**S3. Ans.** (b)
**S4. Ans.** (b) Homologous organs are those organs in different organisms which appear different but are similar in basic anatomical structure and have diverged from a common ancestor. Vertebrate hearts and vertebrate brains are examples of homologous structures.

**S5. Ans.** (d) oral contraceptives block the ovulation, that is prevent releasing of eggs from the ovary. They alter the mucus in the cervix and prevent the entry of sperms.

**S6. Ans.** (b) actinomorphic flowers have radial symmetry, such type of flowers are found in mustard, *datura, c*hilli.

**S7. Ans.** (d) Ladybird the beetle with red and black markings and Dragonflies is very useful in the control of aphids in a crop field.

**S8. Ans.** (b)

**S9. Ans.** (d) Many fungi belonging to the genera Microsporum, Trichophyton and Epidermophyton are responsible for ringworms which is one of the most common infectious diseases in man.

**S10. Ans.** (b)
**Sol.** This process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats) is called adaptive radiation. Darwin's finches represent one of the best examples of this phenomenon.

**S11. Ans.** (a)
**Sol.** yeast *Saccharomyces cerevisiae* is used for bread-making and commonly called brewer's yeast, is used for fermenting malted cereals and fruit juices, to produce ethanol.

**S12. Ans.** (b)
**Sol.** the blind approach of simply sequencing the whole set of genome that contained all the coding and non-coding sequence, and later assigning different regions in the sequence with functions (a term referred to as Sequence Annotation).

**S13. Ans.** (a)
**S14. Ans.** (c) It was shown first in *Escherichia coli* and subsequently in higher organisms.
**S15. Ans.** (a)
**S16. Ans.** (a)

**Section B**

**S17. Ans.** The two vertebrate body parts that are homologous to the forelimbs of the humans are as follows:
(i) The wings of bats and
(ii) Whale flippers

**S18. Ans.** The attributes that a population has but individual organism does not have are natality, mortality, sex ratio and age groups.
**S19. Ans.** Yes, we can detect the disease early before the symptoms appear by the use of technologies like recombinant DNA and PCR and ELISA.
**S20. Ans.** An inoculation stimulating the production of antibodies in the body is called vaccine. Hepatitis B vaccine from yeast was produced by recombinant DNA technology.
**S21. Ans.** Vertical distribution of different species occupying different levels is called stratification.
E.g trees occupy top vertical strata a forest, shrubs the second and grasses occupy the

bottom layers.

**Section C**

**S22. Ans.**

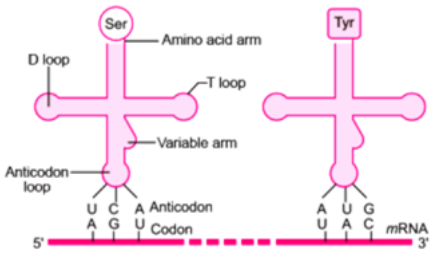
| Microsporogenesis | Megasporogenesis |
|---|---|
| • Microsporogenesis involves the formation of microspores from microspore mother cells by meiotic division.<br>• It occurs inside the pollen sac of the anther. | • Megasporogenesis is the process of arrangement of megaspores from the megaspore mother cell.<br>• It occurs inside the ovule of the ovary. |

During both the process meiosis occurs. After microsporogenesis pollen grains are formed that is the male gametophyte and after megasporogenesis megaspore is formed that later forms the embryo sac that is the female gametophyte.

**S23. Ans.** The hormones involved are as follows:

1) GnRH
2) LH
3) FSH
4) Progesterone
5) Estrogen

**S24. Ans.** The structure of a tRNA adapter molecule is as follows:




t-RNA binds to the ribosomal m-RNA complex through initiation and elongation factors which makes it easier for the addition of the correct amino acid to the polypeptide chain by its specific anticodon to the codon of m-RNA so it is called an 'adapter'.

**S25. Ans.** When our body pathogen for the first time it produces primary response which is of low intensity. Subsequent encounter with the same pathogen shows quick and highly intensified secondary or anamnestic response. This is because in primary response antibodies are formed which have property of memory.

**S26. Ans.** Heterogenous nuclear RNA (hnRNA) is the mRNA that is fomed immediately after transcription. It has both coding sequences or exons and non-coding sequnces or introns. Eukaryotic hnRNA undergoes following processes to become a functional mRNA.

1. The hnRNA is first undergoes a process called splicing. During splicing, the introns are removed from the mRNA and exons are joined in a defined order.
2. Methyl guanosine triphosphate is added to the 5'-end of hnRNA. This process is called capping.
3. Adenylate residues (200-300) are added at 3'-end in a template independent manner. This process is called tailing.

**S27. Ans.** DNA is forced to pass a bacterial cell wall during the process of genetic engineering by making them competent. This is done by treating them with a specific concentration of a divalent cation, such as calcium, which increases the efficiency with which DNA enters the bacterium through pores in its cell wall. Recombinant DNA can then be forced into such cells by incubating the cells with recombinant DNA on ice,

followed by placing them briefly at 42 degree (heat shock), and then putting them back on ice. This enables the bacteria to take up the recombinant DNA.

