SURE SHOT LONG TYPE QUESTIONS FOR CLASS XII

SUBJECT – BIOLOGY

CHAPTER1

Qus. 1 The cell division involved in gamete formation is not of the same type in different organisms. Justify.

Ans. The parents may be haploid or diploid but the gametes always have to be haploid. Diploid parents undergo meiosis to produce haploid gametes. Whereas haploid parents undergo mitosis to produce haploid gametes.

Qus. 2 Mention the unique flowering phenomenon exhibited by *Strobilanthus kunthiana* (neelakuranaji).

or

Why is *Eichhorniacrassipes* nicknamed as –Terror of Bengal"?

Ans.*Strobilanthus kunthiana* flowers once in 12 years.

OR

Eichhornia crassipes is an aquatic weed that grows abundantly and very fast in eutrophic water bodies and imbalances water ecosystem. It causes oxygen depletion leading to death of aquatic life (eutrophication).

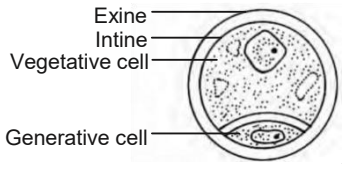
Qus. 3 Name the units of vegetative propagation in water hyacinth. Explain giving reasons why it has become the most invasive aquatic weed.

Ans. Offset. Since the formation of hyacinth offsets does not involve two parents, the process involved is asexual, therefore they spread quickly.

Chapter2

Qus. 4 Draw a labelled diagram of the sectional view of a mature pollen grain in angiosperms. Explain the functions of its different parts.

Ans. Sectional view of a pollen



Functions:

(i) The hard outer layer called exine is made up of sporopollenin which is a resistant organic material. Exine can withstand high temperature, strong acids and alkali thus provide protection.

(ii) The intine has a prominent aperture called germ pore through which pollen tube comes out.

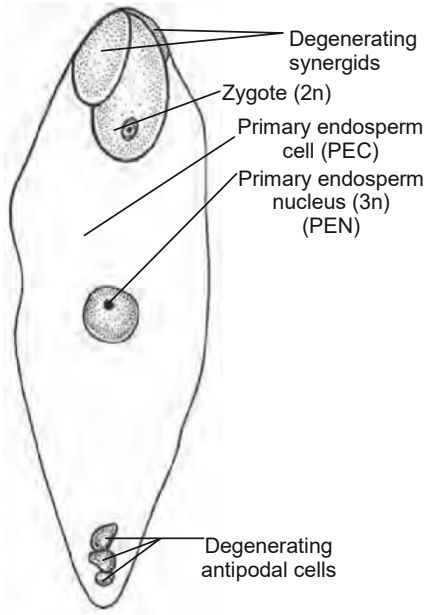
(iii) Vegetative cell has abundant food reserve.

(iv) Generative cell divides mitotically giving rise to two male gametes before pollen grains are shed (3-celled stage).

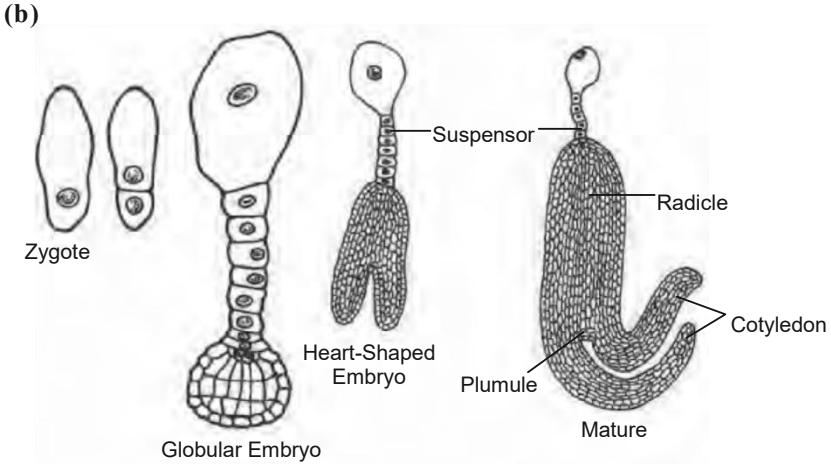
Qus.5 (a) Draw a schematic labelled diagram of a fertilised embryo sac of an Angiosperm.

(b) Describe the stages in embryo development in a dicot plant.

Ans. (a) Fertilised embryo sac showing zygote and Primary Endosperm Nucleus (PEN)



(b)



De vel op ment of dicot embryo

Stages in dicot embryo development:

- The zygote undergoes transverse division forming a large basal cell and a small apical or terminal cell.

- The large basal cell enlarges and undergoes transverse division to from a group of 6–10 cells called **suspensor**.
- The first cell of the suspensor towards the micropylar end is called **haustorium**, whereas the last cell of the suspensor toward the chalazal end is called **hypophysis** that later develops into radicle.
- The smaller terminal or apical cell undergoes one vertical division. The two cells formed from terminal cell divide by a transverse division thus forming four embryonalcell (**quadrant stage**).

Finally these four cells divide vertically forming 8-celled proembryo (**octate stage**). Four cells at the apex give rise to plumule and another four give rise to hypocotyl except its tip.

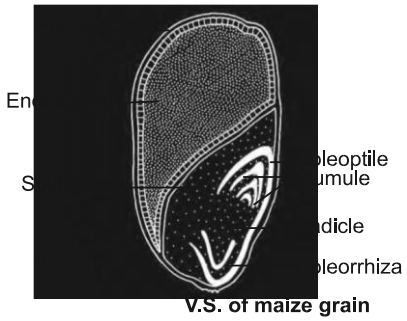
Qus. 6(a)Why is fertilisation in an angiosperm referred to as double fertilisation? Mention the ploidy of the cells involved.

(b)Draw a neat labelled sketch of L.S. of an endospermous monocot seed.

Ans. Fertilisation of haploid egg cell by one haploid male gamete to form diploid zygote is called syngamy.

Fertilisation of two (diploid) polar nuclei by the other haploid male gamete to form triploid primary endosperm nucleus is called triple fusion.

