

Class: XII

Sub: BIOLOGY

QUESTION BANK
FOR POOR PERFORMERS

CLASS XII

BIOLOGY

SYLLABUS

MAXIMUM MARKS – 70

| INIT | TITLE | MARKS |
|-------------|---|--------------|
| 1 | Reproduction (Chapter I,II,III,IV) | 14 |
| 2 | Genetics & Evolution (Chapter V,VI,VII) | 18 |
| 3 | Biology & Human welfare (Chapter VIII,IX,X) | 14 |
| 4 | Biotechnology & Its Applications (Chapter XI, XII) | 10 |
| 5 | Ecology & Environment (Chapter XIII,XIV,XV,XVI) | 14 |
| | TOTAL | 70 |



REPRODUCTION -UNIT 1
CHAPTER 1
REPRODUCTION IN ORGANISMS

Q 1 Cucurbits and papaya plants bear staminate and pistillate flowers. Mention the categories they are put under separately on the basis of the type of flowers they bear. **1M**

Ans –cucurbit is a monoecious plant having staminate and pistillate flower on the same plant. Papaya has staminate and pistillate flowers on separate plants. Hence it is dioecious.

Q 2 Give 1 example each of seasonal breeders and continuous breeders. **1M**

Ans –seasonal breeders – frog, deer, many birds

Continuous breeders- honey bee, cattle.

Q 3 Why are mosses and liverworts unable to complete their sexual mode of reproduction in dry conditions? give reasons. **1M**

Ans-The motile anthozoids in mosses and liver worts have to swim on the surface of water to fertilize eggs which can't take place in dry conditions

Q 4. Why are large number of male gametes produced as compared to female gametes in nature? **1M**

Ans-The motile male gametes have to swim and reach immotile female gametes during which many get destroyed. So the number of male gametes is more to compensate the loss.

Q 5. Identify each part in a flowering plant whether it is haploid or diploid. **2M**

a. Ovary b. Anther c. Egg d. Pollen e. Male gamete f. Zygote

Ans: a. Diploid b. Diploid c. Haploid d. Haploid e. Haploid f. Diploid

Q 6. What are vegetative propagules? Give any four examples. **2M**

Ans: Units of Asexual vegetative structures of plant capable of giving rise to new individuals.

Ex. Rhizome – Zinger

Bulbil – Agave

Leaf buds – Bryophyllum

Bulb - onion

Q 7. If the chromosome number in Meicytes of human being, Rat, Elephant, Rice, Butterfly and Onion are 46,42,56,24,380 and 32 respectively, what will be the chromosome number in gametes of these species?

2M

Ans: 23, 21, 28, 12, 190, 16

UNIT 1
CHAPTER 2
REPRODUCTION IN FLOWERING PLANTS

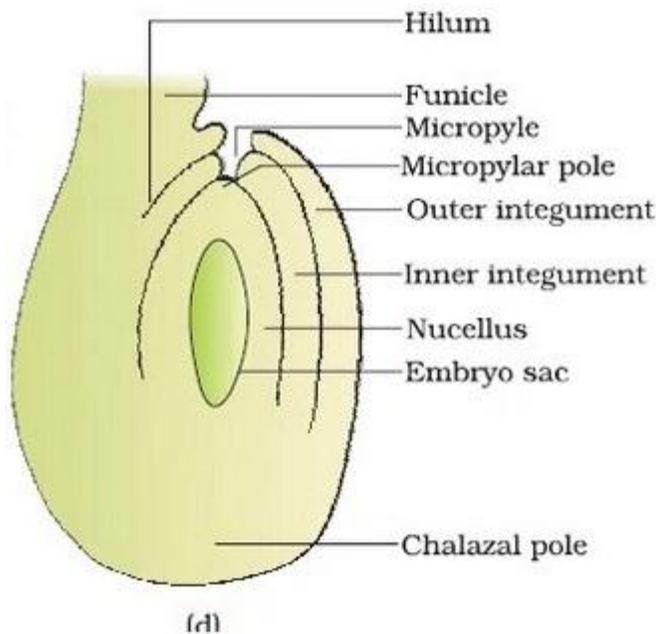
Q 8. a) Pollen grains are tolerant to strong acids and high temperatures. What made it so? **1M**

b) In Which area in the coat of the pollen grain, this tolerance is absent?

Ans –a-sporopollenin b-germ pore

Q 9. Draw the structure of an anatropous ovule and label any 4 parts. **3M**

Ans : Any four labeling.



Q 10. Write the characteristics of flowers favouring wind pollination and insect pollination giving suitable examples. **3M**

Ans : Wind pollinated flowers –dull nectarless, scentless, light in weight, pollen grains are dry, light, small and smooth. eg-grass, corn.

Insect pollinated flowers –bright, with nectar and fragrance, pollen grains are larger, heavier. Eg –rose sweet pea.

Q 11. What is apomixis? Write its significance. explain any 2 ways by which apomictic seeds are developed. **3M**

Ans The phenomenon of asexual reproduction that mimics sexual reproduction by formation of seed without fertilization is called apomixis or agamospermy.

Significance -1 maintains hybrid vigor in crop plants.

2 -It results in the formation of more than 1 embryo in a seed (polyembryony)

2 Ways -1 –a diploid egg without meiosis \implies develops into embryo \implies no fertilization \implies ovules develops into apomictic seeds.

2 –some diploid nucellar cells divide \implies without fertilization develop into embryo.

Q 12. Differentiate parthenogenesis and parthenocarpy. **2M**

Ans parthenogenesis –phenomenon in which the unfertilized ovum develops into a seed. It results in haploid individuals. eg honey bees.

Parthenocarpy –It is the phenomenon of formation of a fruit without fertilization.

It produces seedless fruits. Eg banana, pineapple.

Q 13. Explain any 3 outbreeding devices developed in flowering plants to encourage cross pollination. **3M**

Ans 1 Non synchronisation -of pollen release and stigma receptivity .it prevents self pollination
2 -self incompatibility -pollen do not germinate if falls on the stigma of same flower. It is a genetic mechanism.
3. Position of Anther and Stigma at different places so that pollen cannot come in contact with stigma of the same flower.

Q 14. write the functions of the following -tapetum,tassels ofcorn cob,filliform apparatus,funiculus,endosperm. **5M**

Ans -tapetum -gives nourishment to developing pollen grain

Tassels of corncob -They are stigma and style which wave in wind to trap pollengrains

Filliform apparatus -At the micropylar end guide the entry of pollen tube to the synergids.

Funiculus -stalk which attaches ovule to placenta.

Endosperm -nourishes the developing embryo.

Q 15. Explain albuminous and non albuminous seeds giving examples. **2M**

Ans- Seeds without residual endosperm -non albuminous. Eg -pea groundnut.

Seeds with endosperm-albuminous seeds .wheat maize, castor, sunflower etc .

Q 16. List the post fertilization events in angiosperms. **2M**

Ans : Development of-endosperm - development of embryo - seed formation-fruit formation.

UNIT 1
CHAPTER III
HUMAN REPRODUCTION

Q 17. Explain the role of pituitary and ovarian hormones in menstrual cycle in human females. **3M**

Ans : Pituitary hormones -FSH-stimulates follicle maturation

LH -rapid secretion --- LH surge ---- induces rupture of graffian follicle ---- ovum released.

Ovarian hormones ---- estrogen --- stimulates follicular development

Progesterone ----- corpus leutum ---- maintains endometrium.

Q 18. Explain the following- Trophoblast, Spermiation, Birth canal, Spermiogenesis. (Any Three) **3M**

Ans:

Trophoblast - Outer layer of blastocyst which send finger like projections called chorionic villi into uterine tissue which together form the placenta.

Spermiation - After spermiogenesis, sperm head get embedded into the sertoli cells and is finally released from seminiferous tubule by the process called Spermiation.

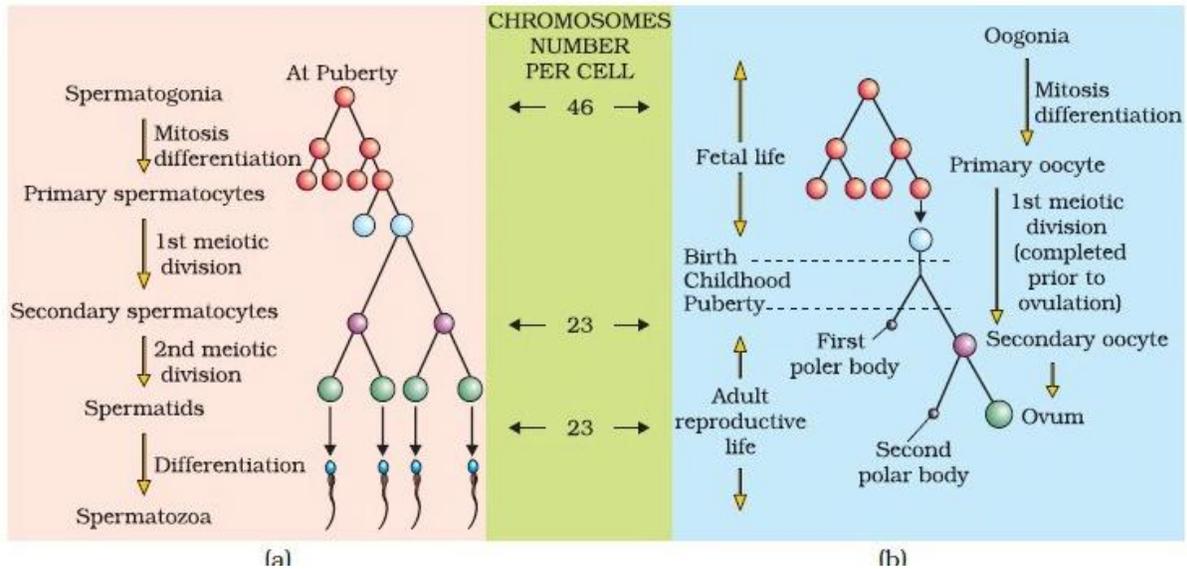
Birth canal - The vaginal canal along with the cervix is called birth canal. It helps in parturition.

Spermiogenesis – The process involving transformation of spermatids into spermatozoa is called spermiogenesis.

Q 19 –describe the schematic events of spermatogenesis and oogenesis. **5M**

Ans : Spermatogenesis

Oogenesis



UNIT 1

CHAPTER IV

REPRODUCTION HEALTH

Q 20. Describe any 5 methods of birth control/contraceptive methods. **5M**

Ans 1. Natural / traditional methods – a) periodic abstinence b) coitus interruptus c) Lactational amenorrhoea.

2. Barrier methods – a) Condoms b) Diaphragms, Cervical caps and Vaults c) Spermicidal cream, gellies & foams.

3. LUDS - a) Non medicated IUD ex. Lippes loop b) Copper releasing IUD ex. Cu T c) Hormone releasing IUD ex. Progestasert.

4. Oral contraceptives – a) Pills containing progestogens or progesteron – estrogen combination by female ex. Saheli – is a non steroidal preparation

5. Surgical methods – a) Vasectomy in Male and Tubectomy in female.

Q 21. Write any four characteristics of ideal contraceptives. **2M**

Ans : User friendly, easily available, effective, reversible with no side effects, noninterfering.

Q 22 –describe any 3 Assisted reproductive technology (ART) to an infertile couple. **3M**

Ans – a) Test tube baby program – (i) IVF – Invitro fertilization (ii) ZIFT – Zygote intra fallopian transfer and IUT – intra uterian transfer.

b) GIFT – Gamete intra fallopian transfer

c) ICSI – Intra cytoplasmic sperm injection

d) AI – Artificial Insemination.

Q 23 –what is reproductive health? Mention any 5 ways by which awareness about significance of reproductively healthy society be developed. **3M**

Ans: Total well being in all respect of reproduction that is physical, emotional, social, behavioral and physiological.

5 ways to create awareness.

1. Awareness of problem due to population explosion, social evil like sex abuse etc.
2. Legal checking of female foeticides by banning amniocentesis
3. Educating people about birth control and other sex related aspects.
4. Providing facility for reproductive help
5. Creating awareness among people by introduction of sex education in school.

Unit II

Chapter 5

Principles of inheritance and variation

1. Why did Mendel choose garden pea for his experiment? How did he make sure that the Plants were true breeding? **3M**

Ans: Mendel selected garden pea for his experimental material because of the following reasons:

- i) It is an annual plant with a short life-cycle. So several generations can be studied within a short period.
 - ii) It has perfect bisexual flowers containing both male and female parts
 - iii) The flowers are predominantly self-pollinating. It is easy to get pure line for several generations.
 - iv) It is easy to cross-pollinate them because pollens from one plant can be introduced to the stigma of another plant by removing the anthers.
 - v) Pea plants produce a large number of seeds in one generation.
 - vi) Pea plants could easily be raised, maintained and handled
 - vii) A number of easily detectable contrasting characters/traits were available.
2. A pea plant with purple flowers was crossed with white flowers producing 50 plants with only purple flowers. On selfing, these plants produced 482 plants with purple flowers and 162 with white flowers. What genetic mechanism accounts for these results? Explain. **2M**

Ans: The gene for purple flowers is dominant over that of white flowers. So when two pure varieties are crossed, the F1 generation has only purple flowers and on selfing, the flowers are produced in a 3:1 ratio.

