual reproductions do not involve any sexual method so they come under a common category, yet they are different in one specific point. Elaborate that specific point ?
17. Why runner, sucker, tuber, offset, bulb are called as vegetative propagules ?
18. Water hyacinth is one of the most invasive aquatic weed, resulting in the degradation of aquatic ecosystem and thereby death of fishes. Does it directly damage the fish life? Give your answer with proper justification?
19. Water hyacinth, a most invasive aquatic weed is widely spread and expands rapidly in the growing season. Which multiplication strategy would you attribute to this type of observation?
20. Why the lower organisms resort to sexual mode of reproduction just before the onset of unfavorable conditions?
21. The changes in the body that are observed during the attainment of reproductive maturity are broadly categorized into two. What are the categories?
22. The population of humans on this earth would not have been this much if humans had oestrous cycle rather than menstrual cycle. Give your justification?
23. In oogamy, female gamete is large and non-motile but the male gamete is reverse in its properties. Why such type of adjustment is there in higher organisms?
24. "Sexual reproduction generally involves fusion of gametes from two different parents belonging to a species, but this is not always true." What explanation can you give in support of the statement?
25. A student while crossing across a papaya orchard observed that some papaya plants have flowers with a very small papaya like structure at its base, while there were other papaya plants that had flowers without such a swollen portion. What information do you get concerning the type of plant and the flower from the above data?
26. Both the prefixes ( Uni- and Mono- ) have the same meaning i.e. one in number. Does it mean that uni-sexual and mono-ecious species are the same?
27. The chromosome number of a meiocyte of a house fly and that of a human is 12 and 46 respectively. What is the number of chromosomes in their mitocytes?

28. In case of sexual reproduction the number of female gametes is generally limited, but that of the male gametes is innumerable. Give reason for this observation?
  29. In case of a monoecious species having bisexual flowers with self-fertilization, is there any need of a mediator for pollination?
  30. In many monoecious species having bisexual flowers there is an attempt to increase variability by adopting some mechanisms that block self-fertilization. How are plants able to increase the chance of variability?
  31. Sexual reproduction involves syngamy (fusion of male and female gametes), thereby forming a zygote which develops into next generation. What can happen if syngamy fails? Is there any possibility of any exception to this principle?
  32. Why is internal fertilization considered to be more advanced method than external fertilization?
  33. What is the difference between the type of gametes and their transfer from male to female organisms of higher animals and higher plants?
  34. "Zygote is a vital link that ensures continuity of a species between organisms of one generation to its next." Justify?
  35. Which one is more recent in origin- Ovipary or Vivipary? Support your answer with a valid reason?
- .....

**1**  
**REPRODUCTION IN ORGANISMS**  
**ANSWERS**

1. Reproduction.
2. Small animals have more BMR, hence short life span.
3. Fragmentation (vegetative method).
4. Binary fission: Irregular in Amoeba, longitudinal in Euglena.
5. Reproduction by sporulation. Spores are dry, light, easily dispersed by wind so they can reach every corner of the biosphere.
6. Potato has small eyes bearing buds which grow to form daughter plants.
7. Grafting of stem cuttings of different mango varieties on a single plant.
8. Cutting, grafting, layering, tissue culture.
9. Root buds growing after a gap from the main root.
10. Appearance of green cover is due to the growth of subterranean stem buds of grass persisting (already existing) from the last years growth. Slow expansion is due to above ground growth of runners ( new growth )
11. Amoeba multiplies by binary fission, so one parent cell divides into two daughter cells without any part of it dieing. So it is called immortal.
12. Sexual methods bring variations and increase chances of survival and continuity of species during unfavorable conditions.
13. Technically yes.
14. Binary fission and budding in single celled organisms.
15. Aquatic habitat: Motile zoospores, Land: Non-motile spores like conidia.

16. Vegetative methods have direct involvement of somatic cells but asexual methods generally do not involve complete somatic cells.
17. They involve parental somatic cells.
18. Rapid growth and death of water hyacinth increases heterotrophic activity of microbes. Increased microbial activity results reduction of dissolved oxygen (DO) in water thereby resulting in death of fishes.
19. Vegetative propagules called offsets.
20. It results in production of thick walled, resistant spores to persist in the unfavourable conditions. Further if meiosis is involved then variations also come.
21. Morphological and physiological.
22. If ever that would have been the situation then humans would have been seasonal breeders. So it might have some reducing effect on the population.
23. In oogamy, female gamete being larger and non motile, is an adaptation for having more food reserves that may be required for the future development. The male gamete has to move to reach the counterpart, so it has the machinery for its reaching and delivering the chromosomes. A lot of cytoplasm will means extra weight also. So both the sex cells have specialized themselves for their functions.
24. Self fertilization involves both the gametes from one parent only.
25. Papaya plant-Dioecious : Its flower – Unisexual.
26. Unisexual is used in reference to the flower (presence of either anther or carpel) Monoecious is used in reference to the plant (morphologically one plant bearing both the sexes in their flowers).
27. Meicyte – A cell that can undergo meiosis ( Diploid no. is 46 for humans)  
Mitocyte - A cell that can undergo mitosis (Diploid no. is 46 for humans).
28. Male gametes have to travel through the female reproductive tract and tolerate its physical and bio-chemical conditions. Many sperms die, so semen must contain a large number of sperms.
29. Basically no mediator is required for self fertilization.
30. To increase variability plants adopt any of the following methods :-  
a) Self incompatibility b) Size asynchrony c) Maturity asynchrony
31. Generally if syngamy fails, next generation will not be formed. But in case of Bees the males are haploid i.e. without fertilization.
32. Internal fertilization ensures more chances of fertilization with less wastage of gametes.
33. Higher animals: - Male gamete is motile and transferred to female by Insemination. Higher plants: - Male gamete is nonmotile and transferred to female by pollen tube .
34. It is the end product of sexual reproduction (Zygote) which further develops into next generation, so it ensures continuity of species.
35. Vivipary (advanced): ensures complete security for the development of next generation.



**SEXUAL REPRODUCTION IN FLOWERING PLANTS**  
**(Questions)**

1. It is the tissue in the ovary on which the ovules develop and are attached to the ovary wall .Name this tissue located inside the ovarian cavity?
2. Can you name the object ( a living structure some time back) which can be used as a symbol for conveying important human feelings such as love, affection, Grief, Mourning etc.?
3. It is the process of formation of megaspores from megaspore mother cell by meiotic division in anther. Name the process.
4. Holding a flower the teacher asked Hena to show the part of a flower which has four-sided (tetragonal) structure consisting of four sporangia grouped as a pair in each lobe. What would be the part of the flower? Can you guess?
5. Pineapples, Grapes are developed from an unfertilized ovary and resulting in seedless fruit. Can you name the developmental process?
6. Vijaya started sneezing and developed some rashes on her hand after returning from her school garden. What causes such type of reaction?
7. It is made of sporopollenin, which can withstand high temperature and action of strong acids or alkalis, no enzymes can degrade it and hence pollen grains are well preserved as fossils. Name the layer.
8. Write the correct name of the following:
  - i) Three cells present at the chalazal end in the embryo sac.
  - ii) A small pore in the ovule through which the pollen tube enter.
  - iii) Wall of fruit having mesocarp , endocarp, epicarp.
  - iv) Two cells present on either side of egg cell in an embryo sac.
  - v) Mass of parental cells enclosed within the integument.
9. What similarities do you find in seed bank and pollen bank? Write their importance.
10. It is a major approach of crop improvement programme. In such crossing experiment it is important to make sure that only the desired pollen grains are used for pollination and the stigma is protected from contamination. How can it be achieved?
11. Unisexual flower have pollen grain which are small, dry, non-sticky. Stigma and style of such flowers are well exposed and hairy. Name the pollinating agent.
12. A flower is large in size, colorful and has notaries. This type of adaptation corresponds to which pollination strategy?
13. A general mechanism to prevent the self pollen from fertilizing the ovules by inhibiting pollen germination or pollen tube growth on the pistil. Name the mechanism?
14. If favorable conditions like adequate moisture, oxygen and suitable temperature, are not available then the embryo may enter a state of inactivity. Name this state of inactivity.
15. Fruits are developed from the ovary but in few species such as apple, strawberry, cashew etc other part of flower also contributes to fruit formation. Name the floral part?

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**SEXUAL REPRODUCTION IN FLOWERING PLANTS  
(Answers)**

1. Placenta.
2. Flower.
3. Megasporogenesis
4. Anther.
5. Parthenogenesis.
6. Allergy to pollen grain.
7. Exine, the hard outer layer.
8. i) Antipodals  
ii) Micropyle  
iii) Pericarp  
iv) Synergids  
v) Nucellus
9. Pollen grain of different species of plants can be stored for years in liquid nitrogen (196°C) like seeds. Such type of storage is called pollen banks similar to seed banks, in crop breeding programme.
10. Artificial hybridization involving emasculation and bagging.
11. Wind is pollination agent.
12. Insect pollinated flowers.
13. Self Incompatibility
14. Dormancy
15. Thalamus

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**HUMAN REPRODUCTION  
(Questions)**

1. The act of procreation in mammals and humans involve some basic steps. Mention them in a sequence?
2. Testis / Ovary are called as primary reproductive organs while all the associated ducts and glands come under secondary organs. Give justification for it?
3. Testis like ovary develop within the pelvic cavity, but in the later part of the development testis descend out of the abdominal cavity . What could be the reason for it?
4. The generating tissue must be accompanied by nursing tissue also. Elaborate this statement with respect to human testis?
5. Spermatogenesis is a continuous process but its release is not. How reproductive system does manage this situation?

6. Based on the above question, explain that under what physiological conditions are the sperms managed and what changes are brought before their release?
7. Penis is considered to be a secondary sex organ; still its tube is called as urino-genital canal. Give reason for this consideration?
8. Penis consists of soft tissue and this condition is of no use for insemination. How is this problem overcome during the reproductive physiology?
9. The spermatozoas need to be activated for bringing out the act of fertilization. What role does accessory sex glands play in this process?
10. Ovaries are made of soft tissue and are not fixed in any bony socket but are placed in abdominal cavity. So there is a possibility that they may get displaced. But this generally does not happen. How is this attained?
11. There is no direct connection between ovary and fallopian tube, so there is possibility that the ovum may be released within the abdominal cavity, but it does not happen. How does a fallopian tube prevent this situation?
12. Vagina has dual role in the female reproductive system, both being very crucial in their aspect. If any one of them fails then the very purpose of the system fails. Explain the statement with proper justification?
13. Uterus has three layers with each performing its specific function. What is the role of middle and inner layers and which hormones influence their functioning?
14. "Presence of hymen is the indication of virginity, while its absence means the reverse." Discuss the authenticity of the statement in the light of modern understanding of the reproductive physiology?
15. Once the breast is emptied of the milk, the milk is being produced continuously but it is not being released simultaneously. Secondly the rate of sucking of milk is more than the rate of its production. What does this tell you about the availability of the stocks of milk?
16. Starting with gameto-gonia ( spermato-gonia and oo-gonia) and ending into sperma-tid and oo-tid, represent the formation of haploid sex cells. Then what is the specific need of morphogenesis and that also in only one of them. Elaborate the statement with proper justification?
17. Seminiferous tubules are the factories for the generation of spermatozoas, but they can't work on their own. What stimulus do they get? Is the stimulus generated within the tubule or some where else?
18. Spermatogenesis and spermeiogenesis are two different processes but both are essential for male reproductive system. How do they differ from each other?
19. A sperm after being released in the vagina must reach the end of the fallopian tube to participate in the act of fertilization. What machinery comes into play for the said purpose?
20. Do LH and FSH have the same function in the male and female reproductive physiology? Justify your answer.
21. For completing the act of fertilization the sperm must fuse with the ovum, but the latter is surrounded by lot of extra follicular cells. How the sperm does manage to fuse with the ovum?
22. Fertilization requires one male and one female gamete, but there are approximately 200 million sperms in a single ejaculation. How then the female reproductive system and the ovum ensure monospermy?
23. The days of the menstrual cycle start with the onset of menses rather than with the end of menses. Give your justification for such a calculation?

24. "Nothing goes waste in the living system. Prove this statement with the help of the different stages of the Graffian follicle in the ovary?"
25. Spermatogenesis when started gets completed in a single sequence, but oogenesis stops at secondary oocyte stage. The process starts again with fertilization. Why it stops first and then what happens during fertilization act that the oocyte regains its activity?
26. The size of single celled haploid ovum is same to the single celled but diploid zygote and its size is same to the multicellular morula till it is in the fallopian tube. Give the reason behind this observation?
27. Placenta is an intimate connection between maternal and foetal tissues. It is a dual organ. Justify?
28. Placenta is not just a connection and umbilical cord is not just a tube. They remain active throughout the gestation period. Is the above statement true? Justify.
29. "After birth" is not the name of any proceeding to be executed after the birth of a baby, it is some thing else. Elaborate on the authenticity of the statement?
30. The dimensions of the fully formed foetus are more than that of the birth canal. How the baby does makes its way out and what role does uterus plays in it?
31. The milk produced by the mother for the first few days is important for the baby not only energetically but also for some other reason. Elaborate on this statement?

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**3**  
**HUMAN REPRODUCTION**  
**(Answers)**

1. Insemination, fertilization, embryogenesis, implantation, development, parturition.
2. Reproduction involves sex cells, so the organs that generate the sex cells are called as primary organs while all others will be called as secondary.
3. Spermatogenesis – Required temperature is app.35<sup>0</sup> C, which can be maintained if they descend out.
4. Testis – generating tissue- Generative layer of seminiferous tubule. Nursing tissue – Sertoli cells.
5. Sperms need to be stored in epididymus till they are to be released.
6. While storing sperms are kept in deactivated stage. The secretions of the glands contain fructose, ions, activation principles that restore the agility and activity.
7. The canal within the penis is common between urinary and genital systems
8. Penis –soft tissue has spongy, vascular tissue which gets filled with blood and thereby generates hydrostatic pressure for erection.
9. Accessory glands release fructose, ions, and activation principles.
10. Ovaries do not normally get displaced due to attached on the mesenteries within the abdominal cavity.

11. Fallopian funnel have fimbriated margins that develop a funneling effect to entrap the released ovum.
12. Vagina: - a) Insemination- the start of reproduction acts.  
b) Birth canal – the culmination of the gestation period.
13. Uterus: Middle layer- Myometrium- muscles for ejection reflux, Inner layer- Endometrium – Implantation and placenta formation.
14. Hymen can break naturally also due to any physical activity.
15. Milk production is continuous process; it is being stored in the alveolus tissue for use when required.
16. Spermatid and Ootid are nearly spherical. Spermatid needs to undergo morphogenesis and develop a tail so that it can swim through the genital tract to reach the ovum.
17. Hormonal stimulus – obtained from pituitary gland .
18. Spermatogenesis is spermatogonia to spermatid, but spermeiogenesis is from spermatid to spermatozoa.
19. Sperm has to move so tail is required, mitochondria for energy generation, source of energy comes from the secretions.
20. LH in male stimulate Leidig cells to release androgens, but in females result in ovulation. FSH in males stimulates sertoli cells to release factors for spermeiogenesis but in females it stimulates a new follicle.
21. Sperm acrosome release sperm lysins which digest the additional layers around the ovum.
22. Touching of the sperm at the right position on the ovum initiates a reaction that blocks the penetration of any further sperm thus polyspermy prevented.
23. Day 01 starts with the start of menses as a new follicle gets stimulated i.e. a new cycle starts.
24. Graffian follicle releases ovum and gets converted into Corpus luteum (release progesterone) and at the end of gestation period release Relaxin hormone.
25. Secondary oocyte requires a centriole to complete second stage of meiosis; it gets it from the sperm after fertilization.
26. Dimension of fallopian tube is narrow, so multiplication occurs without increase in the volume of the cells of the embryo.
27. Placenta- attachment, transport route and endocrine gland.
28. Both remain active through gestation period for the maintenance of pregnancy by physical and hormonal level.
29. After birth- the materials that are dislodged and expelled out of the uterus after the expulsion of baby.
30. Vagina relaxes and pubic symphysis relaxes to widen the canal, uterine muscles contract to generate pressure for expulsion.
31. Colostrum is rich in defence molecules (antibodies) for the baby whose defenses are not mature enough to fight infections.

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## REPRODUCTIVE HEALTH (Questions)

1. “Creating awareness among people about various reproductions related aspect and providing facilities and support for building up a reproductively healthy society are the major tasks of a good government. For this various programmes are undertaken”. Name the programs?
2. A diagnostic technique in which a sample of amniotic fluid is taken from the womb of a pregnant woman during the early stages of foetal development. By what name is this method commonly known as? What can be detected by it?
3. Advancement in technology avoids hunger death, decline in infant mortality rate, and increase in number of people in the reproductive age, etc. These are the contributing factors for what type explosion?
4. The method is performed to remove unwanted pregnancies like
  - a. Where fetus is suffering from an incurable disease.
  - b. Pregnancy has occurred due to unwanted events like rapes.
  - c. Continuations of pregnancy will be harmful to the mother or foetus.
 What is the name given to this method?
5. It is a method involving the transfer of a ovum collected from a donor female into reproductive canal of another female, who cannot produce ova but can provide suitable condition for fertilization and further growth from embryo stage up to parturition. Name the method?
6. In vitro fertilization refers to the fusion gametes outside the reproductive canal almost in similar condition as that exist in the body. Mention the popular name?
7. It is a specialized procedure to form a zygote under laboratory conditions, in which sperm is directly injected into the ovum. Name the procedure?
8. In India often the females is blamed for the couple being child less but more often that the problem lies in the male partner. The same couple could be guided to have children though certain special techniques. Name the techniques?
9. It is methods based on the fact that ovulation and therefore the cycle do not occur during the period of intense lactation following parturition. Name the method?
10. Surgical methods are generally advised for the male / female partner as an ultimate method to prevent any more pregnancies. Name the procedure in case of male and female?
11. Oral administration of small doses of either progestogens or progestogen –estrogen combination is another contraceptive method used by the females . What are they popularly called?
12. Gonorrhoea , Syphilis , Genital Herpes , Chlamydia , Genital Warts, Trichomoniasis, Hepatitis –B etc are collectively called STDS ? Write the full forms of STDs?
13. It is a sterilization procedure in female where a small part of a fallopian tube is removed or tied up through a small incision in the abdomen or through vagina. Name the surgical method?
14. Name the device which can prevent contraception in the following ways.
  - i) By increasing phagocytosis of sperm within the uterus.
  - ii) By suppressing sperm motility and thereby the fertilizing ability
  - iii) By making uterus unsuitable for implantation.

