LIBERTY PAPER SET

STD. 12 : Biology

Full Solution

Time : 3 Hours **ASSIGNMENT PAPER 5**

Part A

1. (C) **2.** (B) **3.** (D) **4.** (C) **5.** (C) **6.** (D) **7.** (C) **8.** (B) **9.** (D) **10.** (C) **11.** (D) **12.** (B) **13.** (B) **14.** (A) **15.** (D) **16.** (B) **17.** (A) **18.** (C) **19.** (B) **20.** (D) **21.** (B) **22.** (B) **23.** (B) **24.** (D) **25.** (C) **26.** (C) **27.** (B) **28.** (C) **29.** (A) **30.** (B) **31.** (B) **32.** (B) **33.** (A) **34.** (A) **35.** (A) **36.** (B) **37.** (B) **38.** (A) **39.** (C) **40.** (D) **41.** (D) **42.** (C) **43.** (A) **44.** (C) **45.** (D) **46.** (D) **47.** (B) **48.** (A) **49.** (C) **50.** (B)

Part B

Section A

➢ **Write the answer of the following questions : (Each carries 2 Mark)**

1.

- The period for which pollen grains remain viable is highly variable and to some extent depends on the prevailing temperature and humidity.
  - In some cereals such as rice and wheat, pollen grains lose viability within 30 minutes of their release, and in some members of Rosaceae, Leguminoseae and Solanaceae, they maintain viability for months.
  - Once they are shed, pollen grains have to land on the stigma before they lose viability if they have to bring about fertilisation.
- Pollen grains are rich in nutrients. It has become a fashion in recent years to use pollen tablets as food supplements.
  - In western countries, a large number of pollen products in the form of tablets and syrups are available in the market.
  - Pollen consumption has been claimed to increase the performance of athletes and race horses.

2.

- In a transverse section, a typical microsporangium appears near circular in outline.
- It is generally surrounded by four wall layers – the epidermis, endothecium, middle layers and the tapetum.
  - The outer three wall layers perform the function of protection and help in dehiscence of anther to release the pollen.
  - The innermost wall layer is the tapetum. It nourishes the developing pollen grains.
  - Cells of the tapetum possess dense cytoplasm and generally have more than one nucleus.
  - When the anther is young, a group of compactly arranged homogenous cells called the sporogenous tissue occupy the centre of each microsporangium.
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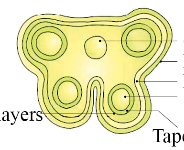
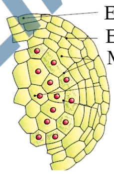


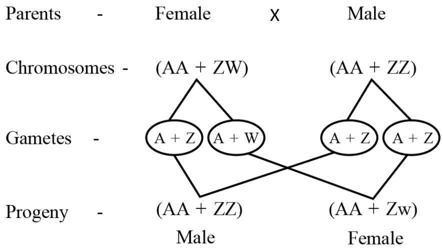


3.

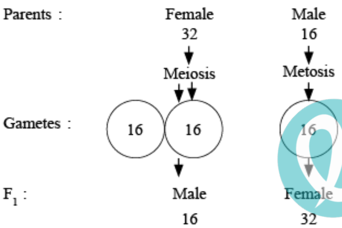
- IUT - intra uterine transfer :
  - Embryos with more than 8 blastomeres, into the uterus (IUT - intra uterine transfer), to complete its further development.
- IUI - intra-uterine insemination :
  - Infertility cases either due to inability of the male partner to inseminate the female or due to very low sperm counts in the ejaculates, could be corrected by **artificial insemination (AI)** technique.
  - In this technique, the semen collected either from the husband or a healthy donor is artificially introduced either into the vagina or into the uterus (IUI - intra-uterine insemination) of the female.
  - Though options are many, all these techniques require extremely high precision handling by specialised professionals and expensive instrumentation.
  - Therefore, these facilities are presently available only in very few centres in the country.
  - Obviously their benefits are affordable to only a limited number of people.
  - Emotional, religious and social factors are also deterrents in the adoption of these methods.
  - Since the ultimate aim of all these procedures is to have children, in India we have so many orphaned and destitute children, who would probably not survive till maturity, unless taken care of.
  - Our laws permit legal adoption and it is as yet, one of the best methods for couples looking for parenthood.

4.