(*b*)

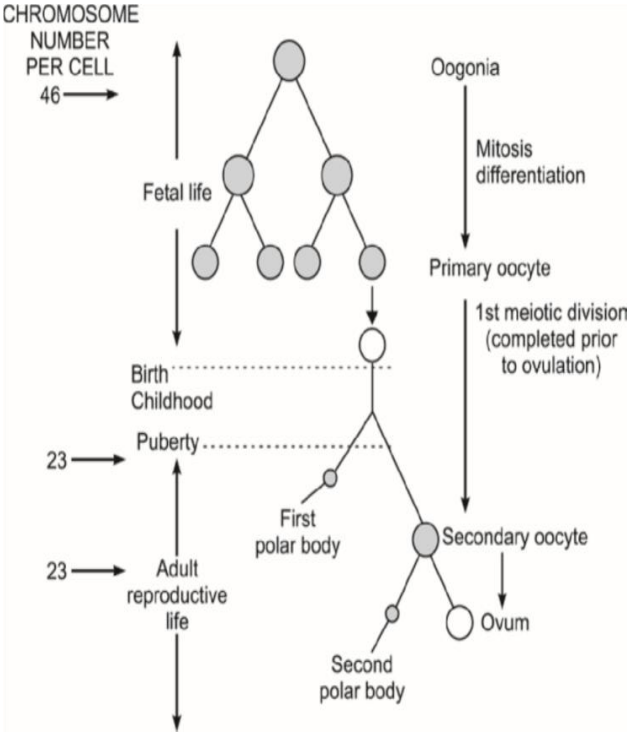


V.S. of maize grain

Chapter3

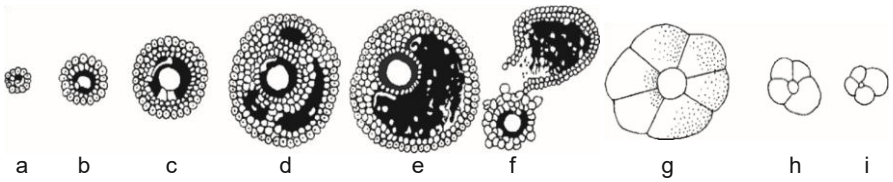
Qus. 7 Give a schematic representation of oogenesis in humans. Mention the number of chromosomes at each stage. Correlate the life phases of the individual with the stages of the process.

Ans.Systematic representation of oogenesis



Qus. 8

The following is the illustration of the sequence of ovarian events –a" to –i" in a human female:



(a) Identify the figure that illustrates corpus luteum and name the pituitary hormone that influences its formation.

(b) Specify the endocrine function of corpus luteum. How does it influence the uterus? Why is it essential?

(c) What is the difference between –d" and –e"?

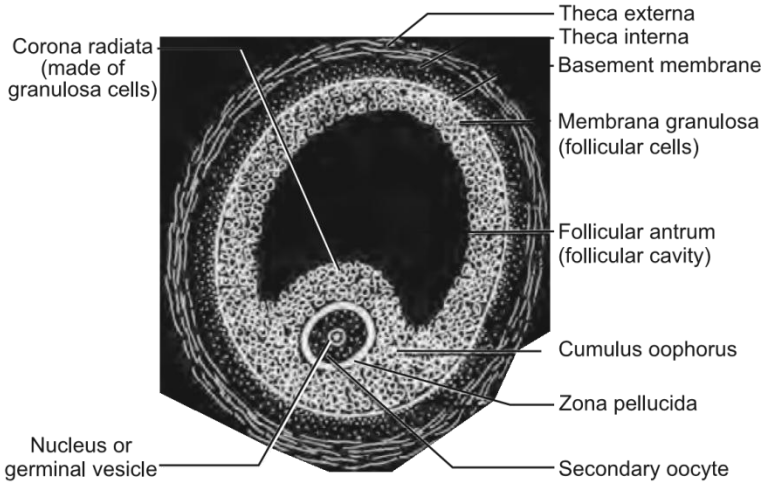
(d) Draw a neat labelled sketch of Graafian follicle.

Ans.(*a*) Corpus luteum is illustrated by _g' and the hormone influencing its formation is luteininsing hormone (LH).

(b) Produces the hormone progesterone, causes proliferation of the endometrium which gets highly vascularised. It is essential for the implantation of the fertilised ovum and maintains the same during pregnancy.

(c) –d" is the developing tertiary follicle. –e" is the Graafian follicle.

(*d*)



OR

Qus. 9 Draw a diagrammatic sectional view of the female reproductive system of human and label the parts

(i) where the secondary oocytes develop

(ii) which helps in collection of ovum after ovulation

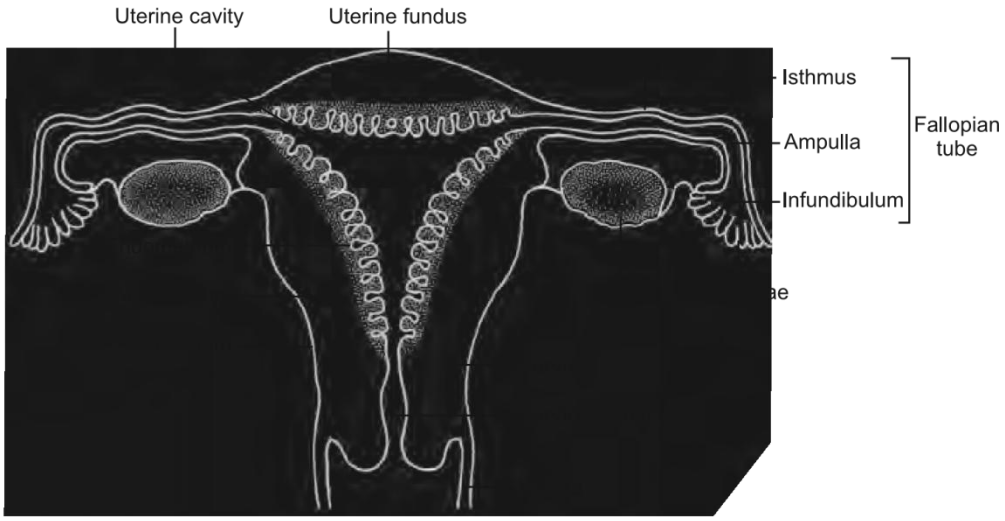
(iii) where fertilisation occurs

(iv) where implantation of embryo occurs.

or

(a) Explain the role of pituitary and the ovarian hormones in menstrual cycle in human females.

