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## PRE-BOARD-1 SET -1 (2022-23)

## CLASS –XII (BIOLOGY-044)

**ANSWER KEY**

Que1. d

Que2. a

Que3. a

Que4. a

Que5. b

Que6. b

Que7. b

Que8.a

Que9. C

Que10. d

Que11. b

Que12. C

Que13. a

Que14. C

Que15. C

Que16. a

**Que17**. Following are the two advantages:

- A breastfeeding mother does not ovulate. So the chances of conceiving are equal to none.
- No pills will be required as a birth control measure; hence, no side-effects.

**Que18.** Sterile air bubbles are sparged into stirred tank bioreactor. The surface area for oxygen transfer is increased.

OR

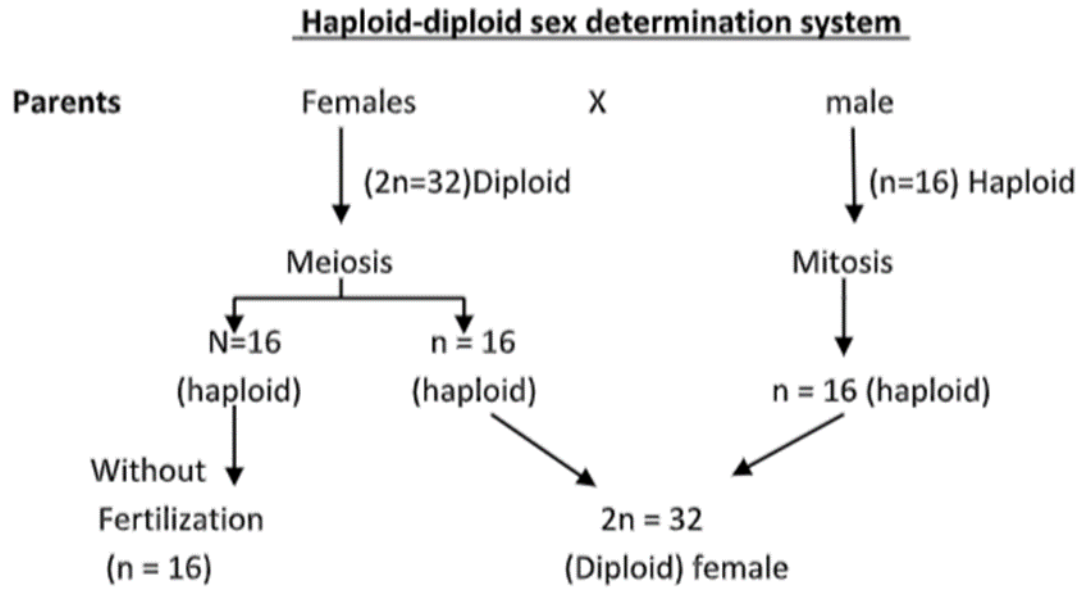
A- Allolactose

B- Beta-Galactosidase

C- Permease

D- Transacetylase

**Que19.**




**Que20.** Bone marrow

Bone marrow is a sponge-like tissue found inside the bones. That is where most immune system cells are produced and then also multiply. These cells move to other organs and tissues through the blood. At birth, many bones contain red bone marrow, which actively creates immune system cells. Over the course of our life, more and more red bone marrow turns into fatty tissue. In adulthood, only a few of our bones still contain red bone marrow, including the ribs, breastbone and the pelvis.

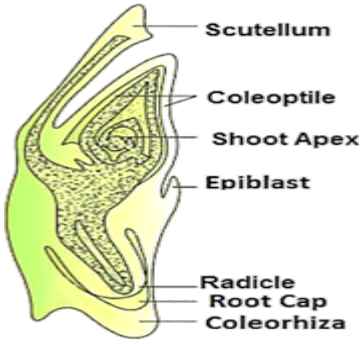
Thymus

The thymus is located behind the breastbone above the heart. This gland-like organ reaches full maturity only in children, and is then slowly transformed to fatty tissue. Special types of immune system cells called thymus cell lymphocytes (T cells) mature in the thymus. Among other tasks, these cells coordinate the processes of the innate and adaptive immune systems. T cells move through the body and constantly monitor the surfaces of all cells for changes.