- In some other organisms, e.g. birds, a different mechanism of sex determination is observed.
- In this case the total number of chromosomes is same in both males and females.
- But two different types of gametes in terms of the sex chromosomes, are produced by females, i.e. female heterogamety.
- In order to have a distinction with the mechanism of sex determination described earlier, the two different sex chromosomes of a female bird have been designated to be the Z and W chromosomes.
- In these organisms, the females have one Z and one W chromosomes, whereas males have a pair of Z-chromosomes besides the autosomes.



- The sex determination in honey bee is based on the number of sets of chromosomes an individual receives.
- An offspring formed from the union of a sperm and an egg develops as a female (queen or worker), and an unfertilised egg develops as a male (drone) by means of parthenogenesis.
- This means that the males have half the number of chromosomes than that of a female.
- The females are diploid having 32 chromosomes and males are haploid. i.e. having 16 chromosomes.
- This is known as haplodiploid sex-determination system and has special characteristic features such as males produce sperms by mitosis they do not have father and thus cannot have sons, but have grandfather and can have grandsons.



Sex determination in honey bee

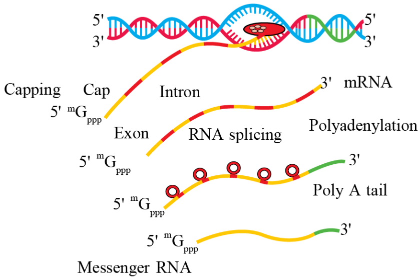
5.

- Type of RNA
- In bacteria, there are three major types of RNAs:
  - (i) mRNA (messenger RNA),
  - (ii) tRNA (transfer RNA), and
  - (iii) rRNA (ribosomal RNA).
- All three RNAs are needed to synthesise a protein in a cell.
- The mRNA provides the template, tRNA brings aminoacids and reads the genetic code, and rRNAs play structural and catalytic role during translation.
- There is a single DNA-dependent RNA polymerase that catalyses transcription of all types of RNA in bacteria.

Process of Transciption

- RNA polymerase binds to promoter and initiates transcription (Initiation).
- It uses nucleoside triphosphates as substrate and polymerises in a template depended fashion following the rule of complementarity.
- It somehow also facilitates opening of the helix and continues elongation.
- Only a short stretch of RNA remains bound to the enzyme.

- Once the polymerases reaches the terminator region, the nascent RNA falls off, so also the RNA polymerase. This results in termination of transcription.
- An intriguing question is that how is the RNA polymerases able to catalyse all the three steps, which are initiation, elongation and termination.
- The RNA polymerase is only capable of catalysing the process of elongation. It associates transiently with initiation-factor (σ) and termination-factor (ρ) to initiate and terminate the transcription, respectively.
- Association with these factors alter the specificity of the RNA polymerase to either initiate or terminate.



Process of Transcription in Eukaryotes

- In bacteria, since the mRNA does not require any processing to become active, and also since transcription and translation take place in the same compartment (there is no separation of cytosol and nucleus in bacteria), many times the translation can begin much before the mRNA is fully transcribed.
- Consequently, the transcription and translation can be coupled in bacteria.

6.

- Pathogen : *Streptococcus pneumonia and Haemophiles influenza*
- Spread through :
  - Droplets or aerosols released by an infected person through coughing or sneezing. Inhalation or by using the utensils of an infected person.
  - As a result of infection, the alveoli get filled with fluid leading to severe problem in respiration.
- Symptoms :
  - Fever, chills, cough and headache
  - In severe condition, the lips and fingers become gray to blue in color.
- Treatment : Antibiotics

7.

- Yes, microbes are used as a source of energy.
- For example microbes are used to produce biogas or gobar gas from dung and bio waste.
- Biogas-gobar gas is a product of anaerobic respiration of which main component is methane gas.
- The spent slurry from the biogas plant is used as fertiliser.

8.

- In addition to 'ori', the vector requires a selectable marker.
- It helps in identifying and eliminating non transformants and selectively permitting the growth of the transformants.
- Transformation is a procedure through which a piece of DNA is introduced in a host bacterium.
- Normally, the genes encoding resistance to antibiotics such as ampicillin, chloramphenicol,tetracycline or kanamycin, etc., are considered useful selectable markers for E. coli.
- The normal E. coli cells do not carry resistance against any of these antibiotics.

9.

- The size of a population for any species is not a static parameter. It keeps changing with time, depending on various factors including food availability, predation pressure and adverse weather.
- In fact, it is these changes in population density that give us some idea of what is happening to the population – whether it is flourishing or declining.
- Whatever might be the ultimate reasons, the density of a population in a given habitat during a given period, fluctuates due to changes in four basic processes, two of which (natality and immigration) contribute to an increase in population density and two (mortality and emigration) to a decrease.