15. A disease reported to be high among individual of age group of 15-24years.  
Name the disease and mention three preventative measures of these diseases

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**REPRODUCTIVE HEALTH  
(Answer)**

1. Reproductive and child health care (RCH) programmes.
2. To know the sex of the fetus this test is done. It is amniocentesis.
3. Population explosion.
4. MTP (medicals termination of pregnancy) or induced abortion.
5. GIFT (gamete intra fallopian transfer )
6. Test tube baby programme.
7. ICSI (intra cytoplasmic sperm injection)
8. ART (Assisted reproductive technology.)
9. Lactation amenorrhea (absence of menstruation)
10. Sterilization. Male – Vasectomy, ` Female - Tubectomy
11. Pills.
- 12 STD (sexually transmitted disease)
- 13 Tubectomy
- 14 IUDS – (intra uterine devices)
- 15 Sexually Transmitted Disease.  
Three preventive measures are
  - i) Avoid sex with unknown partners/multiple partners
  - ii) Always use condoms during coitus.
  - iii) In case of doubt/go to a qualified doctor for diagnosis and get complete treatment.

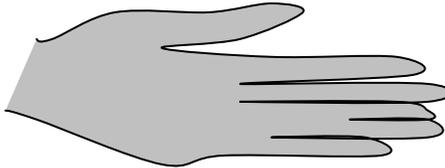
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**PRINCIPLES OF INHERITANCE AND VARIATION  
(Questions)**

1. At which stage of meiosis does the segregation of Mendelian factors can be seen?
2. Which of the following is a recessive or dominant trait in garden pea?
  - a) Tall stem
  - b) Wrinkled seeds
  - c) Green color seed coat
  - d) Constricted pod.
3. Mendel followed a definite sequence of steps in making a cross between tall and Dwarf pea plants to study the inheritance of one gene. Mention them in proper order.

4. Name a cross whose progenies can easily be analyzed to predict the genotype of the organism under observation ?
5. Turner's syndrome is a sterile female generally with normal intelligence and known viable monosomy in humans. Is the combination '44+YO' is also viable. Justify?
6. The genetic disorders can be grouped under two broad categories- Mendelian disorders And chromosomal disorders which one of two can be traced in a family by pedigree chart? Name two such disorders.
7. A mother with blood group 'O' has a foetus with blood group 'A', father is also 'A' If the genes of the both the parents are inherited then the foetus should be a mixture of both the parents i.e. half 'O' and half 'A'. Since the foetus is 'A', how can you explain the situation?
8. What is the advantage of presence of sickle allele in the heterozygous condition?
9. When you will find the percentages of crossing over will be more
  - a) When linked genes are located close to each other.
  - b) When linked genes are located far apart from each other.
  - c) When genes are not linked.
10. What is the name given to the genes present in the different region [Non-Homologous] of the 'Y' chromosomes and what they code for?
11. A) Draw a pedigree chart of a family consisting of the following members, age given Within brackets: - father [70] is normal, mother [65] is a carrier, one son [40] is Normal, second son [37] is affected (sufferer). One daughter (33) is normal (non - Carrier), second daughter (30) is normal (carrier).  
 b) If no daughter in the above family could be born as affected for this trait , work out in a punnet square to find out if this trait could be phenylketonuria and conclude by saying yes or no . [You can use the letters 'A' and 'a' for the dominant and recessive allele of this gene respectively].
- 12. Given below is a diagrammatic sketch of the hand of a person.



- a) Name or mention the genetic feature.
- b) Make a pedigree of the character to mention its inheritance? What do the circles and squares in the chart represent respectively?
- c) Is it a sex linked character? Give reason in support of your answer.
13. The genes for haemophilia are located on chromosome of humans. It is normally impossible for a haemophilic father to pass the gene to his son . Why.
14. In sexually reproducing organisms what is the contribution of the parents to their offspring  $\frac{1}{2}$  of their genes or  $\frac{1}{4}$  of their genes ?
15. Justify the situation that in human beings, sex of the child is determined by father, and not by mother?
16. Write the sex chromosomes compliment of the following.
  - (a) Human female & male
  - (b) Male and Female grasshopper

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## 5

### PRINCIPLES OF INHERITANCE AND VARIATION (ANSWERS)

1. Anaphase- I
2. Dominant trait-tall stem  
Recessive trait-winkled seed, green color coat seed constricted pod.
3. Plant tall and dwarf -removal of anthers [emasculation] from one -transfer of pollen from second to first (pollination) - Syngamy - Seed production - Formation of pod.
4. Test cross.
5. No, absence of even a single copy of 'X' chromosome (lot of important genes) results in nonviability of 'YO' combination.
6. Mendelian inheritance. E.g. - Hemophilia and Colour blindness.
7. Follow the principle of inheritance and law of dominance with gene for 'A' being dominant over gene for 'O', get the mono-hybrid cross.
8. Sickle allele in heterozygous condition protects the person against malaria (RBC having sickle shaped hemoglobin were readily infected with malarial parasite and with the bursting of such an RBC, parasites present in the sickled cells also die.
9. When genes are not linked.
10. Holandric genes (holos-whole: andros –male) They code for male traits such as testes.
11. (a) Carrier may be indicated by dots or written carrier .(Ignore the sequence)  
(b) Phenylketonuria is an autosomal recessive disease, mother is carrier 'Aa', father normal 'AA'. No (aa) produced. No phenylketonuria
12. (a) Polydactyly 11 fingers  
(b) Circles –females  
Squares –male  
(c) No both male and female are showing it.
13. It is 'X' linked disorder and the father passes his only 'X' chromosomes carrying haemophilic gene to his daughter and not to the son (who receives 'Y' chromosome).
14.  $\frac{1}{2}$



11. Give the scientific term for the process of copying genetic message from one strand of DNA into RNA. Only one strand of DNA is used during transcription. Why?
12. i) The DNA strand with Polarity 3'-5' acts as a template during transcription. Why?  
ii) The other strand with polarity 5'-3' is called coding strand. Why?
13. In Arushi Murder Case the criminals could be identified with the help of special Biotechnological procedure. Name the technique used and where is it carried out?
14. In a Forensic Laboratory, a scientist during his research started cutting the nucleotide polymer with the help scissor. Name the special type of scissor used by him and also the material that was cut.

## 6

### MOLECULAR BASIS OF INHERITANCE

#### (ANSWERS)

1. Negatively charged DNA is wrapped around positively charged histone protein octamer to form nucleosome each containing 200 bp. Nucleosomes are the repeating units of chromatin which are packed to form chromatin fibers which are further coiled & condensed to form chromosome .
2. S-strain have mucous coat which protect it in host body & help it to cause disease. Refer NCERT book for details of Griffith's experiment.
3. The conversion of non-pathogenic living R-strain into living pathogenic S-strain indicates that some thing( transforming factors) have been passed from S- to R- strain.
4. They used DNAses, Proteases & RNAses & found that proteases & RNAses did not affect transformation but DNAses when applied to heat killed S-strain did inhibit transformation of living R-strain to S-strain.
5. 'S\*' is an important constituent of protein & is not found in DNA where as 'P\*' is an important constituent of DNA not found in protein.
6. Explanation of the experiment.  
& Conclusion from the experimental result.
7. Able to replicate, chemically & structurally stable, scope for mutation, able to express itself in the form of Mendelian characters. DNA the genetic material.  
As -OH functional group at 2' position of deoxy-ribose in RNA is a reactive group making RNA labile & easily degradable, presence of Uralic instead of thiamine in RNA more ability of RNA to mutation.
8. Codes for protein synthesis, DNA is dependent on RNA for its synthesis etc.
9. To get an E coli with all its nitrogen as heavy isotope.  
 $^{14}\text{NH}_4\text{Cl}$  .  
Observation & conclusion of the experiment.
10. Polyploidy  
DNA dependant DNA polymerase.  
Replication of one strand is continuous while on the other it is discontinuous.  
Discontinuous fragments are joined by DNA ligase.
11. Transcription.  
If both are copied they would code for m-RNA molecules with different sequences hence different proteins will be formed from same DNA sequence. If two strands of m-RNA are produced simultaneously they would coil being complementary to each other.
12. i) DNA dependant RNA polymerase catalyses the polymerization in 5'-3' direction .

- ii) It has sequence same as m-RNA which contains the codes.
  - 13. DNA finger printing –main steps.  
Forensic laboratory.
  - 14. Restriction endo-nuclease, DNA.
- .....

**7**  
**EVOLUTION**  
**(Questions)**

1. Rearrange the following statements to explain the formation of atmosphere on earth
  - i) The lighter hydrogen gas escaped from the surface while oxygen combined with methane, ammonia etc to form water and carbon dioxide etc.
  - ii) Earth cooled and water vapour fell as rain
  - iii) Water vapour, methane, ammonia and carbon dioxide were released from molten mass.
  - iv) UV rays from the sun broke up water into hydrogen and oxygen.
2. Name the theory of origin based on the following statement;
  - i. The supernatural being created the earth, light, plants, animals.
  - ii. Unit of life called spores transferred to different planets including earth.
  - iii. Life arose from decaying matter like straw.
  - iv. First form of life could have come from pre-existing non-living organic molecules.
  - v. The first form of life arose slowly from non-living molecules involving evolutionary forces.
3. Stanley Miller & Urey experimentally proved the chemical evolution of life by creating condition similar to the primitive atmosphere, in the laboratory. Name the gases filled by them in the flask. In what form was the energy supplied for the chemical reaction to occur? For how long the experiments run continuously?
4. Charles Darwin during a Sea voyage round the world in a sail ship (H.M.S Beagle), concluded that there has been gradual evolution of life forms. What is his theory practically known as? Write the main points of his theory. Name a scientist who arrived to similar conclusion like that of Charles Darwin?
5. What is indicated by a cross section of earth's crust? Name the evolutionary evidence in which different aged rock sediments containing fossil of life form are examined?

6. Whales, bats, cheetah & humans shares similarities in the pattern of bones of forelimbs what do we call these structures .How these structures are pointing towards divergent evolution? Give an example from plants which represent the same pattern?
7. The structures which are not anatomically similar but are performing similar function are called analogous structure. Give any two example of analogy.  
Why analogous structure are said to be a result of convergent evolution?
8. Evolution is the stochastic process based on chance events in nature & chance mutation in the organism. Explain it with the help of a suitable example (industrial melanism). State any other example from every day experience.
9. Why small black birds later called Darwin Finches found in Galapagos Islands amazed Darwin.Which evolutionary phenomenon is represented by Darwin finches.  
Give any other example of this phenomenon. When is this phenomenon indicative of convergent evolution?
10. Is evolution a process or the result of a process? Name the two key concepts of Darwinian Theory of evolution.
11. “Giraffes who in an attempt to forage leave on tall trees had to adopt by elongation of their necks.” Make use of this statement to enumerate the main points of Lamark’s theory and Darwin’s theory of Natural selection.
12. “Allele frequencies in a population are stable and are constant from generation to generations”. Who proposed this principle .State the factors that are known to affect it .What do you understand by founder effect. How these five factors mentioned can cause a change in a frequency of alleles of a population?
13. Depending upon the trait favoured natural selection can bring about three different effects. Depict the effects with the help of diagram.
14. Complete the following statement by filling blanks 1 to 5.
  - (i) The first circular form of life → multi cellular organisms →  (1)  around 500 million years ago → jawless fish around 350 million years ago
  - (ii)  (2)  were the ancestors of the modern day frogs and salamanders.
  - (iii) Land reptiles i.e.  (3)  suddenly disappeared from the earth about 65 million years ago. This called  (4)  .
  - (iv) Some of the land reptiles moved back into water to evolve into  (5)  .
15. Rearrange the following to depict the correct sequence of the evolutionary record of man. Homo habilis , Ramapithecus, Homosapiens, Australopithecus, Homo erectus.  
Differentiate between Homo habilis and Homo erectus.
16. Classify the following as examples of homology and analogy:
  - i. Hearts of fish and crocodile.
  - ii. Eyes of octopus and mammals.

- iii. Thorns of bougainvillea and spines of Opuntia.
- iv. Thorns of bougainvillea and tendrils of cucurbits

17. When and where did Neanderthal man live? What was his brain capacity? Mention the advancements he showed over Homo erectus?



7  
**EVOLUTION**  
**(ANSWERS)**

1. (iii),(iv),(i),(ii)
2. (i) Theory of special creation (ii) Theory of Panspermia.(iii)Theory of spontaneous Generation (iv)Oparin & Haldane theory of biochemical creation or chemical Evolution. (v) Biogenesis
3. (i) CH<sub>4</sub>, H<sub>2</sub>, NH<sub>3</sub> & water vapours at 800°c.  
(ii) Electric discharge in closed flask containing gases (i.e. CH<sub>4</sub>, H<sub>2</sub>, NH<sub>3</sub> & water vapours)  
(iii) Seven days.
4. i) Theory of Natural Selection  
ii) Main points of the theory i.e. built in variation in characters, over reproduction, struggle for existence, survival of the fittest through natural selection as a mechanism of evolution.  
iii) Alfred Wallace, a Naturalist.
5. (i) Arrangement of sediments as layers one over the other during the long history of earth.  
(ii) Pale-ontological evidence.
6. Homologous organs. Same structures developed along different directions due to Adaptations to different needs. Thorns of Bougainvillea and tendril of Cucurbita.
7. (1) Sweet potato (root modification) and potato(stem modification)-both for storage of food  
(2) Eye of the octopus & of mammals  
(3) Flippers of penguin and dolphins  
They are not anatomically dissimilar structures but are similar functions
8. Details about the decrease in number of white winged moths due to industrialization and increase in no. of dark winged or melanised moths.  
Excess use of herbicides, pesticides etc. has resulted in selection of resistant varieties in a much lesser time scale
9. From the original seed eating variety, many other forms with altered beaks arose, enabling Them to become insectivorous species & vegetarian finches.  
Adaptive radiation.  
Australian marsupials  
More than one adaptive radiation appears to have occurred in an isolated geographical area (representing a habitat).

10. When we describe the story of this world, evolution is described as a process. If we describe the story of life on earth, we treat evolution as a consequence of a process called natural selection. Hence till the day it is not clear.
11. In order to eat leaves of tall trees, Giraffe had to adapt by stretching (elongation) of their neck i.e. evolution is driven by use & disuse of organs (Lamarckism) main points of theory to be incorporated.  
Variant Giraffes with an ability to elongate the neck were already there in the crowd of giraffes & linking of it to explain main points of Darwin's theory of natural selection.
12. Hardy –Weinberg principle.  
Gene migration, genetic drift, mutation, genetic recombination & natural selection.  
Definitions of founder effect.  
Variation due to mutation or recombination during gametogenesis or due to gene flow or genetic drift results in changed frequency of genes & alleles in future generation. Coupled to enhanced reproductive success, natural selection makes it look like different population
13. Diagrammatic representation of stabilizing, directional and disruption factors.(Fig 7.8).
14. (i) Invertebrates (ii) Coelacanth or lobefins (iii) Dinosaurs (iv) Mass extinction (v) Ichthyosaurs.
15. Ramapithecus, Australopithecus, Homo habilis, Homo erectus, Homo sapiens.  
Brain capacity of Homo habilis was between 650-800cc, where as brain capacity of homo erectus were 900 cc. Homo habilis did not eat meat whereas Homo erectus ate meat.
16. (i)Homologous organs. (ii) Analogous organs.  
(iii) Analogous organs. (iv) Homologous organs.
17. Near east and central Asia between 1, 00,000 - 40,000 years back. Brain capacity is around 1400 cc. , buried their dead & used hides to protect their body.



**8**  
**HEALTH & HUMAN DISEASES**  
**(Questions)**

1. A person is physical fit, exercises, eats balanced diet but his neighborhood was always noisy which disturbed his sleep. How can this situation affect the health of the person? Does this situation fit into the definition of health?
2. 'Child who had some watery boils on skin. The doctor diagnosed it to be chickenpox .When the same child reported to the school for final exams. The teacher did not allow the child to sit with the other students.' What is your opinion about the decision taken by the teacher?  
Did the teacher do any injustice with the child or with the school administrative rulings?