**Que21.** (a) r is the intrinsic rate of natural increase

(b) Increase in "r" value means birth rate is more and death rate is less. Decrease in "r" value means birth rate is less and death rate is more. This is how 'r" value affects the population size.

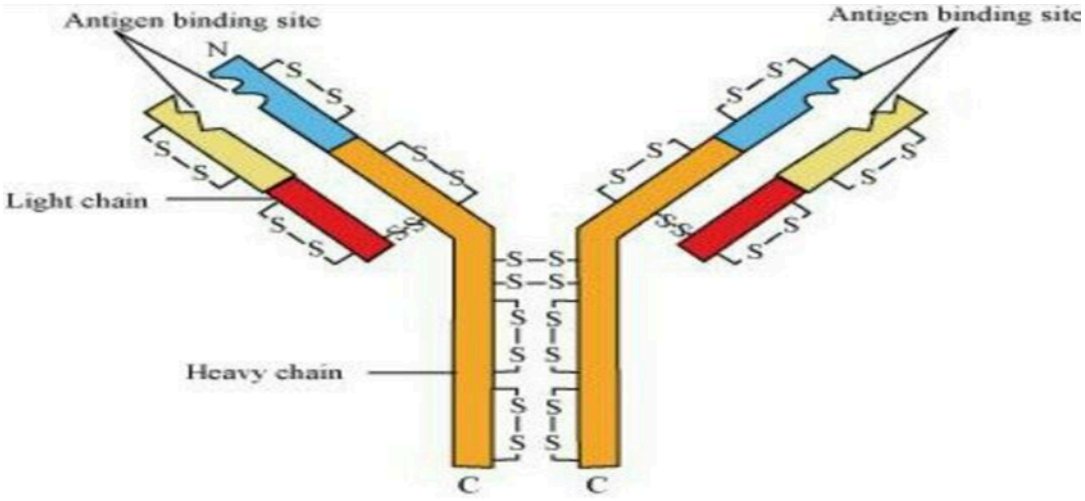
**Que22.**




**Que23**

The fertilized egg contains the genetic material of both the parent i.e. it has the best genetic composition out of the two available genes sets. This fertilized egg cell, after maturation, i.e. after growing into an adult will exhibit the same characters present in that fertilized egg. That's why a fertilized egg is the blueprint of future development.

OR




Structure of an antibody molecule

**Que24**. Replication in DNA strand occurs within a small opening of the DNA helix, known as replication fork.

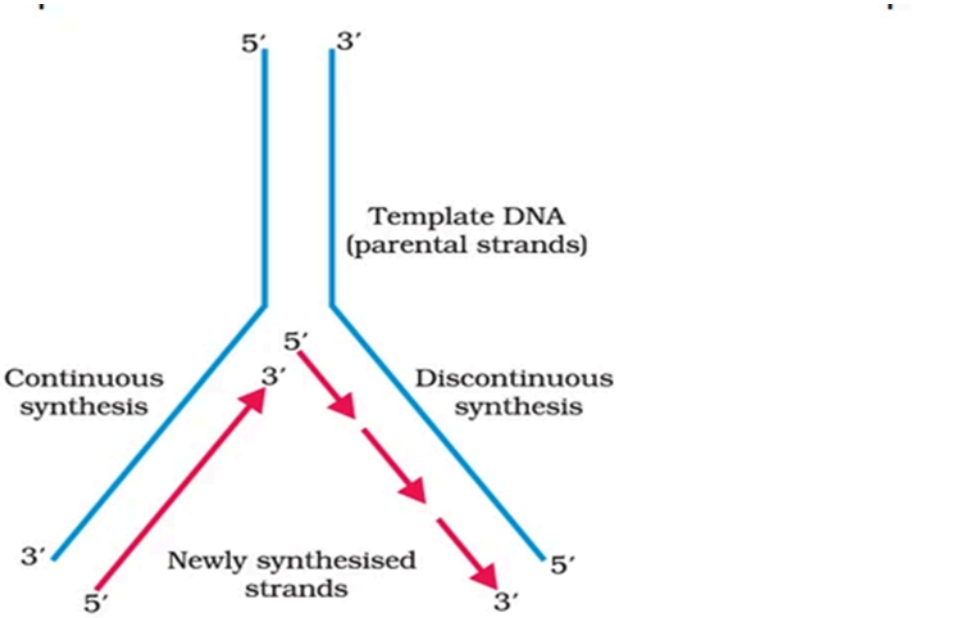



**Fig4. Replication fork** (source NCERT)

DNA polymerases catalyse polymerisation only in one direction, i.e. 5′ → 3′. It creates additional complications at the replicating fork. Consequently, on one strand (template 3′ → 5′), the replication is continuous. This is known as leading strand, while on the other strand (template 5′ → 3′), it is discontinuous. This is known as lagging strand.