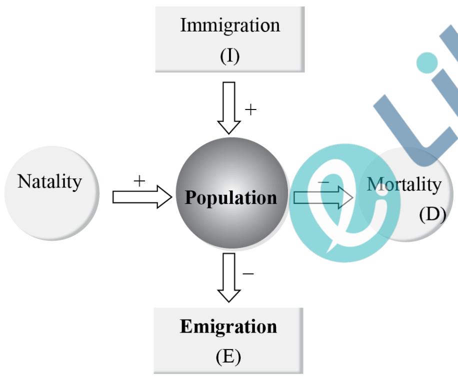
  (i) Natality refers to the number of births during a given period in the population that are added to the initial density.

  (ii) Mortality is the number of deaths in the population during a given period.

  (iii) Immigration is the number of individuals of the same species that have come into the habitat from elsewhere during the time period under consideration.

  (iv) Emigration is the number of individuals of the population who left the habitat and gone elsewhere during the time period under consideration.
- So, if N is the population density at time t, then its density at time t + 1 is

  $Nt + 1 = Nt + [(B + I) - (D + E)]$
- Population density will increase if the number of births plus the number of immigrants (B + I) is more than the number of deaths plus the number of emigrants (D + E).
- Under normal conditions, births and deaths are the most important factors influencing population density, the other two factors assuming importance only under special conditions.
- For instance, if a new habitat is just being colonized, immigration may contribute more significantly to population growth than birth rates.



10.

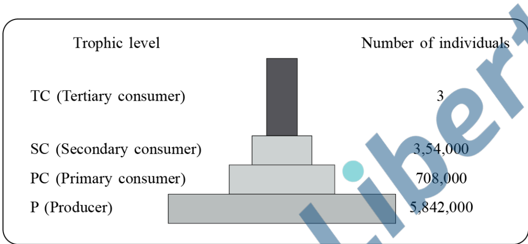
- Primary productivity :
  - Primary production is defined as the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis.
  - Primary productivity depends on the plant species inhabiting a particular area.
  - It also depends on a variety of environmental factors, availability of nutrients and photosynthetic capacity of plants.
  - Therefore, it varies in different types of ecosystems. The annual net primary productivity of the whole biosphere is approximately 170 billion tons (dry weight) of organic matter.
  - Of this, despite occupying about 70 percent of the surface, the productivity of the oceans are only 55 billion tons.

11.

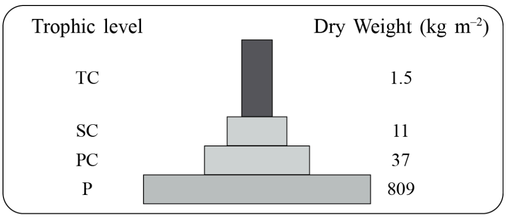
- Stanford ecologist Paul Ehrlich used an analogy to give a proper perspective about biodiversity.
- In an airplane (ecosystem) all parts are joined together using thousands of rivets (species).
- If every passenger travelling in it starts popping a rivet to take home (causing a species to become extinct), 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 is obviously a more serious threat to flight safety than loss of a few rivets on the seats or windows inside the plane.
- The wings of airplane is compared with key species that drive major ecosystem functions.

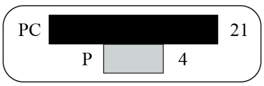
12.

- The trophic structure and function at successive trophic levels, i.e. (producers, herbivores, carnivores), may be graphically represented by means of ecological pyramids where the first or producer level constitutes the base of the pyramid and the successive levels, the tiers, making the apex.
- (A) Pyramid of number :
  - It shows the number of individual organisms at each trophic level. Producers occur in the largest number and top level carnivores are in the smallest number. Normally, the pyramids of numbers is upright.



  - There are exceptions to this generalisation.
  - If you were to count the number of insects feeding on a big tree, the number pyramid is inverted.
  - For example, 50 parrot live on a banyan tree and 50 insects on each parrot.
- (B) Pyramid of biomass :
  - It shows the total dry weight or the average biomass of organisms at a particular trophic level.





  - The pyramid of biomass in sea is generally inverted.
  - Example, the biomass of fishes far exceeds that of phytoplankton.

Section B

➢ **Write the answer of the following questions : (Each carries 3 Mark)**

13.