Ans.*a*)



(*b*) Pituitary hormone:

(i) FSH stimulates maturation of follicle.

(ii) Rapid secretion of LH (LH surge) induces rupture of Graafian follicle, thereby leading to ovulation (release of ovum).

Ovarian hormone:

(i) Estrogen stimulates follicular development.

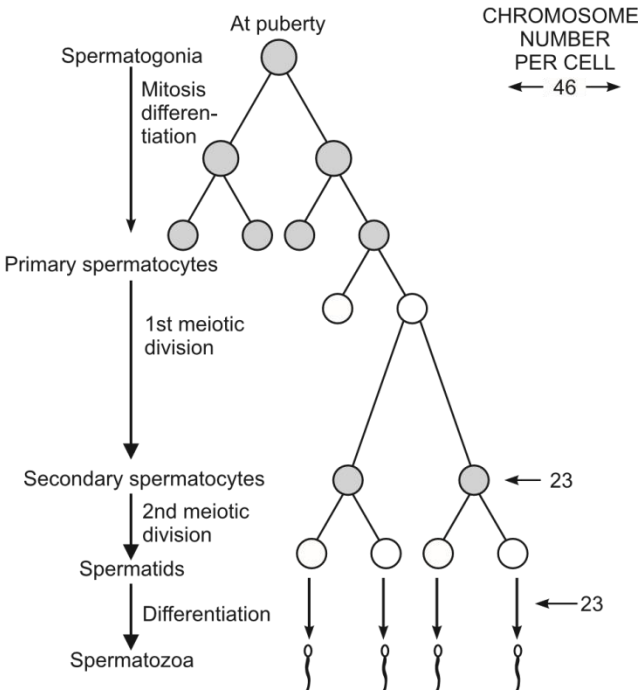
(ii) Progesterone produced by corpus luteum helps to maintain endometrium.

In the absence of fertilisation corpus luteum degenerates and the endometrium disintegrates leading to menstruation.

Qus. 10 (a) Describe the events of spermatogenesis with the help of schematic representation.

(b)Write two differences between Oogenesis and Spermatogenesis.

Ans.(*a*) Schematic representation of spermatogensis



(*b*)

S. No.	Spermatogenesis	Oogenesis
(*i*)	It is the process of formation of haploid spermatozoa from diploid male germ cells of the testes.	It is the process of formation of haploid ova from the gamete mother cells (oogonia) in the ovary.
(*ii*)	Spermatogonia changes to primary spermatocyte.	Oogonia changes to primary oocyte.

Chapter4

Qus. 11 How are assisted reproductive technologies helpful to humans? How are ZIFT and GIFT different from intra uterine transfers? Explain.

Ans. The infertile couples could be assisted to have children through certain special techniques known as assisted reproductive technologies (ART).

ZIFT: The zygote or early embryo with upto 8 blastomeres is transferred into the fallopian tube called zygote intra fallopian transfer (ZIFT).

GIFT: It is the transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce one but can provide suitable environment for fertilisation and further development of the embryo.

Intra uterine transfer refers to the introduction of embryo with more than 8 blastomeres into the uterus of a female to complete its further development.

Qus. 12 Explain how do the following act as contraceptives:

(a) CuT

(b) –Saheli"

Ans.(*a*) Cu ions released suppress sperm motility, lowers the fertilising capacity of sperms.

(*b*) Inhibit ovulation, implantation, as well as alter the quality of cervical mucus to prevent or retard the entry of sperms.

Chapter5

Qus. 13 Explain the pattern of inheritance of haemophilia in humans. Why is the possibility of a human female becoming a haemophilic extremely rare? Explain.

Ans. Haemophilia is a sex-linked (X-chromosome) recessive disorder which shows its transmission from unaffected carrier female to some of the male progeny. A female carrier (heterozygous XX^h female) transmits the haemophilic gene to 50% of her sons and a female sufferer (homozygous X^hX^h) transmits the disease to all her sons and the daughters are carriers.

The possibility of a female becoming haemophilic is extremely rare because she has to be homozygous (X^hX^h) recessive for that trait, *i.e.,* mother of such a female has to be at least a carrier and the father should be haemophilic.

Qus. 14 In a dihybrid cross white eyed, yellow bodied female *Drosophila* crossed with red eyed, brown bodied male *Drosophila* produced in F_2 generation 1.3 per cent recombinants

and 98.7 per cent progeny with parental type combinations. This observation of Morgan deviated from Mendelian F_2 phenotypic dihybrid ratio. Explain, giving reasons, Morgan's observations.

Ans. Morgan saw that when the two genes in a dihybrid cross were situated on the same chromosome, the proportion of parental gene combinations were much higher than the non-parental type. Morgan attributed this due to physical association or linkage of two genes and coined the term linkage to describe this physical association of genes on a chromosome and the term recombination to describe the generation of non-parental gene combinations.

Qus. 15 Explain how does trisomy of 21st chromosome occur in humans. List any four characteristic features in an individual suffering from it.

Ans. Absence of one X chromosome leads to XO abnormality. These are sterile female with rudimentary ovaries. They have shield-shaped thorax, webbed neck, poor development of breasts, short stature, small uterus and puffy fingers

Qus. 16 Why are human females rarely haemophilic? Explain. How do haemophilic patients suffer?

Ans. Haemophilia is a sex-linked recessive disorder. The females haves XX chromosomes and the males have XY chromosomes. If one of the two X chromosomes is normal, she remains a carrier and not diseased. Females will haemophilic only when both the X chromosomes carry the haemophilia gene and this is possible only when the mother is a carrier and father is haemophilic.

Non-stop bleeding and no clotting.

Chapter6

Qus.17 Explain Hershey-Chase experiment. What was proved through this experiment?