The discontinuously synthesised fragments called Okazaki fragments are later joined by DNA ligase.

**Que25**. Stanley L. Muller and Harold C. Urey performed an experiment to describe the origin of life on earth. They were of the idea that the early earth's atmosphere was able to produce amino acids from inorganic matter. The two biologists made use of methane, water, hydrogen, and ammonia which they considered were found in the early earth's atmosphere. The chemicals were sealed inside sterile glass tubes and flasks connected together in a loop and circulated inside the apparatus.

One flask is half-filled with water and the other flask contains a pair of electrodes. The water vapour was heated and the vapour released was added to the chemical mixture. The released gases circulated around the apparatus imitating the earth's atmosphere. The water in the flask represents the water on the earth's surface and the water vapour is just like the water evaporating from lakes, and seas. The electrodes were used to spark the fire to imitate lightning and storm through water vapour.

The vapours were cooled and the water condensed. This condensed water trickles back into the first water flask in a continuous cycle. Miller and Urey examined the cooled water after a week and observed that 10-15% of the carbon was in the form of organic compounds. 2% of carbon had formed 13 amino acids. Yet, the Miller and Urey experiments were condemned by their fellow scientists.

**Que26.** Flocs are masses of essential bacteria associated with fungal filaments to form a mesh-like structure. They are in a sludge structure. They help in increased aerobic decomposition as well as filament help in trapping particles when they are put in the secondary sewage tank.

The activated sludge is a process with high concentration of microorganisms, basically bacteria, protozoa and fungi, which are present as loose clumped mass of fine particles that are kept in suspension by stirring, with the aim of removing organic matter from wastewater.

**Que27**. Nematode *Meloidegyne incognitia* infects the roots of tobacco plants and causes a great reduction in yield. RNA interference (RNAi) was used to stop this infestation. This method involves silencing of a specific mRNA due to a complementary dsRNA molecule that binds to and prevents translation of the mRNA (silencing). The source of this complementary RNA could be from an infection by viruses having RNA genomes or mobile genetic elements (transposons) that replicate via an RNA intermediate.

**Que28**. In-situ conservation, the conservation of species in their natural habitats, is considered the most appropriate way of conserving biodiversity. Conserving the areas where populations of species exist naturally is an underlying condition for the conservation of biodiversity.

**Que29.** (i) RNA contain a reactive 2'-OH group at every ribose sugar, which makes it liable and easily degradable. It also contain uracil which is less stable than thymine in DNA.

(ii) RNA was the first genetic material because essential life prosesses like metabolism, translation, splicing etc, evolved around RNA.

(iii) Yes, Human contains RNA. It helps in the transmission of genetic information during protein synthesis or translation.

**Que30.** (i) Penicillium notatum

(ii) Propionibacterium sharmanii produce large amount of $CO_2$ gas, which then produces large holes in swiss cheese.

(iii) Cyclosporin-A produced by Trichoderma polysporum and used as an immunosuppressive agent in organ transplant patients. Statins are produced by the yeast Monascus purpureus and function as blood cholesterol lowering agents.

**Que31.** Process of Recombinant DNA Technology

The complete process of recombinant DNA technology includes multiple steps, maintained in a specific sequence to generate the desired product.

Step-1. Isolation of Genetic Material.

The first and the initial step in Recombinant DNA technology is to isolate the desired DNA in its pure form i.e. free from other macromolecules.

Step-2.Cutting the gene at the recognition sites.

The restriction enzymes play a major role in determining the location at which the desired gene is inserted into the vector genome. These reactions are called 'restriction enzyme digestions'.

Step-3. Amplifying the gene copies through Polymerase chain reaction (PCR).

It is a process to amplify a single copy of DNA into thousands to millions of copies once the proper gene of interest has been cut using restriction enzymes.

Step-4. Ligation of DNA Molecules.