- Parturition is induced by a complex neuroendocrine mechanism. The signals for parturition originate from the fully developed foetus and the placenta which induce mild uterine contractions called foetal ejection reflex.
- This triggers release of oxytocin from the maternal pituitary. Oxytocin acts on the uterine muscle and causes stronger uterine contractions, which in turn stimulates further secretion of oxytocin.
- The stimulatory reflex between the uterine contraction and oxytocin secretion continues resulting in stronger and stronger contractions. This leads to expulsion of the baby out of the uterus through the birth canal – parturition.
- Soon after the infant is delivered, the placenta is also expelled out of the uterus.
- Certain hormones are required to induce delivery. These hormones control the reflex action to deliver the baby.
- Oxytocin is a hormone that is responsible for inducing uterine contractions, labour, and delivery of the baby.
- When oxytocin is insufficient in the body, it becomes difficult for the baby to be delivered.
- Doctors inject this hormone artificially to carry out the delivery smoothly.
- The mammary glands of the female undergo differentiation during pregnancy and start producing milk towards the end of pregnancy by the process called lactation. This helps the mother in feeding the newborn.
- The milk produced during the initial few days of lactation is called colostrum which contains several antibodies absolutely essential to develop resistance for the new-born babies.
- Breast-feeding during the initial period of infant growth is recommended by doctors for bringing up a healthy baby.

14. Explain the experiment of Matthew Meselson and Franklin Stahl's [Diagram is not necessary]

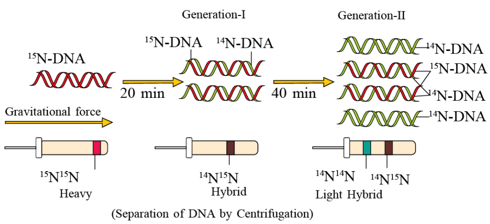
- It is now proved that DNA replicates semiconservatively.
- It was first shown in Escherichia coli and subsequently in higher organism, such as plant and human.
- Matthew Meselson and Franklin Stahl performed the following experiment in 1958 :

(i) They grew E. coli in a medium containing ^{15}NH Cl (^{15}N is the heavy isotope of nitrogen) as the only nitrogen source for many generations.

- The result was that ^{15}N was incorporated into newly synthesised DNA (as well as other nitrogen containing compounds).
- This heavy DNA molecule could be distinguished from the normal DNA by centrifugation in a cesium chloride (CsCI) density gradient (Please note that ^{15}N is not a radioactive isotope, and it can be separated from ^{14}N only based on densities).

(ii) Then they transferred the cells into a medium with normal $^{14}NH_4Cl$ and took samples at various definite time intervals as the cells multiplied, and extracted the DNA that remained as double-stranded helices.

- The various samples were separated independently on CsCI gradients to measure the densities of DNA



Meselson and Stahl's Experiment

(iii) Thus, the DNA that was extracted from the culture one generation after the transfer from ^{15}N to ^{14}N medium [that is after 20 minutes; E. coli divides in 20 minutes] had a hybrid or intermediate density.

- DNA extracted from the culture after another generation [that is after 40 minutes, II generation] was composed of equal amounts of this hybrid DNA and of 'light' DNA.

15. What is adaptive radiation ? Explain with examples.

➥ The process of development of different species starting from one point of a given geographical area to other geographical habitats is called adaptive radiation.

Darwin finch

➥ Darwin Finch is an excellent example of this type of phenomenon.

➥ Darwin saw several species of finches across the Galapagos Islands.

➥ He speculated that all species had evolved on the island by themselves.

➥ Along with other features of the original finches (seed eating), their beaks may have evolved for other forms that made them insectivorous and herbivorous finches.

Australian marsupials

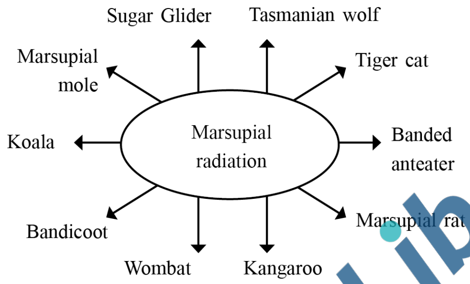
➥ Another example is the Australian marsupial.

➥ Most marsupials were different from each other.

➥ They evolved from a common set of ancestors, but they all evolved on the Australian island continent.

➥ When more than one adaptive diffusion occurs in a geographical area (representing different habitats) it is called convergent evolution.

➥ Mammals of Australia marsupials (E.g.:- the wolf and the Tasmanian wolf) show a similar evolution.