3. How do you think microorganisms are a foe to humans? What medical terminology has been suggested for such organisms?
4. Mary Mallon, a cook along with her delicious food was also spreading Typhoid to many people. How could she do that without suffering or even knowing about it ? What was she nicknamed as? Also name the test conducted for the confirmation of the above disease. ?
5. ‘Rahul was suffering from common cold and was severely coughing and sneezing in the class. His science teacher asked him to use his handkerchief and also explained the reason to do so.’ What could have been the reason behind the decision taken by the teacher ?
6. The doctor on examining a particular patient found that his lips and fingernails had turned gray and the patient was also feeling un-healthy. What diagnosis did the doctor made ? What other symptoms could he have observed in the patient?
7. A doctor was explaining to his students about a particular disease vector that booms particularly during the rainy season (warm and humid). He also explained that one of the type of this disease can show shivering effect and may be fatal. Name the type and its causative agent. Also explain the reason for the other symptoms of the disease?
8. A person was found to be affected by uni-lateral swelling of the lower extremity. On getting the history of swelling, it was noticed that it started with numbness of the feet and then spread upwards mainly due to fluid retention. Is there any problematic situation. Justify your reasoning. Can it be transmitted?
9. ‘Breast feeding a baby is recommended by the doctors, particularly for first few days after birth .’ Why and what makes it the best food source?
10. The property of “Memory” is observed in computers. Can you relate the same property to vaccination and immune system?
11. Talking of defenses of a country, we know that there are barriers which prevent the entry of foreign agents into our country. Correlate this data with the defenses of the body and name some of the barriers of our body and what term is given for such defense / immunity?
12. On encountering a pathogen for the first time the response is generally low, but on second exposure to the same pathogen a highly intensified response is shown by the body .Give justification for this observation?
13. Simran after coming from the garden found that she had running nose, sneezing and Watery eyes .What was the reason her specialist must have told her and what drugs must he have prescribed ?
14. Body has a large reservoir of erythrocytes. Is it a passive or active store house? Validate your answer?
15. Rahul was suffering from the malfunctions of kidneys and need a replacement. His friend comes forward to donate him a kidney but after through examination the doctors refused to accept the kidney. Why he was refused to donate and what is it that the doctors check?
16. Shoib Akthar is very much particular about his performance. Recently he was medically unfit and was not allowed to play the match. What went wrong and what do the sportspersons do to enhance their performance?
17. Raju was curious to experiment a new brand of cigarette. Later on he found that he was unable to quit smoking. Can this lead to addiction and what other problems can crop up?
18. It was diagnosed by a specialist that the immune system of a patient has been suppressed. A special test was done for confirmation. Name the test as well as the disease the patient was suffering? Also give its causative agent?

19. On examining a patient ,he had a mass of proliferating cells damaging the neighboring tissues also. The doctor explained the disease to the patient. Name the disease and its property?
20. Madame Curie discovered Radium for the treatment of cancer. But she herself died of cancer. What can be the reasons? Can virus and genes also cause cancer? Give some examples.

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## Chapter -8 HUMAN DISEASES (Answers)

1. No, he is not mentally fit.  
According to WHO- “health is the state of physical, mental and social well being”.
2. Chicken pox is highly contagious / communicable disease. It could have spread to other students. So, no injustice on either side.
3. Microbes Cause several kind of diseases. Pathogens / disease causing microorganisms.
4. She was a carrier of typhoid.  
She unknowingly was spreading typhoid through the food she prepared.  
Typhoid Mary.  
Widal test .
5. Handkerchief would check the spread of droplet infection (microbes spread in the air ) that can contaminate the object with infectious agents / pathogens.
6. Suffering from advanced stage of pneumonia.  
Symptoms: fever, chill, cough, headache
7. Malaria- C.O.(Pathogen).Plasmodium falciparum  
Reasons for symptoms.- Parasite attack the RBCs and rupture then with the release of a toxin –haemozoin which is responsible for chill and high fever .
8. Filariasis , Wuchereria bancrofti , Lymphatic vessels ,genital organs and lower limbs .
9. It gives passive immunity. The yellowish fluid colostrum secreted by the mother during initial days of lactation has abundant antibodies (IG A) to boost the immunity as the defense system is till weak.
10. In vaccination, vaccines generate memories.-B-and T-cells recognise the pathogen quickly and invade with the massive production of antibodies.
11. Barriers :- Physical (skin), Physiological (saliva), Cellular (WBC), Cytokine (interferons) Innate immunity (in born immunity)
12. Body has memory of the first encounter with the pathogen .This recognises the pathogen and shows heightened immune response.
13. Suffering from allergy.  
Drugs –Anti-histamine, adrenaline and steroids.
14. Spleen. It acts as the filter of the blood by trapping blood borne micro-organism.

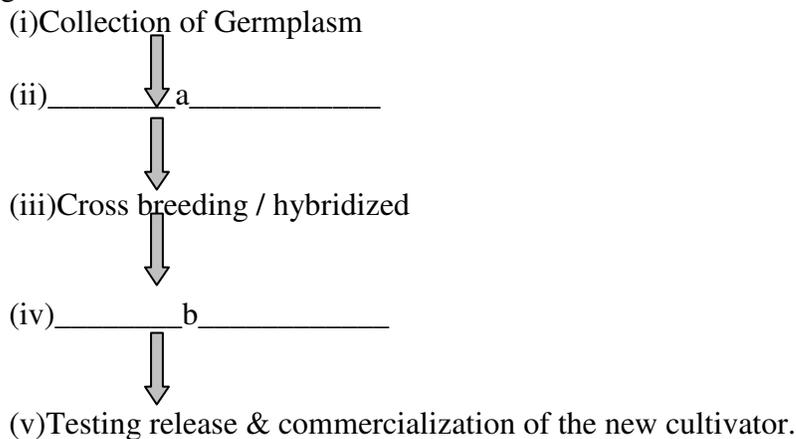
15. He underwent blood group and tissue typing / matching because the body is able to differentiate between self non self .Defense systems may generate cell mediated immune response.
16. Detection of banned drugs in a blood test. Steroids are used to temporarily enhance the performance. They misuse narcotic analgesic, anabolic steroids, diuretics and certain hormones to increase muscle strength .
17. Yes, increased incidence of lung cancer, coronary heart diseases, emphysema etc.
18. ELISA, AIDS, HIV (Human immuno deficiency virus )
19. Malignant tumour , Metastasis
20. Prolonged exposure to ionic radiation is carcinogenic. Oncogenic viruses, cellular oncogenes or protooncogenes on transformation can cause cancer.

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## 9

### **STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION ( Questions)**

1. A farmer in order to continue and enhance the benefits used to cross the siblings of the domesticated cattle from his reserves. This he was doing for the past few generations. He was surprised to notice that the breed which used to give him good returns has reduced its productivity.’ What does this tells you about the exploitation of scientific tech. Was he going wrong some where or there was some other reason for reduced profits?
2. It is estimated that more than 70% of the world livestock population is in India and China. Yet they contribute only 25% of the world’s farm produce .What does it indicates. How can we improve it?
3. As the population is continuously increasing and land for agriculture is decreasing. So how we can overcome food scarcity problem. Suggest two measures.
4. Genetic variability is the root of any breeding program. How can these naturally occurring genetic variations be used for benefit to mankind and the biosphere in general.
5. Following are the steps in a particular process. Name the process and fill in the steps that are given as blanks.



6. SCP- One of the alternate source of protein for animal and human beings. Expand this term and how it could ease the pressure on agriculture and dairy farming.
7. Fill in the blanks 1, 2, and 3.

Name of the crop	Name of the hybrid variety	Resistant to
Brassica	1	Aphids
Flat bean	Pusa sem	2
Okera Bhindi	3	Shoot and fruit borer

8. ‘Three Billion people in the world suffer from the problem of hidden hunger. What does this signifies concerning food availability. Biofortification is the latest concept that is considered to be the possible solution to the problem.’ Comment?
9. Totipotency is the capacity to generate a whole plant from any vegetative single cell. This characteristic of plant cell is used to produce thousands of plantlets through tissue culture. What is the technical term for this method? Are these plants genetically identical to the original plant? What terminology can be given to these plants?
10. MOET is a programme for heard improvement. Expand this term and arrange the following step in correct sequence.
  - a) Produce 6-8 egg.
  - b) A cow is administered hormones with FSH like activity.
  - c) Mating the animal with an elite bull.
  - d) Transferred to surrogate mothers.
  - e) Fertilized eggs at 8-32 cell stages are recovered non surgically.
11. Besides conventional breeding technique for disease resistant varieties, now a day a new breeding technique is practiced. How it is advantageous over the conventional technique or what is the drawback of this technique?
12. 250 g of micro-organism due to its high rate of biomass production can be expected to produce 25 tones of protein. Write scientific name of this organism. How can it decide the future of mankind in the space?
13. Atlas 66 has been used as donar for improving cultivated wheat. Why?



## 9

### STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION

#### Answers

1. Continued inbreeding – accumulation of homozygotes- inbreeding depression – loss of productivity.
2. The per unit productivity is very low. So in addition to conventional practice of animal breeding & care, new technologies also have to be an applied.

3. Sea food fisheries  
Use DNA modulation technique for better prospects in agriculture.
4. Out breeding-unrelated animals of a variety  
Cross breeding-between different breeds  
Inter-specific hybridization between different species
- 5: a) Evaluation and selection of parents  
b) Selection and testing of superior recombinants.
6. Single cell protein-Microbes like spirulina can be grown easily on materials like waste water from potato processing plants, molasses, animal manure, even sewage in large quantities & serve as food as it is rich in nutrients & specially proteins (microbial components).  
250g of microbe *Methylophilus methylotrophus* can yield 25 tones of proteins.
7. 1. Pusa Gaurav      2. Jassids              3. Pusa Sawarnim
8. Breeding crops with higher levels of vitamins and minerals or higher protein & healthier fats is the most practical means to reduce incidence of hidden hunger.
9. Micro propagation. Yes, Somaclones
- 10 [ b,a,c,e,d ]
11. Conventional breeding is often constrained by the availability of limited number of disease resistant gene. New techniques involving :- genetics, molecular biology, tissue culture have resulted in introduction of identification of the desired gene in the nature, its introduction in the cultivated variety, its multiplication by culturing procedures.  
Its disadvantage being the leakage of introduced gene in the wild or the possible unforeseen ill effects.
12. *Methylophilus Methylotrophus*. Less load of food on the space ship, production of food as and when required outside the dimensions of biosphere.
13. Due to its high protein content.

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## 10

### MICROBES IN HUMAN WELFARE

(Questions)

1. The dough/ batter out of which Dosa and idly is made, appears to be puffed when kept for some time. What thing is responsible for the puffy appearance? Can you tell the metabolic pathway responsible for giving this puffy appearance? Also, name the microorganism involved in this process?
2. Different variety of cheese is known by their texture, flavors and taste. A variety of cheese is having “pores” in it. State the reason behind this. Name the microbe responsible for it. Also name the variety of cheese?
3. Rama and Shyama are very fond of enjoying fruit juices. Rama likes to drink fresh juice from a local fruit juice shop while Shyama likes bottled juice. When compared, fresh juice appears to be turbid while bottled juice does not. What is the reason for this observation?

4. Radha had just undergone a kidney transplant A bioactive molecular drug in administered to oppose kidney rejection by the body. What is the bioactive molecule? Also name the microbe from which this is extracted?
5. A patient who has been suffering from myocardial infarction is found to be having clots in the blood vessels. "Clot Buster" is used to dissolve the clots. Name the clot buster used to digest the clot and the micro-organism from which it is extracted also?
6. Water samples, three in number namely river water; sewage water and secondary effluent from STP were subjected to BOD test. They were labeled A B & C but the laboratory technician did not note which was which. The BOD values of three samples A, B & C were recorded as 30mg/l, 8mg/l and 500mg/l respectively. Which sample of water is most polluted? Can you assign the correct label to each assuming the river water relatively clear?
7. A white coloured, dry powdered substances is sprayed on the vulnerable plants to control butterfly caterpillars. Guess what thing of biological origin may be there in. What is the source /micro-organism of it?
8. A bio- active molecule produced by micro-organism acts by competitively inhibiting the enzyme responsible for cholesterol synthesis .Name the enzyme and the microbe out of which it is extracted?
9. Two villagers were arguing for the nutritive value of milk and curd? Being a normal science student and having studied the biochemistry of both the products, tell which one is more nutritive and justify it ?
10. The name virus generally brings in our mind havoc that they are our enemies. There is a category of virus which has species specific narrow spectrum, has insecticidal application, having no impact on plants and other animals. Name the category and give one example?
11. Citric acid is available in the market and acts as an excellent food preservative, can you name the microorganism out of which it is extracted?
12. A farmer was practicing mono culture in his field .Then he was advised to raise paddy crops in his field. He raised after that he observed a boom in the fertility of the field. What can be the reason behind it? Justify your answer.
13. A debate was going on the use of chemical fertilizer and bio-fertilizer. As a student of biology, you have strongly supported the use of bio fertilizer. Acquaint others in what way, you have supported this idea.
14. By chance you have been caught by the neighboring country & you have been put with cattle. You have not only given human food to eat, but plentiful straw and green forage was there. As an intellectual student of biology, what thoughts would have come to your mind if you had eaten Straw ?
15. Assuming you as a chairman of KVIC, suggest the points of maximum utilization of Gobar Gas, the mechanism of its production & ecofriendly aspects of Gobar gas to the villages.

\*\*\*\*\*

**10**  
**MICROBES IN HUMAN WELFARE**  
**(ANSWERS)**

- 1 i) Due to the production of CO<sub>2</sub>
    - ii) Anaerobic Respiration (Alcoholic Fermentation)
    - iii) Saccharomyces cerevisiae(yeast)
  - 2 i) Large amount of CO<sub>2</sub> evolving through the cheese
    - ii) Microbe – A Bacterium - Propionibacterium sharmanii
    - iii) Swiss Cheese
  - 3 i) Fresh juice's turbidity -cellular remnants
    - ii) Bottled juice's clarity – Pectinase and Proteases (of micro organismal origin) digest them, thus providing clarity.
  - 4 i) Cyclosporin-A ( immunosuppressant )
    - ii) A fungus – Trichoderma polysporum.
  - 5 i) "Clot buster"- an enzyme Streptokinase
    - ii) micro-organism-A bacterium - Streptococcus
  - 6 BOD value - 30mg/L - Secondary effluent from STP  
BOD value - 8mg/L – River Water  
BOD value - 500mg/L – Sewage Water  
(Fact – The greater the BOD of water, the more is its pollution potential.)
  - 7 i) White powder is "Dry spores"
    - ii) Source – Bacillus thuringiensis bacteria
  - 8 i) Enzyme – Statins  
Microbe – yeast Monascus purpureus.
  9. Curd / Whey is more nutritious, have vitamin B<sub>12</sub>, synthesized by LAB (absent in milk).
  10. Baculoviruses is the category. Eg :- Nucleopolyhedrovirus
  11. Aspergillus niger (A fungus)
  12. Nitrogen fixation by autotrophic microbes cyanobacteria e.g. Anabaena, Nostoc , Oscillatoria. Cyanobacteria enrich the soil with organic matter and nitrogen components.
  13. Use of Biofertilizers instead of chemical fertilizers because:-
    - (a) Chemical fertilizers cause pollution. (b) Biofertilizers- no pollution.
    - (c) Biodegradable (d) Ecofriendly
  14. If I had been cow , I would have rumen , I would be able to eat straw which is a cellulosic material and digest it with the help of Methanogens ( Methane generating bacteria)
  15. Gobar gas can be abundantly produced in rural areas from gohar with the help of gohar gas plants. Slurry acts as an excellent increase of soil fertility. Ecofriendly i.e. it does not cause pollution when burnt.
- .....

**11**  
**BIOTECHNOLOGY: PRINCIPLES AND PROCESSES**  
**(Questions)**

1. *Agrobacterium tumefaciens* is called natural genetic engineer. It infects only dicot plants. Unfortunately, many important crop plants, including corn, rice, and wheat, are monocots and thus could not be easily transfected using this bacterium. Scientists discovered that by using certain processes, naked DNA molecules can be introduced into plant cell types that are not susceptible to *A. tumefaciens* transfection. Explain any two.
2. Each restriction enzyme cuts DNA at a specific base sequence. For example, EcoRI always cuts DNA at GAATTC

3'—GTAAGAATTCTTTAGAATTCCGCCATTATCGAATTCAGGATCTTAC—5'  
 5'—CATTCTTAAGAAATCTTAAGGCGGTAATAGCTTAAGTCCTAGAATG—3'

- a. How many times EcoRI cuts this long strand?
- b. How many small DNA pieces are formed from this long strand?
- c. These fragments show **overhangs** of single stranded DNA. What are they known as? Why are they called so?
- d. Which enzyme is used to seal these fragments together?
3. Any DNA flanked at its two borders by T-DNA can be integrated into the plant genome. Name the vector used for this plant gene transfer?
4. A dicot leaf is punched and is incubated in a suspension of soil bacteria. The cells on the edge of the punch are transformed and developed into new plants through tissue culture.
  - a. Name the technology.
  - b. Name the soil bacteria responsible for this transformation.
5. Dicot plants do show tumorous growth (crown gall disease) on the stem.
  - a. Name the microorganism responsible for this growth?
  - b. What causes the production of tumors?
6. In Gel electrophoresis, the DNA fragments are placed in wells on a sheet of gelatin and an electric current is applied to the sheet. Based on DNA biochemistry in which side are the wells located? In which direction and why do the fragments migrate?
7. *Agrobacterium tumifaciens* is a pathogen of several dicot plants. But for biotechnologists it is a boon. Justify?
8. Suppose you want to make a billion copies of a small region of the chromosome in vitro, which biotechnological mechanism will you prefer? Name the three main steps involved?
9. A foreign DNA fragment is introduced into the plasmid at the 'Bam H-1' site of the tetracycline resistant gene in the vector 'pBR 322'.
  - a) How does it affect the recombinant plasmid?
  - b) What is this mechanism known as?
  - c) Mention its advantages?
10. In nature *A. tumifaciens* which is called a natural genetic engineer, infects only dicots. Unfortunately many important crop plants are monocots and thus could not be easily transfected. Scientists have discovered certain processes to introduce naked DNA molecules into the plant tissue that are not susceptible to *A. tumefactions* ? Explain any two.
11. In making bacteria as a competent host for transformation with r-DNA, it is treated with a specific concentration of divalent cation like calcium. What is the role of calcium?

