# BIOLOGY – FULL SYLLABUS
# MOCK TEST PAPER - 2
## *CBSE BOARD CLASS – XII (2025-26)*

***Maximum Marks : 70*** ***Time : 3 Hours***

### *General Instructions :*

*(i) All questions are compulsory.*

*(ii) The question paper has five sections and 33 questions. All questions are compulsory.*

*(iii) Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.*

*(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.*

*(v) Wherever necessary, neat and properly labeled diagrams should be drawn.*

## SECTION - A

**1.** The function of copper ions in copper releasing IUDs is that they
(a) inhibit gametogenesis
(b) make uterus unsuitable for implantation
(c) inhibit ovulation
(d) suppress sperm motility and fertilising capacity of sperms.

**2.** Match List-I with List-II.

| | **List-I** | | **List-II** |
|---|---|---|---|
| (p) | Vaults | (i) | Entry of sperm through cervix is blocked |
| (q) | IUDs | (ii) | Removal of vas deferens |
| (r) | Vasectomy | (iii) | Phagocytosis of sperms within the uterus |
| (s) | Tubectomy | (iv) | Removal of fallopian tube |

Choose the correct answer from the options given below.

| | **p** | **q** | **r** | **s** |
|---|---|---|---|---|
| (a) | (iii) | (i) | (iv) | (ii) |
| (b) | (iv) | (ii) | (i) | (iii) |
| (c) | (i) | (iii) | (ii) | (iv) |
| (d) | (ii) | (iv) | (iii) | (i) |

**3.** If the total amount of adenine and thymine in a double stranded DNA is 55%, the amount of guanine in this DNA will be
(a) 45% (b) 27.5% (c) 25% (d) 22.5%.

**4.** Hardy–Weinberg equilibrium is known to be essentially affected by factors like, gene flow, genetic drift, mutation, genetic recombination and
(a) evolution (b) limiting factors (c) saltation (d) natural selection.

**5.** Identify the type of immunity obtained when a injection of antitoxin in tetanus is given?

(a) Active immunity (b) Humoral immunity

(c) Passive immunity (d) All of these

**6.** Which lymphoid organ atrophies with age?

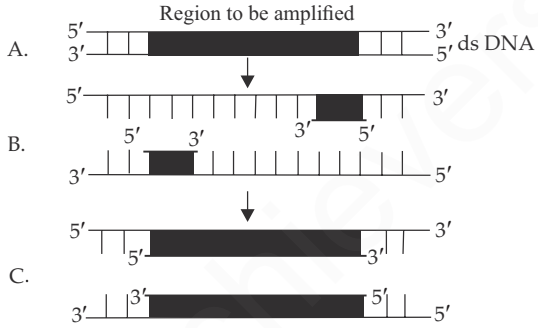
(a) Bone marrow (b) Peyer's patches

(c) Thymus (d) Spleen

**7.** BOD is (i) in polluted water and (ii) in potable water.

| | **(i)** | **(ii)** |
|---|---|---|
| (a) | more | less |
| (b) | less | more |
| (c) | less | less |
| (d) | medium | less |

**8.** The figure below shows three steps (A, B, C) of Polymerase Chain Reaction (PCR). Select the option giving correct identification together with what it represents.




(a) B - denaturation at a temperature of about 98°C separating the two DNA strands

(b) A - denaturation at a temperature of about 50°C

(c) C - extension in the presence of heat stable DNA polymerase

(d) A - annealing with two sets of primers

**9.** A biologist studied the population of rats in a barn. He found that the average natality was 250, average mortality 240, immigration 20 and emigration 30. The net increase in population is

(a) 05 (b) zero (c) 10 (d) 15.

**10.** Which interaction is shown when the invasive prickly pear cactus brought under control after introduction of moth from its natural habitat?

(a) Predation (b) Amensalism

(c) Mutualism (d) Competition

**11.** Mr. X is eating curd/yoghurt. For this food intake in a food chain he should be considered as occupying

(a) first trophic level (b) second trophic level

(c) third trophic level (d) fourth trophic level.