Placental mammals	Australian Marsupials
Mole	Marsupial mole
Ant eater	Numbat (Ant eater)
Mouse	Marsupial mouse
Lemur	Spotted cuscus
Flying squirrel	Flying phalanger
Bobcat	Tasmanian tiger cat
Wolf	Tasmanian wolf

16.

➥ AIDS can not be cured, caution is the best option.

➥ HIV infection which includes - making blood (from blood banks) safe.

➥ From HIV, ensuring the use of only disposable needles and syringes in public and private hospitals and clinics

➥ Free distribution of condoms

➥ Controlling drug abuse

➥ Advocating safe sex and promoting regularcheck-ups for HIV in susceptible populations.

17.

➥ Pathogen : *Rhino* virus and some other viruses.

➥ Spread through :

- Droplets resulting from cough and sneeze of an infected person are either inhalated director transmitted through pen, book, glass, door handle, computer keyboard or mouse etc.
- Rhino virus infects the nose and respiratory tract, but does not infect the lungs.

➥ Symptoms :

- Nasal congestion and discharge, dry throat, runny nose, cough, headache, fatigue etc.
- These symptoms are observed for three to seven days.

18.

- Many useful products for mankind are produced or synthesized by using microbes at industrial level
- Beverages and antibiotics are some examples of this.
- For industrial production, useful microbes are grown in to a big vessel which is called fermentors.
- Microbes have been used from time immemorial for the production of beverages like wine,beer,whiskey brandy or rum.
- *Saccharomyses cerevisiae*(brewer's) yeast is used to produce ethanol from cereals and fruit juices.
- Yeast produces ethanol by an anaerobic respiration pathway.
- Depending on the type of the raw material used for fermentation and the type of processing (with or without distillation) different types of alcoholic drinks are obtained.
- Wine and beer are produced without distillation.
- By distillation whisky, brandy and rum are produced.
- (1) Cyclosporin A :
  - It is derived from *Trichoderma polysporium* fungi.
  - This bioactive molecule is used as immunosuppressive drug in organ transplant patients.
- (2) Statins :
  - It is derived from *Monascus purpurus* a yeast.
  - This drug is used as blood cholesterol lowering agent.
- (3) Streptokinase :
  - This enzyme is derived from *streptococcus* bacterium.
  - This bacterium is modified by using genetic engineering.
  - It is used as "clot bluster" for removing clots from the blood vessels of patients.
  - This drug is used for those patients who have undergone myocardial infraction leading to heart attack.
- Antibiotics are chemical substances which is produced by microbes. It kills pathogenic microbes or slow down their growth.
- This chemicals are called antibiotics.

  (anti=opposite, bio= life)

  e.g. Penicillin is the first discovered antibiotic.
- Discovery :
  - Alexander Fleming while working on *staphylococci* bacteria , once observed a mould growing in one of his unwashed culture plated around which staphylococci could not grow.
  - He found out that it was due to a chemical produced by the mould and he named it penicillin after the mould penicillium notatum.
  - This antibiotic was extensively used to treat American soldiers wounded in world war II
  - Fleming, chain and flory were awarded the Nobel prize in 1945, for this discovery.
- Many products which are useful for mankind are produced by microbes on industrial level.
- For example: beverages, antibiotics, chemicals, enzymes and other biochemical molecules.
- *Saccharomyses cerevisiae*– Yeast is used to prepare wine, beer, whiskey, brandy or rum like beverages and also used for bread making.

  Saccharomyses cerevisiae (brewer's) yeast is used to produce ethanol from cereals and fruit juices.
- Antibiotics are chemical substances which are produced by microbes. They kill pathogenic microbes or slow down their growth. For example: penicillin
- We cannot imagine a world without antibiotics.
- Microbes are also used for commercial and industrial production of certain chemicals like organic acids, alcohols and enzymes.

  Examples :

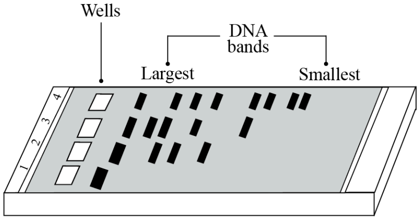
  Aspergillus niger- citric acid

  Acetobacter aceti- acetic acid

  Clostridium butyricum- butyric acid

19.