This result is obtained due to segregation of the alleles at the time of gametogenesis the alleles remain together in a zygote but during gamete formation, they segregate such that the gametes carry only one allele.

3. (a) explain the phenomena of dominance, multiple allelism and co-dominance taking ABO blood group as an example

(b) What is the phenotype of the following? **5M**

- i) I^Ai
- ii) ii

Ans: (a) Dominance: the alleles I^A and I^B both are dominant over allele i as I^A and I^B form antigens A and B, respectively, but i does not form any antigen.

Multiple allelism is phenomenon of occurrence of a gene in more than two allelic forms on the same locus. In ABO blood group in humans, one gene I has three alleles I^A , I^B and i .

Co-dominance is the phenomena in which both alleles express themselves when present together.

We inherit any two alleles for the blood group. When the genotype is $I^A I^B$ the individual has AB blood group since both I^A and I^B equally influence the formation of antigens A and B.

b) i) $I^A I$ – A blood group ii) ii – O blood group.

4. **A.** Explain the law of dominance using a monohybrid crosses. **5M**

B. What is a test cross?

Ans: **A.** law of dominance states that when two different allelomorphic forms (genes) are present in an organism, only one expresses itself in F_1 generation which is called dominant gene while the other which does not show its effect and remains masked is called recessive gene.

When a cross is performed between two individuals taking a single contrasting character at a time is called a monohybrid cross.

The character 'height' in a pea plant has two alleles 'T' and 't'. 'T' exhibits tallness whereas 't' exhibits dwarfness. When a pure tall (TT) pea plant is crossed with a pure dwarf (tt) plant, in the F_1 generation hybrid (heterozygous) 'Tt' is obtained, which is tall due to the presence of allele 'T'. this shows that tallness is dominant over dwarfness which remain unexpressed in generation. Thus, this cross explains law of dominance.

B. It is a cross to find out the genotype of an organism. In this cross organism with unknown genotype is crossed with the recessive parent. If all progeny is dominant, then the organism is homozygous and if the progeny shows recessive and dominant ratio 1:1, the organism is heterozygous.

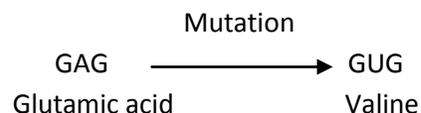
5. Explain Incomplete Dominance with example? **2M**

Ans: in Incomplete dominance, the genes of allelomorphic pairs are not expressed as dominant and recessive but express themselves partially when present together in the hybrid. As a result, F_1 hybrids show characters intermediate of the parental genes. For example, *Mirabilis jalapa* (4 O'clock plant) exhibit two types of flowers, red and white and the hybrids are pink coloured flowers.

6. What is point mutation? Give one example. **2M**

Ans: point mutation is a gene mutation that arises due to change in a single base pair of DNA.

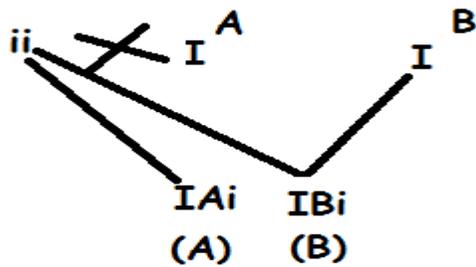
Example : Sickle – cell anaemia.



A substitution of a single nitrogen base (GAG \rightarrow GUG) at the sixth codon of the β -globin chain of hemoglobin molecule causes the change in the shape of the RBC from biconcave disc to elongated spindle shaped, structure which results in sickle-cell anaemia.

7. A woman with blood group O married a man with AB group. Show the possible blood groups of the progeny. List the alleles involved in this inheritance. **2M**

Ans:



The alleles involved in this inheritance are: I^A , I^B and i .

8. (i) Why are grasshopper and Drosophila said to show male heterogamety? Explain
 (ii) Explain female heterogamety with the help of an example. **3M**

Ans : (i) Drosophila exhibits XY type of sex determination. Males produce two types of sperms, one having X chromosome and one having Y chromosome. Whereas females have only X type of chromosomes. Grasshopper exhibit XO type of sex determination. Males produce two types of gametes, one with X chromosome and other with no sex chromosome. Thus both show male heterogamety.

(ii) Female heterogamety can be seen in female birds. In these, the females have one Z and one W chromosome whereas male have a pair of Z chromosomes besides the autosomes.

9. Explain the pattern of inheritance of haemophilia in humans. Why is the possibility of a human female becoming a haemophilia extremely rare? Explain **3M**

Ans: haemophilia is a sex linked (X-chromosome linked) recessive disorder which shows its transmission from unaffected carrier female to sum of the male progeny. If the female is a carrier (heterozygous X^hX^H), it transmits the disease only to some of her sons but a sufferer (homozygous X^hX^h) female trasmis the disease all to her sons.

The possibility of a female becoming haemophilic is extremely rare because to be diseased she has to be homozygous (X^hX^h) recessive for that trait. As females have two XX chromosomes so there is rare chance of being homozygous recessive.

10. Why do the sons of a haemophilic father never suffer from this trait? **2M**

Ans : haemophilia is a X-linked recessive disorder. The father passes only the Y chromosome to the son and not the haemophilic X chromosome. Therefore, sons of hemophilic father never suffer from haemophilia.

11. Identify 'a', 'b', 'c', 'd', 'e' and 'f' in the table given below: **3M**

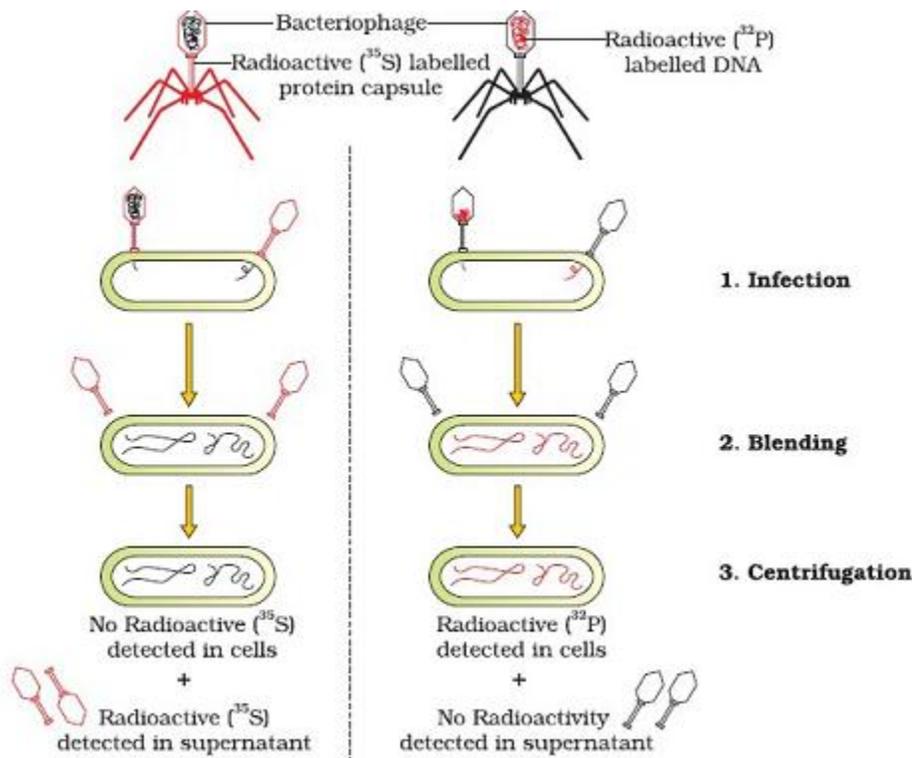
| S.No | Syndrome | Cause | Characteristic of affected individuals | Sex Male/Female/Both |
|------|----------|---------------|--|----------------------|
| 1 | Down's | Trisomy of 21 | 'a'(i) (ii) | 'b' |
| 2 | 'c' | XXY | Overall masculine development | 'd' |
| 3 | Turner's | 45 with XO | 'e'(i) (ii) | 'f' |

Ans: (a) short stature/small round head/furrowed tongue/partially open mouth/mental development retarded.

Q 18. Describe the experiment that proved that DNA is the genetic material

5M

Ans: Hershey and Chase conducted experiments on bacteriophage to prove that DNA is the genetic material.



Procedure:

- (i) Some bacteriophage viruses were grown on a medium that contained radioactive phosphorous (^{32}P) and some in another medium with radioactive sulphur (^{35}S)
- (ii) Viruses grown in the presence of radioactive phosphorous (^{32}P) contained radioactive DNA.
- (iii) Similar viruses grown in presence of radioactive sulphur (^{35}S) contained radioactive protein.
- (iv) Both the radioactive virus types were allowed to infect E.coli separately.
- (v) Soon after infection, the bacterial cells were gently agitated in blender to remove viral coats from the bacteria.
- (vi) The culture was also centrifuged to separate the viral particles from the bacterial cell.

Observations and Conclusions:

- (i) Only radioactive ^{32}P was found to be associated with the bacterial cell, whereas radioactive ^{35}S was only found in surrounding medium and not in the bacterial cell
- (ii) This concludes that only DNA and not protein coat entered the bacteria cell.
- (iii) This proves that DNA is the genetic material which is passed from virus to bacteria and not protein.

Q 19. a Explain the role of the enzymes involved in DNA replication

2M

Ans: Enzymes involved in DNA replication are:

- (i) DNA-dependent DNA polymerase, which catalyses the polymerization of polynucleotides in a very short time only in $5' \rightarrow 3'$ direction with accuracy.
- (ii) DNA ligase, which joins the discontinuously synthesized short segments called Okazaki fragments formed on one of the template strands.

Q 20 -Explain the process of transcription in a bacterium.

5M

Ans: In prokaryotes, the structural gene is polycistronic and continuous.

In bacteria the transcription of all the three types of RNA (mRNA, tRNA and rRNA) is catalysed by single DNA-dependent enzyme, called the RNA polymerase.

In E.coli bacterium, the RNA polymerase has co-factors β , β' , α , α' and ω along with σ (sigma) factor, to catalyse the process.

The transcription is completed in three steps: initiation, elongation and termination.

Initiation: σ (sigma) factor recognizes the start signal and promoter region on DNA which then along with RNA polymerase binds to the promoter to initiate transcription.

Figure.ig 6.1 page 109 T.Book

Elongation : the RNA polymerase after initiation of RNA transcription loses the σ factor but continues the polymerization of ribonucleotides to form RNA.

Termination: once the RNA polymerase reaches the termination region of DNA, the RNA polymerase is separated and newly formed RNA gets released. This process is called termination which is facilitated by a termination factor ρ (rho).

In prokaryotes, mRNA does not require any processing, so both transcription and translation occur in the cytosol. It can be said that transcription and translation are coupled together.

Q 21. What are the three types of RNA? Mention their relation to protein synthesis.

3M

Ans: types of RNA.

| S.No | Type of RNA | Functions |
|-------|----------------------|--|
| (i) | Messenger RNA (mRNA) | (i) It stores the genetic information from DNA (ii) It decides the sequence of amino acid in a polypeptide. |
| (ii) | Transfer RNA (tRNA) | (i) It acts as an adaptor molecule that one end reads the code on mRNA and accordingly binds to amino acid on the other end. (ii) It recognizes the codon on mRNA by its anticodon and leaves amino acid at the protein synthesis site. |
| (iii) | Ribosomal RNA (rRNA) | (i) It constitutes the ribosomal structure (ii) It helps to form peptide bond |

Q 22 . Explain what happens in frameshift mutation. Name one disease caused by the disorder.

2M

Ans: The mutation in which addition/insertion or deletion of one or two bases changes the reading frame from the site of mutation is called frameshift mutation. It may result in polypeptide with different sequences of amino acid. A disease caused by frameshift mutation is muscular dystrophy.

Q 230. (a) Explain DNA polymorphism as the basis of genetic mapping of human genome.(.HOT QUESTION)

3M

(b) State the role of VTNR in DNA fingerprinting

Ans: (a) Genetic polymorphism means occurrence of genetic material more than one form. It is of following types i.e., allelic, SNP

Allelic Polymorphism: allelic polymorphism occurs due to multiple alleles of a gene. Allele possesses different mutations which alter the structure and function of a protein formed by them as a result change in phenotype may occur.

SNP or single nucleotide polymorphism: SNP is very useful for locating alleles, identifying disease-associated sequence and tracing human history.