12. After completion of the biosynthetic stage the products has to be subjected through a series of processes before it is ready for marketing.
  - a) List these processes?
  - b) What are they collectively known as?
  - c) List any other measures to be taken care of?
13. Traditional hybridization procedures used in plant and animal breeding very often leads to inclusion and multiplication of undesirable genes along with the desirable ones. What are the steps involved in genetic engineering to over come this limitation?
14. Selection of recombinants due to inactivation of antibiotics is a cumbersome procedure. Why? Explain the alternative method to overcome this difficulty?
15. Following figures show a biotechnological Procedure which requires template DNA strand, primers, DNA polymerase, and nucleotides.
  - a..Name the procedure.
  - b.List and explain the steps shown in figures 2 - 5



Fig 1



Fig. 2

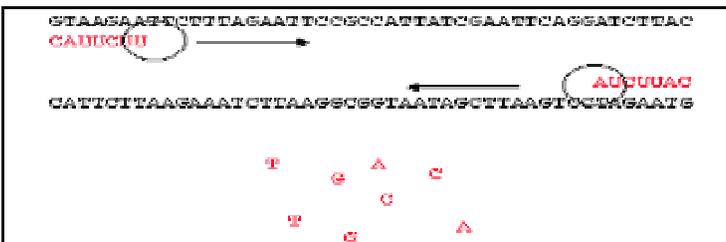


Fig. 3

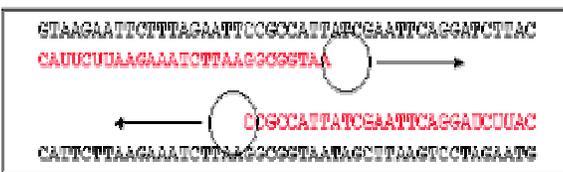


Fig 4



Fig. 5

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**11**  
**Biotechnology-Principles and Processes**  
**(Answers)**

1. a. Micro-injection where r-DNA is directly injected into the nucleus of the host cell.  
b. Cells are bombarded with high velocity micro-particles of gold or tungsten coated with the desired gene with its operating system ( Biolistics /gene gun ).
2. a. Three cuts.  
b. Four strands.  
c. Sticky ends, since they have complementary bases, they can rejoin fragments with complementary sticky ends to form rDNA (gene from vector and the gene to be cloned is inserted)  
d. DNA ligase
3. Tumor inducing plasmids (Ti Plasmids)
4. a. DNA recombinant technology  
b. Agro bacterium termifaciens- a natural genetic engineer.
5. a. Agro bacterium termifaciens  
b. The transfer of bacterial DNA to the plant which integrates into the plant genome and produces hormones for the over growth
6. DNA is loaded on the cathode side of the gel. Since DNA is negatively charged the fragments move towards positive pole (anode) when the electric field is applied.
7. It is considered as a natural genetic engineer. The Ti-plasmid of the bacterium is modified and used as a cloning vector to deliver the genes of our interest into a variety of plants.
8. Polymerase chain reaction to amplify gene of interest.  
(i) Denaturation  
(ii) Annealing  
(iii) Extension
9. a. Due to insert the recombinant plasmids loose the tetracycline resistance.  
b. Insertional inactivation.  
c. To select recombinants from non-recombinants.
- 10 For explanation refer text book.  
a. Micro-injection  
b. Biolistics
11. Creates pores in its cell wall
- 12.a. Separation, purification  
b. Downstream processing

- c. Quality control testing
- 13 (i) Gene cloning  
 (iii) Gene transfer
- 14(i) It requires simultaneous planting on two plants having different antibiotics.  
 (ii) Development & use of selectable marker which differentiate recombinants from non-recombinants on the basis of their ability to produce colour in the process of a chromogenic substance.
- 15(i) Polymerase chain reaction to amplify gene of interest  
 (ii) fig. 2 – Denaturation-DNA is heated approx. 95°C to separate the two strands of the double helix.  
 (iii) Fig.3. Attachment of the primers & then polymerize after cooling annealing.  
 (iv) Fig.3 Extension & amplification

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## 12

### BIOTECHNOLOGY AND ITS APPLICATIONS

(Questions)

1. What will happen if somehow the pH of the gut of caterpillar is sustained acidic rather than basic (alkaline) and they are subjected to carry – protein produced by *Bacillus thuringiensis* ?
2. Crystals of Bt toxin produced by some bacteria do not kill the bacteria themselves. What is the reason behind it?
3. A method to prevent infestation of a nematode *Meloidogyne incognita* on roots of tobacco is silencing the specific mRNA. What is the scientific name of the technique? How is this performed by ds-RNA?
4. A multinational company uses the bio-resources without proper authorization from the country concerned. What is the term given to this unauthorized use?
5. A committee has been constituted by the Indian govt . Which is meant to take decisions regarding the validity of Gm research and safety measures of introducing GMO's for public service. Name it?
6. Proteins encoded by genes 'cry IAc' and 'cry IIAb' and that of 'cry IAb' are slightly different in their control.' What is the logic behind this statement?
7. Use of ----- is considered to be the solution by which the farmers can get maximum yield by minimum use of fertilizers and chemicals ?
8. A cotton plant is produced by DNA technology which is resistant to bollworms. Name the variety of cotton .Also name the organism from which the gene for this Resistance has been exploited?
9. A baby loses his mother in infancy .He was totally depended on breast feeding as cows milk creates digestive problems. Name the first cow whose milk is nutritionally more balanced than normal cow's milk. Which extra nutritional element does it contain and how much magnitude?

10. Shahid a two years old baby is deficient in his immune system since birth. His father was told that this was due to an enzyme deficiency which is crucial for the immune system to function. Name the enzyme, the cause of its deficiency and the cure of the disease?

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## Chapter – 12

### BIOTECHNOLOGY AND ITS APPLICATIONS

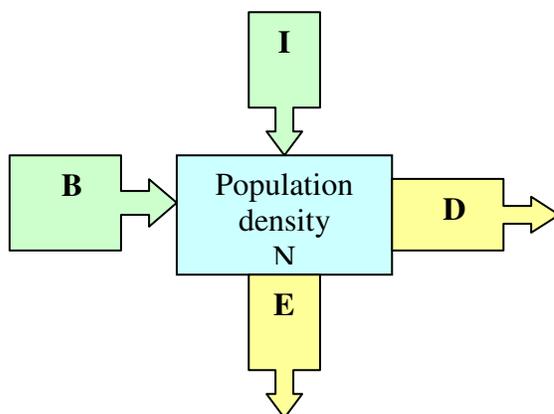
#### (Answers)

1. Bt toxin protein (Cry-protein) exists in its inactive form as pro-toxin. When it enters the gut of the caterpillar then in the alkaline pH, it gets activated ( toxin). It becomes soluble, attaches to the wall of the gut, causes swelling and lysis. No alkaline pH in the gut, no activation of pro-toxin, toxin ineffective ,caterpillar would not die.
2. Cry protein of bt toxin in Bacillus thuringiensis is produced in an inactive state. (pro-toxin). It remains inactive until subjected to alkaline pH.
3. RNA interference (RNAi)  
This technique involves silencing of specific mRNA due to a Complementary ds RNA molecule that binds to and prevents translation of m RNA i.e. RNA has been silenced.
4. Biopiracy.
5. GEAC (Genetic Engineering Approval Committee)
6. Proteins encoded by genes 'cry IAc' and 'cry IIAb' control Boll Worms.  
Proteins encoded by genes 'cry IAb' controls corn borer.
7. Genetically Modified crops
8. Bt cotton  
Bacillus thuringiensis( bacterium)
- 9.. First GM cow(transgenic cow)-Rosie  
Rosie produced milk rich in human protein  
Human protein-Human alpha lact-albumin (2.4g/l)  
(More balanced product for human babies than the milk of normal cow)
10. Enzyme ADA (adenosine deaminase)  
Cause- deletion of a gene for ADA  
Cure of the disease-
  - a) bone marrow transplant
  - b) Enzyme replacement therapy
  - c) Gene therapy on lymphocytes
  - d) Introduction of gene from bone marrow cells producing ADA in to cells at early embryonic stage (for permanent cure)

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## 13. Organism & Population (Questions)

1. Flowers have different adaptations for pollination (essential for reproduction), one of them being colour. But night blooming flowers are generally white in colour. Why?
2. In the early 1920's, in Australia, the prickly pear cactus caused havoc by spreading rapidly over millions of hectares of rangeland. How it was brought under control. What term is used for such methods of controlling the prey?
3. Most of the living organisms try to maintain the constancy of their internal environment in terms of optimal temperature and osmotic concentration. What is the terminology used for this type of constancy. How the following organisms do maintains it and also specifies the terms for that -:
  - a) Mammals
  - b) All plants
  - c) Birds in Siberia
  - d) Bacteria, Fungi & Lower Plants
4. Generally thermo regulation is energetically expensive for many organisms. So, many smaller animals are rarely found in extreme hot or cold climatic condition. Why? Write two specific reasons.
5. A person working in office try to perform his/ her level best at normal room temperature and also wishes to maintain it by using AC, or fans or heaters. But a labourer works well even under adverse climatic condition. How could his body do it ?
6. Some living organisms respond to external environment by changing their morphology or physiology or behavioral pattern. What is the terminology for this? How the desert animal like kangaroo rat is capable of meeting all its water requirements?
7. Green plants prepare their food either by C3 or C4 pathway but most of the desert plants have a special photosynthetic pathway called CAM. What is the reason for such type of adaptation?
8. Many mammals from colder climates generally have shorter ear and limbs in comparison to the mammals of other biome . Why? Which general principle is followed?
9. At high altitudes places like Manali or Mansarover we suffer from altitudes sickness this is because in low atmospheric pressure, body does not get enough oxygen, but gradually the problem is over. How did our body solve this problem?
10. Observe this diagram and answer the following question.



- (a) What is the terminology for B& E.?
- (b) If  $B + I$  is more than  $D + E$  then what will happen to population density?

- (c) What are the most important factors which influence a population density of an area under normal condition ?
- (d) If a habitat is being colonised recently then which factor contribute more to the population growth ?
11. Abingdon tortoise in Galapagos Island became extinct with in a decade after goats were introduced on the island. Why? What could be principle behind this situation?
  12. An orchid plant is growing on the branch of a mango tree. How do we describe this interaction b/w orchid and mango tree?
  13. Mutualism often involves co-evolution of the mutualist . Explain this statement taking example of plant animal relationship?
  - 14 . Name the type of population interaction in each of the following 1,2,3,4.

Species A	Species B	Type of interaction
+	0	1
-	-	2
-	0	3
+	+	4

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## 13

### Organism & Population (Answers)

- 1 Such flowers depend mainly on fragrance; also the white colour has reflective effect so it becomes visible during night.
- 2 Invasive cactus was brought under control only after a cactus feeding predator a moth from its natural habitat was introduced in the country. It is called 'Biological Control'.
- 3 Homeostasis.
  - a) Mammals regulate their body temperature by sweating profusely in summer and shivering in winter- Regulators.
  - b) Conformers - Their body temperature and fluids changes with ambient temperature.
  - c) Migration -They move away temporarily from the stressful habitat to a more comfortable area and returns when stressful period is over.
  - d) Bacteria fungi and lower plants produce various types of thick walled spores to survive unfavourable condition. -Suspend.
4. When it is cold out side, the animals tend to lose body heat quickly if they have large surface area relative to their volume. They expend more energy to generate body heat by metabolism. Small animals have limited reserves of energy, so they cannot survive.
5. Adapting to the ambient environment by sweating in summer and by shivering or doing physical work in winter.
6. Adaptation: Reduce wastage and maximize bio-availability of water from the reserves.
  - (a) By its internal fat oxidation in which water is a by product
  - (b) Ability to concentrate its urine.

7. It enables their stomata to remain closed during day time to prevent transpiration, but open during night for intake of air (O<sub>2</sub>) .
8. To minimize heat lose. This is called the Allen's Rule.
9. By increasing RBC count, By decreasing binding capacity of hemoglobin, By increasing breathing rate.
10. (a) B- Natality ( births), E- Emigration  
(b) Population density will increase  
(c) Births and deaths  
(d) Immigration.
11. Greater browsing efficiency of goat's. Gause's Competitive Exclusion Principle.
12. Commensalism.
13. Evolution of the flowers & its pollinator species.  
Ex. Fig species can be pollinated only by its partner wasp species and no other species. In turn female fly uses the fruit for laying its egg as well as nourishment of its larvae from the developing speed.
- 14 a) Commensalisms  
b) Competition  
c) Amensalism  
d) Mutualism

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## 14 ECOSYSTEM (Questions)

1. Only 1% energy of sun is trapped by green plants and only 10% energy is transferred from one trophic level to another. Based on this data how will you justify the first law of thermodynamics ?
2. Try to Make ecological pyramid of a food web. What difficulties do you face in making it ?
3. A large number (about 1000) of insects are feeding on a tree, while a number of 100 small birds depend on the insects and are in turn eaten by 10 large birds. Draw an ecological pyramid .Also draw ecological pyramid of energy for the same data?
4. Vultures feed on dead animals. Earthworms feed on dead leaves , while Bacteria also feed on dead plants and animals . How can you differentiate the above mentioned organisms ? What is the position of above mentioned organisms in a food chain ?.
5. What is the source of energy in detritus food chain? How its source of energy is different from those of GFC ?
6. A farmer observed that in a field after ploughing , the process of fragmentation of the organic material becomes very slow . What could be the reason for this and why ?
7. Construct a food web from the information below
 

a) Calms eat plankton	b) Rotifers eat plankton
c) Waterfleas eat plankton	d) Insect larvae eat plankton
e) Insect larvae eat rotifers	f) Minnows eat insect larvae and waterfleas

- g) Tadpoles eat plankton
  - h) Tadpoles become frogs (use a dotted arrow)
  - i) Bass eat minnows
  - j) pike eats minnows, tadpoles, frogs and bass
  - k) Snapping turtles eat minnows, bass, pike and frogs
  - i) Frogs eat insects which mature from their larvae (another dotted arrow)
8. What causes one seral communities to change to another seral community?
9. How pioneer species in primary succession on bare rock help in the formation of soil during the early stages of succession ?
10. During a visit, students found that a forest has been destroyed totally by fire. The students asked their teacher, “Can the forest grow here again?” The teacher explained, “ Yes, of course. Even a bare rock in course of time can also convert into a forest. Growth of forest on a bare rock is known as primary succession while community developed in the burnt forest is known secondary succession. “

Now answer the following -----

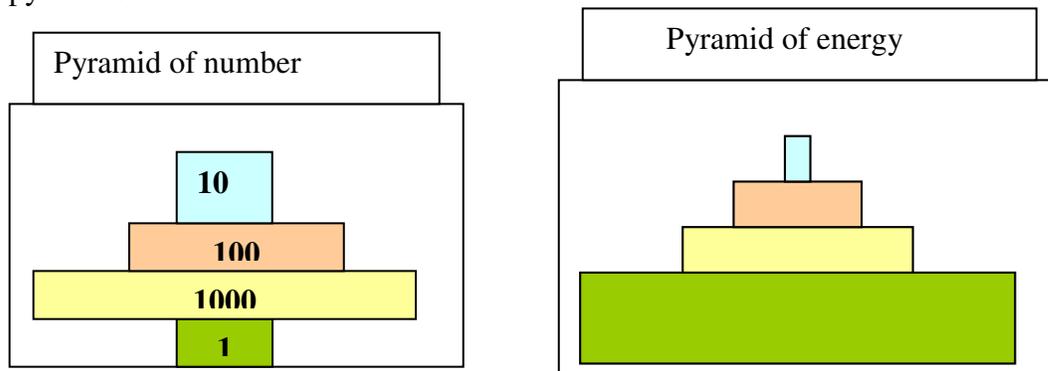
- (i) In your opinion, where will be the growth of community faster ---the burnt forest or the bare rock? Why?
  - (ii) Why on bare rock succession is called primary while in a burnt forest, succession is secondary?
11. From thousands of years, balance was maintained between the amount of CO<sub>2</sub> and O<sub>2</sub> in the atmosphere .But recently it has been observed that amount of CO<sub>2</sub> has increased than normal.
- i) What is the reason for it?
  - ii) What will be its possible effect on life on earth?
12. 70% of earth surface is ocean and it contributes only 55 billion tons of organic matter out of 170 billion tons. What is the reason of low productivity of oceans?.
- 13 . Match each of the columns A with any two of column B
- | A                      | B                        |
|------------------------|--------------------------|
| (i) Community          | 1 Interacting-population |
|                        | 2. Energy flow           |
|                        | 3 Biomass                |
| (ii) Upright pyramid   | 4 solar energy           |
|                        | 5 Gravity                |
|                        | 6 Food chain             |
| (iii) Hydrologic cycle |                          |
14. Suppose the rate of reproduction of phytoplankton in a water body slowed down .What would happen to successive trophic level in the pyramid of energy?
15. (a) All the tigers at Sariska reserved forest have died . What will be the long term effect of this on the population of deer in that forest. (b) Now three tigers have been brought there from outside. What difference will it make?
16. Two groups of students performed an experiment to find out the the biomass of 50 plants of a species. Group A first dried the plants and then measured the weight, while Group B measured weight with fresh plants.
- (i) Whose method is more correct?
  - (ii) Why?