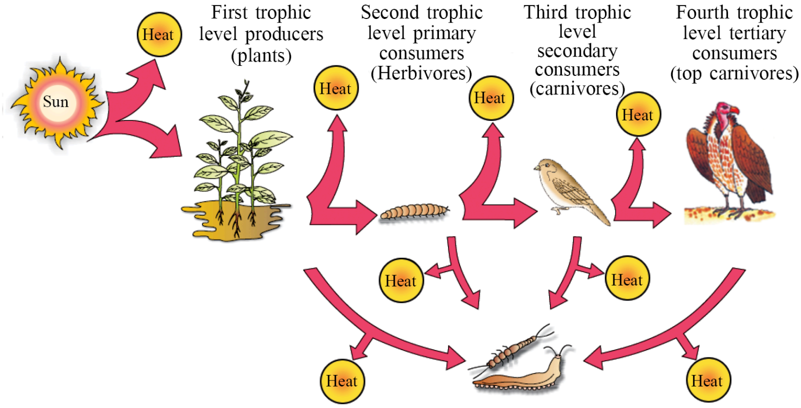
- The techniques used for separation and isolation of DNA fragments is known as gel electrophoresis.
- In this method Agarose gel is used as a medium.
- The cutting of DNA by restriction endonucleases results in the fragments of DNA.
- These fragments can be separated by a technique as shown in figure.



- Since, DNA fragments are negatively charged molecules they can be separated by forcing them to move towards the anode under an electric field througha medium/matrix.
- The DNA fragments separate (resolve) according to their size through sieving effect provided by the agarose gel.
- Hence, the smaller the fragment size, the farther it moves.
- The separated DNA fragments can be visualised only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiation.
- DNA appears as bright orange coloured bands of DNA in an ethidium bromide stained gel exposed to UV light.
- The separated bands of DNA are cut out from the agarose gel and extracted from the gel piece. This step is known as elution.
- The DNA fragments purified in this way are used in constructing recombinant DNA by joining them with cloning vectors.

20.

- Sun is the only source of energy for all ecosystems on Earth, except for the deep sea hydro-thermal ecosystem.
- Of the incident solar radiation less than 50 per cent of it is photosynthetically active radiation (PAR).
- We know that plants and photosynthetic bacteria (autotrophs), fix Sun's radiant energy to make food from simple inorganic materials.
- Plants capture only 2-10 per cent of the PAR and this small amount of energy sustains the entire living world.
- So, it is very important to know how the solar energy captured by plants flows through different organisms of an ecosystem.
- All organisms are dependent for their food on producers, either directly or indirectly.
- The flow of energy from the sun to producers and then to consumer is unidirectional.
- In ecosystem, flow of energy follows two important principles.
- According to the first law of Thermodynamics, energy can neither be destroyed nor can it be created. Thus the quantum of energy is constant. Energy can be converted from one form into another.
- According to the second law 'whenever energy is converted from one form into another, some energy is dissipated in the form of heat'.
- Producers can only convert solar energy in to chemical energy.
- They need a constant supply of energy to synthesise the molecules they require, to counter act the universal tendency toward increasing disorderliness.
- The green plant in the ecosystem are called producers. In a terrestrial ecosystem, major producers are herbaceous and woody plants. Likewise, producers in an aquatic ecosystem are various species like phytoplankton, algae and higher plants.
- The chain or web is formed because of this interdependency. The energy trapped by the producer, hence, is either passed on to a consumer at different trophic levels.
- During conversation of energy in trophic levels, certain amount of energy is lost as a heat.



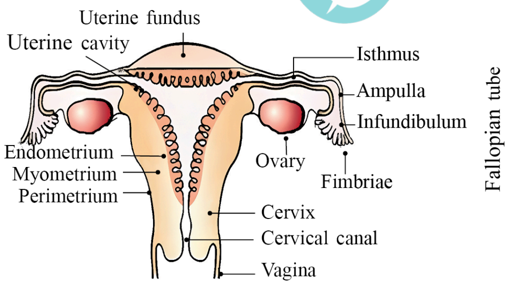
21.

- In this approach, threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care.
- Zoological parks, botanical gardens and wildlife safari parks serve this purpose.
- There are many animals that have become extinct in the wild but continue to be maintained in zoological parks.
- In recent years ex situ conservation has advanced beyond keeping threatened species in enclosures.
- Now gametes of threatened species can be preserved in viable and fertile condition for long periods using cryopreservation techniques.
- Eggs can be fertilized in vitro.
- Plants can be propagated using tissue culture methods.
- Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks.