(b) Variable Number Tandem Repeats (VNTRs) are used in DNA fingerprinting as markers. VNTRs vary from person to person and are inherited from one generation to the next. Therefore only closely related individuals have similar VNTRs.

Q 24 Explain the steps of DNA fingerprinting .

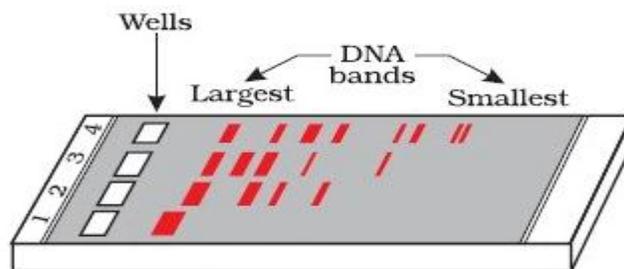
5M

Ans : Dr. Alec Jeffreys developed the technique of DNA fingerprinting in an attempt to identify DNA marker for inherited diseases.

DNA fingerprinting uses short nucleotide repeats called Variable Number Tandem Repeats (VNTRs) as markers. VNTRs vary from person to person and are inherited from one generation to next. Only closely related individuals have similar VNTRs

Methodology and Technique

- (i) DNA is isolated and extracted from the cell or tissue by centrifugation
- (ii) By the process of polymerase chain reaction (PCR) many copies are produced. This step is called amplification
- (iii) DNA is cut into small fragments by treating with restriction endonucleases.
- (iv) DNA fragments are separated by agarose gel electrophoresis.
- (v) The separated DNA fragments are visualized under ultraviolet radiation after applying suitable dye.
- (vi) The DNA is transferred from electrophoresis plate to nitrocellulose or nylon membrane sheet. This is called **Southern blotting**.
- (vii) Probes are now added which bind to specific nucleotide sequences that are complementary to them. This is called hybridization.
- (viii) The hybridized DNA fragments are detected by autoradiography. They are observed as dark bands on X-ray film.



A typical agarose gel electrophoresis showing migration of undigested (lane 1) and digested set of DNA fragments (lane 2 to 4)

Q 25. State the conditions when genetic code is said to be

3M

- (i) Degenerate,
- (ii) Unambiguous and specific,
- (iii) Universal

Ans:

- (i) Degenerate – when some amino acids are coded by more than one amino acids.
- (ii) Unambiguous and specific – when one codon codes for only one specific amino acid
- (iii) A particular codon codes for same amino acid in all organisms except in mitochondria and few protozoa.

Q 26. A cistron consists of 20 codons. How many amino acids will it code in the polypeptide

transcribed? Why ?

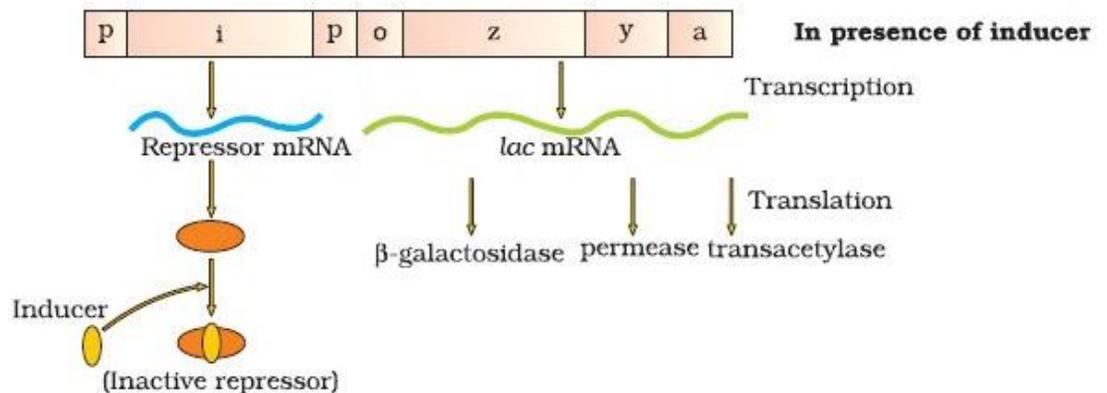
2M

Ans: It will code for 19 amino acids because, the last codon on mRNA will be a terminating codon. Which will not code for any amino acid?

Q 27 Study the figure below and answer the questions:

3M

Fig.



- (a) How does the repressor molecule get inactivated?
- (b) When does the transcription of lac mRNA stop?
- (c) Name the enzyme transcribed by the gene 'z'.

Ans:

- (a) When the inducer comes in contact with repressor, it is inactivated.
- (b) When lactose is lacking or absent, the transcription of lac mRNA stops.
- (c) β - galactosidase.

Q 28 (a) why is DNA molecule a more stable genetic material than RNA? Explain.

5M

(b) “Unambiguous”, “degenerate” and “universal” are some of the salient features of genetic code. Explain.

Ans: (a) in DNA, presence of thymine at the place of uracil confers more stability to DNA. In RNA, the –OH group is a reactive group that makes RNA labile and degradable, while its absence in DNA makes DNA chemically less reactive and more stable.

(b) **Unambiguous:** One codon specifies only one particular amino acid hence it is called unambiguous.

Degenerate: Some amino acids are coded by more than one codons hence the code is said to be degenerate.

Universal: A particular codon coding for an amino acid is same in all organisms except in mitochondria and protozoa.

Q 29 A template strand is given below. Write down the corresponding coding strand and the mRNA strand that can be formed, along with their polarity. **2M**

3' ATGCATGCATGCATGCATGC 5'

Ans: Coding strand : 5' TACGTACGTACGTACGTACG 3'

mRNA strand: 5' UACGUACGUACGUACGUACG 3'

Q 30 An mRNA strand has a series of codons out of which three are given below: **2M**

(i) AUG (ii) UUU (iii) UAG

(a) What will their DNA codon be translated into?

(b) What are the DNA codon that would have transcribed these RNA codon?

Ans: (a) (i) AUG – Methionine (start Codon)

(ii) UUU – Phenylalanine

(iii) UAG – No amino acid is coded as it is a stop codon.

(b) TAC, AAA, ATC.

UNIT II
CHAPTER – 7
EVOLUTION

Q 31. What is Oparin – Haldane theory? Can life be originated abiotically inside the laboratory today? **2M**

Ans: Oparin – Haldane’s theory states that the first life from originated from non-living organic molecules like RNA, protein, etc. yes, life can be originated abiotically inside the laboratory under controlled conditions.

Q 32. Mention the contribution of S.L. Miller’s experiments on Origin of Life **3M**

Ans: S.L. Miller created an environment in laboratory similar to the one that existed before life originated. In a closed flask containing CH_4 , H_2 , NH_3 and water vapour at 800°C , electric discharge was created. The conditions were similar to those in primitive atmosphere. After a week, they observed presence of amino acids and complex molecules like sugars, nitrogen bases, pigments and fats in the flask. This provided experimental evidence for the theory of chemical origin.

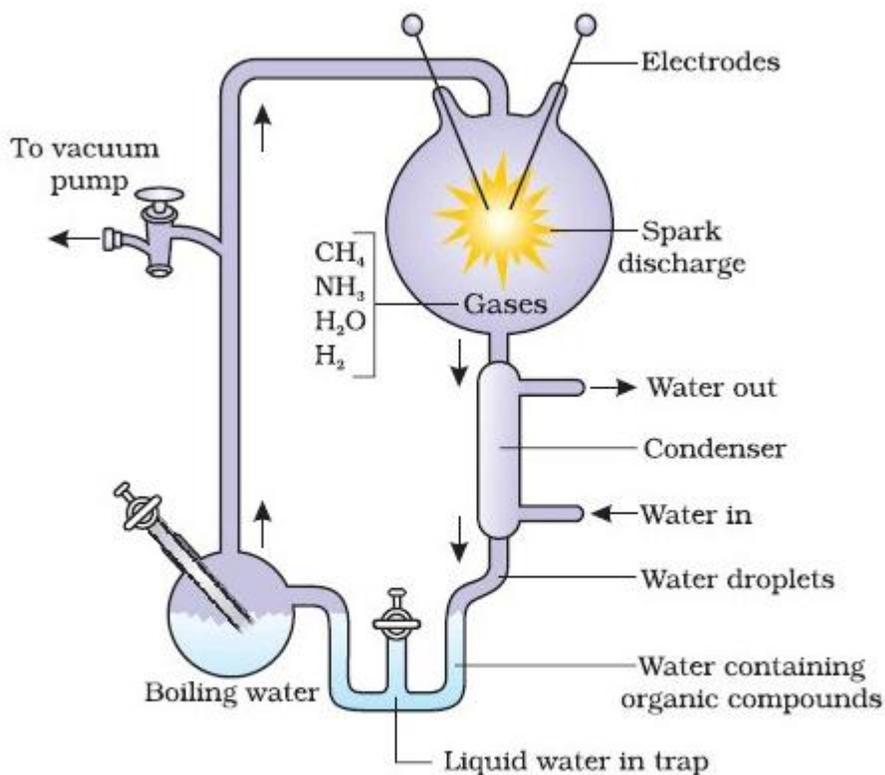


Figure 7.1 Diagrammatic representation of Miller's experiment

Q 33. Give one example of adaptive radiation **1M**

Ans: Darwin's finches in the Galapagos Island once had a common ancestor but with evolution they modified into different types according to their food habitat.

Q 34. What is speciation? List any two events leading to speciation.

2M

Ans: the process involving formation of new species from the existing species is called speciation.

Two events leading to speciation are:

- (i) Interbreeding among different populations or species
- (ii) Migration.

Q 35. Give two examples of biogeographical evidence in favor of evolution

1M

Ans: (i) Darwin's finches

(ii) Australian marsupials.

Q 36. How do Darwin's finches illustrate adaptive radiation?

2M

Ans: Darwin during his journey to Galapagos Islands observed that there were many varieties of small black birds called Darwin's finches

- (i) All the varieties, he conjectured, evolved on the island itself.
- (ii) From the original seed-eating features, many other forms with altered beaks arose, enabling them to become insectivorous and vegetarian finches
- (iii) This process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats) is called **adaptive radiation**.

Q 37. With the help of two suitable examples explain the effect of anthropogenic actions on organic evolution.

2M

Ans: New species evolve in a short time scale of months or years due to anthropogenic actions or human activities. This hastens the evolutionary process. For example.

- (i) During post industrialization period, the tree trunks were covered by dust, coal particles and thus became dark. On such trunks, white moths could be easily picked up leaving the dark – peppered moths.
- (ii) Due to excessive use of antibiotics or herbicides, new resistant varieties of organisms appeared. These resistant varieties got selected over the non-resistant varieties.

Q 38. Explain the increase in the numbers of melanic (dark winged) moths in the urban areas of post-industrialization period in England

2M

Ans: During post industrialization period, the tree trunks became dark due to accumulation of industrial smoke and soot. Under this condition the white-winged moth was easily spotted by the predators against the dark background. Whereas the dark-winged or melanised moth camouflaged against the dark background and survived.

Q 39. Discovery of lobefins is considered very significant by evolutionary biologists. Explain

2M

Ans: Lobefins were fish like animals with stout and strong fins that lived both on water as well as on land. Their discovery is significant as they prove that amphibians have evolved from fish-like organisms. Lobefins are ancestors of modern day frogs and salamanders.

Q 40 (a) Write the Hardy-Weinberg principle

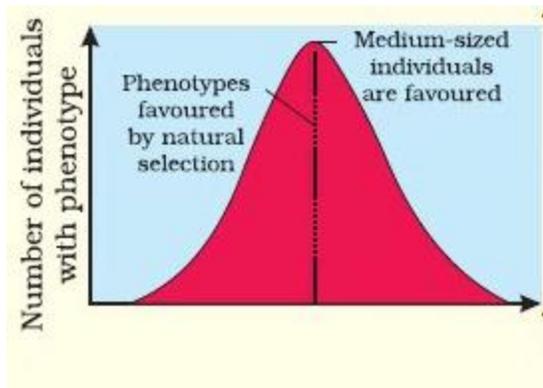
3M

(b) Explain the three different ways in which natural selection can affect the frequency of a heritable trait in a population shown in the graph given below.

Graph

Ans: (a) Hardy-Weinberg principle states that the gene pool (total genes and their alleles in a population) remains constant, i.e., the allele frequencies in a population are stable and constant from generation to generation. This is called genetic equilibrium.

(b) Natural selection can lead to stabilisation (in which more individuals acquire mean character value), directional change (more individuals acquire value other than the mean character value) or disruption (more individuals acquire peripheral character value at both ends of the distribution curve)



Q 41. Identify the following pairs as homologous or analogous organs and explain the reason: **2M**

- (i) Sweet potato and potato - Analogous
- (ii) Eye of octopus and eye of mammals - Analogous
- (iii) Thorns of Bougainvillea and tendrils of Cucurbits
- (iv)** Forelimbs of Bat and Whale

Ans: (i) Analogous - Sweet potato (root modification) and potato (stem modification) to store food.

