Solution

PRACTICE Paper 03 (2020-21) Class 12

Biology

Section A

1. Two spermatozoa are formed from one secondary spermatocyte.

2. Parturition signals arise from the fully developed fetus and placenta. This triggers release of oxytocin from the maternal pituitary gland.

3. Test cross

4. It is an irreversible process, hence cannot be considered as contraceptive device

5. a. Exponential growth curve
b. Logistic growth curve

6. Recessive allele expresses itself only in homozygous condition because in the presence of a dominant allele its effect is masked.

7. Sutton and Boveri

8. Cannabinoids are obtained from *Cannabis sativa*.. They affect the cardiovascular system

9. Hepatitis B recombinant vaccine is currently being used in the vaccination programme.

10. Wheat: Product: Bread, cake, etc.
Rice: Product: Idli. dosa
Bengal gram: Product: Dhokla. Khandvi

11. (a) Both assertion and reason are correct
Explanation: Turner's syndrome is caused due to the absence of one X chromosomes. The female suffering from the turner's syndrome is sterile as ovaries are rudimentary along with other secondary sexual characters.

OR

a. Both assertion and reason are correct

Explanation: Duplicate genes are two or more genes found on different chromosomes that produce the same or nearly the same phenotypic effect in the dominant state. They produce the same intensity of effect even when present together.

12. (a) Both Assertion and Reason are true, and the Reason is the correct explanation of the Assertion

Explanation: The lgE-primed mast cell releases granules and powerful chemical mediators, such as histamine, cytokines, granulocyte macrophage colony-stimulating factor (GM-CSF), leukotrienes, heparin, and many proteases into the environment. These chemical mediators cause the characteristic symptoms of allergy.

13. (a) Both Assertion and Reason are true, and the reason is the correct explanation of the assertion.
Explanation: UAA of mRNA does not code for any amino acids so it is a termination codon. If the termination codon is present on mRNA, the protein synthesis stops abruptly at that point.
14. (a) Assertion and reason both are correct statements and reason is correct explanation for assertion
Explanation: **Genetic diversity**: A single species might show high diversity at the generic level over its distributional range. The genetic variation shown by the medicinal plant *Rauwolfia vomitoria* growing in different Himalayan ranges might be in terms of the potency and concentration of the active chemical (reserpine) that the plant produces. India has more than 50.000 genetically different strains of rice and 1,000 varieties of mango.
15. i. (d) all of these
ii. (a) reducing the rate of transpiration
iii. (a) Allen's rule
iv. Both (a) and (b)
v. (a) Both Assertion and Reason are true, and Reason is the correct explanation of the Assertion.
16. i. (b) Coleorhiza
ii. (c) Primary endosperm nucleus
iii (a) three haploid nuclei
iv (b) Scutellum
v (c)(D) stage in embryo development in dicot

Section B

17. Graafian follicles mature into corpus luteum after maturation. Corpus luteum releases progesterone that maintains endometrial lining of uterus during pregnancy

18. Since the blood group of the child is O so it must be homozygous for the allele I^oI^o . Since the parents have blood groups A and B and produce a child with O blood group, they must have to contribute the I° gene and be heterozygous that is the genotype of the father must be I^AI^o and the genotype of the mother be I^BI^o

The genotypes of the other possible offspring will be: -

Male /female	I^A	I^o
I^B	$I^A I^B$	I^BI^o
I^o	$I^A I^o$	I^oI^o

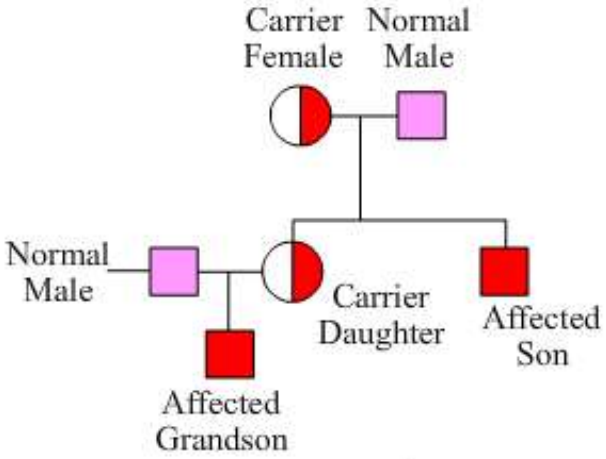
19. In 1983, Eli Lilly, an American company prepared two DNA sequences corresponding to A and B, chains of human insulin and introduced them in plasmids of *E. coli* to produce insulin chains. Chains A and B were produced separately, extracted and combined by creating disulfide bonds to form human insulin.

