Solution

SECTION A

1. Remnants of nucellus are persisitent in the black pepper and are called perisperm. [1]

2. a. Community is in equilibrium with the environment [½]

b. Species undergo ecological succession. [½]

3. The **sertoli cells** feed the sperm cells through acrosome and releasethem at maturity. [1]

4. The technique is named Embryo transfer. The embryo is at 8-cell blastomere stage. [1]

5. Gene is a unit of inheritance.

Allele: Two or more variants of the same gene which bring about variation in phenotype. [1]

SECTION B

6. Plants such as Viola (common pansy), Oxalis, and Commelina produce two types of flowers –

(a) chasmogamous flowers have exposed anthers and stigma and can self or cross-pollinate. [1]

(b) Cleistogamous flowers which do not open at all. In such flowers, the anthers and stigma lie close to each other and show sure shot pollination even in the absence of pollinators. [1]

7. The chromosome pattern in the human female is XX + 44 autosomes and that in the male is XY plus 44 autosomes. Thus, all the haploid gametes produced by the female (ova) have the sex chromosome X + 44 autosomes whereas in the male gametes (sperms) the sex chromosome could be either X or Y, hence, 50 per cent of sperms carry the X chromosome while the other 50 per cent carry the Y. [2]

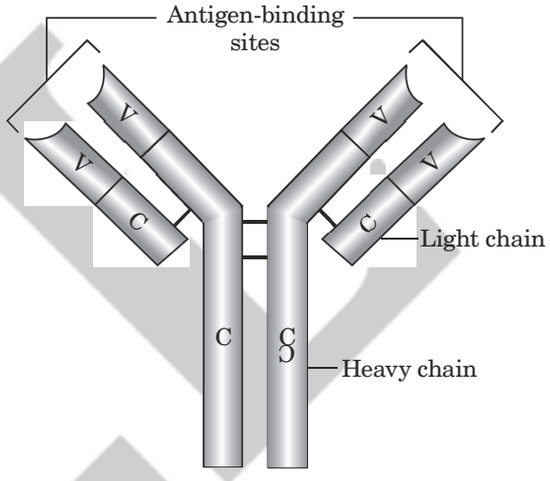
8. A- Butyric acid

B- Ethanol

C- Swiss cheese

D- Streptokinase- clot buster [2]

9.



[2]

10. Plasmodium is the causative agent of Malaria.

High fever followed by chills

Vector- Anopheles

Malignant malaria- Plasmodium falciparum [2]

OR

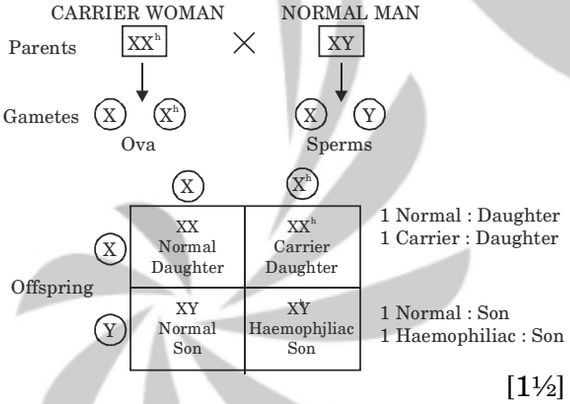
Benign tumors remain confined to their original location and do not spread to other parts of the body and so cause only little damage. Malignant tumors, are a mass of proliferating cells called neoplastic or tumor cells. These cells grow very rapidly, invading and damaging the surrounding normal tissues. [2]

SECTION C

11. Foetal ejection reflex is induced by a complex neuroendocrine mechanism. The signals for it originate from the fully

developed fetus and the placenta which induce mild uterine contractions. This triggers release of oxytocin from the maternal pituitary. Oxytocin acts on the uterine muscle and placenta 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 even stronger contractions. This leads to expulsion of the baby out of the uterus through the birth canal, ie., parturition. [3]