In this step of Ligation, the joining of the two pieces – a cut fragment of DNA and the vector together with the help of the enzyme DNA ligase.

Step-5. Insertion of Recombinant DNA Into Host.

In this step, the recombinant DNA is introduced into a recipient host cell. This process is termed as Transformation. Once the recombinant DNA is inserted into the host cell, it gets multiplied and is expressed in the form of the manufactured protein under optimal conditions.

OR

Types of Ecological Pyramid

Three types of ecological pyramid exist. They are as follows:

Pyramid of Numbers

In this type of ecological pyramid, the number of organisms in each trophic level is considered as a level in the pyramid. The pyramid of numbers is usually upright except for some situations like that of the detritus food chain, where many organisms feed on one dead plant or animal.

Pyramid of Biomass

In this particular type of ecological pyramid, each level takes into account the amount of biomass produced by each trophic level. The pyramid of biomass is also upright except for that observed in oceans where large numbers of zooplanktons depend on a relatively smaller number of phytoplanktons.

Pyramid of Energy

Pyramid of energy is the only type of ecological pyramid, which is always upright as the energy flow in a food chain is always unidirectional. Also, with every increasing trophic level, some energy is lost into the environment.

**Que32**. (a) Aneuploidy - the abnormal condition were one or more chromosomes of a normal set of chromosomes are missing or present in more than their usual number of copies. Monoploidy - the loss of an entire set of chromosomes. Euploidy - an entire set of chromosomes is duplicated once or several times.

(b) (i) Down syndrome: This syndrome is a type of trisomy as there is an extra copy of chromosome 21. It is named after the person who discovered this chromosomal disorder – Langdon Down. The symptoms in a person include the following:

The person is short and has a small and round head

Physical and mental development is retarded

Furrowed tongue and partially open mouth,

Broad palm

(ii) Klinefelter syndrome: This genetic disorder arises due to the presence of an additional X chromosome in males. Thus, resulting in a chromosome count of 47 (44 + XXY) instead of 46. The symptoms include:

Such a person has a masculine physique but has feminine development like the development of breasts

Such individuals are sterile, i.e.; they cannot reproduce

(iii) Turner syndrome: Unlike Klinefelter syndrome, in this chromosomal disorder there is the absence of one X chromosome in females. Hence, decreasing the chromosomes count to 45 (44 + X0). The symptoms include the following:

Such females are sterile

Have rudimentary ovaries and there is the absence of secondary sexual characters.OR