(ii) Analogous- Different in origin but similar in function

(iii)– Homologous - both of them are stem modifications and thus are structurally similar but both have different functions. Thus, they are homologous structures as tendrils and thorns both arise in auxiliary position and hence are modified branches but tendrils help in climbing and thorns protect the plant.

(iv) Homologous- Both are modifications of four limbs and similar in origin but different in functions.

Q 42. (a) How does the Hardy-Weinberg's expression ($p^2+2pq+q^2 = 1$) explain that genetic equilibrium is maintained in a population? **5M**

(b) List any two factors that can disturb the genetic equilibrium.

Ans: Sum total of all the allele frequencies is 1: Let there be two alleles A and a in a population.

The frequency of allele A and allele a are p and q, respectively. The frequency of AA individuals in a population is simply p^2 and it can be explained that the probability that an allele A with a frequency of p appear on both the chromosomes of a diploid individual is simply the product of the probabilities, i.e., p^2 . Similarly of aa is q^2 , of Aa $2pq$.

$p^2+2pq+q^2 = 1$, where p^2 represents the frequency of homozygous dominant genotype, $2pq$ represents the frequency of the heterozygous genotype and represents the frequency of the homozygous recessive.

(ii) genetic equilibrium states the status of evolution. If there is some fluctuation or disturbance in genetic equilibrium or Hardy-Weinberg's equilibrium, i.e., change of frequencies of alleles in a population then it can be predicted that evolution is in progress.

(b) Factors that affect Hardy-Weinberg's equilibrium:

- (i) Genetic migration or gene flow
- (ii) Genetic drift
- (iii) Mutation

UNIT 3

CHAPTER 8

BIOLOGY AND HUMAN WELFARE HUMAN HEALTH AND DISEASES

Q 1 Name any two organisms that are responsible for ringworms in humans. Mention two diagnostic symptoms. Name the specific parts of the human body where these organisms thrive and explain why.

3M

Ans: Microsporium/Trichophyton/Epidermophyton.

Symptoms: Dry/scaly lesion on skin/nails/scalp/intense itching (any two)

These thrive in body groin/between toes, thrive better in heat/moisture/perspiration.

Q 2 Identify a,b,c and d in the following table:

3M

| Sno | Name of the human disease | Name of the causal bacteria/virus | Specific organ or its part affected |
|-------|---------------------------|-----------------------------------|-------------------------------------|
| (i) | Typhoid | Salmonella typhi | A |
| (ii) | Common cold | B | C |
| (iii) | Pneumonia | Streptococcus pneumoniae | D |

Ans: (a) small intestine

(b) Rhino virus

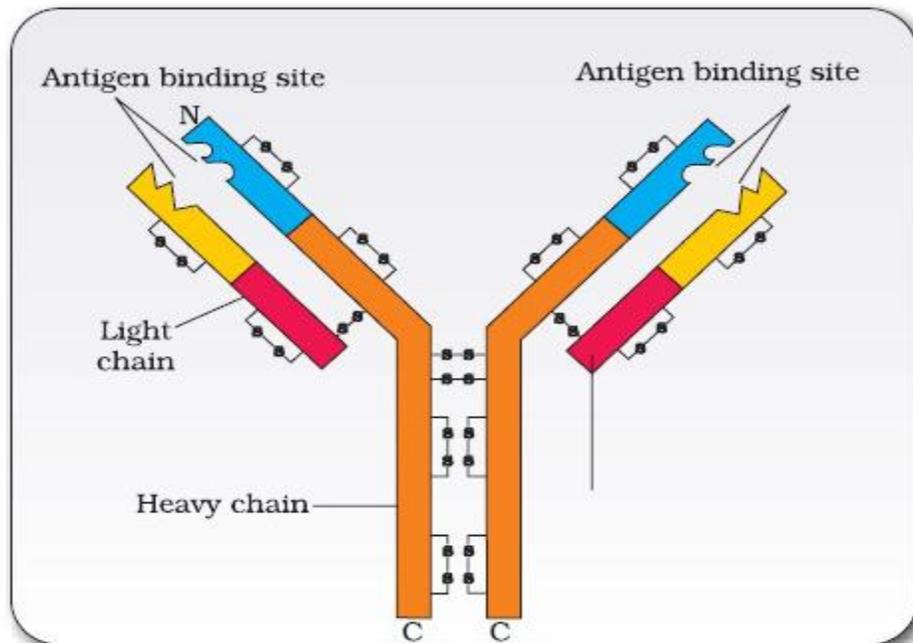
(c) Nose and respiratory passage

(d) alveoli of lungs

Q3 Draw a well labeled diagram of an antibody molecule.

3M

Ans:



Q 4 Define innate immunity. Name and explain the category of barrier which involves macrophages.

2M

OR

Name and explain the type of barrier of innate immunity system which involves macrophages.

Ans: Innate immunity is non-specific type of defence, that is present at the time of birth and is inherited from parents. Cellular barrier/phagocytosis involves macrophages. The macrophages form an important component of this type of immunity. At the site of infection, the blood flow

increases and so does the cellular components. Macrophages and neutrophils engulf the microbes and cellular debris whenever they happen to enter the body.

Q 5 Name and explain the two types of immune responses in humans.

2M

Ans: The two types of immunity are active immunity and passive immunity.

Active immunity: immunity developed in the host body due to production of antibodies in response to antigens.

Passive immunity: when ready-made antibodies are directly given to protect the body against foreign agents.

Or

The two types of immunity are humoral immunity and secondary immunity

Humoral immunity: Immune responses given by antibodies found in the blood.

Cell-mediated immunity: T- lymphocytes mediate this immunity.

Or

The two types of immunity are primary immunity and secondary immunity.

Primary immunity: when our body encounters a pathogen for the first time produces primary response.

Secondary immunity: subsequent encounter with the same pathogen generates highly intensified secondary response.

Q 6 Explain the role of the following in providing defence against infection in human body:

3M

- (i) Histamines (ii) Interferons (iii) B-cells

Ans: (i) Histamines: these are chemicals which cause inflammatory responses.

(ii) Interferons: these are glycoproteins which protect non-infected cells from further viral infection

(iii) B-cells: these produce proteins called antibodies in response to pathogens into the blood to fight with them.

Q 7. What are allergens? How do human beings respond to them?

2M

Ans: Allergens are allergy causing agents or substances which act as weak antigens and cause inappropriate and excessive immune response. Allergen being a harmless substance initiates antibody formation which in turn binds to the receptors on the mast cell. The mast cell releases chemicals such as histamines, which in turn cause inflammation of the mucous membranes. Many anti-allergic treatments suppress mast cells or neutralize histamines.

Q 8. Explain the response initiated when a dose of vaccine is introduced into the human body.

2M

Or

Write the events that take place when a vaccine for any disease is introduced into the human body.

Ans: the vaccine contains proteins of pathogen or inactivated/weakened pathogen. When a dose of vaccine is introduced into the body, it behaves as an antigen and the body produces antibodies in response to the antigen. This response generates active immunity. The antibodies thus produced will neutralize the pathogenic agents during actual infection. The vaccines also generate memory B-

and T- cells that recognize the pathogen quickly on subsequent exposure and overwhelm the invaders with a massive production of antibodies.

Q 9. Define auto-immune disease. Give two examples. **2M**

Ans: auto-immune disease refers to the disease when body's immune system due to genetic or other unknown reasons starts destroying self-cells and molecules, e.g., rheumatoid arthritis and systemic lupus.

Q 10. Name any two carcinogens? Also explain the term malignancy. **2M**

Ans: UV rays and 5-bromouracil.

The property of tumor cells by which they move in the body fluid to different sites away from their site of origin is called malignancy

Q 11. Write the source and the effect on the human body of the following drugs: **3M**

(i) Morphine (ii) Cocaine (iii) Marijuana

Ans: (i) **Morphine:** it is obtained from poppy plant *papaver somniferum*. It binds to specific opioid receptors present in central nervous system and gastrointestinal tract.

(ii) **Cocaine:** it is obtained from coca plant *Erythroxylum coca*. It interferes with the transport of the neurotransmitter dopamine.

(iii) **Marijuana:** it is obtained from *Cannabis sativa*. It affects the cardiovascular system of the body.

Q 12. What are the various public health measures which you would suggest as safeguard against infectious disease? **3M**

Ans: The common preventive measures are as follows:

(i) **Education:** people should be educated about communicable diseases to protect themselves from such diseases.

(ii) **Isolation:** the infected person should be isolated to minimize the spread of infection

(iii) **Vaccination:** people should get vaccination on time to avoid infection

(iv) **Sanitation:** the Sanitation condition should be improved to avoid infection from polluted water, contaminated food etc.

(v) **Eradication of vectors:** the breeding places of vectors should be destroyed and adult vectors should be killed by suitable methods

(vi) **Sterilization:** the patient's surroundings and articles of use should be completely sterilized so as to reduce the chances of infection.

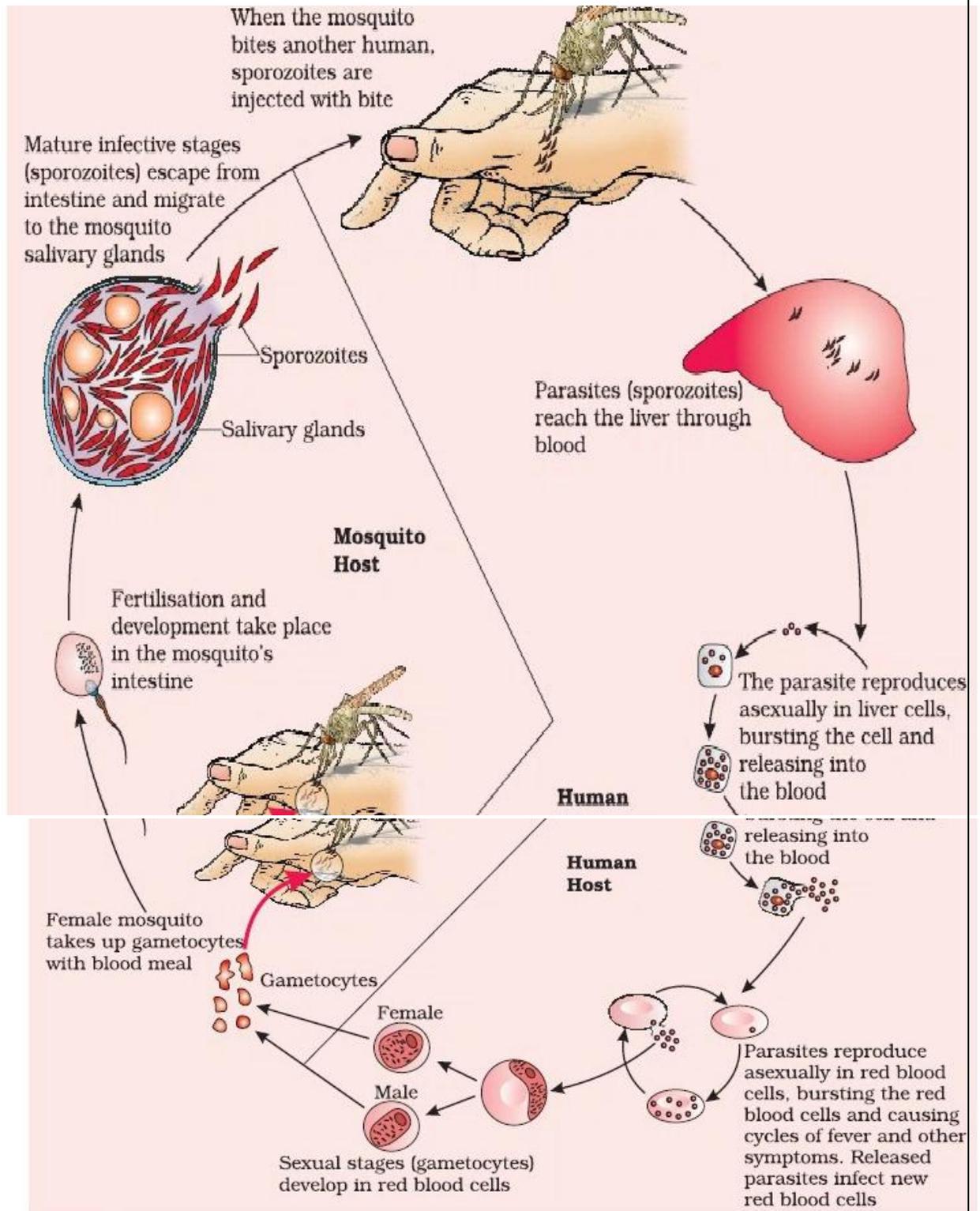
Q 13. (a) Name the stage of plasmodium that gains entry into the human body **3M**
(b) Trace the stages of plasmodium in the body of female Anopheles after its entry
(c) Explain the cause of periodic recurrence of chill and high fever during malarial attack in humans

Ans: (a) plasmodium enters the human body as sporozoites

(b) When a female Anopheles mosquito bites an infected person, the parasites enter the mosquito's body and undergo further development. The parasites multiply within them to form sporozoites that are stored in salivary glands until their transfer to human body

(c) The rupture of RBCs release a toxic substance called haemozoin, which is responsible for the

chill and high fever recur.