- (iii) What term is used to denote mass of living material at a particular time in a trophic level?
17. Why Phosphorus cycle is called an imperfect cycle, while Carbon and Nitrogen cycle are perfect ?
18. Why the length of a food chain in an ecosystem is generally limited to 3--4 trophic levels ?
19. Name the first trophic level of a detritus food chain. How is it different from first trophic level of GFC ?

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## 14 ECOSYSTEM (ANSWERS)

- Rest of the energy is liberated in the form of heat. 90% of the energy is used for growth and maintenance and rest 10% remains that is passed on.
- Pyramid can not accommodate species belonging to two or more trophic levels.
- The pyramids are as follows:-



- |           |       |                               |
|-----------|-------|-------------------------------|
| Vulture   | ----- | Consumer / Scavenger          |
| Earthworm | ----- | Detrivores - do Fragmentation |
| Bacteria  | ----- | Decomposer                    |
- Ultimate source of energy in both DFC & GFC is Sunlight .
- Fragmentation done by detrivores like earthworms. -- Due to ploughing detrivores exposed to their predators --.Due to killing of detrivores , rate of fragmentation slows down.
- (Students can make food web themselves).
- Due to change in the condition of soil, nutrients, environmental conditions, the communities specific to it also change.
- In primary succession on rock, pioneer species like lichens secrete acid which dissolve rocks helping in weathering and soil formation.
- (A) Ecological succession on a burnt forest will be faster due to ---
  - Presence of soil & organic matter.
  - Presence of seeds & spores beneath the soil.
  - Remains of previous flora like roots, underground stem etc.

(B) Ecological succession on bare rock is known as primary succession because there were no previous flora / fauna, while secondary succession developed after the destruction of previous flora .

11. (i) (a) Excess use of fossil fuel (b) Rapid deforestation (c) Increase in number of Transport vehicles  
(ii) Global warming
12. (i) Due to scarcity of nutrients in the upper parts of oceans . (ii) In deep water there Are lots of nutrients but not sunlight?
13. (i) Community ----interacting population , food chain  
(ii) Upright pyramid ----- Energy flow and biomass  
(iii) Hydrologic Cycle ----solar energy and gravity
14. Pyramid of energy is always erect. If the rate of reproduction of phytoplankton was slowed down ,it would cause a reduction in the number of trophic level ,because there would be very less energy available to sustain a particular level .
15. (a) The reduction in tiger population may result in the increase of prey population (deer ) , since they are not preyed upon .and increase in number of deer leads to reduction in grass .  
(b) After the introduction of tigers, balance in nature is expected to return.
16. (i) Group A who measured dry leaves.  
(ii) In fresh leaves along with dry weight water is also present.  
(iii) Standing crop.
17. In phosphorus cycle, the bulk of material remain in the relatively inactive and immobile reservoir , while in carbon cycle , material remains is in circulation .
18. According to 10% law, 90% of energy is lost when it moves from trophic level to the next , the residual energy decreases drastically with 2-3 trophic levels. That is why a food chain in an ecosystem is generally limited to 3-4 trophic levels.
19. Ist trophic level of DFC ----- detritus.  
Ist trophic level of GFC are producers which convert solar energy into chemicals  
Which is stored in form of food, while detritus is organic remains of living  
Organisms –like dead plants / animals / excreta etc

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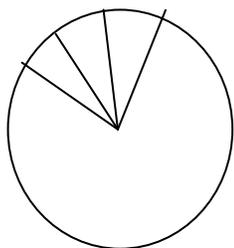
**15**  
**Biodiversity**  
**(Questions)**

1. India is one of the twelve mega biodiversity countries of the world. What are the various levels of biodiversity observed in India?
2. India has only 2.4% of the land area of the world but it has 8.1% of the species diversity. What are the favourable environmental condition that has favoured speciation in India ?
3. The tropics (between  $23.5^{\circ} \text{N}$  to  $23.5^{\circ} \text{S}$ ) harbours more species than temperate and polar regions. Explain the probable reasons for difference in biodiversity between tropical and temperate regions.
4. Biodiversity decreases as one move from equator towards pole. Justify this statement with a suitable example.
5. Amazonian rain forests in South America have the greatest biodiversity on earth, what can be the reason for it?
6. On a log scale, species area relationship becomes linear and can be represented by equation  $\log S = \log C + z \log A$ . What is represented by S, z, a & c in this equation. What is the average value of Z-line irrespective of the taxonomic group or the region? The z value for frugivorous birds and mammals in the tropical forests of different continents is found to be 1.15. Why is it so?
7. Ecologists believe that communities with more species tend to be more stable than those with less species. What attributes are taken into account while defining a stable community. Mention the observation of David Tilman ecological experiments using outdoor plots.
8. Name a scientist who proposed that species richness increases with increased explored area but only up to a limit. What is the shape of a graph if species richness is plotted against area for a wide variety of taxa.
9. What is the scientific term for measurement of species diversity if (i) number of species per unit area are measured (ii) relative abundance with which each species is represented in an area is measured.
10. 20 parrots, 50 sparrows and 150 crows are found in one part of seven senses garden which has large number of trees. Which parameter- species richness or species evenness can be easily assessed from this information?

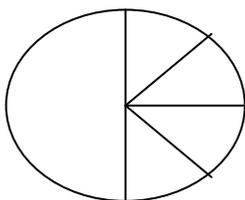
11.  Ecological diversity                      Species diversity                      Genetic diversity  
What conclusion can be drawn from the above mentioned depiction?

12. What is depicted by the following representation of species diversity? Why these estimates do not give any figure-for-

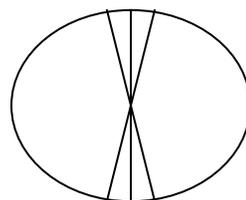
prokaryotes.



(a)



(b)



(c)

13. Since the origin of life on earth and evolution there have been 5 episodes of mass extinction, but the current rate of extinction is 100-1000 times. What are the main causes of high extinction rate and how is it going to harm human beings?
14. The invasion of alien species is responsible for extinction of the indigenous species. Give 2 examples to support this statement.
15. If a species of fish becomes extinct, all those parasites, specific to that fish also face extinction. Which of the major cause describe as “the evil Quintet’s is being accounted?
16. Categorize the followings statement into narrowly utilitarian, broadly utilitarian and ethical reason:-
  - i) Every species in biodiversity has an intrinsic value even if it not of value to us.
  - ii) Human beings device a number of economic benefits like food, fiber etc from biodiversity.
  - iii) Biodiversity provides ecosystem services which can not be given price tag.
 Justify your categorization also.
17. Which strategy of Bioconversion is being taken care of if the endangered species are removed from the unsafe or threatened habitat and placed under the care of humans? How is this strategy different from the other strategy of bio-conservation.?
18. Categorize the following into in-situ and ex-situ approaches of biodiversity conservation.
 

i) Botanical gardens	ii) Wild life sanctuaries	iii) Gene bank
iv) Biosphere reserves	v) Sacred forests/lakes	vi) Pollen banks
vii) Tissue culture	viii) Cryo-preservation	
19. Western Ghats & Srilanka, Indo-Burma and Himalaya are three hot spots of India. Why are these places named so? What are the criteria of determining hot spots?
20. Conservation of bio-diversity is a collective responsibility of all nations. Mention the steps taken by various countries in this direction.
21. Loss of key species that drive major ecosystem functions is the most serious threat to species diversity found in any ecosystem. How is it explained by Paul Ehalich through the "rivet popper hypothesis" analogy.

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**15**  
**Biodiversity**  
**(Answers)**

1. Species diversity, gene diversity, ecosystem diversity.
2. Much of its land area in the latitude.
3. Tropical have remained undisturbed for millions of years, temperate are subjected to frequent glaciations, tropical environment is less seasonal, more constant & Predictable.
4. Equator has tropical environment and hence harbours more species e.g. Columbia near the equator has 1400 species of birds, while New York at 41°N has 105 Species.
5. Tropical environment with all benefits of tropics as mentioned in Q.3.
6. S – species, A – area, Z – slope of the line (regression coefficient), C – Y intercept. Z value is 0.1 to 0.2.  
Value 1.15 indicates larger suitable areas for species diversity.
7. Less variation in productivity from years to years, resilient to occasional disturbances, resistant to invasions by alien species. Tilman found that plots with more species showed less year to year variations in total biomass & increased diversity contributed to higher productivity.
8. Alexander von Humbolt / Rectangular hyperbola which on log scale appears as linear straight line.
9. Species richness, Species evenness.
10. Species richness, Definition.
11. Ecological diversity determines species diversity & hence genetic diversity.
12. These represent global biodiversity of (a) invertebrates (b) vertebrates (c) plants. Conventional taxonomic methods are not suitable for identifying microbial species; many species are simply not culturable in lab conditions.
13. Human activities are the basic cause for it.  
Causes – 4 major causes (The evil Quartet along with suitable examples of each:-
  - (i) Habitat loss and fragmentation-decline in covered forest area from 14% to 6%.
  - (ii) Overexploitation- extinction of steller's sea cow
  - (iii) Alien species invasion-Nile perch introduction into Lake Victoria resulted in extinction of 200 species cichlid fish.
  - (iv) Co-extinction-coevolved plant pollinator mutualism.  
Harms: (a) Decline in plant production.  
(b) Lowered resistance to Env. Perturbations like drought.  
(c) Increased variability in certain ecosystem processes such as plant productivity, water use etc.
14. (i) Nile perch introduced into Lake Victoria resulted in extinction of 200 species of cichlid fish  
(ii) Parthenium and Eicchornia posed threat to our native species.
15. Co-extinction as extinction of one invariably leads to extinction of the other.
16. (i) Ethical  
(ii) Narrowly utilitarian

(iii) Broadly utilitarian

17. Ex-situ. Any two differences between ex-situ and in-situ conservation of biodiversity
18. (i) Exsitu (ii) Insitu (iii) Exsitu (iv) Insitu (v) Insitu  
(vi) Exsitu (vii) Exsitu (viii) Exsitu
19. Regions with high level of species richness, high degree of endemism
20. Earth Summit held at Rio de Janerio and World Summit on sustainable development held in 2002 in Johannesburg South Africa where 190 countries pledged their commitment to achieve by 2010, a significant reduction in the current rate of biodiversity loss at global, regional and local levels.
21. Details of rivet popper hypothesis emphasizing the loss of rivets on the wings of an aeroplane, less of key species that drive major ecosystem function is a serious threat.

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**16**  
**ENVIRONMENTAL ISSUES**  
**(Questions)**

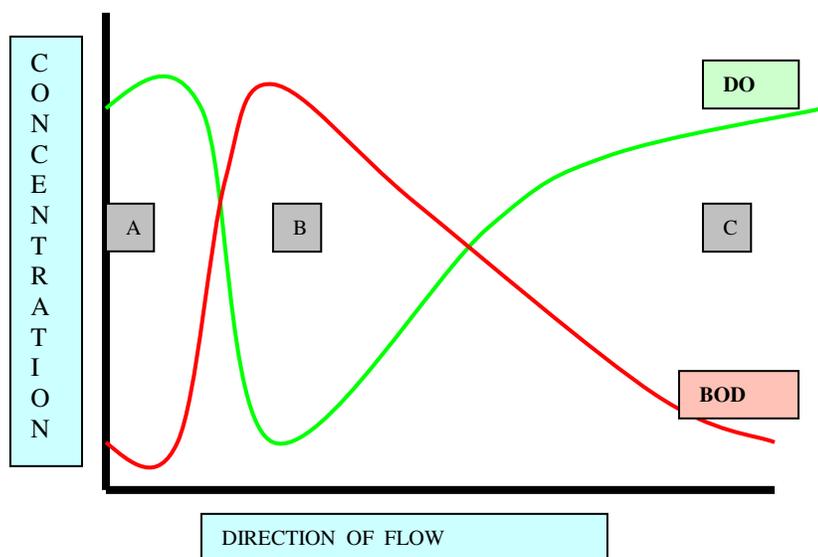
1. During the past century, lakes and ponds in many parts of the earth have been gradually converted into land.
  - (a) What is the phenomenon called?
  - (b) How does human activity accelerate this phenomenon?
  - (c) What measures can we take to control this?
2. During last few decades, most products are being sold in secure 'consumer friendly' packages .
  - a) Should this be encouraged?
  - b) How are modern packaging techniques turning into a major environmental threat?
  - c) Give some examples where such packaging can be easily avoided.
3. Why are grains and vegetables produced in organic farms supposed to be better for human consumption than those produced in farms where chemical fertilizers, pesticides etc. has been used?
4. Why is organic farming considered more eco –friendly than agro-chemical farming?
5. There are reports that the size of Arctic ice cap is decreasing every year.
  - (a) What are its possible reasons?
  - (b) How we the human beings are responsible to a greater extent for this?
  - (c) How we can contribute to check this trend?
6. You want to set up a chemical producing unit. What steps will you take that your project does not turn into a hazard to environment?
7. India in last two decades has seen a boom in automobile production and use.
  - (a) What has been its environmental impact?
  - (b) What steps are being taken so that the rapid increase in the number of automobiles does not become a curse?

8. A farmer established a farmhouse where along with agriculture, he also kept cattle for dairy purpose, started bee-keeping and rainwater harvesting .Ultimately he observed that there was no waste material.
  - a) Name the type of farming.
  - b) How did he manage all this.
  - c) What are its benefits of the process adopted by him..
9. Observe the diagram (see page 271, NCERT Book—Electrostatic precipitator)
  - (a) What will happen if electrode wires are not maintained at several thousand volts?
  - (b) The velocity of air is high.
10. Why do certain organisms that disappear at the point of sewage disposal reappear at a certain distance in a river?
11. In a survey it is observed that the population of fish-eating birds living on the bank of lake is continuously declining, where DDT is regularly sprayed to check mosquitoes.
  - i) What could be the reason behind this?
  - ii) Name the phenomenon involved.
12. A study was conducted in Delhi on petrol driven cars and following data was collected.

Sample size	30 cars		
	I	II	III
	ppm	ppm	ppm
Sulphur	150	140	350
No.of cars	6	12	12

Answer the following questions

- (i) How many cars are in the limited norm? Suggest any other fuel with reason which can bring down the pollution level.
  - (ii) Which other kind of pollution has been added in Air (Prevention & Control of Pollution) Act?
13. Children of a school visited the river near a large farm. They were surprised to see that the colour of the water had changed and was having unpleasant odour .Also large green floating plants grew in abundance. When they visited the same place before rainy season, the water was clear.
    - (i) What could be the reason for this change?
    - (ii) What will be the effect of such type of change on the fishes?
    - (iii) Suppose the path of flowing water from the field is diverted elsewhere, Can we still find this type of change?
  14. what in your opinion is more polluted and why – Domestic sewage or ndustrial effluents/waste from a agricultural field containing fertilizes and pesticides?
  15. Why was Eichhornia introduced into India? What is the consequence of its introduction?
  16. List some of the waste which is generated at home. Which of them can you avoid or reduce easily?
  17. Suppose your father is planning to set up a factory. .
    - (i) What measures would you suggest to him to provide protection against noise pollution.
    - (ii) Mention two harmful effects of noise pollution.
  18. Nuclear energy is the most suitable source of energy in future. But still this idea can not be materialized effectively. Mention the problems associated with it . ?
  19. Study the graph below and answer the following questions.



- (i) Define BOD .What does it indicate?
  - (ii) Compare the quality of water at point A and C.
  - (iii) How water quality can be improved. .
20. In the figure above sewage is discharged at point A.
- (i) What will be the effect on fishes at point A? Why?
  - (ii) Compare BOD at points A and C. Give reason.
  - (iii) Compare DO at B and C.

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**16**  
**ENVIRONMENTAL ISSUES**  
**(ANSWERS)**

1. a) Accelerated eutrophication  
b) Sewage from homes, agricultural waste and Industrial wastes containing nutrients like nitrogen , phosphorus etc.  
c ) Domestic sewage and agricultural wastes should be treated before releasing into river / avoid to release in river.  
d) Mandatory for all industries to install treatment plants.
2. a) No  
b) (i) Polythene causes leakage in sewer system  
(ii) If burnt, produces toxic gases and causes air pollution  
c) (i) Use of cotton / jute bags , paper bags encouraged  
(ii) Polythene packets can be used to make polyblend which can be used in making roads
3. Chemical fertilizers / pesticides --non -biodegradable , enter into food chain through vegetables / grains , causes biomagnification in humans . In organic farms manure is used , whose produce causes no harm to human health .