Section C

- **Write the answer of the following questions : (Each carries 4 Mark)**

22.

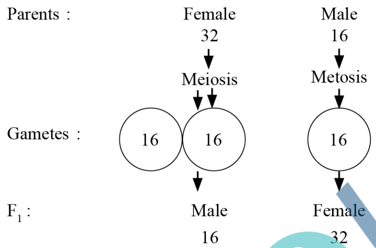
- 

- The oviducts (fallopian tubes), uterus and vagina constitute the female accessory ducts.
- Structure of Oviducts :
  - Each fallopian tube is about 10-12 cm long.
  - It extends from the periphery of each ovary to the uterus.
  - The part closer to the ovary is the funnel-shaped infundibulum.
  - The edges of the infundibulum possess finger-like projections called fimbriae, which help in collection of the ovum after ovulation.
  - The infundibulum leads to a wider part of the oviduct called ampulla.
  - The last part of the oviduct, isthmus has a narrow lumen and it joins the uterus.
- Structure of Uterus :

- The uterus is single and it is also called womb.
- The shape of the uterus is like an inverted pear.
- It is supported by ligaments attached to the pelvic wall.
- The wall of the uterus has three layers of tissue.
  (i) The external thin membranous perimetrium.
  (ii) middle thick layer of smooth muscle, myometrium.
  (iii) inner glandular layer called endometrium that line the uterine cavity.
- The endometrium undergoes cyclical changes during menstrual cycle while the myometrium exhibits strong contraction during delivery of the baby.
- The uterus opens into vagina through a narrow cervix.
- The cavity of the cervix is called cervical canal which along with vagina forms the birth canal.

23.

- The sex determination in honey bee is based on the number of sets of chromosomes an individual receives.
- An offspring formed from the union of a sperm and an egg develops as a female (queen or worker), and an unfertilised egg develops as a male (drone) by means of parthenogenesis.
- This means that the males have half the number of chromosomes than that of a female.
- The females are diploid having 32 chromosomes and males are haploid. i.e. having 16 chromosomes.
- This is known as haplodiploid sex-determination system and has special characteristic features such as males produce sperms by mitosis they do not have father and thus cannot have sons, but have grandfather and can have grandsons.

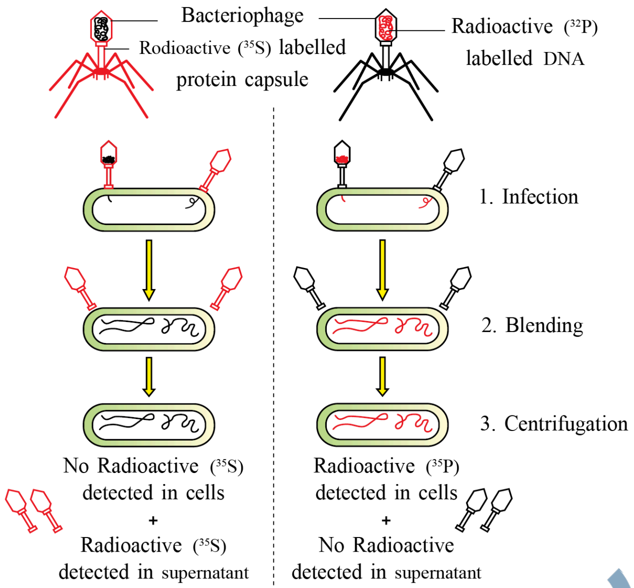


Sex determination in honey bee

24.

- The unequivocal proof that DNA is the genetic material came from the experiments of Alfred Hershey and Martha Chase (1952). They worked with viruses that infect bacteria called bacteriophages.
- The bacteriophage attaches to the bacteria and its genetic material then enters the bacterial cell.
- The bacterial cell treats the viral genetic material as if it was its own and subsequently manufactures more virus particles.
- Hershey and Chase worked to discover whether it was protein or DNA from the viruses that entered the bacteria.
- They grew some viruses on a medium that contained radioactive phosphorus and some others on medium that contained radioactive sulfur.
- Viruses grown in the presence of radioactive phosphorus contained radioactive DNA but not radioactive protein because DNA contains phosphorus but protein does not.
- Similarly, viruses grown on radioactive sulfur contained radioactive protein but not radioactive DNA because DNA does not contain sulfur.
- Radioactive phages were allowed to attach to E.coli bacteria.
- Then, as the infection proceeded, the viral coats were removed from the bacteria by agitating them in a blender.
- The virus particles were separated from the bacteria by spinning them in a centrifuge.
- Bacteria which was infected with viruses that had radioactive DNA were radioactive, indicating that DNA was the material that passed from the virus to the bacteria.
- Bacteria that were infected with viruses that had radioactive proteins were not radioactive.
- This indicates that proteins did not enter the bacteria from the viruses.