**12.** In which of the following, both pairs have correct combination?

(a) *In-situ* conservation : Seed Bank
*Ex-situ* conservation : National Park

(b) *In-situ* conservation : Tissue culture
*Ex-situ* conservation : Sacred groves

(c) *In-situ* conservation : National Park
*Ex-situ* conservation : Botanical Garden

(d) *In-situ* conservation : Cryopreservation
*Ex-situ* conservation : Wildlife Sanctuary

**Q. No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:**

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true and R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

**13. Assertion :** In angiosperms, the central cell after triple fusion becomes the primary endosperm cell.
**Reason :** Double fertilisation ensures that the nutritive tissue is formed before the zygote starts cleaving.

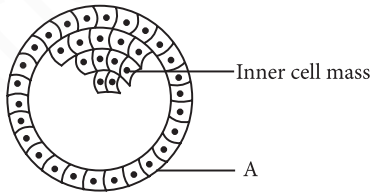
**14. Assertion :** When yellow bodied, white eyed *Drosophila* females were hybridised with brown-bodied, red eyed males; and $F_1$ progeny was intercrossed, $F_2$ ratio deviated from 9 : 3 : 3 : 1.
**Reason :** When two genes in a dihybrid are on the same chromosome, the proportion of parental gene combinations are much higher than the non-parental type.

**15. Assertion :** Organisations like GEAC are necessary to monitor GM researches and to test the safety of introducing GM organisms for public services.
**Reason :** GM researches can have unpredictable results which even can be disastrous when genetically modified organisms are introduced into the ecosystem.

**16. Assertion :** Predators maintain prey population under control.
**Reason :** Predators reduce the intensity of competition among competing prey species.

## SECTION - B

**17.** Refer to the following figure and answer the questions that follow :




(i) Name the stage of human embryo the figure represents. Identify 'A' in the figure and mention its functions.

(ii) Where are the stem cells located in this figure?

**18.** A cross between a red flower bearing plant and a white flower bearing plant of *Antirrhinum* produced all plants having pink flowers. Work out a cross to explain how this is possible.

**19.** Name an allergen and write the response of the human body when exposed to it.

**20.** (a) How is an exonuclease functionally different from an endonuclease?

(b) Give an example of any two endonucleases other than *Sal* I.

**21.** Construct a pyramid of numbers considering a big banyan tree supporting a population of insects, small birds and their predators.

**OR**

Explain 'standing crop' in an ecosystem. Draw a pyramid of biomass when a small standing crop of phytoplanktons supports large standing crop of zooplanktons in the sea.

## SECTION - C

**22.** Explain the hormonal control of spermatogenesis in humans.

**23.** Emasculation and bagging are the two important steps carried during artificial hybridisation to obtain superior varieties of desi red plants. Explain giving reasons, in which types of flowers and at what stages are the two processes carried out.

**24.** What are 'SNP's? Where are they located in a human cell? State any two ways the discovery of SNPs can be of importance to humans.

**25.** (a) Rearrange the following in the correct order of their appearance on earth between two million years and 40,000 years back.

*Neanderthals, Australopithecines, Homo erectus* and *Homo habilis*.

(b) Which one of the above

(i) had the largest brain size (ii) ate fruits?

**26.** (a) Name and explain giving reasons, the type of immunity provided to the newborn by the colostrum and vaccinations.

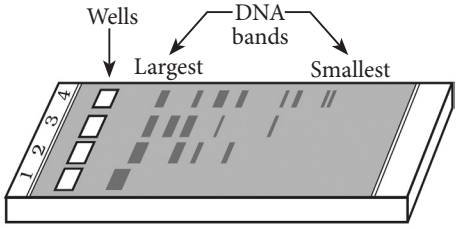
(b) Name the type of antibody

(i) present in colostrum (ii) produced in response to allergens in human body.