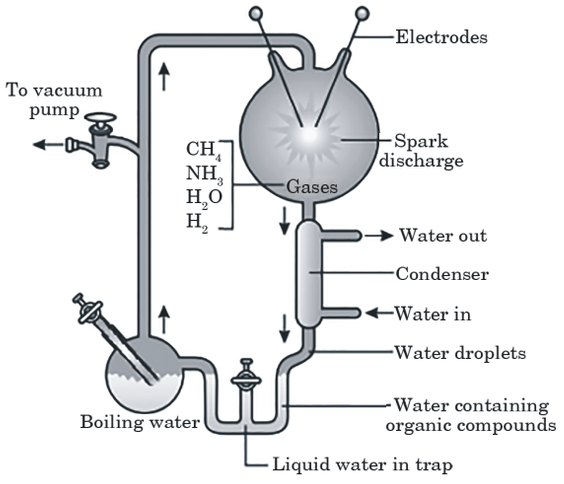
12. Hemophilia is a sex linked recessive disease, and shows its transmission from unaffected carrier female to some member of the male progeny. A single protein that is a part of the cascade of proteins which is involved in the clotting of blood is affected. In an affected individual a simple cut will result in non-stop bleeding. The heterozygous female (carrier) for haemophilia may transmit the disease to sons. [1½]



[1½]

13. Oparin and Haldane proposed that the first form of life could have come from pre-existing non-living organic molecules (e.g. RNA, protein, etc.) which completely disapproved the theory of spontaneous regeneration. Life formation was preceded by chemical evolution, i.e., formation of diverse organic molecules from inorganic constituents. Earth had high temperature, volcanic storms, reducing atmosphere containing CH_4, NH_3, etc. at that time. The scientists created similar conditions in a laboratory scale, induced electric discharge in a closed flask containing CH_4, H_2, NH_3 and water vapour at 8000 degree Celsius. They observed formation of amino acids. [1]

With this limited evidence chemical evolution was more or less accepted. [1]



[1]

14. PCR stands for Polymerase Chain Reaction. In this reaction, multiple copies of the gene of interest is synthesized. It uses two sets of primers (small chemically synthesised DNA oligonucleotides that are complementary to the regions of DNA). The enzyme DNA polymerase. extends the primers using the nucleotides provided in the reaction. The genomic DNA as template. [1]

If the process of replication of DNA is repeated many times, the segment of DNA can be amplified to approximately 2n times. More than 1 billion copies are made. Such repeated amplification are made possible using a thermostable DNA polymerase, which remains active during the high temperature induced denaturation of double stranded DNA. The amplified fragment if desired can now be used to ligate with a vector for further cloning. [1 + 1]

15. *Salmonella typhi* is the causative organism.

Symptoms- fever-39-40 degrees. Stomach-ache and constipation, weakness, loss of appetite.

Test- Widal test. [3]

16. Forests are lungs of the earth. A healthy forest ecosystems purifies air and water, mitigate droughts and floods, recycle nutrients, generate fertile soils, provide wildlife habitat, maintain biodiversity, pollinate crops, provide storage site for carbon and also provide aesthetic, cultural and spiritual values. [2]

The estimated costs of these services account to be about 33 trillion$ a year which is twice the global GNP

i.e., 1 Normal : Daughter
1 Carrier : Daughter
1 Normal : Son
1 Haemophiliac :Son 18 trillion $. [1]

17. a. They have increased shelf life. [1]

b. They use less resources like water, soil and are more productive, more foraging. [1]

c. They require less land and are more productive [½]

d. Added nutrition by rDNA technology eg, vitamin A enriched rice. [½]

18. RNAi is a method of using a small Intermediate RNA molecule to silence the genes or mRNA. By using Agrobacterium vectors, nematode-specific genes are introduced into the host plant. The DNA introduced is such that it produces both sense and anti-sense RNA in the host cells. These two RNA's formed a double stranded (dsRNA) due to complemetarity which initiates RNAi and thus, silences the specific mRNA. [3]

OR

(a) This test identifies the metabolites of drug abuse. [1]

(b) Cocaine, Atropa belladonna, Datura [1]

(c) *Erythroxylum coca*- produces cocaine

Cannabis sativa produces cannabinoids [1]

19. 1. Non hormonal- Lippe's loop [1]

2. Copper ion releasing – Cupper –T, Cu7, Multiload-375 [1]

3. Hormone releasing-LNG-20,

progestral [1]

20. (a) Nucleopolyhedrovirus – it is a baculovirus which affects insects, predominantly moths and butterflies. It is used as a biopesticide. [½]

(b) Saccharomyces cerevisiae – A yeast used for ethanol production [½]

(c) Monascus purpureus – A yeast which produces statins for lowering blood cholesterol [½]