Ans . Procedure:

a. Hershey and Chase grew some bacteriophages on a medium that contained radioactive phosphorus (^{32}P) and some in another medium with radioactive sulphur (^{35}S).

b. Bacteriophages grown in the medium containing radioactive phosphorus (^{32}P) contained radioactive DNA.

c. Similarly bacteriophages grown in the medium containing radioactive sulphur (^{35}S) contained radioactive protein.

d. Both the radioactive bacteriophage types were allowed to infect *E. coli* separately.

e. Soon after infection, the bacterial cells were gently agitated in blender to remove viral coats.

f. The culture was also centrifuged to separate the bacteriophage particle 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 indicates that only DNA and not protein coat entered the bacterial cell.

(iii) This proves that DNA is the genetic material which is passed from virus to bacteria and not protein.

Qus. 18 What is ‗semi-conservative' DNA replication? How was it experimentally proved and by whom?

Ans. Watson and **Crick** in 1953 proposed a scheme that DNA replication was **semi-conservative**. According to the scheme, the two parental strands separate and each strand acts as a template for synthesising a complementary strand over it. After completion of replication, each DNA had one parental strand and one newly synthesised strand. Experimental Proof for semi-conservative mode of DNA replication:

- **Matthew Meselson** and **Franklin Stahl** in 1958 performed experiments on *E. coli* to prove that DNA replication is semi-conservative.
- They grew *E. coli* in a medium containing $^{15}NH_4Cl$ (in which ^{15}N is the heavy isotope of nitrogen) for many generations.
- As a result, ^{15}N got incorporated into newly synthesised DNA.
- This heavy DNA can be differentiated from normal DNA by centrifugation in caesium chloride (CsCl) density gradient.
- Then they transferred the cells into a medium with normal $^{14}NH_4Cl$ and took the samples at various definite time intervals as the cells multiplied.
- The extracted DNAs were centrifuged and measured to get their densities.
- The DNA extracted from the culture after one generation of transfer from the ^{15}N medium to ^{14}N medium (i.e., after 20 minutes) showed an intermediate hybrid density.

- The DNA extracted from culture after two generations (i.e., after 40 minutes) showed equal amount of light DNA and hybrid DNA.

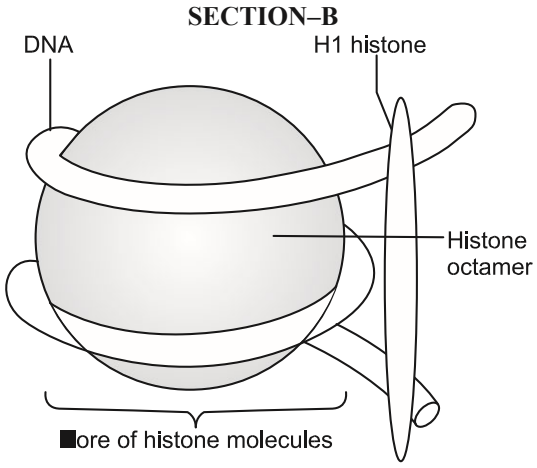
Qus. 19(*a*) Draw a neat labelled diagram of a nucleosome.

(*b*) Mention what enables histones to acquire a positive charge.

Ans.

SECTION–B

7. (*a*)



Nucleosome

(*b*) Basic amino acid residues of lysines and arginines.

Qus. 20 Why is DNA considered a better hereditary material than RNA?

OR

How is *hn*RNA processed to form *m*RNA?

Ans.DNA is considered a better hereditary material than RNA because of the following reasons:

(i) It is able to generate its replica (replication).

(ii) It is chemically and structurally stable.

(iii) It provides the scope for slow changes (mutation) that are required for evolution.

(iv) It expresses itself in the form of Mendelian characters.

OR

The *hn*RNA undergoes the following processes to form *m*RNA:

(i) Capping: Addition of methyl guanosine triphosphate at 5'-end.

(ii) Tailing: Addition of 200-300 adenylate residues at 3'-end.

(iii) Splicing: Removal of introns and joining of exons.

Qus. 21 (a) Name the primates that lived about 15 million years ago. List their characteristic features.

(*i*) Where was the first man-like animal found?

(ii) Write the order in which Neanderthals, *Homo habilis* and *Homo erectus* appeared on earth. State the brain capacity of each one of them.

(iii) When did modern *Homo sapiens* appear on this planet?

Ans. (a) Primates called *Dryopithecus* and *Ramapithecus* lived 15 million years ago.

Their characteristic features are:

(i) They were hairy and walked like gorillas and chimpanzees.

(ii) *Ramapithecus* was more man-like.

(iii) *Dryopithecus* was more ape-like.

(*i*) First man-like animal was found in Ethiopia and Tanzania.

(ii) The order of appearance from the earliest to the latest is:

Homo habilis, *Homo erectus*, Neanderthals.

The brain capacity of *Homo habilis* is 650–800 cc, of *Homo erectus* is 900 cc and of Neanderthals is 1400 cc.

(iii) Modern *Homo sapiens* appeared between 75,000–10,000 years ago.

Qus. 22 Branching descent and natural selection are the two key concepts of Darwinian theory of evolution. Explain each concept with the help of a suitable example.

Ans . Branching descent: Different species descending from the common ancestor get adapted in different habitats, *e.g*., Darwin‘s finches—varieties of finches arose from grain eaters; Australian marsupials evolved from common marsupial.

Natural selection: It is a process in which heritable variations enable better survival of a species to reproduce in large number, *e.g*., white moth surviving before the industrial revolution and black moth surviving after industrial revolution; long-necked giraffe survived the evolution process; DDT-resistant mosquitoes survive. (*Any suitable example*)

Qus. 23 Explain the salient features of Hugo de Vries theory of mutation. How is Darwin‘s theory of natural selection different from it? Explain.

Ans. Salient features of theory of Hugo de Vries:

(*i*) Mutations cause evolution.

(ii) New species originate due to large mutations.

(iii) Evolution is a discontinuous process and not gradual.

(iv) Mutations are directionless,

(v) Mutations appear suddenly.

(vi) Mutations exhibit their effect immediately.