(a) Any two

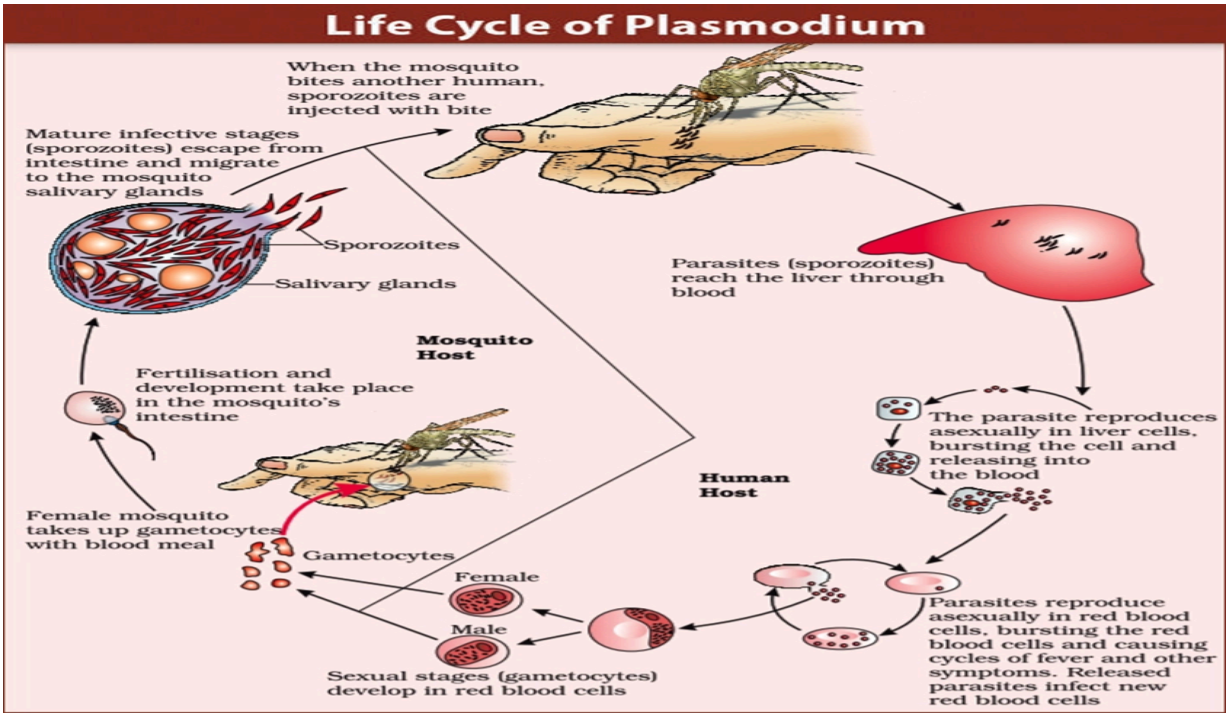
(i) Plasmodium vivax

(ii) Plasmodium falciparum

(iii) Plasmodium malariae

(iv) Plasmodium ovale

(b)



(c) Feeling of chilliness, In response to chills the body temperature starts rising and may reach 106 F at the height of fever. The patient sweats a lot and temperature steadily goes down to normal.

**Que33**. An organism undergoes a series of changes throughout its life cycle. Gametogenesis (spermatogenesis and oogenesis), plays a crucial role in humans to support the continuance of generations.

Gametogenesis is the process of division of diploid cells to produce new haploid cells. In humans, two different types of gametes are present. Male gametes are called sperm and female gametes are called the ovum.

Spermatogenesis: Sperm formation

Oogenesis: Ovum formation

Spermatogenesis

In the male, immature germ cells are produced in the testes. At puberty, in males, these immature germ cells or spermatogonia are converted into sperms by the process of spermatogenesis. Spermatogonia are diploid cells that undergo mitotic division and their number increases. Primary spermatocytes undergo meiosis and produce haploid cells- secondary spermatocytes. These secondary spermatocytes undergo the second meiotic division to produce immature sperms or spermatids. These spermatids undergo spermiogenesis to transform into sperms. Various hormones like GnRH, LH, FSH and androgens are involved in stimulating spermatogenesis.

Oogenesis

In females, the oogonia are converted to the mature ovum. This process is called oogenesis. In the female ovary, millions of oogonia or mother cells are formed during fetal development. These mother cells undergo the meiotic cell division, the meiotic division rests at the prophase-I and lead to the production of primary oocytes. Primary oocytes are embedded within the primary follicles on the outer layer. Primary follicles get surrounded by more granulosa cell layer and forms secondary follicles. Secondary follicles then turn into the tertiary follicle. At the stage of female puberty, the primary oocytes present in the tertiary follicles complete meiosis and form secondary oocytes (haploid) and the polar body by unequal division. The tertiary follicle undergoes some structural and functional changes and produces mature Graafian follicle. Secondary oocyte undergoes second meiotic division to form an ovum. Ovum is released from the Graafian follicle during the menstrual cycle. The release of an ovum from the Graafian follicle is called ovulation. Ovulation is controlled by the female reproductive hormone which is stimulated by the pituitary gland.

OR

DNA Fingerprinting Steps

Alec Jeffreys developed this technique in which he used satellite DNAs also called VNTRs (Variable Number of Tandem Repeats) as a probe because it showed the high level of polymorphism.

Following are the steps involved in DNA fingerprinting:

Isolating the DNA.

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Digesting the DNA with the help of restriction endonuclease enzymes.

↓

Separating the digested fragments as per the fragment size by the process of electrophoresis.

↓

Blotting the separated fragments onto synthetic membranes like nylon.

↓

Hybridising the fragments using labelled VNTR probes.

↓

Analysing the hybrid fragments using autoradiography.

DNA Fingerprinting Applications

As discussed earlier the technique of fingerprinting is used for DNA analysis in forensic tests and paternity tests. Apart from these two fields, it is also used in determining the frequency of a particular gene in a population which gives rise to diversity. In case of the change in gene frequency or genetic drift, Fingerprinting can be used to trace the role of this change in evolution