(d) Trichoderma polysporum – A fungus which produces immunosuppressive agent – Cyclosporin A. [½]

(e) Penicillium notatum – A fungus which produce antibacterial drug-Penicillin [½]

(f) Propionibacterium sharmanii – A bacterium for production of Roquefort cheese. [½]

21. Immunity against microbes obtained by exogenous antibodies is called passive immunity. [1]

The yellowish fluid colostrum is secreted in mother's milk during the initial days of lactation has abundant antibodies (IgA) to protect the infant. Another example is, foetus receives some antibodies from their mother, through the placenta during pregnancy. [2]

22. (a) Contact inhibition – It prevents normal cells from uncontrolled proliferation [1]

(b) Interferons – Eg, Cytokines they induce- antiviral state in non-infected cells [1]

(c) Placenta – Tissue which allows exchange of nutrition and excretory products between foetus and mother [1]

OR

(i) Histone 1-4 are positively charged proteins where H1 is linker which unites 2 copies each of H2A-H2B, H-3 and H4 which form an octamer on which DNA molecule winds up. [1]

(ii) Nucleosome-The negatively charged DNA wrapped around the positively charged histone octamer forms nucleosome. A typical nucleosome has 200 bp of DNA helix. Nucleosome is a basic unit of DNA packaging in Eukaryotes. DNA is wound in sequence around 8 histone core proteins. [1]

(iii) Chromatin- Repeated unit structure of nucleosome in the nucleus which bears thread like stained bodies in the nucleus. They are visible as beads-on string structure under Electron Microscope. [1]

SECTION D

23. (a) The parents in our society feel embarrassed to discuss sexuality and reproduction related issues with their adolescent children due to the following reasons:

(i) The parents feel that discussing sexuality and reproduction will have a negative impact on children.

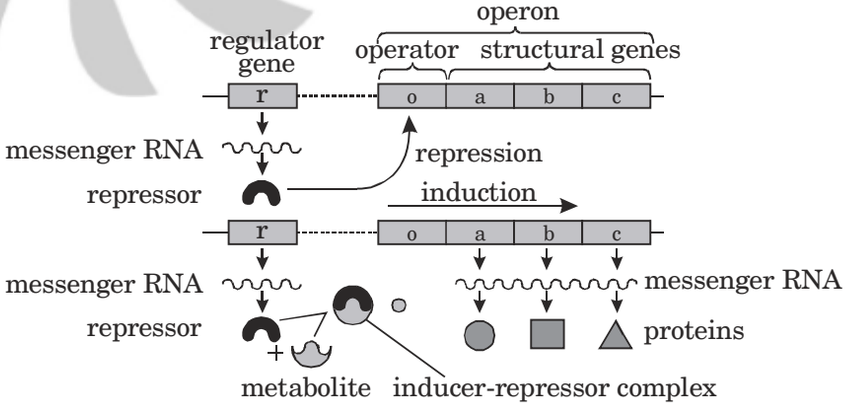
(ii) Taking about sex-related issues are considered as taboo in our society, so people feel uncomfortable to discuss these issues.

(iii) Illiteracy, conservative mind set and social barrier are the other reasons. [2]

(b) To overcome inhibitions about reproduction and sexuality, parents can explain about sexuality and reproduction with one or two examples of plants or animals. In papaya, palm plants, male and female reproductive structures are present on the different plant like humans. Similarly in animals such as earthworm both male and female organs are present in one individual. [2]

SECTION E

24. In the absence of lactose, the repressor binds to the operator and prevents transcription of Lac Z operon. In the presence of Lactose, the lactose sugar binds to the repressor, and operator becomes free to be transcribed by RNA polymerase. [2]



[3]

25. (a) 1. Humans derive countless economic benefits from nature like food (cereals, pulses, fruits), firewood, fibre, construction material, industrial products (tannins, lubricants, dyes, resins, perfumes) and products of medicinal importance. [1]

2. The broadly utilitarian use of biodiversity plays a major role in many ecosystem services like production of oxygen and pollination. [1]

3. Ethical reasons of what we owe to plants as each species has an intrinsic value which we should conserve spiritually and philosophically.