Darwin's Theory of Natural Selection	Vries Theory of Mutation
1. He believed that minor variations cause evolution.	1 . He believed that mutation causes evolution.
2. Darwinian variations are small and directional.	2 . Mutations are random and directionless.
3. He believed evolution to be gradual.	3. He believed sudden mutations caused evolution.

Chapter8

Qus.24 (i) How and at what stage does *Plasmodium* enter into a human body?

(ii) With the help of a flow-chart, only show the stages of asexual reproduction in the life cycle of the parasite in the infected human.

(iii) Why does the victim show symptoms of high fever?

Ans. (i) *Plasmodium* enters the human body as sporozoites (infectious form) through the bite of infected female *Anopheles* mosquito.

Sporozoites are injected with the bite of *Anopheles* mosquito into the body.

Sporozoites reach the liver through blood

Parasite reproduces asexually in the liver cells, and
by bursting

the liver cells enter the blood

.

They enter the red blood cells

Parasites reproduce asexually in red blood cells and by bursting them release

haemozoin which causes cycles of fever

Parasites enter new red blood cells

Starts the sexual stages (gametocytes) in red blood cells.

Stages of asexual reproduction in the life cycle of *Plasmodium* (iii) A toxic substance called ~~–h~~aemozoin" is released by the rupture of red blood cells which cause the chill and high fever recurring every three to four days.

Qus.25 Name the bacterium that causes typhoid. Mention two diagnostic symptoms. How is this disease transmitted to others?

Ans. *Salmonella typhi*.

Constipation, stomach pain, headache, weakness, loss of appetite, high fever. (*Any two*)
The disease is transmitted through contaminated food/water.

Qus.26 Name the cells that act as HIV factory in humans when infected by HIV. Explain the events that occur in the infected cell.

Ans. Macrophages/Helper T-cells act as HIV factory.

The virus enters macrophages or helper T-cells where RNA genome of the virus replicates to form viral DNA with the help of the enzyme reverse transcriptase. The viral DNA then gets incorporated into host cell's DNA and directs infected cells to produce virus particles.

Chapter9

Qus.27 Identify A, B, C and D in the table given below.

Crop	Variety	Resistance to disease
Wheat	A	Leaf and stripe rust

B	*Pusa Shubhra*	Black-rot
Cowpea	*Pusa Komal*	C
Brassica	*Karan Rai*	D

Ans.A : *Himgiri* B : Cauliflower

C : Bacterial blight D : White rust

Qus.28 (*a*) Mention the property of plant cells that has helped in growing crops by tissue culture.

(*b*) Explain how it is possible to grow on a commercial scale:

(i) Banana crop

(ii) Virus free crop plants from virus infected good quality crop plants

Ans. *a*) Totipotency

(b) (*i*) Banana crop can be grown on a commercial scale by micropropagation. A part of the plant called explant is taken for tissue culture. The explant is grown in aseptic condition in synthetic/cultural media which is rich in inorganic nutrient, vitamins, amino acids and growth regulators like cytokinin and auxin.

(ii) Healthy banana plants can be obtained from diseased plants by meristem culture. Although the plant is virus infected, the apical and axillary meristem is free of virus. The meristem is removed from the plant and grown in vitro by micropropagation. The plants produced are virus-free.

Qus.29(*a*) What is the programme called that is involved in improving success rate of production of desired hybrid and herd size of cattle?

(*b*) Explain the method used for carrying this programme for cows.

Ans. (*a*) Multiple ovulation embryo transfer method/MOET.

(*b*) Procedure

(i) A cow is administered hormones with FSH-like activity to induce follicular maturation and super-ovulation.

(ii) The cow produces 6–8 eggs instead of one egg produced normally.

(iii) It is now, either mated with an elite bull or artificial insemination is carried out.

(iv) When the fertilised eggs attain 8–32 cells stage, they are non-surgically removed and transferred to a surrogate mother.

(v) The genetic mother can now be again super-ovulated.

Chapter10

Qus.30 Explain the different steps involved in sewage treatment before it can be released into natural water bodies.

Ans. Sewage treatment is carried out in two stages:

(*i*) Primary treatment or physical treatment

- It is the physical removal of large and small particles from sewage.
- First, the floating debris is removed by sequential **filtration** by passing through wire mesh screens.
- Then, the grit (soil and small pebbles) are removed by **sedimentation** in **settling tanks**. The sediment is called **primary sludge** and the supernatant is the **effluent**.
- OO The effluent is taken for secondary treatment.

➢ **(*ii*) Secondary treatment or biological treatment**

- OO Primary effluent is passed into large **aeration tanks** with constant mechanical agitation and air supply.
- OO Useful aerobic microbes grow rapidly and form flocs.
- OO The growing microbes consume organic matter and thus reduce the biochemical oxygen demand (BOD).
- OO When BOD of sewage has reduced, the effluent is passed into **settling tank**.
- OO Here, the bacterial flocs settle and the sediment is called **activated sludge**.
- OO A small part of the sludge is used as an inoculum in the aeration tank and the remaining part is passed into large tanks called **anaerobic sludge digesters**.
- OO In the digesters, **heterotrophic microbes** anaerobically digest bacteria and fungi in sludge producing mixture of gases such as methane, hydrogen sulphide and CO_2 which form the biogas.
- OO The effluent can now be released into the water body.

Qus.31 Explain the role of the following in increasing the soil fertility and crop yield:

(a) Leguminous plants

(b) Cyanobacteria

(c) Mycorrhizae

Ans. (*a*) Leguminous plants possess root nodules where nitrogen is fixed by symbiotic nitrogen fixing bacteria *Rhizobium* and fertilise the soil.

(c) Cyanobacteria as biofertilisers

OO They fix atmospheric nitrogen and increase the organic matter of the soil through their photosynthetic activity, *e.g.*, *Nostoc, Anabaena, Oscillatoria*, etc.

OO Blue-green algae increase the soil fertility by adding organic matter to the soil

(d) Fungi as biofertilisers

OO Fungi form symbiotic association with the roots of higher plants called **mycorrhiza**, *e.g.*, *Glomus*.