**OR**

At what stage is *Plasmodium* picked up by the female *Anopheles*? Describe the life cycle of the parasite in this insect.

**27.** Name and describe the technique shown below that helps in separating the DNA fragments formed by the use of restriction endonuclease.

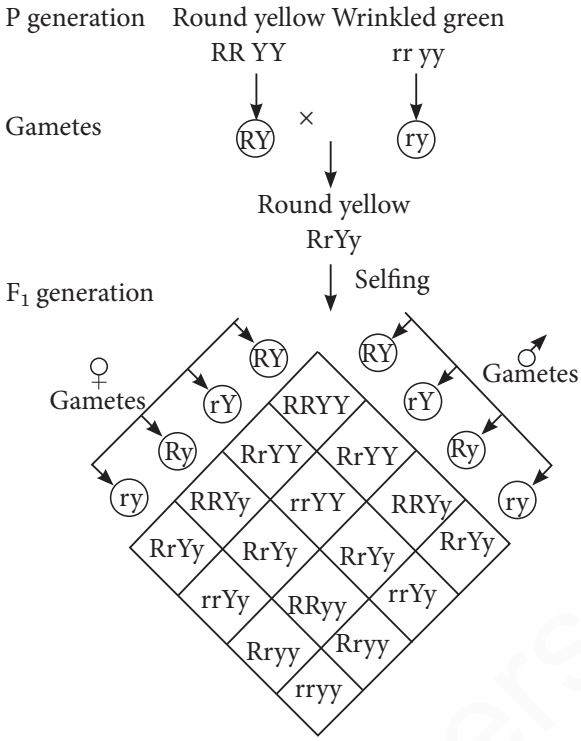



**28.** What are the consequences of loss of biodiversity in a region? Explain.

## SECTION - D

**Q. No. 29 and 30 are case based questions. Each question has 3 subparts with internal choice in one subpart.**

**29.** A scientist crosses homozygous round yellow seeded pea plant to homozygous wrinkled green seeded pea plant and observed the inheritance of both traits as per the following pattern. He collected total 1600 seeds in $F_2$ generation.




(a) How many seeds would be homozygous for round shape and green colour in $F_2$ generation?

**OR**

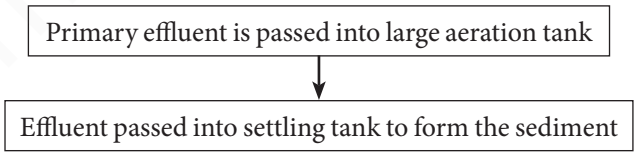
How many seeds could be heterozygous for round shape and yellow colour in $F_2$ generation?

(b) What phenotypic ratio would be obtained if the plants of $F_1$ generation would be crossed with wrinkled green seeded plant?

(c) What would be the total number of seeds heterozygous for yellow colour and homozygous for round seed shape?

**30.** Large quantities of sewage is generated everyday in cities and towns, which is treated in Sewage Treatment Plants (STPs) to make it less polluted. Given below is the flow chart of one of the stages of STP.

Observe the given flow chart and answer the questions accordingly.




(a) Why large aeration tanks are important for primary effluent?

(b) Write the significance of activated sludge.

(c) Explain the digestion step in the formation of biogas.

**OR**

Explain the role of flocs in the given sewage treatment plant (STP).

## SECTION - E

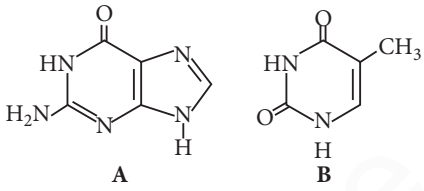
**31.** Explain the different stages of oogenesis in humans starting from fetal life till its completion. When and where in body is oogenesis completed?

**OR**

(a) Trace the development of embryo after syngamy in a dicot plant with diagrams.

(b) Endosperm development precedes embryo development. Give reason.