4. Organic farming ---in which no use of chemicals like fertilizers and pesticides . It is a Zero-waste procedure where waste products of one process are cycled as nutrients for other processes .
5. a) Global warming due to increase of green- house gases like CO<sub>2</sub> , methane etc.  
 b) Excess use of fossil fuel, and deforestation  
 (c) Reforestation , encouraging use of non-conventional energy sources .
6. Treatment of waste material, Use of high chimney, using electrostatic precipitator to remove particulate matter, use scrubber to remove harmful gases like SO<sub>2</sub> .
7. a) Enhance air pollution  
 b) Proper maintenance of automobiles along with use of lead-free petrol or diesel .  
 c) Use of catalytic converter for reducing emission of poisonous gases .  
 d) Use of CNG in place of petrol, diesel.
8. (a) Integrated organic farming  
 (b) Waste products of one activity are cycled and used for other activity.  
 (c) (i) no waste material , no pollution  
 (ii) Maximum utilization of resources and increased efficiency of production  
 (iii) Economical and sustainable venture
9. (a) Corona will not be formed ,no release of electrons ,dust particles can not be negatively charged , so can not settle down in electrostatic precipitator .  
 (b) Dust will not settle down
10. BOD increases , O<sub>2</sub> utilized in decomposition , DO becomes zero . After complete decomposition, BOD lowers and DO increases as oxygen dissolves in water .
11. (i) Increase in the level of DDT with each trophic level.  
 (ii) Biomagnification
12. (i) 18  
 (ii) CNG-It burns more efficiently, and very little of it is left un burnt.  
 (iii) Noise.
13. (i) River eutrophicated due to run off water from field containing non-biodegradable chemicals like fertilizers containing Nitrogen / Phosphorus .Water becomes nutrient- rich . A large algal bloom is formed..  
 (ii) DO deplete ---fish will die.  
 (iii) No
14. Wastes from agricultural field /& Industrial effluents, because they are non-Biodegradable and toxic.
15. Introduced for their lovely flowers - have caused havoc by their excessive growth and causing blocks in our waterways.
16. (a) polythene packets (b) vegetable peels (c) Dry cells , blades  
 (d) aluminium foils (e) Pieces of glass etc.  
 Polythene packets can be avoided by using cotton bags, jute bags etc.(or any other waste with reason )
17. (i) a) Planting trees around the factory .  
 b) Walls should be equipped with sound absorbent material.  
 c) Workers should be equipped with ear-muffs.  
 (ii) a) impairing hearing ability  
 b) Sleeplessness, increased heart beat

18. (i) Accidental leakage (ii) disposal of radioactive waste.
19. (i) Biological Oxygen Demand. It indicates presence of sewage in water.  
 (ii) At A water is polluted. At C clean water.  
 (iii) Treatment of water
20. (i) Fishes will die as DO utilized for decomposition of sewage .  
 (ii) BOD –more required for decomposition at A ,  
 At C ---BOD nil as no organic matter.  
 (iii) DO at B is little as it is utilized for decomposition, while at C –substantial amount present as dissolved from air .

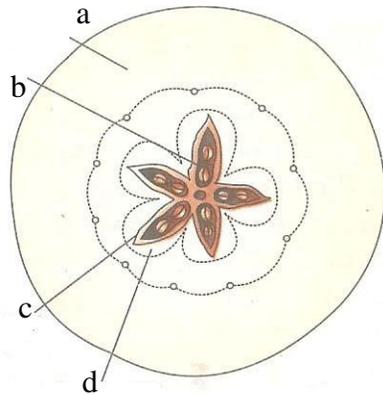
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**Biology XII**  
**SAMPLE PAPER**  
**Section A**

- Q1. Plantlet raised by vegetative propagation is called a clone. Why?
- Q2. Some times the doctor injects some medicines into the body of women to induce uterine contraction and delivery. What do you think the doctor has injected.
- Q3. What is the role of enzyme like chitinase, lysozyme and cellulase in genetic engineering?
- Q4. Write blood group of a person with genotype  $I^A I^B$ . What is the term used for such a combination?
- Q5. If a given segment of a double stranded DNA has 30% thymine, what percentage of guanine and adenine does this segment of DNA has respectively?
- Q6. It was diagnosed by a specialist that the immune system of the body of a patient has been suppressed. Name the disease the patient is suffering from and its causative organism?
- Q7. Write any two example of transgenic organism?
- Q8. On the basis of Gause’s competition exclusion principle, two closely related species competing for the same resources cannot co-exist indefinitely. Why?

**Section B**

- Q9. A transverse section of an apple is given below. Label its parts a,b,c,d.



- Q10. Gametes are always haploid though the parent body may be haploid or diploid. How is it achieved in both kinds of organism?
- Q11. In snapdragon species a plants with red flowers are crossed with a plant with white flowers. Phenotype different from the parents in obtained in F1 generation. Why? Write scientific name of this plants and also genotypic ratio obtained in F2 generation.
- Q12. Name and explain the common evolutionary phenomenon shown by Australian Marsupials and Darwin finches?
- Q13. Do you think that friends can influence one to take alcohol/drugs? If yes, how may one protect himself /herself from such an influence?
- Q14. What are selectable markers in the vector? Name some useful marker in E coli.
- Q15. Name the type of population interaction in each of the following (1, 2, 3& 4)

Species A.	Species B	Type of interaction
+	0	1
-	-	2
-	0	3
+	+	4

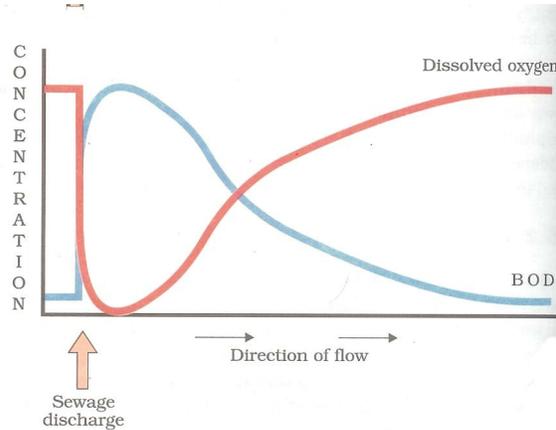
+ Sign for beneficial

- - Detrimental

0 for neutral

- Q16. What would happen to the successive trophic levels in the pyramid of energy, if the rate of reproduction of phytoplankton was slowed down? Suggest two factors which could cause such a reduction in phyto- planktons reproduction.
- Q17. List any four factors which may lead to loss of biodiversity.

Q18. As the sewage is discharged in the water body, there is a sharp decline in dissolved oxygen DO and increase in BOD as depicted in the graph. Study the graph carefully and answer the following questions.



- (1) Define the term BOD.
- (2) What happens to the aquatic organism when
  - (a) BOD level increase
  - (b) BOD level decrease

### Section C

- Q19. Give a schematic representation of oogenesis in human. When this process does starts in females?
- Q20. A large number of couples all over the world are unable produce children. But now they can have children due to Assisted Reproductive Technology available. Explain any three such technologies available in our country for such couples?
- Q21. In pea plants allele for purple flower (P) is dominant to the allele for white flowers (p). The genotype of purple flower could be PP or Pp. How will you determine the orrect genotype of purple flowered plant?
- Q22. A segment of DNA-3'—TTCACGGGGATG—5' was translated into an oligopeptide lysine- serine- proline- tyrosine in the respective sequence.
- (i) Write the codons for these four amino acids.
  - (ii) If the first adenine in the DNA segment is substituted by Guanine, what will be the sequence of amino acids in the new oligopeptide?
  - (iii) Write the anticodons for these amino acids.
- Q23. What does Oparin –Haldane hypothesis about the origin of life suggest. Who provided support to their hypothesis?
- Q24. Fill in the spaces/ blanks in the following flow chart.
- (i) Mosquito bites a healthy human and injects sporozoites .



(ii) Sporozoites reach the \_\_\_\_ a \_\_\_\_ through \_\_\_\_ b \_\_\_\_



(iii) Reproduces \_\_\_\_ c \_\_\_\_ burst the cells and release into blood



(iv) Enter the \_\_\_\_ d \_\_\_\_



(v) Reproduce asexually and release by bursting the cells release \_\_\_\_ e \_\_\_\_ responsible for fever



(vi) Some of them form \_\_\_\_ f \_\_\_\_ that are picked up by a mosquito when it bites.

Q25. Why was hybridization carried out between the species of sugarcane grown in North India and that grown in South India? Write scientific name of these two species of sugarcane?

Q26. For the brain haemorrhage of a patient, the doctor prescribed a biomolecule- enzyme. Name this enzyme. Mention the source of industrial production of this molecule. What is its role here?

Q27. What is cry protein? Name an organism that produces it. How this protein has been used for the betterment of the society?

### Section D

Q28. Trace the development of female gametophyte in a flower. Draw labelled diagram of final stage. OR

What is spermatogenesis? Describe briefly the different stages in the process.

Q29. Now days it has become possible to correct the defective gene using r DNA technology. What terminology is used for such treatment? Explain by giving an example.

OR

Describe the technique of Polymerase Chain Reaction with a diagrammatic representation

Q30 (i) what is global warming? How the gases Carbon dioxide and methane are responsible for it.

(ii) List any four strategies of reducing global warming.

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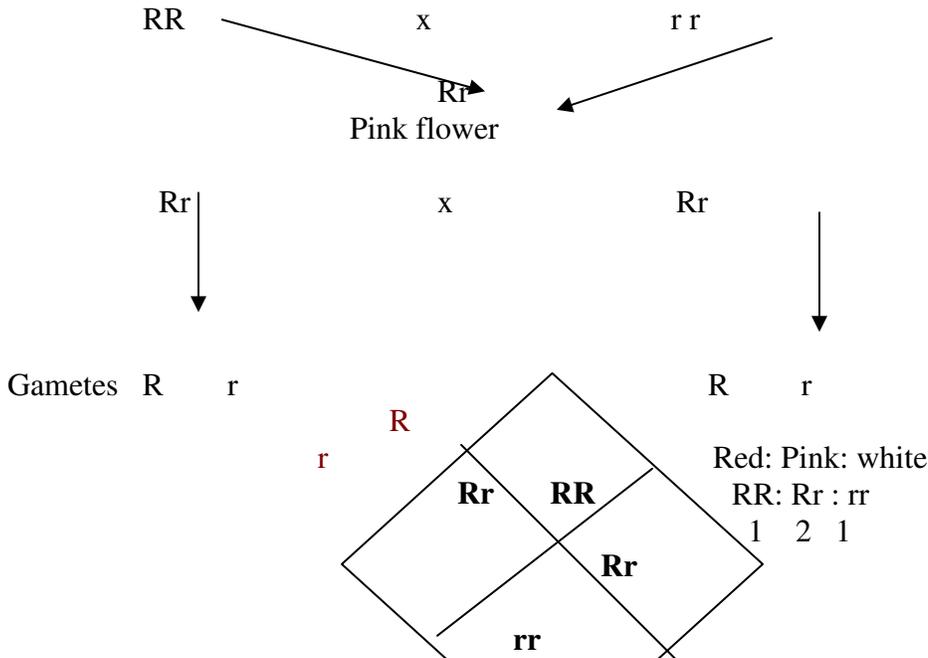
MARKING SCHEME

SECTION A

1. Genetically identical to the parent plant.
2. Oxytocin
3. They digest the cell wall of the fungi, bacteria and plant cell respectively.
4. AB, co-dominance 1/2, 1/2,
5. Guanine-20%, Adenine-30%
6. AIDS, HIV
7. Bt cotton, Rosie cow 1/2, 1/2,
8. Two closely related species competing for the same resources cannot coexist indefinitely.

SECTION B

9. a) Thalamus b) seed c) endocarp d) mesocarp
10. In haploid organism gametes are produced by mitotic division. ex fungi. In diploid organism gametes are produced by meiotic division. Ex plants, animals.
11. Red flowers White flowers



This is due to incomplete dominance. In this phenomenon neither of the two alleles of a gene is completely dominant over the other.

(1)

Antirrhinum majus  
 Genotypic ratio 1: 2: 1

1/2

## 12. Phenomenon-Adaptive radiation

It is defined as the evolutionary phenomenon in which a common stock/ancestor gives rise to new species that are adapted to a new habitats and new ways of life.

## 13. Yes. Friends can influence one to take alcohol.

- (a) Education and counseling – Education and counseling the child to face problem and stress.
- (b) Avoid undue peer pressure – A child should not be pushed unduly to perform beyond his threshold limit.
- (c) Seeking help from parents and teachers – Parents and teachers need to look for and identify the danger sign.
- (d) Seeking professional and medical helps – Qualified psychologist can render their help through some organized programmes like NAEP.

14. Selectable marker – A marker is a gene which helps in selecting those host cells which contain the vector transformants and eliminating the non transformants.

Common useful markers for E.coli – ampicillin, chloramphenicol, tetracycline, and kanamycin.

## 15. 1. Commensalism

2. Competition

3. Amensalism

4. Mutualism

16. As phytoplanktons are producers, the amount of energy available will decrease and hence organisms at each trophic level will also decrease

Two factors

- (a) Low nutrients
  - (b) Less oxygen availability
17. Loss of Biodiversity – (Explanation of each in one line)
- (a) Habitat loss and fragmentation
  - (b) Over exploitation
  - (c) Invasion by Alien Species
  - (d) Co –extinction.

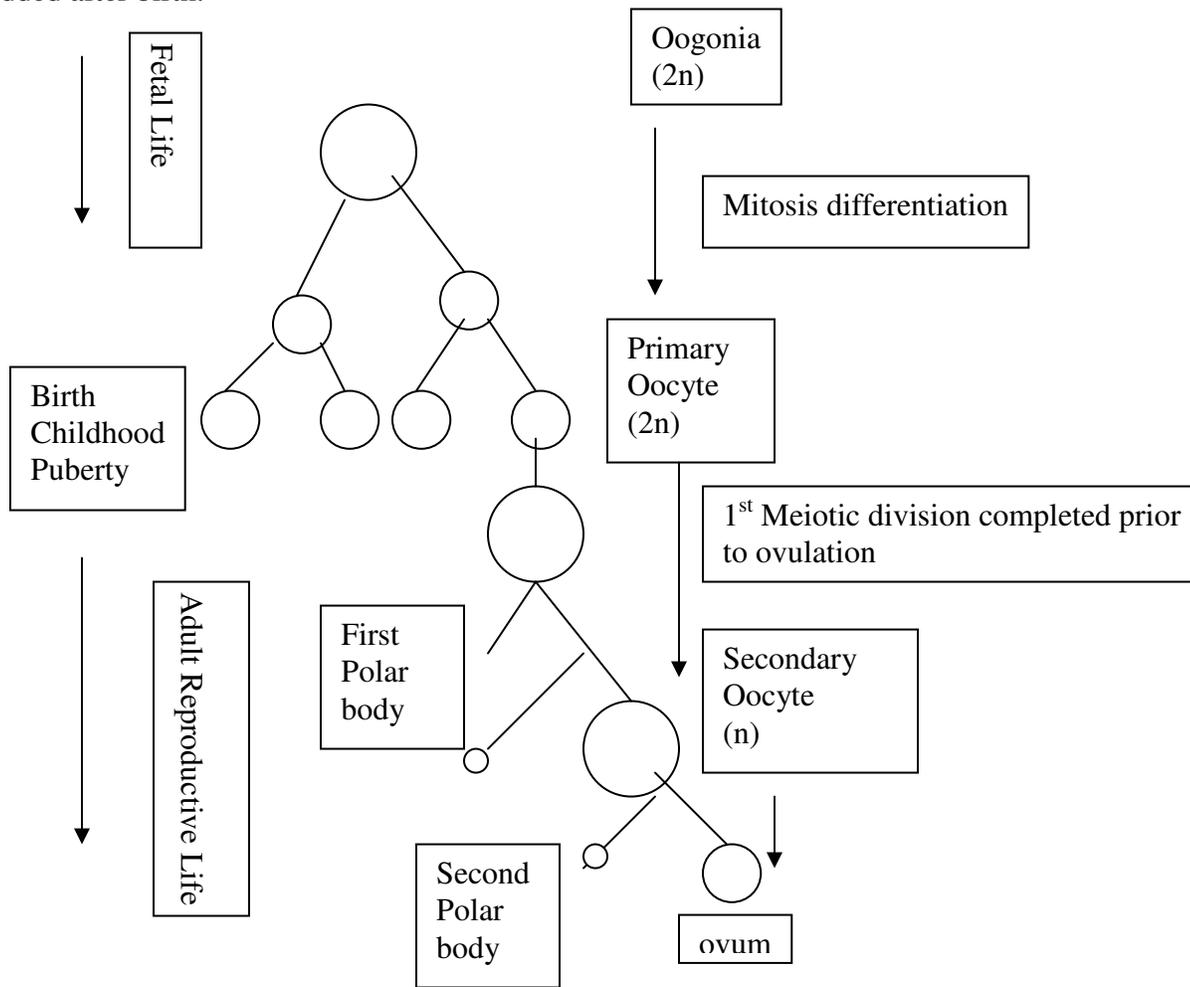
18. BOD- It is a measure of the oxygen required by aerobic decomposers for degradation of biodegradable organic matter of sewage in the water bodies.

- (a) Aquatic organisms and fish die.
- (b) Aquatic organism increases.

## SECTION C

19. Oogenesis. It is the process of formation of female gamete or ova in the the ovary. Oogenesis is initiated during embryonic development in a female foetus.

All the Oogonia are formed in the ovary of the foetus of 25 weeks. No more Oogonia are added after birth.