OO The fungal hyphae absorb phosphorus from soil and passes it to the plant.

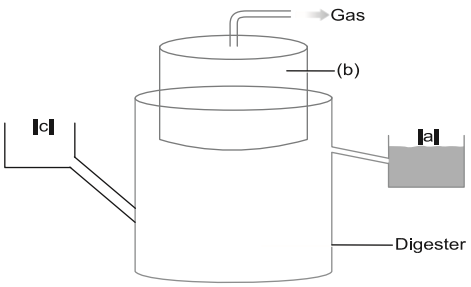
OO Mycorrhiza shows the following benefits:

(a) resistance to root-borne pathogens.

(b) tolerance to salinity and drought.

(c) overall increase in plant growth and development.

Qus.32



The diagram above is that of a typical biogas plant. Explain the sequence of events occurring in a biogas plant. Identify *a*, *b* and *c*.

Ans. The biogas plant tank is fed with slurry of dung. A floating cover is placed over the slurry which keeps on rising as the gas is produced in the tank due to the microbial activity of methanogens like *Methanobacterium*. Methanogens grow anaerobically on cellulosic material in cowdung to produce large amount of methane, CO_2 and H_2. The biogas plant has an outlet, which is connected to a pipe to supply biogas. The spent slurry is removed through another outlet and is used as fertiliser.

a—Sludge tank, b—Gas holder, c—Charge pit

Chapter11

Qus.33 How and why is the bacterium *Thermusaquaticus* employed in recombinant DNA technology? Explain.

OR

(a) What are ~~–m~~olecular scissors"? Give one example.

(b) Explain their role in recombinant DNA technology.

Ans. DNA polymerase (*Taq* polymerase) in recombinant technology is obtained from a bacterium, *Thermusaquaticus*.

(i) DNA polymerase (thermostable) remain active during the high temperature induced during denaturation of double stranded DNA.

(ii) This enzyme extends the primers using the nucleotides provided in the reaction and the genomic DNA as template.

(iii) The repeated amplification is achieved by this enzyme and the amplified fragment if desired can be used to ligate with a vector for further cloning.

OR

(a) The restriction endonucleases are called molecular scissors, as they cut the DNA segments at particular locations, *e.g.,Eco*RI cuts DNA between bases G and A only when sequence GAATTC is present in the DNA.

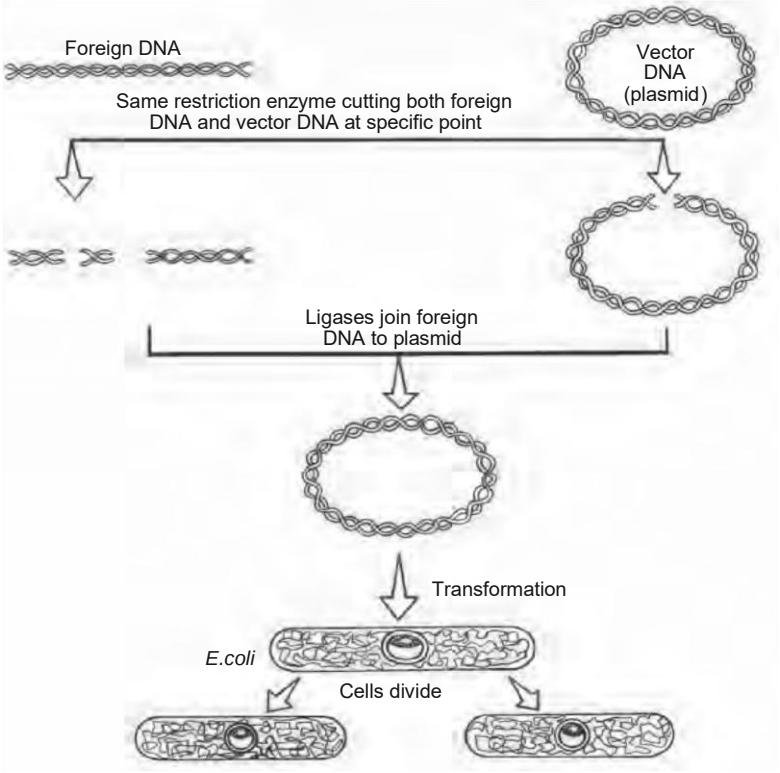
(b) The restriction enzymes cut the DNA strands a little away from the centre of the palindromic sites, but between the same two bases on the opposite strands. This leaves single stranded portions with overhanging stretches called sticky ends on each strand as they form hydrogen bonds with their complementary cut counterparts. This stickiness at the ends facilitates the action of the enzyme DNA ligase.

Qus. 34 (a) Mention the role of vectors in recombinant DNA technology. Give any two examples.

(b) With the help of diagrammatic representation only, show the steps of recombinant DNA technology.

Ans. (a) Role of vectors: The vectors have the ability to replicate within the bacterial cells independent of the control of chromosomal DNA. If an alien piece of DNA is linked to the vector like bacteriophage or plasmid DNA, it can be made to multiply its number equal to the copy number of the vector. Vectors are also used in the selection of recombinants from non-recombinants. Plasmids and bacteriophages are the most commonly used vectors.

(b)

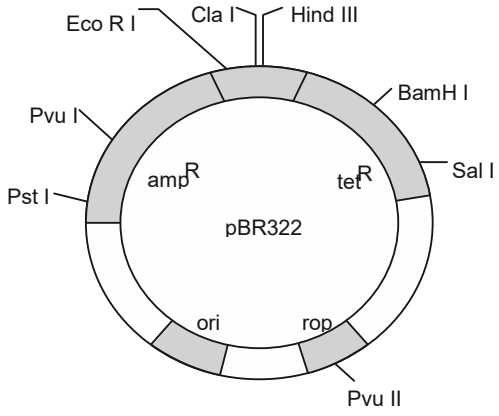


Di a gram matic rep re sen ta tion of steps in re com bi nant DNA tech nology

Qus. 35 Why is *Agrobacterium tumefaciens* a good cloning vector? Explain.