20. Transgenic animals can serve as models to understand progression of various diseases in humans. Transgenic models exist for many human diseases like cancer, cystic fibrosis, rheumatoid arthritis and Alzheimer's. These animals can be observed to understand the causative gene for a particular disease. This can help in devising suitable treatment for a disease.

OR

Recombinant vector vaccines make use of recombinant DNA technology. These vaccines make use of an attenuated virus or bacterium to introduce microbial DNA to cells of the body. Recombinant technology has allowed the production of antigenic polypeptides of the pathogens in other microbes like yeast and bacteria. For example, Hepatitis B vaccine is produced using a yeast cell.

21. a



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(b) Haemophilia is a sex-linked recessive disease. Here, it is transmitted from the carrier female to the sons. From the above pedigree chart, it can be observed that the disease is being transmitted from the carrier female to her daughter (carrier) and son (affected). The carrier daughter transmits this disease to the grandson. This pattern of inheritance is called criss cross inheritance.

22. DNA fragments separate when they are moved towards the anode in the electric field. Agarose gel provides the matrix through which DNA fragments separate due to the sieving effect. Separated DNA fragments can be visualized only after staining with ethidium bromide and then by exposure to UV radiation. After staining, DNA fragments appear as bright orange bands.

OR

The method is based on color reaction (blue, white selection). The α galactosidase enzyme can cleave a colorless, synthetic substrate, X-gal, into a blue colored product if the gene is inactivated by insertion of gene of interest into it. the development of blue color will be prevented.

23. Passenger pigeons and great auks, both were over hunted to extinction.

24. Calotropis plant produces poisonous cardiac glycosides. Therefore, cattle or goats do not graze on these plants.

25. Fishes caught per trap; number of tigers per unit area (using pug marks); percentage cover in biomass.

Section C

26. In Fl generation —Pink flowered plants obtained. It is due to incomplete dominance

In F2—generation -Alleles of the hybrid (F1) segregate during gamete formation and the parental characters reappear without any change. So, the phenotypic and genotypic ratios of F2-generation are the same.

RR : Rt : rr

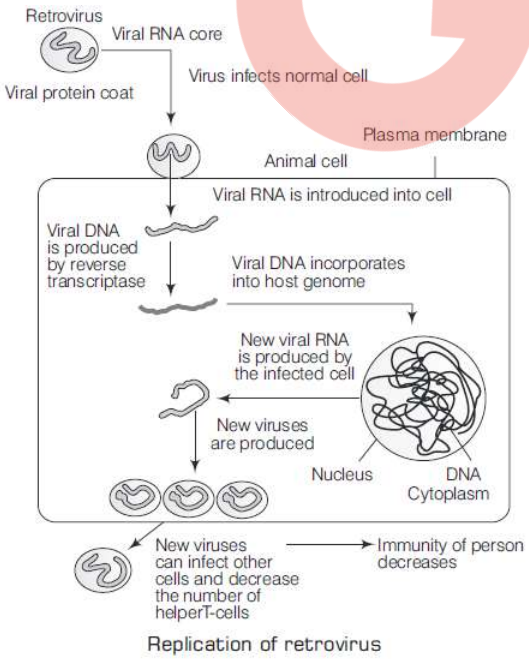
1:2:1

27. Technique: DNA fingerprinting

steps: DNA extraction; cutting of DNA; Electrophoresis; transferring the DNA onto paper; adding radioactive probe; autoradiography

28. i. Repeated blood transfusion may result in contracting diseases like AIDS. The recipient must ensure that the donor's blood is being screened for HIV and other pathogens. Also, he should make sure that doctors are using fresh needles.

ii. In the absence of such measures, the patient can get infected by HIV (Human Immunodeficiency Virus) which causes AIDS. It is a threatening disorder that weakens the immune system by attacking helper T Cells In the body. A schematic diagram showing the cycle of proliferation and effects of retrovirus (HIV) in infected person is as follows:



Replication of retrovirus

29.

Transcription in Prokaryotes	Transcription in Eukaryotes
i) Products of transcription become effective in situ.	i) Products of transcription come out of the nucleus for the functioning in cytoplasm.
(ii) There is only one RNA polymerase.	(ii) Three RNA polymerases take part in it.
(iii) mRNA is polycistronic	(iii) mRNA is monocistronic
(iv) Splicing is not required	(iv) Splicing is required for removing introns,

30. - The causal organism is *Entamoeba histolytica.*
- Symptoms - Abdominal pain and cramps
- Stool with blood and mucous
-Mode of transmission: the tetranucleate cysts of the parasite, transmitted through contaminated food and water.