**32.** Observe the given figures and answer the following questions.



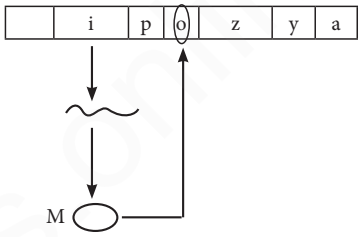

(a) Identify the nitrogenous bases A and B.

(b) Where are these molecules found?

(c) What are the type and number of bonds they form with other nitrogenous bases?

**OR**

Refer to given figure showing regulation of gene expression in *E.coli* and answer the following questions.




(a) Name the molecule 'M' that binds with the operator.

(b) Mention the result of such binding.

(c) What will prevent the binding of the molecule 'M' with the operator gene? Mention the event that follows.

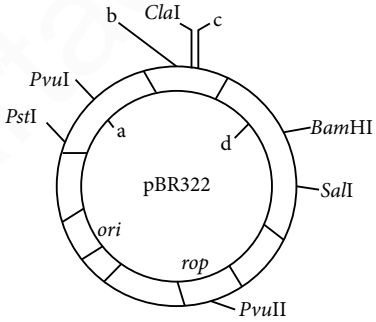
**33.** (a) A and B are the two different cloning vectors in two different bacterial colonies cultured in chromogenic substrate. Bacterial colonies with cloning vector A were colourless whereas those with B were blue coloured. Explain giving reasons the cause of the difference in colour that appeared.

(b) What are cloning vectors? Give examples.

(c) How do *'ori'* and 'cloning sites' facilitate cloning into a vector?

**OR**

(a) Identify the selectable markers in the diagram of *E. coli* vector shown below.




(b) How is the coding sequence of β-galactosidase considered a better marker than the ones identified by you in the diagram? Explain.

# SOLUTIONS

**1. (d) :** Copper releasing IUDs (*e.g.*, CuT, Cu7 and multi load 375) are placed in the uterus of the females. Copper ions released by them suppress motility and fertilising capacity of the sperms.

**2. (c)**

**3. (d) :** According to the Chargaff's rule,
A = T and G = C
A + G = T + C
A + T = 55%
So, A = 27.5 than T = 27.5%
G + C = 100 – 55% = 45%
G = C = 22.5%

**4. (d) :** Hardy-Weinberg principle describes a theoretical situation in which a population is undergoing no evolutionary change. It states that allele frequencies in a population are stable and constant from generation to generation. There are five factors that affect Hardy-Weinberg Principle. These are - mutation, gene flow, genetic drift, genetic recombination and natural selection.

**5. (c) :** If a person is infected with some deadly microbes, a quick immune response is required against microbes. This quick response can be initiated by directly injecting the preformed antibodies or antitoxin. This type of immunisation is called passive immunisation.

**6. (c)** **7. (a)**

**8. (c) :** In the given figure of PCR A, B and C are denaturation, annealing and extension respectively.

**9. (b) :** Natality and immigration positively contribute to the population growth while mortality and emigration are negative factors. In the given question,
The net increase in population is
natality + immigration = 250 + 20 = 270
The net decrease in population is
mortality + emigration = 240 + 30 = 270
Thus, net increase in population = 270 – 270 = 0

**10. (a)**

**11. (c) :** Mr. X eating curd/yoghurt should be considered as occupying third trophic level. Producers or green plants (first trophic level) are consumed by herbivores (second trophic level) and from them curd/yoghurt (made from dairy breed) is consumed by third trophic level organisms like man.

**12. (c) :** *In-situ* (on site) conservation is conservation and protection of the whole ecosystem and its biodiversity at all levels, in order to protect the threatened species. Two *in-situ* methods are being used to save biodiversity *viz*., hotspots and protected areas. Protected areas include National parks, sanctuaries, biosphere reserves and sacred groves. *Ex-situ* (off site) conservation is conservation of selected rare plants/animals in places outside their natural homes. *Ex-situ* conservation includes botanical garden, zoological parks, seed banks, gene banks, *in vitro* fertilisation, cryopreservation techniques and tissue culture.