OR

Explain the importance of (a) ori, (b) amp^R and (c) rop in the *E. coli* vector shown below:



Ans.*Agrobacterium tumifaciens* is a soil bacterium which causes disease in many dicot plants. It is able to deliver a piece of DNA known as T-DNA, to transform the normal cells into tumour cells and direct these tumour cells to produce the chemicals required by the pathogen. The tumour inducing (Ti) plasmid of *Agrobacterium tumifaciens* has been modified into a cloning vector which is no more pathogenic to the plants but still delivers genes of interest into a variety of plants.

OR

(a) ori: It 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. It is also responsible for controlling the copy number of the linked DNA.

(b) amp^R : The ligation of alien DNA is carried out at a restriction site present in any antibiotic resistance gene.

(c) rop: It codes for the proteins involved in the replication of the plasmid.

Chapter12

Qus.36 (a) List any four beneficial effects of GM plants.

(b)Explain how has *Bacillus thuringiensis* contributed in developing resistance to cotton bollworms in cotton plants.

Ans. (*a*) (*i*) Increased tolerance against abiotic stresses (cold, drought, salt, heat).

(ii) Reduced reliance on chemical pesticides (pest-resistant crops).

(iii) Reduced post-harvest losses.

(iv) Increased efficiency of minerals used by plants (this prevents early exhaustion of fertility of soil).

(v) Enhanced nutritional value of food, e.g., vitamin _A' enriched rice (golden rice). (*Any four*)

(*b*) **Bt cotton**

OO Some strains of *Bacillus thuringiensis* produce proteins that kill some insects like lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes).

OO *B. thuringiensis* forms protein crystals which contain a toxic insecticidal protein.

OO Bt toxins are initially inactive protoxins but after ingestion by the insect their inactive toxin becomes active due to the alkaline pH of the gut which solublise the crystals.

OO The activated toxin binds to the surface of midgut epithelial cells thus creating pores which causes cell swelling and lysis, further leading to death of the insects.

OO Specific Bt toxin genes obtained from *Bacillus thuringiensis* are used in several crop plants like cotton.

- The toxin is coded by a gene called *cry* which is of various types. For example, proteins encoded by the genes *cryIAc* and *cryIIAb* control the cotton bollworms and that of *cryIAb* control corn borer.
- Bt tobacco was first cultured to kill hornworm (*Manduca sexta*).

Fig. Cotton boll: (*a*) destroyed by bollworms; (*b*) a fully mature cotton boll

Qus.37 How did Eli Lilly synthesise the human insulin? Mention one difference between this insulin and the one produced by the human pancreas.

Ans. Eli Lilly 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 disulfide bonds to form human insulin. Insulin in human pancreas is synthesized as a prohormone containing the C peptide. Which is removed in mature hormone. The synthesised insulin did not contain C peptide and was prepared in mature form.

Qus.38 How does RNA interference help in developing resistance in tobacco plant against nematode infection?

Ans. The nematode *Meloidegyne incognitia*infects tobacco roots leading to reduction in the yield. To prevent this infestation, a strategy based on the process of RNA interference (RNAi) was adopted.

Using *Agrobacterium*vectors, nematode-specific genes were introduced into host plants. This DNA produced both sense and anti-sense RNA in the host cells. These two RNAs being complementary to each other, formed a double stranded (dsRNA) RNA. The specific mRNA of the nematode binds to dsRNA and thus prevents its translation (silencing). The parasite could not survive in a transgenic host expressing specific interfering RNA. And the transgenic plant is thus, protected.

Chapter13

Qus.39 Name the type of interaction seen in each of the following examples:

(i) *Ascaris* worms living in the intestine of humans

(ii) Wasp pollinating fig inflorescence

(iii) Clown fish living among the tentacles of sea-anemone

(iv) Mycorrhizae living on the roots of higher plants

(v) Orchid growing on a branch of a mango tree

(vi) Disappearance of smaller barnacles when *Balanus* dominated in the coast of Scotland.

Ans. (*i*) Parasitism (*ii*) Mutualism

(*iii*) Commensalism (*iv*) Mutualism

(*v*) Commensalism (*vi*) Competition

Qus.40 How do organisms like fungi, zooplanktons and bears overcome the temporary short-lived climatic stressful conditions? Explain.

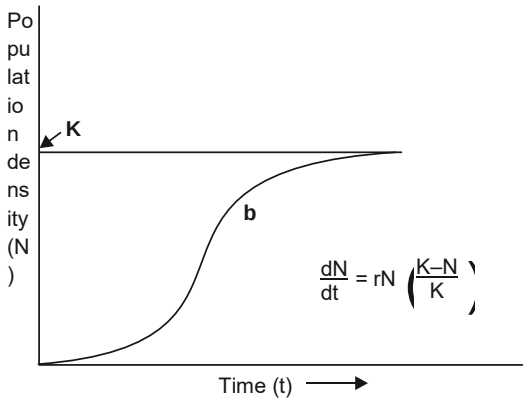
Ans. Fungi: They form thick-walled spores which help them survive in unfavourable conditions. On availability of suitable environment, these germinate.

Zooplankton: Under unfavourable conditions, these species in lakes and ponds enter diapause, a stage of suspended development.

Bears: In extreme low temperatures, they escape winter time, *i.e.*, they hibernate.

Qus.41 Draw and explain a logistic curve for a population of density (N) at time (t) whose intrinsic rate of natural increase is (r) and carrying capacity is (k).

Ans. . Logistic growth



Popul at ion growth curve

When res ponses are lim it ing the growth,

plot is log ist ic, K is carr yi ng capacity

The resources become limited at certain point of time, so no population can grow exponentially.

l Every ecosystem or environment or habitat has limited resources to support a particular maximum number of individuals called its carrying capacity (K).

l When N is plotted in relation to time t, the logistic growth show sigmoid curve and also called *Verhulst-Pearl logistic Growth.* æ K - N ö dN / dt = rN ç ÷, è K ø

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

K = Carrying capacity.

Chapter14

Qus.42(*a*) Describe primary succession that occurs on bare rock.

(*b*) Differentiate between Xerarch and Hydrarch successions.

Ans. (*a*) Primary succession on rocks

OO Lichens are the pioneer species on a bare area.