➥ DNA is therefore the genetic material that is passed from virus to bacteria.



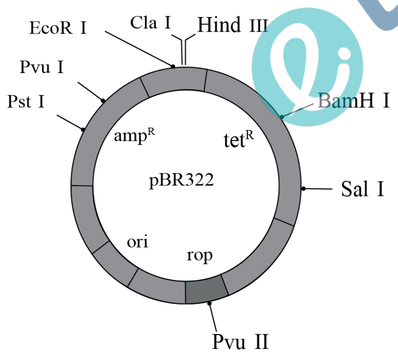
The Hershey-Chase experiment

25.

➥ 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.

➥ Presence of more than one recognition sites with in the vector will generate several fragments, which will complicate the gene cloning.



➥ The ligation of alien DNA is carried out at a restriction site present in one of the two antibiotic resistance genes.

➥ For example, you can ligate a foreign DNA at the BamHI site of tetracycline resistance gene in the vector pBR322.

➥ The recombinant plasmids will lose tetracycline resistance due to insertion of foreign DNA but can still be selected out from non-recombinant ones by plating the transformants on tetracycline containing medium.

➥ The transformants growing on ampicillin containing medium are then transferred on a medium containing tetracycline.

➥ The recombinants will grow in ampicillin containing medium but not on that containing tetracycline.

➥ But, non- recombinants will grow on the medium containing both the antibiotics.

➥ In this case, one antibiotic resistance gene helps in selecting the transformants, whereas the other antibiotic resistance gene gets 'inactivated due to insertion' of alien DNA, and helps in selection of recombinants.

26.

- In angiosperms, the seed is the final product of sexual reproduction.
  - It is often described as a fertilised ovule.
  - Seeds are formed inside fruits.
  - A seed typically consists of seed coat(s), cotyledon(s) and an embryo axis.

- **Structure**

(i) Seed coat :

- Integuments of ovules harden as tough protective seed coats. Outer integument form "testa" and inner integument form "Tegmen" (Aril is third integument present in some plants).
- The micropyle remains as a small pore in the seed coat.
- This facilitates the entry of oxygen and water into the seed during germination. Funiculus: Stack of ovule - forms stalk of the seed. Ultimately stalk withers and leaves a minute scar called "hilum".

(ii) Cotyledons :

- The cotyledons of the embryo are simple structures.
- Seeds are of three types based on food strorage in cotyledons or else where.

(a) Non-albuminous/Ex-albuminous/Non-endospermic seeds:

- In this type of seeds cotyledons are generally thick and swollen due to storage of food reserves.
- Seed has no residual endosperm as it is completely consumed during embryo development.
- e.g. pea, groundnut

(b) Albuminous/Endospermtic seeds :

- Retain a part of endosperm as they are not completely used up during embryo development
- e.g. wheat, maize, barley, castor.

(c) Perispermic seeds : Seeds having perisperm.

- Occasionally in some seeds such as black pepper and beat, remnants of nucellus are also persistent. This residual, persistent nucellus is the "perisperm"

(iii) Embryo axis :

- Discussed earlier in embryo section.

- As the seed matures, its water content is reduced and seeds become relatively dry. It has 10-15% moisture by mass.
- The general metabolic activity of the embryo slows down.
- The embryo may enter a state of inactivity called "dormancy" - If favourable conditions are available like adequate moisture, oxygen and suitable temperature, they germinate.

27.

- Innate immunity is non-specific immunity, which is present at the time of birth.
- 1) Physical barrier :
  - Our skin is the main physical barrier that prevents the entry of microorganisms.
  - Mucous membrane lining the respiratory tract, gastrointestinal tract and urinary tract also helps to prevent germs from entering the body.
- 2) Physiological barrier :
  - Acid in the stomach, saliva in the mouth, tears in the eyes etc. inhibit the growth of pathogens.
- 3) Cellular Barrier :
  - Some white blood cells [WBCs] in our body, such as polymorphonuclear leukocytes and natural killer cells, a type of lymphoid cell in the blood, can feed on and destroy microbes.
- 4) Cytokine barrier :
  - Virus-infected cells secrete proteins called interferons, which protect other uninfected cells from virus infection.