**13. (a)**

**14. (a) :** In *Drosophila*, the genes for body and eye colour are located on X chromosome. When two genes in a dihybrid cross are situated on the same chromosome, the proportion of parental gene combination are higher than non-parental type. This occurs due to physical association or linkage of the two genes while non-parental gene combinations due to recombination between two genes. Thus, linkage and recombination deviates the ratio from Mendelian ratio of a dihybrid cross, *i.e.,* 9 : 3 : 3 : 1.

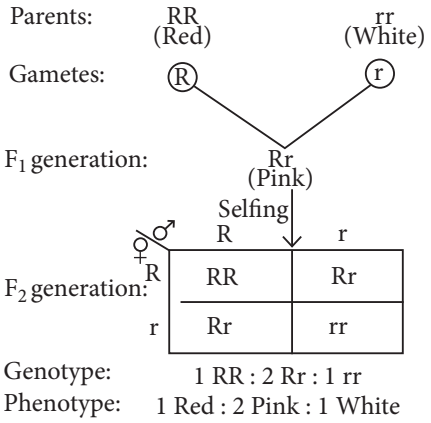
**15. (a)**

**16. (a) :** Predation is an interaction between members of two species in which members of one species capture, kill and eat up members of other species. The former are called predators while the latter are termed as preys. Predators also help in maintaining prey population under control by reducing the intensity of competition among competing prey species.

**17.** (i) Blastocyst
A is trophoblast. It helps in attachment of the blastocyst to the endometrium of uterine wall, help to provide nutrition to the embryo and later forms extra embryonic membranes namely chorion and amnion and parts of placenta.
(ii) Inner cell mass.

**18.** Neither of the two alleles of a gene is completely dominant over the other, hence the phenomenon

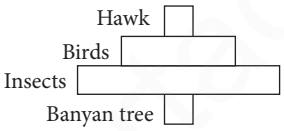
is known as incomplete dominance. Incomplete dominance in *Antirrhinum* is explained below :




**19.** Pollen grain is an allergen. Exposure to pollen causes hay fever. It is the form of allergy due to pollen of grasses, trees and other plants. It is characterised by inflammation of the membrane lining the nose and sometimes of the conjunctiva. The symptoms are sneezing, running nose and watering eyes due to release of histamine.

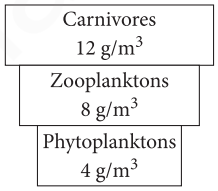
**20.** (a) Exonucleases remove nucleotides from the ends of the DNA whereas endonucleases make cuts at specific positions within the DNA.
(b) Two examples of endonucleases other than *Sal*I are *Eco*RI and *Hin*dII.

**21.** In the given case, pyramid of numbers will be spindle-shaped as shown here.




**OR**

Standing crop refers to mass of living material at a particular trophic level at a particular time. It is measured as biomass or the number in a unit area.
Pyramid of biomass in sea is inverted as shown here.




**22.** During spermatogenesis, gonadotropin releasing hormone (GnRH) is secreted by the hypothalamus, which stimulates the anterior pituitary gland to secrete luteinising hormone (LH) and follicle stimulating hormone (FSH). LH acts on the Leydig's cells of the testes to secrete testosterone while FSH acts on Sertoli cells of the seminiferous tubules of the testes to secrete androgen binding protein (ABP) and inhibin. ABP concentrates testosterone and inhibin suppresses FSH synthesis. FSH also acts on spermatogonia to stimulate sperm production.

**23.** Emasculation is removal of male sex organs (anther) from the floral buds of bisexual flower (possess both stamen and pistil). A breeder needs to emasculate a bisexual flower to eliminate the chances of self pollination. Breeder needs to remove anthers from the flower bud before the anther dehisces using a pair of forceps. Dehiscence results in the release of pollen which may then reach the stigma (part of pistil) and lead to germination of pollen grain. Bagging is the covering of flowers by butter paper or polythene. Bagging can be done in both bisexual and unisexual flowers. In the case of bisexual flowers emasculation is followed by bagging. Emasculated flowers must be kept covered by bags to prevent from contamination by unwanted pollen grains.