**S28. Ans.** Some such examples are as follows:

- made crops more tolerant to abiotic stresses (cold, drought, salt, heat).
- reduced reliance on chemical pesticides (pest-resistant crops).
- helped to reduce post-harvest losses.
- increased efficiency of mineral usage by plants
- enhanced nutritional value of food, e.g., golden rice, i.e., Vitamin 'A' enriched rice

**Section D**

**S29. Ans. (a)**The opening of the DNA within which the process of replication occurs is called the replication fork. The creation of replication fork occurs because DNA is very long and the two strands of DNA cannot be separated in its entire length due to very high energy requirement, and the process has to be carried out with high degree of accuracy, so replication occurs within a small opening called replication fork.
(b)The enzyme that plays an important role in the polymerisation reaction of replication is DNA dependent DNA polymerase that catalyses the polymerisation only in one direction that is 5' → 3'. (c) The polarity of the template DNA is 3' → 5'.

**OR**

The replication of DNA and cell division cycle should be highly coordinated. A failure in cell division after DNA replication results into polyploidy(a chromosomal anomaly). Y
**Ans. 30.** (a) A declining population can be represented as follows:


(b) Mortality is the number of deaths in the population during a given period. Emigration is the number of individuals of the population who left the habitat and gone elsewhere during the time period under consideration. In this case the population is declining.
(c) Food and space availability is obviously essential for the unimpeded growth of a population. Ideally, when resources in the habitat are unlimited, each species has the ability to realise fully its innate potential to grow in number.
OR
(C) The birth rate would be 8/20 = 0.4

**Section E**

**S31. Ans.** Oral contraceptives (pills) contain progestogens or progestogen–estrogen combinations. Pills have to be taken daily for a period of 21 days starting preferably within the first five days of menstrual cycle. After a gap of 7 days (during which menstruation occurs) it has to be repeated in the same pattern. The mode of action of oral contraceptives is that they inhibit ovulation and implantation as well as alter the quality of cervical mucus to prevent retard entry of sperms. The females are advised to take the pills for a period of 21 days starting preferably within the first five days of menstrual cycle. After a gap of 7 days (during which menstruation occurs) it has to be repeated in the same pattern. Example- Saheli that was developed by Central Drug Research Institute, Lucknow.

OR

MTP stands for Medical termination of pregnancy, it is also called as induced abortion.
MTPs are considered relatively safe during the first trimester, i.e., up to 12 weeks of pregnancy but second trimester abortions are very risky. The Government allowed it under strict conditions in the year 1971, it is

generally done to get rid of unwanted pregnancies either due to casual unprotected intercourse or failure of the contraceptive used during coitus or rapes.
MTPs are also essential in cases where pregnancy could be harmful or even fatal to the mother/ foetus or both. But people use it for their benefit. One disturbing trend observed is that a majority of the MTPs are performed illegally by unqualified quacks which are not only unsafe but could be fatal too. Another dangerous trend is the misuse of amniocentesis to determine the sex of the unborn child. Frequently, if the foetus is found to be female, it is followed by MTP which is totally against what is legal.

**S32. Ans.** The process of producing a new combination of genes by crossing over during meiosis is called recombination. It is characteristic feature of all the sexually reproducing organisms.
It's application include the following:

(a) It is the cause of variation in a population that leads to evolution.
(b) Other than this, variation also leads to better adaptation and survival.
(c) Linkage groups helps in the preparation of the chromosome maps that are very useful in research.
(d) The desired recombinants can be produced.

E.g Genetic engineering has been applied in creating recombination for various species to produce useful products for humans. Like, Bt cotton and Bt brinjal have been produced through genetic engineering. Some vaccines are also being produced through this process like hepatitis-B vaccine.

**OR**

Morgan and his group conducted various experiments in the field of genetics. Sturtevant was a student of Morgan. Some of the contributions by them are as follows: Morgan carried out several dihybrid crosses of Drosophila. He observed that the phenotypic ratio was not similar to the standard phenotypic ratio as observed by Mendel. Morgan and his team were aware that the genes were located on the X-chromosome. Thy inferred that when the genes were situated on the same chromosome, they did not segregate independently of each other. When the genes are situated on the same chromosome, the chances of the parental combination are much higher than the non-parental combination. The physical association of genes on the same chromosome was termed as linkage by Morgan. He also coined the term recombination to describe the generation of non-parental combination.
On the other hand, his student Sturtevant came out with the finding that relative distance between two genes on the same chromosome was an important factor in recombination or lack of recombination. If the genes were tightly linked, they did not show recombination. But if the genes were far apart then chances of recombination were higher. Today's genetic mapping could be developed because of contributions made by Morgan and his team.

**S33. Ans.** (a) In a degenerate code, different words or terms have the same meaning, the genetic code is degenerate because many codons may code for the same amino acid while an unambiguous code, one codon specifies one amino acid only.
(b)The Severo Ochoa enzyme was discovered by Severo Ochoa. It is a polynucleotide polypeptide that is primarily often used to catalyze RNA polymerization reactions. It contributes to template-independent polymerization. The enzyme helps in the template-independent polymerization of RNA sequences (enzymatic synthesis of RNA).

OR

Salient features of the human genome are as follows

- Human genome consists of 3164.7 million nucleotides.
- The average gene consists of 3000 bases. But the size of each gene vary greatly.
- Approximately 30,000 genes are present in human genome.
- The functions of over 50 per cent of the discovered genes are unknown.

Less than 2 per cent of the genome codes for proteins.

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