OR

The principle of vaccination is based on the property of memory of the immune system. In vaccination, a preparation of antigenic proteins of pathogens or inactivated/live but weakened pathogens are introduced into the body. The antigens generate the primary immune response by producing antibodies. The vaccines also generate memory B-cells and T—cells. When the vaccinated person is attacked by the same pathogens, the existing memory B-cells or T—cells recognize the antigen quickly and overwhelm the invaders with massive production of lymphocytes and antibodies, Hepatitis B vaccine is produced from yeast

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Section D

31. i. Spermatogenesis is the production of sperms in males.
a. In testis, the immature male germ cells (spermatogonia) produce sperms by spermatogenesis that begins at puberty due to significant increase in the secretion of gonadotropins. Le. luteinizing hormone and follicle stimulating hormone under the influence of Gonadotropin Releasing Hormone (GnRH) released from the hypothalamus.

b. Spermatogonia (sing, spermatogonium] present on the inside wall of seminiferous tubules multiply by mitotic division and increase in numbers.
c. Each spermatogonium is diploid and contains 46 chromosomes. Some of the spermatogonia called primary spermatocytes periodically undergo meiosis.
d. The primary spermatocyte undergoes meiosis .1 and forms two haploid secondary spermatocytes containing 23 chromosomes each.
e. The secondary spermatocytes undergo meiosis - II and form four equivalized haploid spermatids
f. Spermatids transform into the spermatozoa by spermiogenesis.
g. After spermiogenesis, the sperm heads are embedded in the Sertoli cells and released from the seminiferous tubules via spermiation process.
ii. Diagram of human sperm with two labellings
a. The acrosome is filled with enzymes that help the sperm to penetrate the ovum.
b. Middle piece possesses many mitochondria to produce energy for the movement of the tail to facilitate sperm motility.

OR

i. Figure 'illustrates corpus luteum, Luteinizing hormone
ii. Corpus luteum secretes progesterone hormone. which stimulates the continued growth of the superficial layer of endometrium and endometrium becomes ready for implantation. — it is essential for the continuation of pregnancy.

iii.The figure 'd' represents tertiary follicle in which primary oocyte completes its first meiotic division. while figure 'e' represents the mature follicle (Graafian follicle) ready for ovulation.

iv.

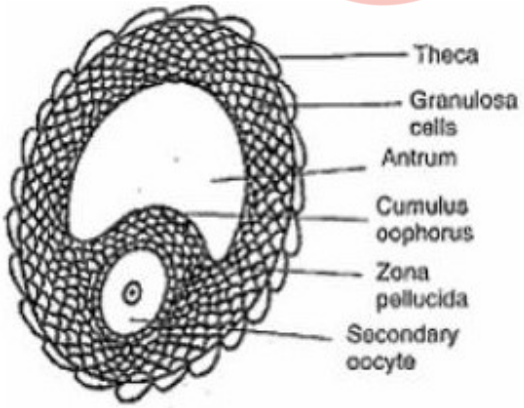
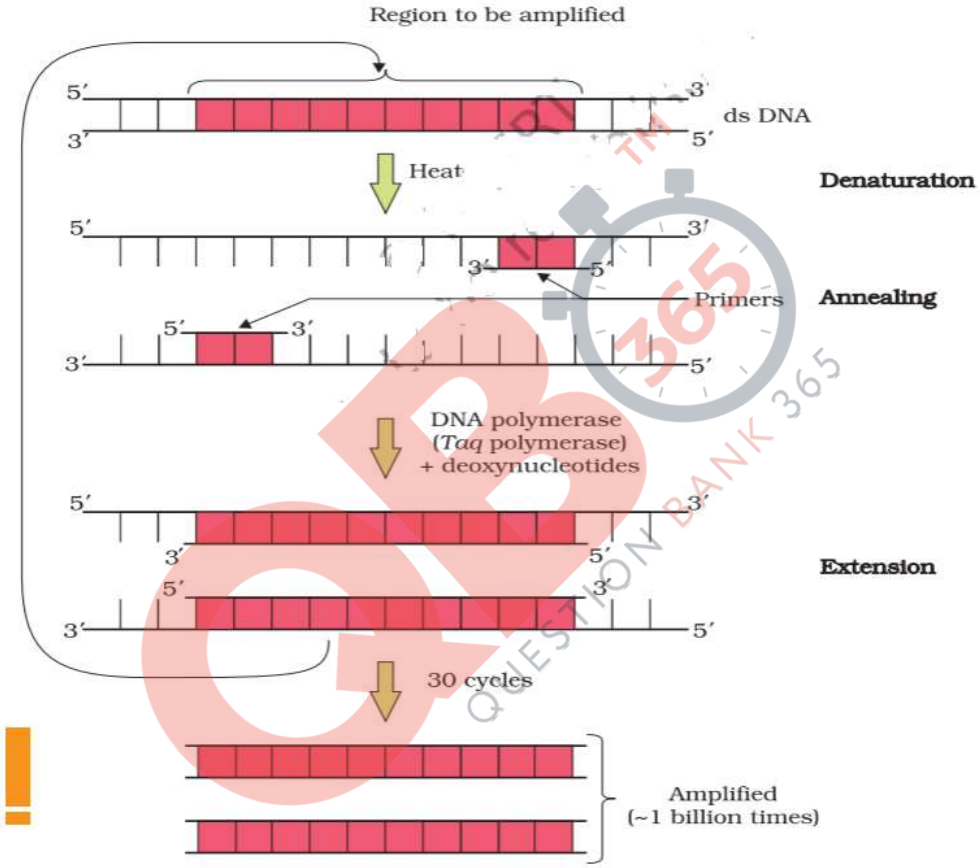