**24.** 'SNP's stands for single nucleotide polymorphism. About 1.4 million single base DNA differences or SNPs have been identified in humans. SNPs occur normally throughout a person's DNA almost once in every 1000 nucleotides on an average. Their number may be more than 10 million.
They are helpful in finding chromosomal locations with disease associated sequences and tracing human history.

**25.** (a) *Australopithecus* → *Homo habilis* → *Homo erectus* → *Neanderthals*
(b) (i) *Neanderthals* (ii) *Australopithecus*

**26.** (a) Colostrum (mother's first milk) provides natural passive immunity to new born. In passive immunity, ready-made antibodies are directly given to protect the body against foreign agents.
Through vaccination, artificial active immunity will be provided to the newborn in which his own cells will produce antibodies in response to vaccine. *E.g.*, BCG vaccine for tuberculosis.
(b) (i) IgA (ii) IgE

**OR**

Female *Anopheles* mosquito picks up *Plasmodium* as gametocytes with blood meal.
Life cycle of *Plasmodium* in mosquito is as follows :
The gametocytes come out of the RBCs into the lumen of the stomach of the mosquito. Inside the stomach of the mosquito, the male and female gametocytes change into male and female gametes respectively. The gametes fuse (fertilise) to form zygote called oocyst. The nucleus of oocyst divides first by meiosis and subsequently by mitosis, forming large number of small haploid nuclei. At the same time, spindle

shaped bodies called sporozoites are formed. When mature oocysts rupture, the sporozoites are liberated into the haemocoel (body cavity filled with blood) of the mosquito. Being motile, the sporozoites move to different organs in the body cavity of the mosquito, but many of them penetrate the salivary glands. The mosquito now becomes infective. When the female *Anopheles* mosquito bites a healthy person, the sporozoites are injected in his/her blood along with saliva. These sporozoites start the cycle again in human body.

**27.** After the cutting of DNA by restriction enzyme, fragments of DNA are formed. Separation of DNA fragments according to their size or length is done by a technique called agarose gel electrophoresis.

It is a technique of separation of molecules such as DNA, RNA or protein, under the influence of an electrical field, so that they migrate in the direction of electrode bearing the opposite charge, *viz*., positively charged molecules move towards cathode (–ve electrode) and negatively charged molecules travel towards anode (+ve electrode) through a medium/ matrix. Most commonly used matrix is agarose.

DNA fragments separate according to size through the pores of agarose gel. Hence the smaller the fragment size, the farther it moves.

The separated DNA fragments can be seen only after staining the DNA with a compound known as ethidium bromide (EtBr) followed by exposure to UV radiation. The fragments are visible as bright orange coloured bands.

**28.** The loss of biodiversity in a region may lead to:

(i) decline in ecosystems productivity (the amount of food energy that is converted into the biomass).

(ii) lowered resistance to environmental perturbations such as drought.

(iii) increased variability in certain ecosystem processes such as plant productivity, water use and pest and disease cycle.

(iv) extinction of plants and animals due to habitat loss, fragmentation and biodiversity loss.

(v) excessive exploitation of a species whether plant or animal reduces size of its population so that it becomes vulnerable to extinction.

**29.** The given cross represents the dihybrid cross. The total number of seeds produced in $F_2$ generation are 1600.

(a) According to the given cross, the seeds homozygous for round shape and green colour are 1/16. Therefore, the total number of round green seeds obtained is 100 (RRyy).