Q 14 How does spleen act as a lymphoid organ? Explain

2M

Ans: the spleen is a large bean-shaped organ. It mainly contains lymphocytes and phagocytes. It acts as a filter of the blood by trapping blood-borne microorganisms. Spleen also has a large reservoir of erythrocytes.

Q 15. A person has been diagnosed to be HIV+.

3M

- (i) Name the test which the person has undergone.
- (ii) Write the test which of the pathogen involved and describe its structure.
- (iii) Which particular cells of this person are likely to get destroyed?

Ans: (i) ELISA – Enzyme Linked Immuno-Sorbent Assay.

- (ii) Human Immunodeficiency Virus

Structure of HIV:

(a) It has an envelope enclosing the genetic material which is single stranded RNA.

(b) The envelope has spikes with receptors capable of recognizing antigen receptors found on helper T-cells.

(c) Helper T-Cells.

- Q 16.** (a) Explain the property that prevents normal cells from becoming cancerous. **2M**
 (b) All normal cells have inherent characteristic of becoming cancerous. Explain

Ans: (a) by the contact inhibition property, normal cells do not change into cancerous cells.

(b) Several genes called cellular oncogenes (c-onc) or proto-oncogenes in normal cells which, when activated under certain conditions, could lead to oncogenic transformation of cells leading to cancer.

- Q 17.** Name the blank spaces a, b, c and d in the table given below: **2M**

| SNo | Name of the drug | Plant source | Organ system affected |
|-----|------------------|--------------|-----------------------|
| 1 | a | Poppy plant | b |
| 2 | Marijuana | C | d |

Ans: (a) Morphine b) Central nervous system
 (c) Cannabis sativa d) Cardiovascular system

- Q 18.** From which plant are cannabinoids obtained? Name any two cannabinoids. Which part of the body is affected by consuming these substances? **2M**

Ans: Cannabinoids are obtained from the inflorescences of the plant *Cannabissativa*. Marijuana, hashish, charas, ganja are some cannabinoids. These chemicals interact with cannabinoid receptors of the body, mainly present in the brain. Cardiovascular system is effected adversely.

- Q 19.** How does the transmission of each of following diseases take place? **2M**

- (a) Amoebiasis b) Malaria
- (c) Ascariasis d) Pneumonia

Ans: (a) **Amoebiasis:** Caused by *Entamoeba histolytica*(protozoan parasite). Transmission:

- (i) By ingesting cysts with food and water
- (ii) The cysts are carried by flies from faces to food and drinks

(b) **Malaria:** Caused by *Plasmodium*sps. Transmission:

- (i) Transmitted by female Anopheles mosquito.
- (ii) Female anopheles injects sporozoites along with saliva while sucking blood.

(c) **Ascariasis:** Caused by *Ascaris lumbricoides*. Is transmitted through contaminated food and water with Ascaris eggs.

(d) **Pneumonia:** Caused by *Streptococcus pneumoniae*. Transmission is through sputum, droplets or aerosols of the patient.

Q 20. (a) Cancer is one of the most dreaded diseases of humans. Explain 'Contact inhibition' and 'Metastasis' with respect to the disease. **2M**

(b) Name the group of genes which have been identified in normal cells that could lead to cancer and how they do so?

(c) Name any two techniques which are useful to detect cancers of internal organs

(d) Why are cancer patients often given α -interferon as part of the treatment?

Ans: (a) Contact inhibition is the property of normal cells in which contact with other cells inhibits their uncontrolled growth. Metastasis is the property in which tumor cells reach distinct sites in the body, through blood.

(b) Proto oncogenes or cellular oncogenes. These genes when activated under certain conditions could lead to oncogenic transformation of the cells.

(c) Biopsy/ radiotherapy/CT/MRI

(d) α -interferon activates immune system and destroys the tumor.

Q 21. Why does a doctor administer tetanus anti toxin and not a tetanus vaccine to a child injured in a road side accident with a bleeding wound? Explain. **2M**

Or

Why a person with cuts and bruises following an accident is administered tetanus anti toxin? Give reasons.

Ans: tetanus is caused by a microbe which has a deadly and fast action. Action of vaccine is slow and this delay may become fatal therefore anti toxin's are administered which neutralize the effect of bacterial toxin.

Q 22. Why an immuno suppressive agent is taken after an organ transplant? **2M**

Ans: Our immune system is capable to differentiate between self and non self cells/tissues. The graft is a non-self tissue which may be rejected by our immune system. So to prevent the rejection, immuno suppressants are taken after the transplant.

UNIT-3

CHAPTER 9

STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION

Q 23. List any four important components of poultry farm management.

2M

Ans: Four important components of poultry farm management are:

- (a) Selection of a disease free and suitable breeds
- (b) Proper and safe farm conditions
- (c) Proper feed and water
- (d) Hygiene and health care

Q 24. MOET program has helped in increasing the herd size of the desired variety of cattle.
List the steps involved in conducting the program.

3M

Or

Expand MOET. Explain the procedure of this technology in the cattle improvement?

Ans: MOET stands for Multiple Ovulation Embryo Transfer Technology. It is a programme for herd improvement in animals like cattle, sheep, rabbits, buffaloes, mares etc.

High milk yielding breeds of females and high quality (lean meat with less lipid) meat-yielding bulls have been bred successfully to increase herd size in a short time.

Procedure:

- (i) a cow is administered hormones, with FSH-like activity, to induce follicular maturation and superovulation.
- (ii) a cow produces six to eight eggs instead of one egg produced normally.
- (iii) The animal is either mated with an elite bull or artificially inseminated.
- (iv) The fertilized eggs at 8–32 cells stages, are recovered non-surgically and transferred to surrogate mothers.
- (v) The genetic mother is available for another round of super ovulation.

Q 25. (a) Name the Indian scientists whose efforts brought green revolution in India.
(b) Mention the steps that are essentially carried out in developing a new genetic variety of crop under plant breeding programme / steps to obtain disease resistance crops.

3M

OR

Write in sequential order the four steps that a plant breeder should follow to obtain a disease resistant crop.

- Ans:**
- (a) M. S. Swaminathan
 - (b) The steps are:
 - (i) Collection of variability
 - (ii) Evaluation and selection of parents/screening germplasm for resistance sources.
 - (iii) Cross hybridization among the selected parents
 - (iv) Selection and testing of superior recombinants
 - (v) Testing, release and commercialization of new cultivates.

Q 26 List two steps that are essential for carrying out artificial hybridization in crop plants and why? **2M**

- Ans:**
- (a) **Selection of parents:** only those plants are selected which have desired traits.
 - (c) **Crossing over:** pollen grains from selected male plant is collected and transferred

to the female plant after which it is bagged.

Q 27. What is single cell protein? What is its significance of such a protein?

2M

Ans: the biomass obtained from micro organisms can be treated or processed in industry to be used as food and is called single cell protein.

Significance of single cell protein:

- (i) It reduces environmental pollution.
- (ii) Single cell protein provides a protein rich diet.
- (iii) It fulfills the demand of protein for human diet and takes of the pressure from agriculture system.

Q 28. (i) What is protoplast?

5M

- (ii) Name the two enzymes used in producing protoplast.
- (iii) Describe the steps in producing somatic hybrids from protoplast.
- (iv) Mention the usefulness of somatic hybridization

Ans:

- (i) The plant cell without the cell wall is called protoplast.
- (ii) Pectinase and cellulase
- (iii) **somatic hybridization**

The process of fusion of protoplast of somatic cells obtained from different varieties/species of plant on a suitable nutrient medium in vitro to develop a somatic hybrid is called somatic hybridization.

It is carried out by the following steps:

- (a) single cells from plants are isolated
- (b) The cell walls of cells are digested by enzymes like pectinase and cellulose, to expose the naked protoplast.
- (c) Naked protoplast surrounded only by the plasma membranes is isolated.
- (d) The isolated protoplast is fused to obtain hybrid protoplast under sterile conditions in special nutrient media.
- (e) The hybrid protoplast are cultured in a suitable media to form a new plant.
- (f) Pomoto is an example of somatic hybrid produced by fusion of tomato and potato protoplast.

Uses are:

- (i) Somaclonal variations can be created by this method.
- (ii) The plant which failed to produce sexual hybrid may produce somatic hybrids.
- (iii) Healthy plants can be recovered from diseased plants.

Q 29. What is biofortification? What is its importance? Mention the contribution of indian agricultural research institute towards it with the help of two examples. What benefits do these crops offer to the society?

5M

OR

IARI has released several varieties of crop plants that are biofortified. Give three examples for such crops and their biofortifications.

Ans: Biofortification is a method for breeding crops with higher levels of vitamins and minerals, or higher protein and healthier fats – is the most practical means to improve public health.

The objective of biofortification is to improve:

- (i) Protein content and quality – Hybrid Maize with twice the amount of amino acids.
 - (ii) Oil content and quality
 - (iii) Vitamin content and
 - (iv) Micronutrient and mineral content – Rice with high iron.
- (i) The Indian agricultural research institute released several vegetable crops that are rich in vitamins and minerals for example, vitamin A enriched carrots, spinach enriched in iron and calcium, pumpkin; vitamin C enriched bitter melon etc.

Consumption of such biofortified foods will enrich the nutritive value of our common foods and will vastly improve public health.

Q 30. Give the scientific name of the most common species of honeybee reared in India. **2M**
Why it is advantageous to keep beehives in crop fields during flowering periods.

Or

Honey bee collection improves when beehives are kept in crop fields during flowering season.
Explain?

Ans: The most common species is *Apis indica*. Honeybees are good pollinators of almost all the plants. The flowers in turn offer floral rewards like nectars and pollen grains. So when beehives are kept in crop fields during the flowering season honey collection increases and in turn the yield also increases.

Q 31. What is inbreeding depression? Why do the self-pollinated crops not show the ill effects of inbreeding depression? **2M**

Ans: The continuous inbreeding depression may lead to reduced fertility and even productivity called inbreeding depression. Self-pollinated crops do not show the ill effects of inbreeding depression because the deleterious allele becomes homozygous and de-exhibits their lethal effect so it is eliminated by the selection.

Q 32. Scientists have succeeded in recovering healthy sugarcane plants from a diseased one **2M**
(a) Name the part of the plant used as explants by the scientists
(b) Describe the procedure that the scientists followed to recover the healthy plants
(c) Name this technology used for crop improvement.

Ans: (a) Meristem (apical and axillary)
(b) The explant or virus-free meristem is grown in nutrient medium under aseptic conditions. The tissue proliferates to form undifferentiated mass/callus. This callus formed is transferred to a medium containing growth hormones like auxins and cytokinins.
(c) Tissue culture or micro propagation

Q 33. Artificial insemination helps overcome several problems of normal mating. **2M**
Justify the statement and list a few of them.

Ans: This statement is completely justified
(i) It helps in selective breeding in animals
(ii) Semen of a single bull can be used to impregnate several females
(iii) Quality semen is available in preserved form all the time at all the places.
(iv) Frozen semen can be exported or imported. It is the most reliable method

Q 34. How can crop varieties can be made diseased resistant to overcome food crises in India?

3M

Explain. Name one disease resistant variety in India of

- (a) Wheat to leaf and stripe rust
- (b) Brassica to white rust.

Ans: Crop varieties can be made disease resistant by conventional breeding methods or by mutation breeding. The germ plasma is screened for resistant sources or mutations are introduced followed by hybridization of selected parents the resulting hybrids are evaluated and tested. Finally disease resistant varieties are released.

Disease resistant variety of

- (c) Wheat to leaf and stripe rust - himgiri
- (a) Brassica to white rust – pusa swarnim

UNIT-3
CHAPTER 10
MICROBES IN HUMAN WELFARE

Q 35. Explain the role of the following in increasing the soil fertility and crop yield.

3M

- (a) Leguminous plants
- (b) Cyanobacteria
- (c) Mycorrhizae

Ans: (a) Leguminous plants possess root nodules where nitrogen is fixed by the symbiotic nitrogen fixing bacteria rhizobium and fertilize the soil.
 (b) Cyanobacteria fix atmospheric nitrogen and increase the organic matter of the soil through their photosynthetic activity. Example nostoc, anabaena, oscillatoria etc.
 (c) Mycorrhizae as biofertilizer: Fungi from symbiotic association with the roots of higher plants called Mycorrhizae, e.g., Glomus.