4. Aesthetics walking in woods in the forests

We can do so by:

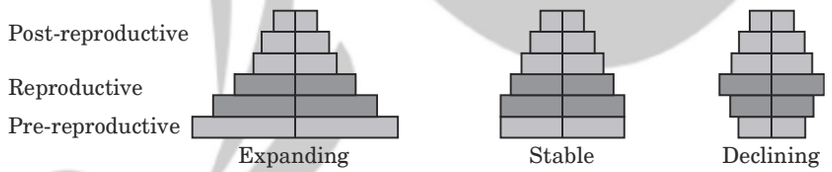
In situ conservation: We conserve whole forests to save its natural habitat.

Ex situ conservation: Threatened species are taken to special places and kept for special care. Eg., Zoological parks, Botanical gardens and wildlife safari.

(b) Tropical regions where species richness is high and are highly endemic are the places where the biodiversity survives. In many communities as a part of their culture, whole forests were set aside. Trees and wildlife were given total protection. These are called sacred groves. They are present in Khansi and Jaintia Hils in Meghalaya, Aravali hills of Rajasthan. [2]

OR

(a)



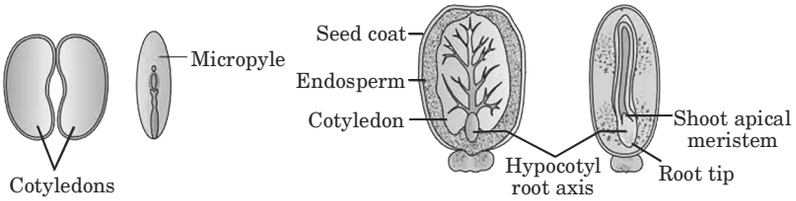
(b) (i) Phosphorus cycle

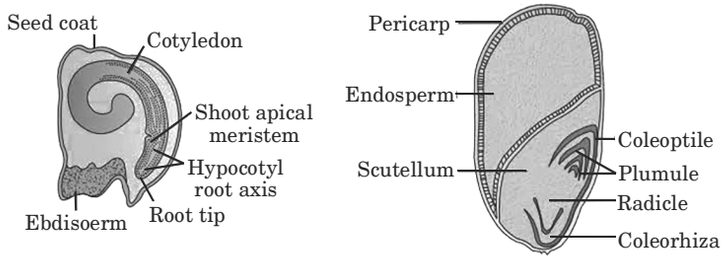
(ii) Sulphur cycle [5]

26. Endosperm feeds the growing ovules. Formation of endosperm precedes the growing embryo. In the triploid endosperm formed from triple fusion, the nuclei undergo free nuclear divisions. It is called free- nuclear endosperm. Gradually formation of cell wall occurs and it becomes cellular. [1]

Ovule become seed- Embryo develops at the micropylar end only after some amount of endosperm is formed. Embryo develops from zygote to pro-embryo, globular embryo, heart shaped embryo, mature embryo. Seeds form inside the fruit. A seed has three layers- seed coat, cotyledon and embryo axis. Integuments harden as tough protective seed coats. [1]

The micropyle retains as a pore in the seed coat. It facilitates entry of oxygen and water into the seed during germination. The embryo enter a state of inactivity called dormancy when the general metabolic activity of the embryo slows down as the seed matures, or if favourable conditions are available (adequate moisture, oxygen and suitable temperature), they undergo germination. [3]



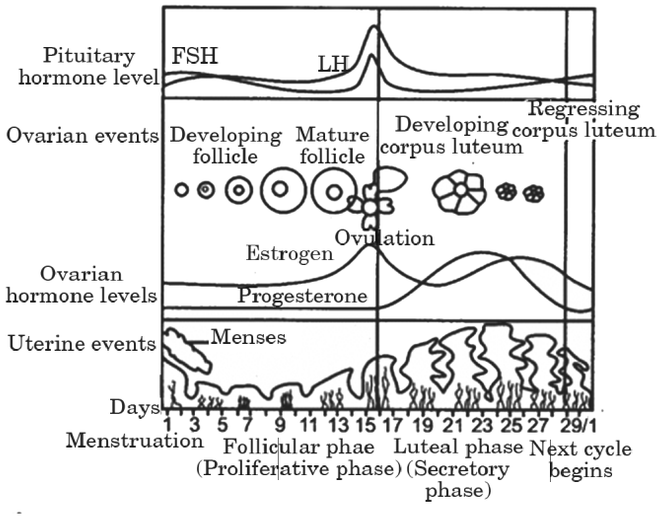


[1]

[1]

Ovary becomes fruit- The wall of ovary becomes the wall of the fruit called pericarp.

OR



[5]