Homozygous round green seeds = 1/16 × 1600 = 100

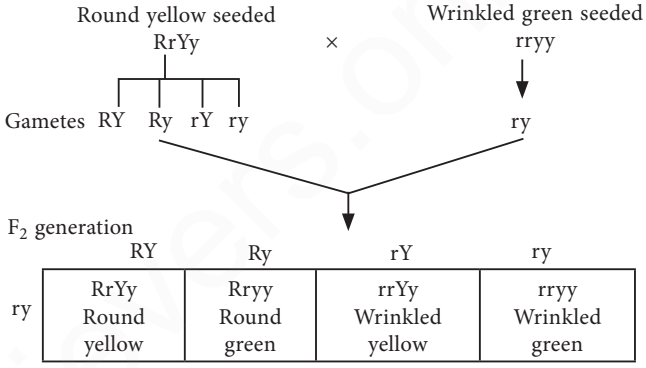
**OR**

According to the given cross, the seeds heterozygous for round shape and yellow colour are 4/16 (RrYy).

Therefore, the total number of round yellow seeds

$$= \frac{4}{16} \times 1600 = 400$$

(b) The cross between $F_1$ hybrids with wrinkled green seeded plants (rryy) can be explained with the help of following cross:




The phenotypic ratio obtained in $F_2$ generation is 1:1:1:1 and the genotypic ratio obtained in $F_2$ generation is 1:1:1:1.

(c) The analysis of cross reveals that the number of seeds heterozygous for yellow colour and homozygous for round seed shape are 2 out of 16. (RRYy)

Therefore, the total number of seeds heterozygous for yellow colour and homozygous for round seed shape are:

= 2/16 × 1600 = 200

**30.** (a) Primary effluent is passed into large aeration tank for vigorous growth of useful aerobic microbes into flocs.

(b) Activated sludge is the term used for the sediment formed. Some of it is pumped back into the aeration tank to serve as an inoculum.

(c) During digestion, the major part of activated sludge is passed into a large tank called anaerobic sludge digester. Here, aerobic microbes (if present in the sludge) get killed. Anaerobic microbes digest the organic matter as well as aerobic microbes of the sludge. During this digestion, bacteria produce a mixture of gases ($CH_4$, $CO_2$, $H_2S$, etc.). These gases form biogas and can be used as source of energy.

**OR**

During secondary treatment, the primary effluent is taken to aeration tanks. A large number of aerobic heterotrophic microbes grow in the aeration tank. They form flocs which are masses of bacteria held together by slime and fungal filaments to form mesh like structures. The microbes digest a lot of organic matter, converting it into microbial biomass and releasing a lot of minerals. As a result, the BOD of the waste matter is reduced to 10-15% of raw sewage, it is passed into settling tank.

**31.** The process of formation of a mature female gamete (ovum) is called oogenesis. It occurs in the ovaries. It consists of three phases : multiplication, growth and maturation.

(i) Multiplication phase : In the fetal development, certain cells in the germinal epithelium of the ovary of the fetus are larger than others. These cells divide by mitosis, producing a couple of million egg mother cells or oogonia in each ovary of the fetus. The oogonia multiply by mitotic divisions forming the primary oocytes.

(ii) Growth phase : This phase of the primary oocyte is very long. The oogonium grows into a large primary oocyte by taking food from the surrounding follicle cells.

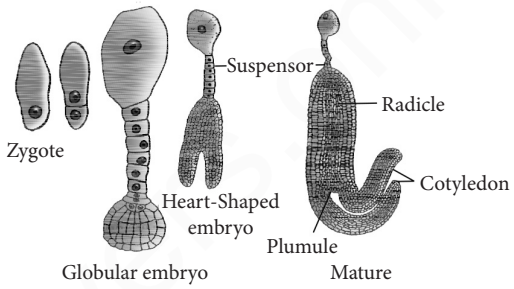
(iii) Maturation phase : Each primary oocyte undergoes two maturation divisions, first meiotic and the second meiotic.

In the first, meiotic division, the primary oocyte divides into two very unequal haploid daughter cells - a large secondary oocyte and a very small first polar body. In the second maturation division, the first polar body may divide to form two second polar bodies. The secondary oocyte again divides into unequal daughter cells, a large ootid and a very small second polar body. The ootid grows into a functional haploid ovum. Thus from one oogonium, one ovum and three polar bodies are formed. The polar bodies take no part in reproduction and, hence, soon degenerate. In humans, ovum is released from the ovary in the secondary oocyte stage, this process is called ovulation.