Q 36. Name the blanks spaces a, b, c and d in the table given below:

2M

| Type of microbe | Name | Commercial product |
|-----------------|-------------------|--------------------|
| Fungus | a | Pencillin |
| Bacterium | Acetobacter aceti | b |
| c | Aspergillus niger | Citric acid |
| Yeast | d | Ethanol |

Ans: (a) Penicillium notatum b) Acetic acid
 (c) Fungus d) Saccharomyces cerevisiae

Q 37. Name the blanks spaces a, b, c and d in the table given below:

2M

| Type of microbe | Name | Commercial product |
|-----------------|---------------------|--------------------|
| Bacterium | a | Lactic acid |
| Fungus | b | Cyclosporine A |
| c | Monascus purpureus | Statins |
| Fungus | Penicillium notatum | d |

Ans: (a) Lactobacillus (b) Trichoderma polysporum
 (c) Fungus (d) Pencillin

Q 38. (a) why are the fruit juices brought from the market clear as compared to those made at home **2M**
 (b) Name the bio active molecules produced by trichoderma polysporum and monascus purpureus.

Ans: (a) the fruit juices brought from the market clearer because they have been clarified by pectinases and proteases.
 (b) trichoderma polysporum: Cyclosporin A
 Monascus purpureus : Statins

Q 39. (a) Baculoviruses are excellent candidates for integrated pest management in an ecological Sensitive area. Explain giving two reasons.

5M

OR

Explain the significant role of genus Nucleopolyhedrovirus in an ecological sensitive area.

Ans: Nucleopolyhedrovirus is very useful for species specific narrow spectrum insecticidal applications they have been shown to have no negative impact on plants, birds, fish mammals, birds, fish or even non target insects

(b) What is organic farming? Why it is suggested to switch over to organic farming.

Ans: (a) the reasons are:

(i) Baculoviruses are biological control agents which are excellent candidates for species specific, narrow spectrum insecticidal applications.

(ii) They have no negative impact on plants mammals and even on non target insects.

(b) The use of biofertilizers and biopesticides to improve the crop yields as they are problems associated with over use of chemical fertilizers is known as organic farming. It is advised to switch to organic farming due to the following reasons:

(i) Use of excess chemical fertilizers make the soil unsuitable for cultivation

(ii) Natural resources get depleted due to manufacturing of chemical fertilizers.

UNIT-4
CHAPTER 11
BIOTECHNOLOGY: PRINCIPLES AND PROCESSES

Q 1. Which enzyme is used to digest walls of bacteria and fungi in genetic engineering? **1M**

Ans: Lysozyme digests bacterial wall and chitinase digests fungal cell wall.

Q 2. What is Ti plasmid? Name the organism where it is found. How does it help in genetic engineering? **2M**

Ans: An extra-chromosomal DNA which delivers gene of interest into variety of plants and act as cloning vector is called Ti plasmid. They are present in *Agrobacterium tumifaciens*. Ti plasmid vectors are used for genetic transformation in many dicot plants. The tumor inducing (Ti) lasmid of *Agrobacteriumtumifaciens* has now been modified into a cloning vector which is nomorepathogenic to the plants but is still able to use the mechanismsto deliver genes of our interest into a variety of plants.

Q 3. How and why is the bacterium *Thermus aquaticus* employed in recombinant DNA technology? Explain. **2M**

Ans: DNA polymerase is obtained from the bacterium *Thermus aquaticus*.DNA polymerase from this organism (thermostable) remains active during the high temperature induced denaturation ofdouble stranded DNA. The amplified fragment if desired can now beused to ligate with a vector for further cloning.

Q 4. Can you list 5 recombinant proteins which are used in medical practice? Find out where they are used as therapeutics. **5M**

Ans:

| S.No | Recombinant Proteins | Therapeutic uses |
|-------|-------------------------|------------------------------|
| (i) | Human Insulin (Humulin) | Treatment of diabetes type 1 |
| (ii) | DNase | Treatment of cystic fibrosis |
| (iii) | Calcitonin | Treatment of rickets |
| (iv) | Hirudin | Used as an anticoagulant |
| (v) | Chronic Gonadotropin | Treatment of infertility |

Q 5. (a) Why are engineered vectors preferred by biotechnologists for transferring the desired genes into another organism? **3M**

(b) Explain how do “ori” “selectable markers” and “cloning sites” facilitate cloning into a vector.

Ans: (a) Vectors used at present, are engineered in such a way that they help easy linking of foreign DNA and selection of recombinants from non-recombinants.

(b) **Origin of replication (ori):** This is a sequence from where replication starts and any piece of DNA when linked to this sequence can be made to replicate within the host cells. This sequence is alsoresponsible for controlling the copy number of the linked DNA.

Cloning sites:In order to link the alien DNA, the vector needs to have very few, preferably single, recognition sites for the commonly used restriction enzymes.

More than one recognition sites within the vector can complicate the gene cloning as it will generates several fragments.

- Q 6.** (i) Describe the characteristics that a cloning vector must possess. **3M**
(ii) Why DNA cannot pass through the cell membrane? Explain. How a bacterial cell is made 'competent' to take up recombinant DNA from the medium?

Ans: (i) A cloning vector must have the following characteristics:

- (a) Ori or origin of replication which can make large number of copies.
 - (b) Selectable marker, genes encoding for an antibiotic resistance or genes encoding for α -galactosidase.
 - (c) Recognition sites for restriction enzyme to recognize.
- (ii) DNA is a hydrophilic molecule; it cannot pass through cell membrane.
The bacterial cells can be made competent by treating them with a specific concentration of a divalent ion like calcium. The cells are then incubated on ice followed by a heat shock by placing them briefly at 42⁰C and then putting back on ice.

- Q 7.** How is insertional inactivation of an enzyme used as a selectable marker to differentiate recombinants from non-recombinants? **2M**

Ans: When a recombinant DNA is inserted within the coding sequence of an enzyme, β -galactosidase, it results into inactivation of the enzymes. The bacterial colonies having inserted plasmid, show no colouration while those without inserted plasmid show blue color.

UNIT-4
CHAPTER 12
BIOTECHNOLOGY AND ITS APPLICATIONS

Q 8. Mention some transgenic plants and their potential applications (Any Five).

5M

Ans: Some transgenic plants and their potential applications are given below:

| S.No | Transgenic plants | Useful applications |
|--------|-------------------|---|
| (i) | Flavr Savr tomato | Better nutrient quality |
| (ii) | Brassica napus | Contains hirudin that prevents blood clotting. Hirudin is synthesized chemically and it is transferred into <i>Brassica napus</i> |
| (iii) | Bt cotton | It has resistance to bollworm infestation, tolerance to herbicide, high yielding |
| (iv) | Wheat | Resistant against herbicide PPT (commercial name "Basta" -26 percent PPT) |
| (v) | Potato | Content of starch increased by about 20-40 per cent |
| (vi) | Corn, brinjal | Insect resistance |
| (vii) | Maize, soyabean | Herbicide resistance |
| (viii) | Golden rice | Rich in vitamin A |

Q 9. Name the process involved in the production of nematode-resistant tobacco plants using genetic engineering. Explain the strategy adopted to develop such plants.

3M

OR

How does the process of RNA interference help to control the nematode from infecting roots of tobacco plants? Explain.

Ans: The process involved in the production of nematode-resistant tobacco plants is RNA interference or RNAi. Using *Agrobacterium* vectors, nematode-specific genes were introduced into the host plant. The introduction of DNA was such that it produced both sense and anti-sense RNA in the host cells. These two RNA's being complementary to each other formed a double stranded (dsRNA) that initiated RNAi and thus, silenced the specific mRNA of the nematode. The consequence was that the parasite could not survive in a transgenic host expressing specific interfering RNA. The transgenic plant therefore got itself protected from the parasite.

Q 10. Explain how is Bt cotton resistant to pests?

3M

Ans: Bt Cotton :

Some strains of *Bacillus thuringiensis* produce proteins that kill certain insects such as lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes). *B. thuringiensis* forms protein crystals during a particular phase of their growth. These crystals contain a toxic insecticidal protein. Why does this toxin not kill the *Bacillus*? Actually, the Bt toxin protein exists in inactive form. As an insect ingests the inactive toxin, it is converted into an active form of toxin due to the alkaline pH of the gut which solubilises the crystals. The activated toxin binds to the surface of midgut epithelial cells and creates pores that cause cell swelling and lysis and eventually cause death of the insect.

Q 11. Explain the synthesis of genetically engineered human insulin.

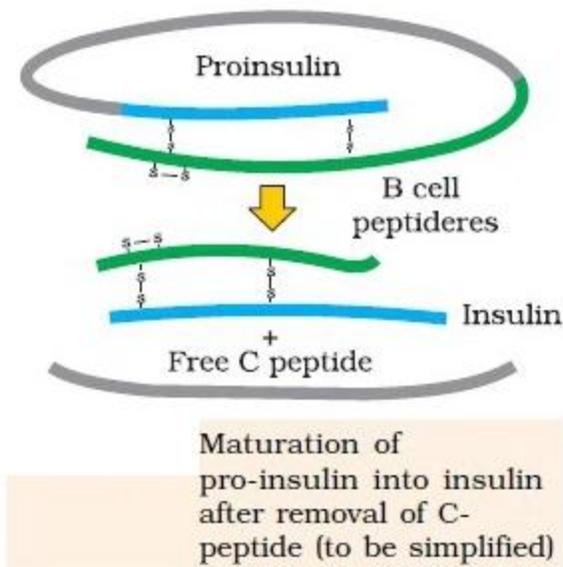
3M

Ans: Insulin consists of two short polypeptide chains: chain A and chain B that are linked together by disulphide bridges.

In mammals, including humans, insulin is synthesised as a pro-hormone (like a pro-enzyme, the pro-hormone also needs to be processed before it becomes a fully mature and functional hormone) which contains an extra stretch called the C peptide.

This C peptide is not present in the mature insulin and is removed during maturation into insulin.

The main challenge for production of insulin using rDNA techniques was getting insulin assembled into a mature form. In 1983, Eli Lilly an American company prepared two DNA sequences corresponding to A and B, chains of human insulin and introduced them in plasmids of *E. coli* to produce insulin chains. Chains A and B were produced separately, extracted and combined by creating disulphide bonds to form human insulin.



Q12. Describe the gene therapy produced for an ADA- deficient patient

2M

Ans : Lymphocytes from the blood of the patient are grown in a culture outside the body. A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are subsequently returned to the patient. However, as these cells are not immortal.

Q.13 (a) List three steps involved in polymerase chain reaction (PCR)

3M

(b) Name the source organism of Taq polymerase. Explain the specific role of this enzyme in PCR.

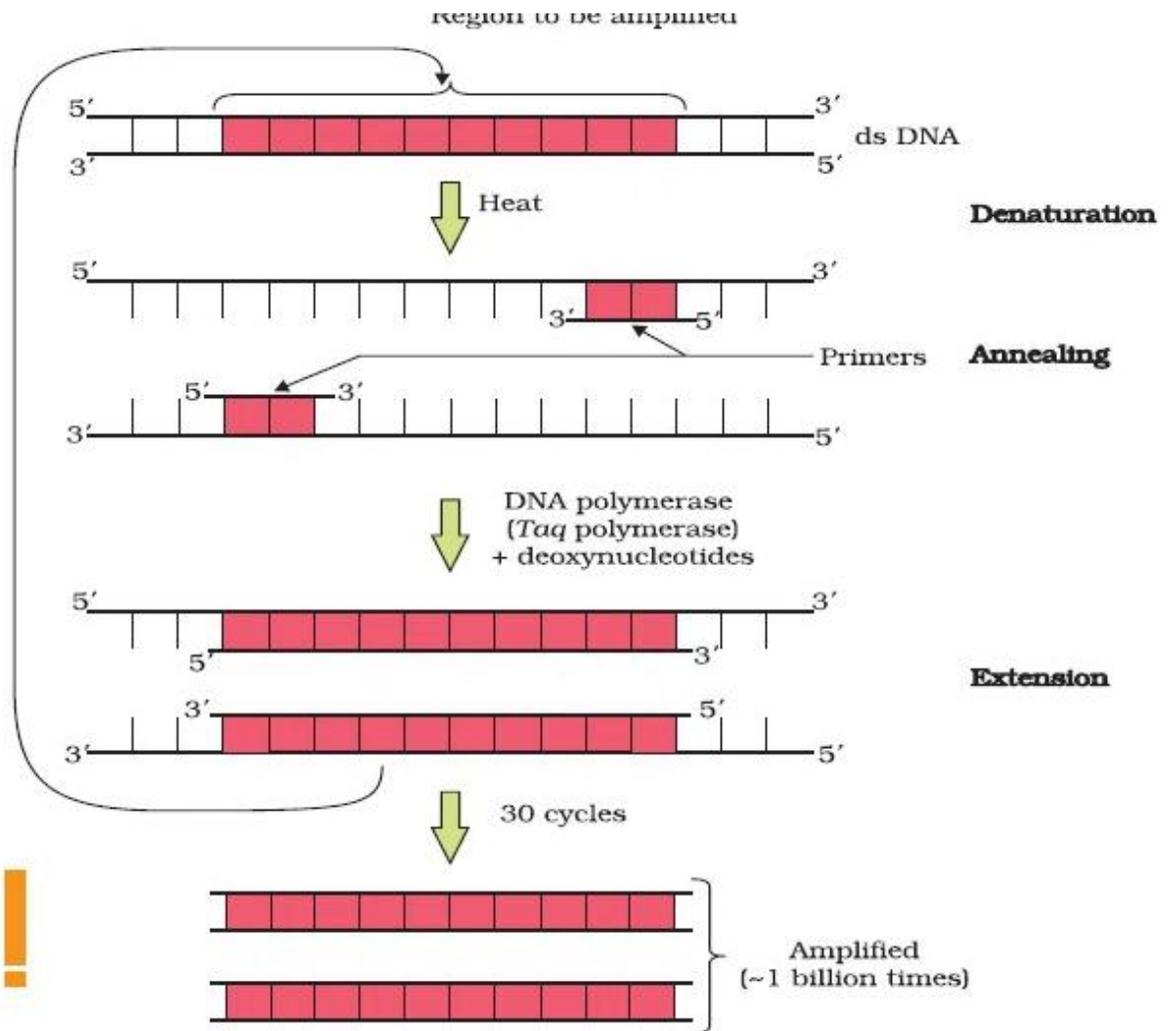
Ans: (a) The three steps involved in polymerase chain reaction.