OO The lichen secretes some acids to dissolve rock and help in weathering and soil formation.

OO Later, some small bryophytes invade and hold the small amount of soil.

OO The bryophytes are succeeded by herbs, shrubs and ultimately big trees.

OO At last, a stable climax forest is formed.

OO The xerophytic habitat gets converted into a mesophytic one.

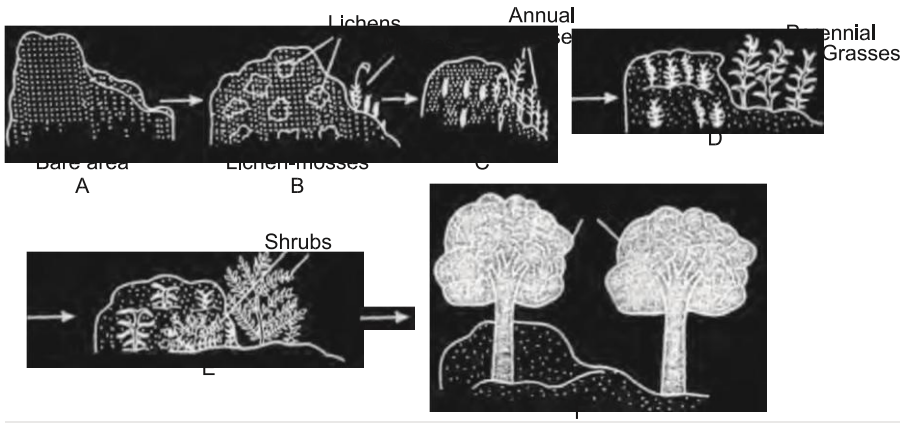


Fig. Biotic succession on a bare rock

(*b*) The plant succession is of two types:

(i) Hydrarch succession: The plant succession which takes place in wet area or water, leading to a successional series progress from hydric to the mesic conditions.

(ii) Xerarch succession: The plant succession which takes place in dry area, leading to a successional series from xeric to mesic conditions.

Qus.43(*a*) Explain primary productivity and the factors that influence it.

(*b*) Describe how do oxygen and chemical composition of detritus control decomposition.

30. **Ans.** (*a*) Primary productivity is defined as the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis. It varies in different types of ecosystems. It is expressed in terms of weight (g^{-2}) or energy (kcal m^{-2}) . It depends on the following factors :

(i) Plant species inhabiting a particular area

(ii) Environmental factors

(iii) Availability of nutrients

(iv) Photosynthetic capacity of plants.

(*b*) Decomposition of detritus is slow if it contains lignin, chitin, tannins and cellulose, whereas it is quicker if detritus is made up of nitrogenous compounds and watersoluble substances like sugars. This is because the latter are easy to degrade.

Qus.44 Describe the process of decomposition of detritus under the following heads: Fragmentation; leaching; catabolism; humification and mineralisation.

Ans. The process of breaking down complex organic matter into inorganic substances like—CO_2, water and nutrient is called decomposition. The raw materials for decomposition is called detritus. They are dead remains of plants and animals.

Steps in decomposition:

(a) **Fragmentation:** The process of breaking down of detritus into smaller particles is called fragmentation, e.g., earthworm.

(b) **Leaching:** The process by which water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts.

(c) **Catabolism:** The enzymatic process by which degraded detritus is converted into simple inorganic substances is called catabolism.

(d) **Humification:** The process of accumulation of a dark coloured amorphous substance called humus, that is, highly resistant to microbial action and undergoes decomposition at an extremely slow rate.

(e) **Mineralisation:** The process by which humus is further degraded by some microbes and release inorganic nutrients is called mineralisation.

Chapter15

Qus.45 Write any two hypotheses put forth by ecologists explaining the existence of greater biodiversity in tropical regions than in temperate regions.

Ans. (i) Tropical environments are less seasonal, relatively more constant and predictable than temperate environments. This promotes niche specialisation and results in greater diversity.

(ii) There is more solar energy available in tropics which contributes to higher productivity and in turn greater biodiversity.

Qus.46.

Ans.

Qus.47

Ans.

Chapter16

Qus.48 How did Ahmed Khan, plastic sacks manufacturer from Bangalore, solve the everincreasing problem of accumulating plastic waste?

Ans. He collected plastic wastes and recycled them. He powdered plastic to form polyblend, which is blended with bitumen. Polyblend was used in road laying, which increased road life by a factor of three, making it more durable.

Qus.49 What is eutrophication? How does a lake undergo accelerated eutrophication?

Ans. Eutrophication

- OO It is defined as the natural aging of a lake by biological enrichment of its water.
- OO Water in a young lake is cold and clear to support life.
- OO With time, it is enriched with nutrients by streams draining into it.
- OO This encourages growth of aquatic life—plant and animal life.
- OO Organic remains deposit at the bottom of the lake and with time makes the water warmer.
- OO Eventually, floating plants develop in the lake, finally converting into land.
- OO The accelerated aging of lakes due to sewage and agricultural and industrial wastes is called **cultural** or **accelerated eutrophication**.

Qus.50 While planning and organising any celebrations or functions a large quantity of paper is used in the form of writing pads, file covers, elaborate invitation cards, decorative posters, gift wrappings, paper plates, etc. After the function is over the bulk of the used paper gets dumped into the dust-bins.

(a) Write your comments on such a paper usage.

(b) Give your suggestions:

(i) How would you reuse the paper effectively that got dumped into the dust-bins?

(ii) In which two alternative ways would you have liked to use the paper for such functions and celebrations?

(e) Explain the long term effects of such practices on the environment.

Ans. (*a*) Such use of paper is harmful to the environment and is a waste of resources.

(f) (*i*) The waste papers can be used to make paper bags, gift wrapping. The file covers can be reused in other functions or be distributed to volunteers for reuse.

(ii) Gift wrappings could be done by old newspapers or used papers, thermacol plates could be used instead of paper plates.

(g) Such wasteful use of paper will lead to increase in cutting of trees. This can lead to deforestation if these trees are not replaced by planting of new trees. Deforestation can lead to desertification of land.