Oogenesis gets completed in fallopian tube during fertilisation events.

**OR**

(a) Embryo develops at the micropylar end of the embryo sac where the zygote is situated. Most zygotes divide only after certain amount of endosperm is formed. This is an adaptation to provide assured nutrition to the developing embryo. Though the seeds differ greatly, the early stages of embryo development (embryogeny) are similar in both monocotyledons and dicotyledons. The zygote gives rise to the proembryo and subsequently to the globular, heart-shaped and mature embryo. A typical dicotyledonous embryo, consists of an embryonal axis and two cotyledons. The portion of embryonal axis above the level of cotyledons is the epicotyl, which terminates with the plumule or stem tip. The cylindrical portion below the level of cotyledons is hypocotyl that terminates at its lower end in the radicle or root tip. The root tip is covered with a root cap (calyptra). The stages in embryo development in a dicot is shown below.




(b) Endosperm provides nourishment to the developing embryo. So, endosperm development precedes embryo development.

**32.** (a) The given figure represents two molecules A-Guanine, B-Thymine. Guanine is a kind of purine (a two ringed, heterocyclic nitrogenous compound) and thymine is a kind of pyrimidine (single ringed nitrogenous compound).

(b) Purines (adenine and guanine) and pyrimidines (thymine, cytosine and uracil) are involved in making nucleic acids- DNA and RNA. Purines and pyrimidines are an important ingredient of the DNA along with the phosphate and the pentose sugar. They form the backbone of nucleic acid as nucleotides. Thymine is found in DNA only.

(c) In DNA, guanine pairs with cytosine with three hydrogen bonds and thymine pairs with adenine with two hydrogen bonds.

**OR**

(a) M is repressor protein.

(b) Binding of repressor (M) with operator (O) switches off the *lac* operon.

(c) Presence of inducer *i.e.,* lactose will prevent the binding of the molecule M with the operator gene. Inducer will bind to the repressor, change the latter into non-DNA binding state so as to free the operator gene and switch on the *lac* operon.

**33.** (a) Presence of the insert within a gene results in insertional inactivation of the enzyme β-galactosidase, hence bacterial colonies do not produce any colour. Therefore, bacterial colonies with cloning vector A are colourless as they are recombinants with the insert and bacterial colonies with cloning vector B are blue coloured as they are non-recombinants.

(b) Cloning vectors are DNA molecules that can carry foreign DNA segment and replicate inside a host cell. It may be plasmids, a phagemid, cosmids, yeast artificial chromosomes(YACs), Bacterial artificial chromosomes (BACs) and viruses.

(c) *Ori* sites are the origin of replication sites which control replication of the DNA in which they are present. Cloning of a vector containing rDNA requires its multiplication to produce large number of copies and ori is essential for it. Cloning sites are the specific sites in vector that possess recognition sequences for a particular enzyme. It enables insertion of foreign DNA segment into that particular site.

**OR**

(a) Selectable marker in given cloning vector pBR322 are ampicillin resistance gene(a), and tetracycline resistance gene(d). They help in selecting transformant from non-transformant ones.

(b) Selection of recombinants due to inactivation of antibiotics is a cumbersome procedure because it requires simultaneous plating on two plates having different antibiotics. Therefore, alternative selectable markers have been developed which differentiate recombinants from non-recombinants on the basis of their ability to produce colour in the presence of a chromogenic substrate. In this, a recombinant DNA is inserted within the coding sequence of an enzyme, β-galactosidase. This results into inactivation of the enzyme, which is referred to as insertional inactivation. The presence of a chromogenic substrate gives blue coloured colonies if the plasmid in the bacteria does not have an insert. Presence of insert results into insertional inactivation of the β-galactosidase and the colonies do not produce any colour, these are identified as recombinant colonies.