(i) Denaturation of double standard DNA (dsDNA) at high temperature.

(ii) Annealing of two sets of primers.

(iii) Extension of primers to form dsDNA by taq polymerase deoxynucleotides.

(b) Source of organism is the bacterium *thermus aquaticus*. This enzyme is heat tolerant and repeatedly amplifies DNA at high temperature.



Q 14. Write three advantages and disadvantages of production of genetically modified crops **3M**

Ans: Advantages of genetically modified crops: (Any Three)

- (i) Reduces the use of chemical fertilizers and pesticides which cause pollution (pest-resistant crops).
- (ii) Production of new resistant varieties against pathogen more tolerant to abiotic stresses -cold, drought, heat, salinity etc.
- (iii) Provides raw materials to industries like pharmaceuticals.
- (iv) Helped to reduce post harvest losses.
- (v) Increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil).
- (vi) Enhanced nutritional value of food, e.g., Vitamin 'A' enriched rice.

Disadvantages of genetically modified crops:

- (i) Proteins produced by GM organisms might cause allergy and other reactions
- (ii) Resistant characters might develop against antibiotics of the intestinal bacteria of the body
- (iii) Resistant genes transferred by pollen to the weeds may also become resistant to pests.

Q 15. How have transgenic animals proved to be beneficial in:

2M

- (a) Production of biological products
- (b) Chemical safety testing

Ans: (a) Rosie-the transgenic cow produced human proteins containing human α -lactalbumin. Transgenic animals have been made to produce 2-1-antitrypsin used to treat in emphysema.

- (b) Toxicity testing-transgenic animals are more sensitive to toxic substances, so the results are obtained in less time.

UNIT-5

CHAPTER 13

ORGANISMS AND POPULATIONS

Q 1. List the attributes that populations, but not individuals possess/list the characteristics of populations and explain any three. **5M**

Ans: The attributes that populations, but not individuals possess are:

- | | |
|-------------------------------|-----------------------------|
| (i) Population density | (ii) Population growth |
| (iii) Mortality or death rate | (iv) Natality or birth rate |
| (v) Sex ratio | (vi) Age distribution |

The three important characteristics of a population are as follows:

- (i) **Population density:** Population density of a species is the number of individuals of a species per unit area or volume.

$$PD = \frac{N}{S}$$

Where PD = Population density

N = number of individuals in region

S = number of unit area in a region

- (ii) **Birth rate:** it is expressed as the number of births per 1000 individuals of a population per year.
(iii) **Death rate:** it is expressed as the number of deaths per 1000 individuals of a population per year.

Q 2. How is a cactus adapted to survive in its habitat? **2M**

Ans: Adaptions in cactus:

- (i) The leaves are modified into spines
- (ii) The stems are expanded, fleshy, spongy to store waters and food.
- (iii) The root system is deep-seated to draw underground water
- (iv) They have sunken stomata to reduce transpiration

Q 3. (a) Write the importance of measuring the size of a population in a habitat or an ecosystem. **3M**

- (b) Explain with the help of an example how the percentage cover is a more meaningful measure of population size than mere numbers.

Ans: (a) by measuring the size of a population, following can be predicted:

- (i) Status of the population in a habitat
- (ii) Outcome of competition with other species
- (iii) Impact of predator or pesticides
- (iv) Increase or decrease of population size
- (b) Example: Banyan tree and Parthenium plants.

In an area, if there are 200 *Parthenium* plants but only a single huge banyan tree with a large canopy, stating that the population density of banyan is low relative to that of *Parthenium*

amounts to underestimating the enormous role of the Banyan in that community. In such cases, the per cent cover or biomass is a more meaningful measure of the population size.

Q 4. What is Gause's competitive exclusion principle? Explain with an example.

3M

Ans: Gause's 'Competitive Exclusion Principle' states that two closely related species competing for the same resources cannot co-exist indefinitely and the competitively inferior one will be eliminated eventually. This may be true if resources are limiting, but not otherwise. More recent studies do not support such gross generalizations about competition. For example after the introduction of goats in Galapagos Islands, the Abingdon tortoise became extinct within a decade due to greater browsing efficiency of the goats.

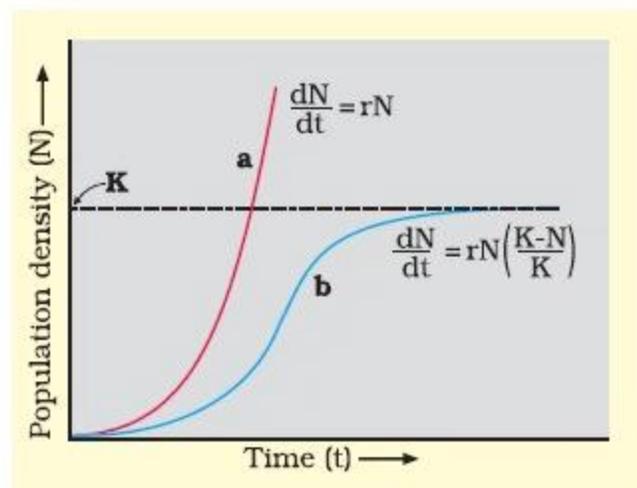
Q 5. Explain Verhulst-Pearl Logistic Growth of a population.

3M

Ans: According to growing in a habitat with limited resources show initially a lag phase, followed by phases of acceleration and deceleration and finally an asymptote, when the population density reaches the carrying capacity. It is given by the following equation:

$$\frac{dN}{dt} = rN \left(\frac{K-N}{K} \right)$$

Where N = Population density at time t
 r = Intrinsic rate of natural increase
 K = Carrying capacity



Population growth curve
a when responses are not limiting the growth, plot is exponential,
b when responses are limiting the growth, plot is logistic,
K is carrying capacity

Q 6. Explain the three basic types of interspecific interaction.

3M

Ans: The three basic types of interspecific interaction are.

(a) **Competition:** It is generally believed that competition occurs when closely related species compete for the same resources that are limiting, but this is not entirely true. Firstly, totally unrelated species could also compete for the same resource. For instance, in some shallow South American lakes visiting flamingoes and resident fishes compete for their common food, the zooplankton in the lake.

- (b) **Parasitism:** In this mode of interaction, one species (parasite) depends on the other species (host) for food and shelter so that one species is benefited and the other is harmed. For example, the human liver fluke (a trematode parasite) depends on two intermediate hosts (a snail and a fish).
- (c) **Mutualism:** This interaction confers benefits on both the interacting species. Lichens represent an intimate mutualistic relationship between a fungus and photosynthesising algae or cyanobacteria. Similarly, the *mycorrhizae* are associations between fungi and the roots of higher plants. The fungi help the plant in the absorption of essential nutrients from the soil while the plant in turn provides the fungi with energy-yielding carbohydrates.

Q 7. Name the interaction in each of the following:

5M

1. *Cuscuta* growing in a shoe flower plant.
2. Mycorrhizae living on the roots of higher plants
3. Clown fish living among the tentacles of sea anemone
4. Koel laying its eggs in crow's nest.
5. *Ascaris* worms living in the intestine of human
6. Sucker fish attached to the shark.
7. Smaller barnacles disappeared when *Balanus* dominated in the coast of Scotland
8. Wasp pollinating fig inflorescence.
9. Orchid growing on mango tree.
10. Disappearance of smaller barnacles when *Balanus* dominated the coast in Scotland

Ans:

- (a) Parasitism
- (b) Mutualism
- (c) Commensalism
- (d) Brood parasitism
- (e) Parasitism
- (f) Commensalism
- (g) Competition
- (h) Mutualism
- (i) Commensalism
- (j) Competition

Q 8. The density of a population in a habitat per unit area is measured in different units. Write the unit of measurement against the following:

2M

- | | |
|--------------|-----------|
| (a) Bacteria | (b) Grass |
| (c) Banyan | (d) Deer |

Ans:

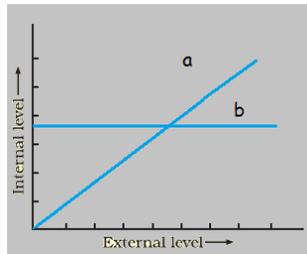
- | | |
|--------------------|-------------------|
| (a) Numbers/volume | (b) Coverage/area |
| (c) Biomass/area | (d) Numbers/area |

Q 9. The following graph represents the organismic response to certain environmental condition (e.g., temperature):

2M

- (i) Which one of these, 'a' or 'b' depicts conformers?
- (ii) What does the other line graph depict?
- (iii) How do these organisms differ from each other with reference to homeostasis?
- (iv) Mention the category to which humans belong.

(HOT QUESTION)



Ans:

- (i) 'a' depicts conformers
- (ii) The other line depicts response of the regulators

| Conformers | Regulators |
|--|---|
| aquatic animals and plants in which the osmotic concentration/body temperature of the body fluids changes according to the ambient conditions/environment of water/environment are called conformers | Some organisms are able to maintain homeostasis by physiological means which ensures constant body temperature, constant osmotic concentration etc. |

(iii) Regulators.

Q 12. Name the pioneer and the climax species in a water body. Mention the changes observed in the biomass and the biodiversity of the successive seral communities developing in the water body. **3M**

Ans: pioneer species – Phytoplanktons

Climax species – Forest or trees

Biomass will be gradually increased and Phytoplanktons are replaced by free-floating angiosperms then by rooted hydrophytes followed by different seral communities thus, biodiversity also increases.

Q 13. (a) Describe primary succession that occurs on bare rock. **5M**
(b) Differentiate between xerarch and Hydrarch successions.

Ans:

(a) **primary succession on rocks:**

Are usually lichens which are able to secrete acids to dissolve rock, helping in weathering and soil formation.

These later pave way to some very small plants like bryophytes, which are able to take hold in the small amount of soil.

They are, with time, succeeded by bigger plants, and after several more stages, ultimately a stable climax forest community is formed.

The climax community remains stable as long as the environment remains unchanged.

With time the xerophytic habitat gets converted into a mesophytic one.

(b) Xerarch and Hydrarch successions

xerarch succession takes place in dry areas and the series progress from xeric to mesic conditions.

Hydrarch succession takes place in wetter areas and the successional series progress from hydric to the mesic conditions.

Q 14. What are ecosystem services. Name any four ecosystem services. **3M**

Ans: The product of ecosystem process are named as ecosystem services.

e.g 1) Forest ecosystem purify air and water

2) Mitigate draught and flood.

3) Provide wildlife habitat and maintain biodiversity.

4) Pollinate crop provide storage site and also provide aesthetic, cultural and spiritual values.

Q 15. “Pyramid of energy is always upright”. Explain. **2M**

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

Each bar in the energy pyramid indicates the amount of energy present at each trophic level in a given time or annually per unit area.

Q 16. What will happen to an ecosystem if.

3M

- (a) All producers are removed
- (b) All organisms of herbivore are eliminated; and
- (c) All top carnivore population is removed

- Ans:** (a) Reduction in primary productivity. No biomass available for consumption by higher trophic levels/heterotrophs and hence heterotrophs also die of starvation
- (b) Increase in primary productivity and biomass of producers. carnivore population will subsequently dwindle due to food shortage
- (c) Increase in number of herbivores which leads to over-grazing by herbivores, finally resulting in desertification.