Fig. Mature Graafian Follicle

32. i. The type of restriction enzymes in (a) is Restriction Endonuclease while (I!) is Restriction Endonuclease.

ii. PCR stands for Polymerase Chain Reaction. This technique is used for gene amplification. The well-labelled diagram showing different steps of PCR is as follows:

fig : Polymerase chain reaction (PCR): Each cycle has three steps: (i) Denaturation



(ii) Primer annealing; and (iii) Extension of primers.

OR

i. Since. DNA molecules are hydrophilic. they cannot pass through cell membranes. For recombinant DNA to be integrated into the vector or host genome, it is necessary for the DNA to be inserted in the cell. Therefore. making the host cells competent is necessary for biotechnology experiments.
The two ways by which cells can be made competent to take up DNA are:

a. **Chemical action**- The host cell is treated with a specific concentration of divalent cation. i.e., calcium which increases the pore size in the cell membrane. DNA is then incubated with the treated bacterial cell at 42"C. thereby increasing the efficiency of DNA entering through pores in the cell wall.

b. Heat shock treatment- Incubating the cells with recombinant DNA on ice, followed by a brief treatment of heat at 42°C and again putting them back on ice.

ii**. Biolistic guns** or gene guns are used to bombarded rDNA loaded on gold or tungsten particles with high velocity. In this way, the rDNA is delivered to the desired host cells.

33 i. The category of microbes naturally occurring in sewage and making it less polluted are bacteria and fungi, wherein masses of bacteria get associated with filaments of fungi to form a mesh-like structure called flocs.
ii. The different steps involved in secondary or biological treatment of sewage:
The secondary treatment of sewage is also called biological treatment because. in this treatment. sewage is subjected to biodegradation. It means that it involves the participation of microorganisms. The process of secondary treatment involves the following steps:

a. Primary effluent is passed into large aeration tanks with constant mechanical agitation and air supply, this allows vigorous growth of useful aerobic microbes into flocs (masses of bacteria and fungi filaments).
b. These microbes consume a major part of organic matter in the effluent while growing. This reduces the BOD of the effluent.
c. When BOD of sewage gets reduced, it is passed into the settling tank. The bacterial flocs settle in the tank and the sediment is called activated sludge. A small amount of activated sludge is pumped back into the aeration tank to serve as inoculum.
d. The remaining major part of the sludge is pumped into large tanks called anaerobic sludge digesters. where other kinds of bacteria. which grow anaerobically. digest the bacteria and the fungi in the sludge. During this process, bacteria produce a mixture of gases. such as methane. Dihydrogen sulphide and carbon dioxide. which form biogas. The effluent from secondary treatment is generally released into natural water bodies. it helps to reduce water pollution and water borne diseases.

OR

a. In normal cells, growth and differentiation is highly controlled and regulated (contact inhibition). The cancerous cells have lost the property of contact inhibition, hence continue to divide giving rise to masses of cells(tumors). Cancerous cells can metastasize whereas normal cells do not.

b. The benign tumor remains confined in the organ affected as it is enclosed in a connective tissue sheath and does not enter the metastatic stages.

c. Cancer may be caused due to carcinogens which are physical (X rays, gamma rays and UV rays), chemicals (Nicotine, aflatoxin, Cadmium oxide, Asbestos) and biological (viral oncogenes and proto-oncogenes).

d. Surgery, radiotherapy, chemotherapy, immunotherapy by using biological response modifiers like Alpha interferon(Any two).