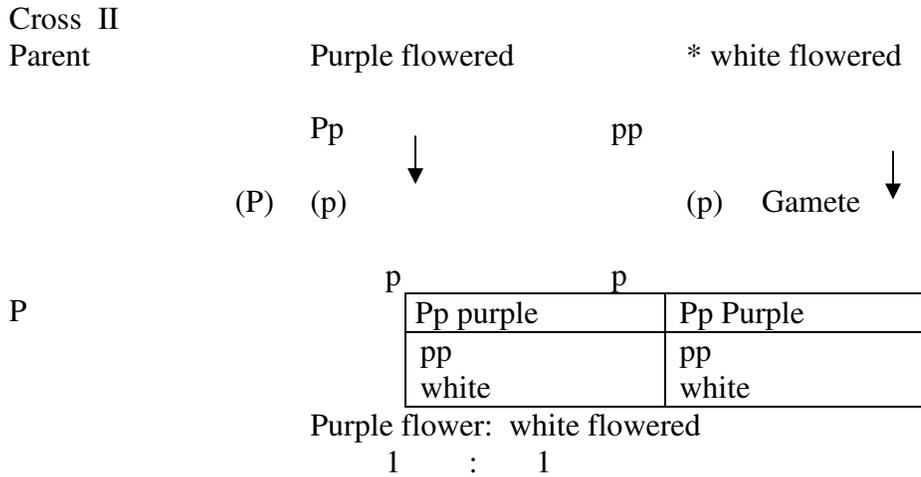
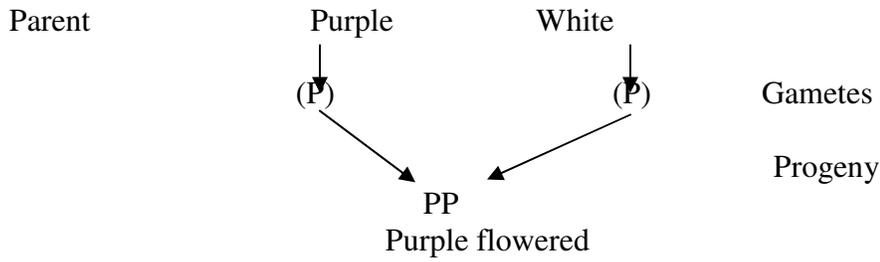
20. Assisted Reproductive Technology to help the couple to produce children are as follows.

- (a) ZIFT – The zygote or embryo upto eight blastomeres is transferred into the fallopian tube, it is called Zygote Intra Fallopian Transfer technique(ZIFT)
- (b) IUT – embryos with more than eight blastomeres are transferred into the uterus is called Intra Uterine Transfer (IUT)
- (c) GIFT – Gamete Intra Fallopian Tranfer – Transfer of an ovum collected from a donor female into another female who cannot produce ova, but can provide suitable condition for fertilization and further development of foetus.

21. By conducting test cross.

By crossing the purple PP with a homozygous recessive (pp) individual with white flower.

Cross I            PP                    \* pp



If the progeny consist of purple flowered individuals only, then the given plant is homozygous dominant (PP)

->If the progeny consist of purple and white flowered individuals, then the given plant is heterozygous (Pp).

22. 1-Lysine- AAG  
 Serine -UCC  
 Proline- CCC  
 Tyrosine- UAC
- 2- Lysine – Proline- Proline- Tyrosine
- 3-Anticodon for this amino Acid Lysine – UUC,      Proline -GGG,      Tyrosine -AUG

23. Oparine and Haldane-

The proposed that the life form could have come from the pre- existing non living organic molecule (Like RNA, proteins etc)

And formation of life was preceded by chemical evolution.

Water vapour, CH<sub>4</sub>, CO<sub>2</sub> and NH<sub>3</sub> were liberated from the molten mass. They formed earth's atmosphere.

These molecules would have reacted to form organic molecules (RNA, Proteins) due to UV rays, very high temperature.

→ The theory was supported by Harold Urey and Stanley Miller.

24.                      a) Liver                      b) blood

- c) Asexually
- d) Red blood cells
- e) Haemozoin
- f) Gametocytes

25. Hybridisation was carried out between sugar canes of North India and south India for successfully combining the high yield, high sugar content and thicker stems of south Indian sugar cane as it can not grown in North India.

North Indian Sugar- Saccharum barberi

South Indian sugar cane- Saccharum barberi.

26. Streptokinase

It is produced from streptococcus and modified by genetic engineering.

It removes blood clots from the blood vessels so it also called clot buster .

27. Crystalline protein produced by bacteria which are toxic to insect pests

a) Bacillus thuringiensis

b) The gene encoding cry protein has been isolated and transferred to several crops which resulted in the development of resistant variety of plant.

#### Section D

28. Development of female gametophyte

A pistil consist of – ovary

Style

Stigma

Ovary (diploid 2n)

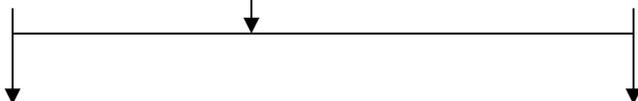
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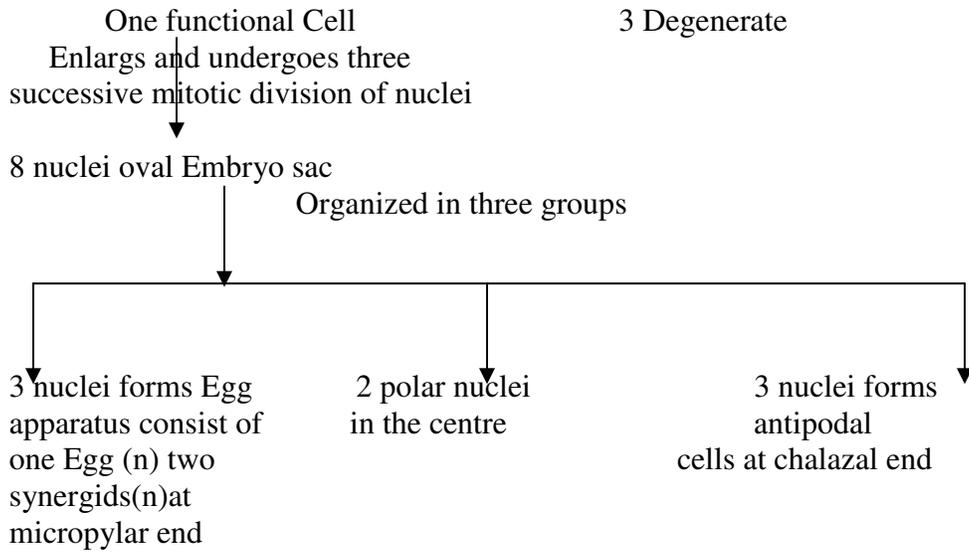
Ovules or mega sporangia

Single megaspore mother cell  
(Formed from sperogenous cell )

Meiotic division

4 Mega spores

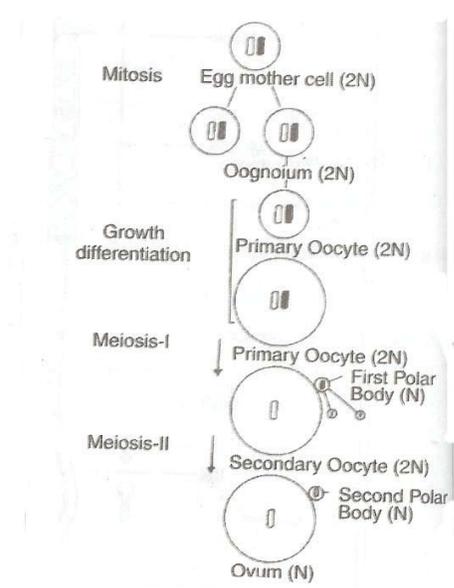
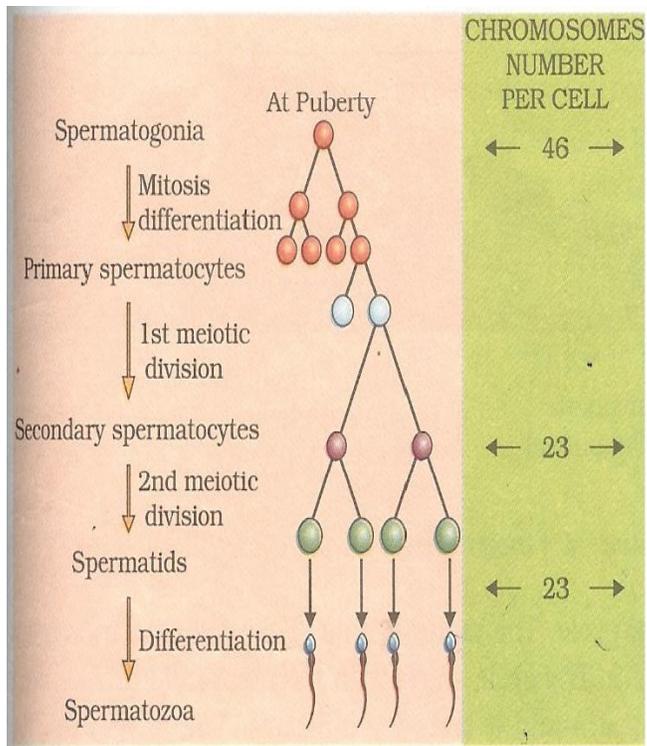




Ref:- Diagram on Page no. 26 fig 2.8( c) of NCERT text book

Or

Spermatogenesis – the process of formation of spermatozoa in the testis is called Spermatogenesis



29. Gene

Therapy

- In this method genes are inserted into the cells and tissues of an individual to correct certain hereditary diseases.
- It involves the delivery of a normal gene into individual or embryo to replace the defective mutant allele of the gene.
- Viruses which attack the host and introduce their genetic material into the host are used as vectors.
- The first clinical gene therapy was given in 1990 to a four year old girl with adenosine deaminase (ADA) deficiency.
- ADA deficiency can be cured by bone marrow transplantation in some children but it is not completely curative.
- For gene therapy, lymphocytes were grown in a cultural and functional ADA. cDNA id then introduced into lymphocytes.
- These lymphocytes are then transferred into the body of patients: the patient requires periodic infusion of such genetically engineered lymphocytes.
- If a functional gene is introduced into the bone marrow cells at early embryonic stage, it would be a permanent cure.

30. i) Global warming

- Global warming is the phenomena of increase in the global mean temperature caused by the greenhouse gases in the atmosphere.

Causes:

- The surface of the earth re-emits heat in the form of infra-red radiation.
- The atmospheric gases like carbon dioxide and methane absorb a major fraction of these infra-red rays.
- The molecule of these gases radiates heat energy that comes back to the earth's surface and heats it up again.
- The cycle is repeated many times and is responsible for increasing the temperature of earth's surface and the atmosphere.

ii) Strategies to reduce global warming

- Reduce emission of greenhouse gases by limiting the use of fossil fuels and utilizing alternate sources of energy.
- Increasing the vegetation cover especially forests to absorb carbon dioxide.
- Developing substitutes for CFC's.
- Minimizing the use of nitrogenous fertilizers to reduce N<sub>2</sub>O in the atmosphere.

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## Sample Paper Biology ( Theory )

Time : 3 hours

Maximum Marks : 70

General instructions:

All questions are compulsory.

- (i) The question paper consists of four sections A, B, C and D. Section A consists of 8 questions of 1 mark each .Section B consists of 10 questions of 2 marks each. Section C has 9 questions of of 3 marks each whereas Section D is of 3 questions of 5 marks each .
- (ii) There is no overall choice. However an internal choice has been provided in one Question of 2 marks, one question of 3 marks and all the three questions of 5 mark weightage.. A student has to attempt only one of the alternatives in such questions.
- (iii) Wherever necessary , The diagrams drawn should be neat and properly labeled .

### SECTION A

1. DDT was known to be highly effective insecticide in the past . Why did it not wipe out all mosquito population ?
2. It is observed that male gametes are produced in large number in comparison to female gametes in mammals . Why ?
3. If a double standard DNA has 30% of cytosine , calculate the percentage of adenine in the DNA ?
4. What is the aim of JEM ?
5. Arrange the following terms in a correct developmental sequence ---  
Pollen grain ,sporogenous tissue , microspore tetroid , pollen mother cell .male gametes ?
6. Mention two with drawl symptoms of drug abuse ?
7. In 1977 , an American company got patent rights on Basmati rice without compensation though it was native to India . What term we use to refer this act of the company ?
8. Expand GEAC . Write its role in India ..

SECTION B

9. Give four reasons for sequencing human genome .
10. An experimental technique allows purified mRNA from a eukaryotic cell to be hybridized (paired up ) with the DNA which codes for it under electron microscope . The following structure is observed .. .

CBSE Biotechnology Sample paper II 2007-08

Q No. 7 page 232

- (i) Indicate DNA and mRNA strands in the picture A and B
- (ii) If prokaryotic mRNA was hybridized with prokaryotic DNA , would the structure alter ?. How ?
11. Write four characteristic features of a vector .
12. Name the ecologist who gave the rivet popper hypothesis . What message he wants to convey through the hypothesis .?
13. During last few decades , most products are being sold in secure consumer-friendly packages . How are these modern packaging techniques turning into a major environmental hazard ?  
Give some examples where such packaging can be easily avoided .
14. What is the importance of regeneration in plant tissue culture ?  
What are the plant hormones used to aid this process. ?

or

A technician in a tissue culture laboratory accidentally removed the identification tag of a petridish containing cells from a cancerous biopsy . How can he identify this petridish among other petridishes containing normal cells ?

15. Make a pyramid of number as well as for energy for the following data :  
1 tree .100 ants  
, 10 small birds , 1 large bird
16. Three water samples , namely river water , untreated sewage water and secondary effluent discharged from a sewage treatment plant were subjected to BOD test .The samples were labeled A ,B and C but the attendant did not note which was which .  
one laboratory  
In your opinion out of the three samples
- (i) Which would have the highest BOD ?
- (ii) Which would the lowest BOD ?
- (iii) Which would have the highest DO ?
- (iv) Which would have the lowest DO ?



and their meanings . Fill up the gaps .

- 
- |       |                |   |
|-------|----------------|---|
| (i)   | A              | 1. Ceasation of menstrual cycle             |
| (ii)  | Geitonogamy    | 2. B  |
| (iii) | C              | 3. Removal of anthers from a flower         |
| (iv)  | Spermiogenesis | 4. D  |
| (v)   | Spermiation    | 5. E  |
| (vi)  | F              | 6. Production of seed without fertilization |

23. What are STDs ? what principles will you follow in your life to avoid STDs ?.

OR

Draw a neat diagram to show double fertilization in a flower's ovary. Label any four parts.

24. The allele frequency in a population is stable and constant from Generation to generation . Answer the following questions :

- Name the underlying principle .
- Give the value of sum total of all the allelic frequencies in a population.
- What would happen if this principle is disturbed ?

25. What is plant breeding ? What are the main steps in breeding a new genetic variety ?

26. What are bio-fertilizers ? A farmer is advised to add a culture in the soil. before sowing the crop .Name the bacterium in the culture .How is this bacterium useful to the crop.?

27. A person has been diagnosed to be HIV positive .

- Name the test which the person has undergone .
- Write the full name of pathogen involved and describe its structure.
- Which particular cells of this person are likely to get destroyed ?

SECTION D

28 . Make a sketch of the experimental setup used by Stanley Mirror in the laboratory to recreate the probable conditions of the atmosphere of the primitive earth .

- Whose theory was put to test by Miller ?
- What was the theory ?
- How did the experiment prove the theory ?

OR

- (i) Write the scientific name of the organism that T.H.Morgan selected for his experiment . Why did he choose this organism ?
- (ii) Mention any four characteristic symptoms of the Downs' syndrome afflicted child . What is the genetic basis of this disorder ?

29. In the given figure major biomes are showing their distribution with respect to annual temperature and precipitation . Observe the figure and give answer of the following questions .

NCERT book Page 220 fig.13.1

Without labeling of grassland and temperate forest

- (i) Name biome A and B
  - (ii) Which biome shows maximum annual precipitation
  - (iii) What is the range of mean annual temperature of coniferous forest .
  - (iv) Define biome.
  - (v) Name any two major biomes of India
- or

A farmer establishes a farmhouse which has dairy management , water harvesting alongwith agriculture . No waste is produced in the whole process .

- (i) Name the type of farming.
- (ii) How does he manage all this ?
- (iii) What are its benefits ?

30. (a) How will you use the technique of PCR to amplify a DNA fragment? Explain with the help of diagram .

(b) What would happen if you add only one primer to the PCR reaction ?

or

fig. 11.1 page 196 NCERT book

- (i) Name the technology whose steps are shown in the figure .
- (ii) EcoR I -----Explain conventional method of naming EcoR I .How was This name derived ?
- (iii) Classify EcoR I as exonuclease and endonuclease .
- (iv) What is the name of recognition sequence and what is its unique characteristic .

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ANSWER KEY

SECTION A

1. DDT resistant variety evolves in mosquitoes. 1
- 2..Fertilization internal ( in the body of female ) , so ovum is secure while sperms are motile , have to compete among themselves to fertilize ovum 1
3. 20% 1
4. JEM---Joint Forest Management –Govt works closely with the local Communities for protecting and managing forests 1
5. (i) sporogenous tissue  
(ii) pollen mother cell  
(iii) microspore tetrad  
(iv) pollen grain 1  
(v) male gamete
6. Anxiety , shakiness , nausea , sweating--- any two  $\frac{1}{2} + \frac{1}{2}$
- 7.Biopiracy 1
8. (i) Genetic Engineering approval Committee  
(ii) Makes decision regarding the validity of GM research and the Safety of introducing GM organisms for public services  $\frac{1}{2} + \frac{1}{2}$
9. Goals of HGP (any four ) NCERT Book page 118  $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$
10. (i) A—DNA B –mRNA  $\frac{1}{2} + \frac{1}{2} + 1$   
(ii)Yes. No loops in DNA will be seen because prokaryotic genes have no interons.
- 11.Should contain (i) origin of replication (ii) selectable marker

(iii) restriction site (iv) small in size  $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$

12. Paul Ehrlich --(i) Rich diversity is essential for stability of ecosystem ..

(ii) Importance of key species  $1 + \frac{1}{2} + \frac{1}{2}$

13. (i) Modern packaging techniques use non-biodegradable material

which cause pollution ,choke drains etc

(ii) using biodegradable material like paper bags ,jute bags etc.  $1 + 1$

14 A whole plant can be raised from cultured plant tissue by regeneration.

Auxins and cytokinins help in formation of root and shoot.  $1 + 1$

or

Cancerous cells multiply faster –uncontrolled growth of cells ,while normal

Cells do not show uncontrolled growth  $1 + 1$

15. Draw yourself.

i.