UNIT-5

CHAPTER 15

BIODIVERSITY AND CONSERVATION

Q 17. Mention the 3 important features that make a stable biological community. **3M**

Ans: Features that make a stable biological community are:

- (i) Communities should have greater biodiversity for greater stability
- (ii) It should be able to prevent invasion by alien species
- (iii) It should be able to restore itself in a short period of time

Q 18. Write Evil Quartet biodiversity. **2M**

Ans: The four major causes of biodiversity losses are known as the Evil Quartet.

They are

- (i) Habitat loss and fragmentation
- (ii) Over exploitation
- (iii) Alien species invasion
- (iv) Co extinctions

Q 19. Explain 'rivet popper' hypothesis. Name the ecologist who proposed it. **2M**

Ans: Stanford ecologist Paul Ehrlich. In an airplane (ecosystem) all parts are joined together using thousands of rivets (species). If every passenger travelling in it starts popping a rivet to take home (causing a species to become extinct), it may not affect flight safety (proper functioning of the ecosystem) initially, but as more and more rivets are removed, the plane becomes dangerously weak over a period of time. Furthermore, which rivet is removed may also be critical. Loss of rivets on the wings (key species that drive major ecosystem functions) is obviously a more serious threat to flight safety than loss of a few rivets on the seats or windows inside the plane.

Q 20. What is cryopreservation? Give its one use. **2M**

Ans: cryopreservation is a preservation technique in which sperms, eggs, cells, tissues etc., are stored at ultra-low temperature of -190°C under nitrogen. Cells and gametes of threatened species can be preserved by this method.

Q 21. What did David Tilman's long term ecosystem experiments show? **2M**

Ans: David Tilman's long-term ecosystem experiments using outdoor plots provide some tentative answers. Tilman found that plots with more species showed less year-to-year variation in total biomass. He also showed that in his experiments, increased diversity contributed to higher productivity.

Q 22. Differentiate between *in situ* and *ex situ* approaches of conservation of biodiversity.

2M

Ans:

| S.No | <i>In situ approach</i> | <i>ex situ approach</i> |
|------|--|--|
| (i) | It involves protection of endangered species of plants and animals | It involves protection of endangered species by removing them from the natural habitat. |
| (ii) | This is done by protecting the natural habitat or ecosystem. eg Biosphere reserves, National Park Sanctuaries. | This is done by placing the species under special care. eg. Zoological park, Botanical garden. |

Q 23. How is biodiversity important for ecosystem functioning?

2M

Ans: Importance of biodiversity for ecosystem functioning:

- (i) **Stability:** Biodiversity is an important aspect for stability of an ecosystem. Ecologists believed that communities with more species, generally, tend to be more stable than those with less species.
- (ii) **Productivity:** Ecosystem with higher biodiversity show more productivity than ecosystems with lower biodiversity. David Tilman's long-term ecosystem experiments using outdoor plots provide confirmation.
- (iii) **Ecosystem health:** Rich biodiversity is not only essential for ecosystem health but imperative for the survival of the human race on earth. Species are interlinked and so, killing or disappearance of one would effect the others also.
- (iv) **Resilience:** Increased biodiversity provides resilience of ecosystem against natural or man-made disturbances.

UNIT-5
CHAPTER 16
ENVIRONMENTAL ISSUES

Q 24. Mention the six harmful effects of noise on human health. **3M**

Ans: Six harmful effects of noise on human population are:

- (i) Stress
- (ii) Sleeplessness
- (iii) Increased rate of heart beat
- (iv) Altered berating patterns
- (v) Damage of eardrum if sound levels are very high
- (vi) Damage of hearing abilities at low level noise

Q 25. What is eutrophication? Explain its consequences on the life of plants and animals in such water bodies. **3M**

Ans: Eutrophication is the natural aging of a lake by biological enrichment of its water. In a young lake the water is cold and clear, supporting little life. With time, streams draining into the lake introduce nutrients such as nitrogen and phosphorus, which encourage the growth of aquatic organisms. Consequences of eutrophication on the life of plants and animals in such a water bodies are as follows:

- (i) Presence of large amount of nutrient in such water bodies causes excessive growth of planktonic (free-floating) algae leading to algal bloom. Algal bloom causes deterioration of water quality and fish mortality. Some of them are toxic to human beings and animals.
- (ii) Growth of water hyacinth leads to imbalance in the aquatic ecosystem.

Q 26. Explain accelerated eutrophication. Mention any two consequences of this phenomenon. **3M**

Ans: Accelerated eutrophication is nutrient enrichment of water bodies due to human activities like passage of sewage.

Consequences are:

- (i) Large amounts of nutrients in water causes excessive growth of planktonic algae which impart characteristics color to water bodies
- (ii) Depletion of oxygen content of water leading to the death of the aquatic organisms.

Q 27. What is global warming? List four strategies for reducing global warming. **3M**

Ans: The Greenhouse gases in the atmosphere causes the rise in global mean temperature called global warming. Four strategies for reducing global warming are:

- (i) Reducing deforestation
- (ii) Planting trees
- (iii) Slowing down the growth of human population
- (iv) Reduction in the emission of greenhouse gases.

Q 28. (a) Mention the causes of depletion of ozone layer in the stratosphere? How does this affect the human life?

5M

(b) Explain biomagnification of DDT in an aquatic food chain. How does it affect the bird population.

OR

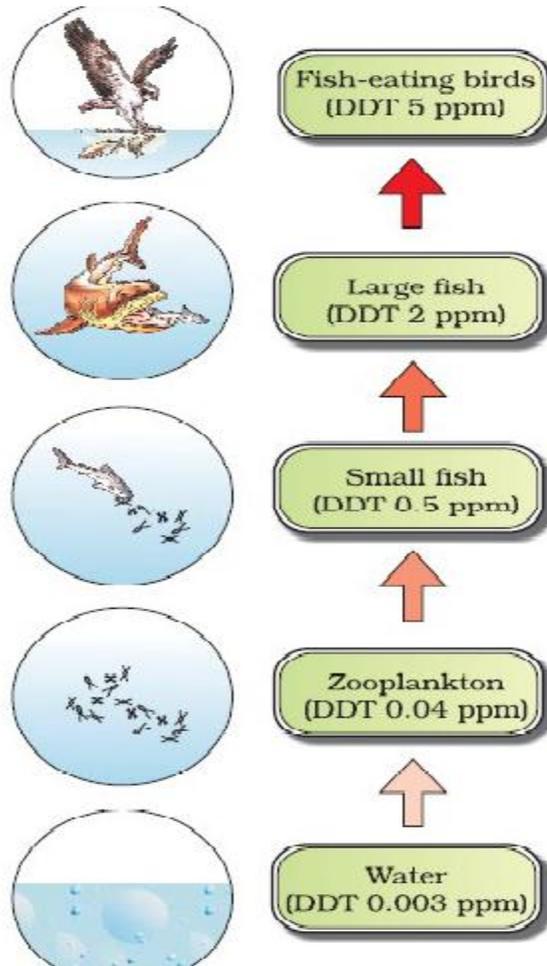
DDT content in the water of a lake that supplies drinking water to the nearby villages is found to be 0.003ppm. The kingfishers of that area were reported to have 2ppm of DDT. Why has the concentration increased in these birds? What harm will this cause to the bird population? Name the phenomenon.

Ans: (a) Chlorofluorocarbons (CFCs) deplete ozone in the stratosphere.

UV(B) damages DNA causing mutation, skin cancer, inflammation of cornea, cataract, aging of skin, snow blinders.

(b) If DDT leaches from the agricultural field, it gets into the water body and enters the food chain: zooplanktons->small fish->large fish->any fish eating bird. Concentration of DDT increases along resulting in decline in bird population.

The DDT being a toxic substance gets accumulated in the organism and passes to the next higher trophic level because it cannot be metabolized or excreted. Thus, concentration of DDT has increased in the birds. The high concentration of DDT disturbs the calcium metabolism in birds and causes thinning of eggshell and their premature breaking and eventually causes a decline in the bird population. The phenomenon is called biomagnification.



- Q 29.** (a) What are the effects of climate change? Explain how it accounts for biodiversity loss. **3M**
(b) Explain any three measures that you as an individual would take, to reduce Environmental pollution.

Ans: (a) Scientists believe that this rise in temperature is leading to deleterious changes in the environment and resulting in odd climatic changes (e.g. El Nino effect) , thus leading to increased melting of polar ice caps as well as of other places like the Himalayan snow caps. Over many years, this will result in a rise in sea level that can submerge many coastal areas.

(b) Measures to reduce environmental pollution are:

- (i) Use of renewable energy resources
- (ii) Use of television and other gadgets to low pitch
- (iii) Minimum use of fossil fuel
- (iv) No tobacco smoking
- (v) Planting more trees.

- Q 30.** How does an algal bloom cause eutrophication of a water body? Name the weed that can grow in such a eutrophic lake. **2M**

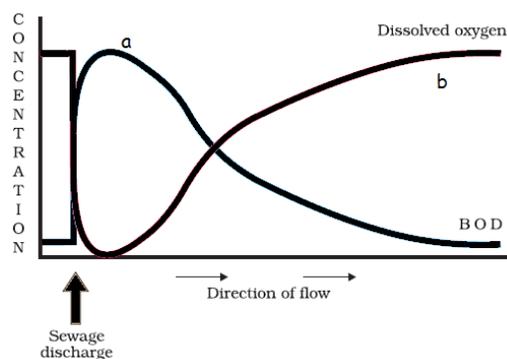
Ans: Presence of large amounts of nutrients in waters also causes excessive growth of **planktonic** (free-floating) algae, called an **algal bloom** which imparts a distinct color to the water bodies. Algal blooms cause deterioration of the water quality and fish mortality. Some bloom-forming algae are extremely toxic to human beings and animals.

- Q 31.** (a) Expand BOD **3M**
(b) At a particular segment of a river near a sugar factory, the BOD is much higher than the normal level. What is it indicative of? What will happen to the living organisms in this part of the river?
(c) Under what conditions will the BOD be lowered in the river? How will it affect the aquatic life?

Ans: (a) BOD stands for Biological Oxygen Demand.

- (b) A lot of organic matter is added which are biodegraded by microorganisms in the water body. Maximum is consumed and thus dissolved oxygen is reduced at a particular segment of a river near a sugar factory. It will cause the mortality of fish and other aquatic organisms.
- (c) When the amount of organic matter decreases and the microbes do not need oxygen for decomposition, the BOD decreases. Thus, aquatic organisms will start floating.

- Q 32.** Explain giving reasons the cause of appearance of peaks 'a' and 'b' in the graph given below. **2M**



Effect of sewage discharge on some important characteristics of a river.

Ans: 'a' – High BOD due to sewage discharge

'b' – Increase in dissolved oxygen due to sewage decomposition.

Micro-organisms involved in biodegradation of organic matter consume a lot of oxygen; therefore there is a sharp decline in dissolved oxygen. When the sewage is completely degraded, oxygen concentration again increases.

Q 33. Suppose sewage water is disposed off in the river. What will be its effect on BOD **2M**

and dissolved oxygen.

Ans: Discharge of sewage water into a river will result in rise of BOD as decomposers will consume more dissolved oxygen in river. If sewage quantity is large, the whole of the dissolved oxygen will be consumed leaving nothing for respiration of fishes and other aquatic organisms. This increases the mortality rate of aquatic creatures.

Q 34. Explain how a catalytic converter works. **2M**

Ans: 1. It is fitted in to automobile for reducing emission of poisons gases like NO₂ and CO. 2. It has expensive metals like platinum, Palladium and Rhodium as catalysts. When exhaust emission passes through catalytic converter, NO split in to N₂ and O₂, CO is converted in to CO₂ and un burnt hydrocarbon convert in to carbon dioxide and water. Motor vehicle fitted with catalytic converter should use unleaded petrol as lead in activates the catalyst.

Q 35. Explain any two control methods of air pollution. **2M**

Ans: a. Scrubber b. Electrostatic precipitator

a. Scrubber – Use to remove sulphur dioxide from industrial exhaust by passing it to a spray of water or lime when water dissolve gasses and lime react with Sulphur dioxide to form precipitate of calcium sulphate and sulphide.

b. Electrostatic precipitator – Used to remove particulate matter present in the exhaust of thermal plant. ESP has electrode wire and a stage of collecting plate which are earthed to attract the charged dust particle. Electric current of thousand volts passed through wire electrodes which produces a corona to release electrons. The air is passed slowly through plates to allow dust particles to fall.

Q 36. State the euro norms for auto fuel policy. **2M**

Ans: 1. Euro II norm – To control Sulphur content at 350ppm in diesel and 150ppm in petrol and aromatic hydrocarbon 42%.

2. Eleven Indian cities all automobile were to meet the euro III emission specification by April 11, 2005.

3. Since April 1, 2010 the same eleven cities met euro IV norms.

Q 37. Explain what is Ecosan? Mention its advantages. **2M**

Ans: Advantages – 1. Practical and hygienic and efficient method of waste disposal.

2. Cost effective. 3. Human excreta can be recycled in to natural fertilizer to replace chemical fertilizer.