Pyramid of energy should always be inverted.

16. (i) B (ii) A

(iii) A (iv) B

17. (i) 1 egg (ii) 1 egg/ovum (iii) yes , fraternal twins by fertilization

of two eggs by two sperms  $\frac{1}{2} + \frac{1}{2} + 1$

18. (i) cleavage (ii) blastomeres –Diploid (iii) 8-16 cells

(iv)blastocyst—cell mass  $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$

19. R cells—non-virulent having rough cell wall  $\frac{1}{2} + \frac{1}{2} + 2$

S cells—virulent having smooth cell walls

By his experiment , Griffith concluded that the R-strain bacteria

( non-virulent ) had somehow been transformed by heat killed S-type

(virulent type) , which must be due to the transfer of the genetic material .

20. (i) transformation

(ii) With the help of plasmid

(iii) infection with bacteriophages 1+1+1

21. (i) a--AUG

b---UAA/UAG/UGA 1+1+1

(ii) AUG codes for methionine

UAA/UAG/UGA stop codon /nonsense codon/does not code for any aminoacid

(iii) charged tRNA are brought closer together on mRNA in the ribosome , ribosome acts as a catalyst ( ribozyme ) forming peptide bond  $1/2 \times 6 = 3$

22. (a) menopause (b) transfer of pollen grain from one flower to another of the same plant © emasculation (d) spermatid transformed into s spermatozoa (e) release of sperms from seminiferous tubules  
(f) apomixis

23. STDs—sexually transmitted diseases which are transmitted through s sexual contacts. -

Principles to avoid STDs-----

(i) Avoid sex with unknown partners/ multiple partners .

(ii) Always use condom during coitus

(iii) In case of doubt , go to a qualified doctor for early detection and

Get complete treatment if diagnosed with disease.  $1/2 + 1/2 \times 3$

or

Fig.no. 2.12 NCERT book C

$\frac{1}{2} \times 4$   
1 fig. 1

24. (i) Hardy –Weinberg principle

(ii) 1 (one) ( $p^2+2pq+q^2 = 1$ )  $1 \times 3 = 3$

(iii) speciation (formation of new species )

24. Plant breeding ----purposeful manipulation of plant species in order to create desired plant types that are better suited for cultivation , give

better yields and are disease resistant .

Steps  $\frac{1}{2} + 2\frac{1}{2}$

(1) collection of germplasm

(ii) evaluation and selection pf parents

(iii)cross hybridsation among the selected parents

(iv) selection and testing of superior recombinants

(v) Testing , release and commercialization of new cultivars

26. Biofertilizers are those micro-organisms , which are addedto soil to

Increase its fertility .

Rhizobium / Azospirillum / Azobacter enriching the nitrogen content

of soil  $1 \times 3 = 3$

27. (i) ELISA  $1 \times 3 = 3$

(ii) Human Immuno Deficiency virus . Retrovirus which has an envelop

Enclosing RNA genome

(ii) Helper T lymphocytes

28. Sketch NCERT book page 128 fig. no. 7.1  $2 + \frac{1}{2} + 1 + \frac{1}{2}$

(a) Oparin and Haldane

(b) First form of life could have come from pre-existing non-living organic molecules (eg. RNA , protein etc.) chemical evolution

© Description of experiment . In the end of experiment he found amino acids .

or

*Drosophila melanogaster*  $\frac{1}{2}+2+2+1/2$

Reasons (a) could be grown on simple synthetic medium in the laboratory

(b) Short life cycle.----two weeks

(c ) single mating could produce a large number of progeny flies

(d) clear differentiation of sex .

(e) has many types of variation

(ii) Short statured with small round head .

Furrowed tongue , partially open mouth .

Palm is broad with characteristic palm crease .

Physical psychomotor and mental development retarded.

29. (i) (A) Grassland (B) temperate forest  $1+1+1+1+1$

(ii) tropical forest

(iii) 0 degree C----15degreeC

(iii) A very large unit , consisting of major vegetation type and associated fauna found in a specific climatic zone .

(iv) A very large unit , consisting of major vegetation type and

Associated fauna found in a specific climatic zone.

(v) Tropical rain forest ,Deciduous forest , Desert , Sea coast (any two)

or

- (A) (i) organic farming  $\frac{1}{2}+1+1$   
(ii) Waste product of one activity utilized for other  
(iii) No waste produce / no pollution
- (B) Criteria (i) High level of species richness  $\frac{1}{2} \times 3 + \frac{1}{2} \times 2 = 2 \frac{1}{2}$   
(ii) Endemism  
(iii) Degree of threat to habitat

Exp. (i) Western Ghats

(ii) Himalayas

30. PCR ----- (i) Denaturation.  $2 \frac{1}{2}$   
(ii) Annealing  
(iii) Extension/ elongation
- Diagram -----  $1 \frac{1}{2}$

(b) only one strand of DNA fragment will be amplified. 1

or

- (i) recombinant DNA technology  
(ii) EcoR I comes from *Escherichia coli* RY 13 .

The letter R is derived from the strain .

Roman No. following the names indicate the order in which the enzyme were isolated from the strain of bacteria .

- (iii) EcoR I ---- endonuclease  
(iv) Exonuclease –remove nucleotides from the end of DNA.

Endonuclease – make cuts at specific positions within the DNA.

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**CLASS XII  
(BIOLOGY)**

**TIME - 3 HRS**

**MARKS -70**

GENERAL INSTRUCTION-  
ALL QUESTION ARE COMPULSORY

**SECTION –A**

**1 MARK EACH**

- Q1 Mention one commercial use of “statins”.
- Q2 What are conformers?
- Q3 Define the term “induction”?
- Q4 What is gene pool?
- Q5 What is homeostasis?
- Q6 What is clones?
- Q7 Why is human male called heterogametic?
- Q8 Who coordinated human genome project?

**SECTION –B**

**2 MARKS EACH**

- Q9 Where are leydig cells located ?
  - Q10 What is germplasm collection? Why is it necessary
- OR**
- What are 3 benign tumors & malignant tumors ?
- Q 11 What is meant by the following
    - 1 biopiracy
    - 2 gene gun
  - Q12 Why is logistic model considered more realistic in nature ? explain.
  - Q13 Differentiate between gene flow and genetic drift
  - Q14 Brief out the advantage of molecular diagnostics over conventional methods
  - Q15 Name the chemicals and bthere sound cells which cause allergic response in our body.
  - Q16 define (a) juvenile phase (b)senescent phase.
  - Q17 How does a transgenic organisms differ from rest of the population ? write any two examples of such organisms .
  - Q18 Who discovered mutation ?write the scientific name of the plant he worked on .

**SECTION C**

**3 MARKS EACH**

- Q19 Write the scientific name of organisms that causes malaria . how doesa it spread?
- Q20 List 3 attributes that population possess but not individual
- Q21 Mention the advantage of recombinant varieties . How many of them are approved for them are marked in INDIA.
- 22. Suggest any three methods to assist infertile couple to have children.

23. Through labelled diagram outline the structure of nucleosome. What is significance of nucleosome?
24. What are the significance of predation in nature?
25. Mention the steps involved in DNA fingerprinting.
26. What are GMO's? Mention any four benefits of gm techniques.
  - (1) What is the disadvantage of human insulin produced from other animal sources?
  - (2) What are the concerns about transgenic insulin.
27. Explain what is meant by biofortification.

#### **SECTION-D**

Q.nos 28 to 30 are long answer type. Each has internal choice. Answer these question in approximately 80 to 120 words each.

28. Who demonstrated the semiconservative replication of dna? Explain their experiment

**or**

What is 'operon concept'? How is the operator switch turned on and off in the expression of genes in this operon.

29. What do you mean by PCR? Give the diagrammatic representation if amplification of gene of interest using PCR.

**or**

What do you mean by 'genetic engineering'? Mention the steps involved in this process.

30. What is menstruation? What are the specific action if FSH, LH, estrogen & Progesterone in menstruation cycle?

**or**

- (1) Why is autogamy discouraged in plants? Mention 4 adaptations to ensure xenogamy.
- (2) Draw a labelled diagram of transverse section of a mature anther.

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### **BIOLOGY SAMPLE PAPER- III MARKING SCHEME**

#### **SECTION-A**

1. 'Statins' commercially used as blood-cholesterol lowering agents.(1marks)
- 2.Organisms which change their body temperature and osmotic concentration with the ambient temperature and water concentration .(1 marks)
- 3 Induction is the phenomenon in which operon is induced for expression. (1 marks)
- 4.Gene pool –is the total number of different types of genes pooled by all the members of a population. It helps to adapt in an environment.(1marks)

5..Homeostatis –maintenance of a constant internal environment by the organisms despite varying external environmental conditions.(1/2+1/2)

6.Clones are morphologically and genetically similar individuals of a single parent.(1/2+1/2)

7Human male cells contain two different types (x&y) of sex chromosomes.

8.u.s. department of energy (1/2 marks)

National institute of health.(1/2marks)

SECTION-B

9.Ley dig cells are located in the interstitial space/(regions outside semniferouous tubules) of testes (1marks) secrete testosterone (1 marks)

10.Germ plasm collection -the entire collection (of plants/seeds) having all the diverse alleles for all genes crop is called germplasm collection .(1 marks)

Necessary-(1/2+1/2)

1.genetic variability is the root of any breeding programme.

2Collection of germplasm is necessary for exploitation of natural genes available in the population.

Or

10.Benign tumors

Malignant tumors

i remain confined to their orginal location and donot spread to other parts.

are the masses of the nroplsstic cells which grow rapidly invade and damage the Surrounding normal cells.

ii do not show metastasis

ii show metastatis

( 1 -1mark 2 1mark – 02 marks )

11 biopiracy – refers to unauthorized use of bioresources and traditional knowledge related to bioresources benefit by certain organization without proper consent from concern nation

2 gene gun – mostly plant cells bombarded with high velocity micro particles of gold or tungsten coated with DNA to introduce alien into host cells the method is known as gene gun

12.- No population of any species in nature can have unlimited resources to permit exponential growth

- this leads to competition among individuals for limited resources. Eventually only the fittest individuals will survive and reproduce

.13. Gene flow  
Change in allelic frequencies of

Genetic Drift  
Random changes in the allele frequencies

a given population, when the individuals of a population occurring only by chance, migrate into the population (immigration) or from the population (emigration) constitute genetic drift

14. Advantages of molecular diagnostics over conventional

- (1) Early diagnosis is not possible using conventional methods but by using DNA Technology and PCR, early diagnosis is not possible.
- (2) Mol. Diagnosis is a powerful technique to identify many genetic disorders
- (3) Mol. diagnosis is also used to detect mutations in suspected cancer patients

15. Juvenile phase- the period of growth involving an increase in body dimensions before attaining sexual maturity is called juvenile phase

SENESCENCE Phase – the part of life involving an increase in degenerative changes than repair

17. A transgenic organism is a genetically modified organism that carries certain foreign Genes thus it differs from the rest of the population in having one or more genes apart from the gene pool of that population.

- Eg 1- transgenic mouse with gene for human growth hormone
- 2- transgenic E-coli with gene for human insulin

18. Hugo de Vries discovered mutations  
Evening primrose (*Oenothera lamarckiana*)

### SECTION C

19. The scientific name of organism which causes malaria is Plasmodium  
Malaria spreads through bite of female Anopheles mosquito that transfers sporozoite stage of Plasmodium

20. (1) An individual may have births & deaths whereas population have births & deaths rates referred as per capita births and deaths

(2) A population has sex ratio whereas an individual is either a male or a female

(3) Age distribution is the attribute of population whereas age is of individual.

Age distribution - (percent individuals of a given age or age group)

21. Advantages –

- The recombinant therapeutics do not induce unwanted immunological responses like similar products of non human origin. (2 marks)

- About 30 recombinant therapeutics have been approved world over. (1/2 marks)

- 12 of them are being marketed in India. (1/2 marks)

22. There are special techniques called Assisted Reproductive Technology (ART) to help the sterile couple to have children; They are as follows-

- (1) Test-tube babies programmes.
- (2) Gamete Intra fallopian transfer (GIFT)
- (3) Intra cytoplasmic Sperm Injection (ICSI)

(4) Artificial Insemination (Any 3\*1=3 marks )

23. Nucleosome –labelled diagram (1/2\*3=1.5 marks ,3 for correct labeling & ½ for correct diagram )

Significance of nucleosome – nucleosomes are the unit of chromatin which ensure efficient packing of large length of DNA in smaller dimension of nucleus(1/2 marks)

24. Significance of predation in nature –

- (1) Predation acts as conduits for energy transfer to higher trophic levels .(1)
  - (2) They keep the prey population under control, which otherwise can reach very high population density and cause imbalance in the ecosystem (1)
  - (3) They help in maintaining species diversity in a community by reducing the intensity of competition among the competing prey species (1)
- (3\*1=3 marks)

25. Steps involved in DNA finger printing –

- (1) Isolation of DNA
- (2) Digestion of DNA by restriction endonucleases .
- (3) Separation of DNA fragments by electrophoresis
- (4) Transferring of (blotting of ) separated DNA fragments to synthetic membrane ,such as nitrocellulose or nylon .
- (5) Hybridisation using labelled VNTR probe and .
- (6) Detection of hybridized DNA fragments by autoradiography.

26. GMO's stands for genetically Modified Organisms .These are the organisms (plants, bacteria, fungi and animals whose genes have been altered by manipulation ). (1 mark)

Four benefits of GM techniques –

- (1) Made crops more tolerant to abiotic stress .
  - (2) Reduce reliance on chemical pesticides .
  - (3) Helped to reduce post –harvest losses .
  - (4) Increased efficiency of mineral usage by plants
  - (5) Enhanced nutritional value of food
- (any four 4\*1/2=2 marks)

OR

26(i) Disadvantages of non-human insulin

- it can cause allergy.
- It causes other types of reactions to the foreign protein. (1.5 marks)

(ii) Concerns about transgenic insulin

- the removal of c-peptide during maturation.
- assembling of the polypeptide into mature form.

27 Biofortification

Biofortification refers to breeding of crops to produce varieties with higher level of nutrients like vitamins, minerals , proteins or healthier fats. (1.5marks)

Many nutrients –enriched varieties have been produced as given below:

- Atlas-66 wheat has high protein content
- Iron(Fe)-fortified rice variety.
- Vitamin-A enriched carrot and spinach.

#### SECTION-D

28 Name of scientists- 0.5+0.5=1mark

(i) Mathew Meselson (0.5 mark)

(ii) Franklin Stahl (0.5 mark)

3 major steps of experiments and their observations (diagram represented)

1+1+1=3marks

Interpretation of observation (1mark)

OR

Operon is transcriptionally regulated system consisting of regular gene, promoter gene and operator sequence. Diagrammatic representation of Lac-operon (1mark)

Steps involved in switch off (1.5marks)

Steps involved in switch on (1.5marks)

(1+1+1.5+1.5=5marks) 29 PCR stands for polymerase chain reaction PCR

rapidly amplifies a single DNA molecule into many billions of molecules using two sets of primers (small chemically synthesized oligosaccharides that are complementary to the regions of DNA) and enzyme DNA polymerase

(1 mark)

Steps of gene amplification using PCR.

(i) Denaturation with diagram (1mark)

(ii) Annealing with diagram (1mark)

(iii) Extension with diagram (1 mark)

(iv) Amplified with diagram (1 mark)

OR

Genetic engineering – involve techniques to alter the chemistry of genetic material (DNA and RNA) to introduce these into host organisms and thus change the genotype of the host organisms. The techniques of genetic engineering include creation of recombinant DNA, use of gene cloning and gene transfer (1 mark)

Steps involved in genetic engineering

(1) isolation of DNA.

(2) fragmentation of DNA by restriction endonucleus.

(3) isolation of desired DNA fragment.

(4) ligation of DNA fragment into a vector

(5) amplification of gene of interest using PCR.

(6) transferring the recombinant DNA fragment into a host.

(7) culturing the host cells in a medium at large scale

(8) extraction of the desired product

(4 marks)

(1+4=05marks)

30. Menstruation: It is a process by which the disintegrate uterine mucosa(endometrium) are sloughed off and discharged from uterus along with the unfertilized egg and some blood through the vagina. (1mark)

Roles of Hormones:

1.FSH- stimulates the growth of graafian follicle and maturation of an ovum in it, during proliferating.

- induces the formation of corpus luteum from the ruptured graafian follicle.
- stimulate secretion of estrogens from follicle cells. (1 mark)

2.LH-stimulates ovulation

- induces formation of corpus leuteum
- induces secretion of progesterone from corpus leuteum. (1mark)

3.Estrogen-control the growth , maturation and functioning of female secondary thickens endometrium. (1mark)

4.Progesterone-brings pregnancy changes, prevents maturation of any other graffian follicle and ovulation.

- controls growth of secretory alveoli in the mammary glands. (I mark) (1+1+1+1+1=05 marks)

OR

1.Autogamy or self pollination resulys in homozygosity and inbreeding depression. (1mark) four adaptations for xenogamy.

(a)flowers are unisexual and the plants are dioceous

(b)pollen release and stigma receptivity are not synchronized either the anthers mature first (protandry) or the pistil/ gynoeciem matures first (protoginy) before anthers.

(c)the anthers and stigma of a flower are placed in such a way that the pollen of the same flower cannot fall on the stigma.

(d)self –incompatibility is a genetic mechanism that prevents the germination of pollen from the same flower on the stigma . (4\*1/2=2marks)

2. Draw a T.S. of mature anther.

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