COMMON PRE-BOARD EXAMINATION: 2022-23

Class-XII Subject: BIOLOGY (044)

Date: 19/01/2023

MARKING SCHEME

CLASS-XII 2022-23

SECTION - A

1. (a) increase phagocytosis of sperms and suppress sperm motility and fertilizing capacity of sperms. 1

2. (d) a)-(ii) b)-(iv) c)-(i) d-(iii) 1

3. (c) large loops held by proteins 1

4. (a) saltation and natural selection 1

5. (c) Physical barrier- Mucus 1

6. d) B), D),E) 1

7. d) Methanobacterium 1

8. (b)-A-sequence where replication starts D- selectable marker 1

9. (c) dN/dt = r N(K-N/K) 1

10. (d) brood parasitism 1

11. b) Pyramid of energy 1

12. (b) Sacred groves 1

Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer thesequestions 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. A. Both A and R are true and R is the correct explanation of A. 1

14. C. A is true but R is false 1

15. B. Both A and R are true and R is not the correct explanation of A. 1

16. C. A is true but R is false. 1

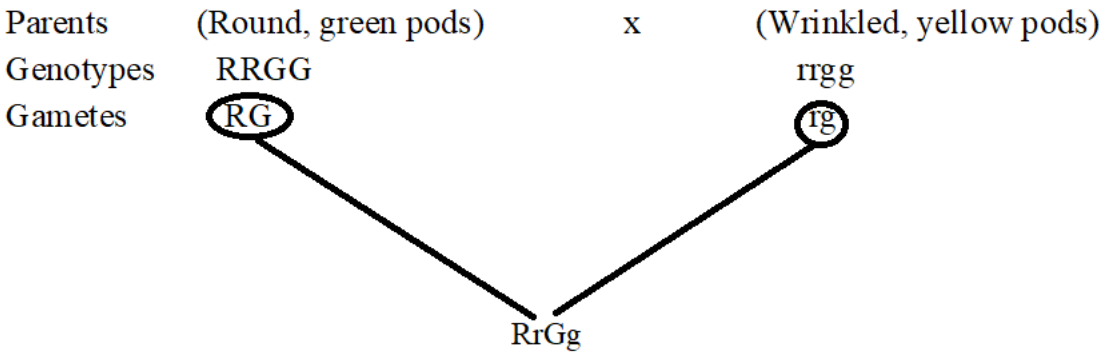
SECTION - B

17.

A- Testosterone -1/2m B- Reproductive tract and internal organs -1/2m
C- Sertoli cells -1/2m D-spermatogenesis- ½ m each 2

-

18.

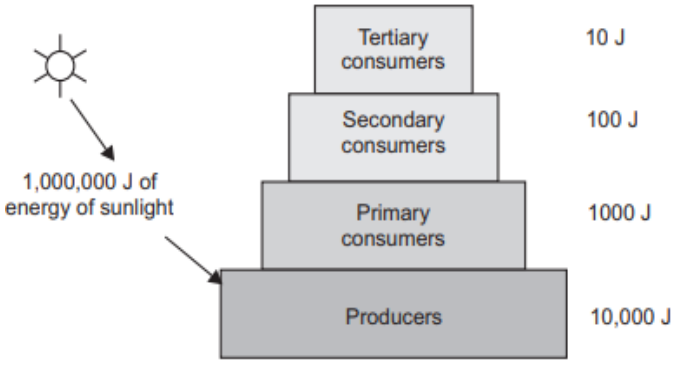


Making the correct punnett square 1 mark)
Phenotype - All Inflated green pods (½ mark)
Genotype – (½ mark) 2

19. Microbial pathogens enter the gut of humans along with food:
- Physical barriers: Mucus coating of the epithelium lining the gastrointestinal tract helps in trapping microbes entering our body. -1m
- Physiological barriers: Acid in the stomach, saliva in the mouth prevent microbial growth.-1m 2

20. (a) Palindromes-1/2m
(b) Restriction endonucleases-1/2m
(c) They play a very important role in DNA replication, regulation and gene expression. -1m 2

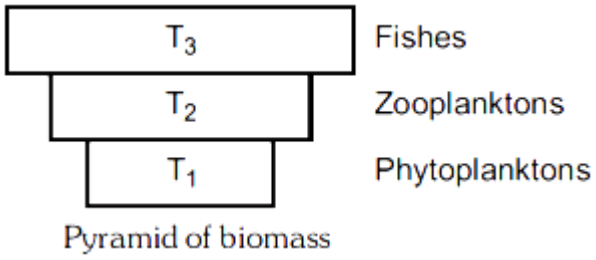
21. a)



-1m

b) The difference between Detritivores and Decomposers is that decomposers are microorganisms that decompose organic material whereas detritivores are organisms that feed on dead and decompose organic matter by oral ingestion. /Also, decomposers are microorganisms and it has three types of detritivores, scavengers, and saprophytes.-1m

OR



Pyramid of biomass -1m

The pyramid is inverted because the biomass of fishes is much more than that of the zooplankton and phytoplankton. -1m 2

SECTION - C

22.

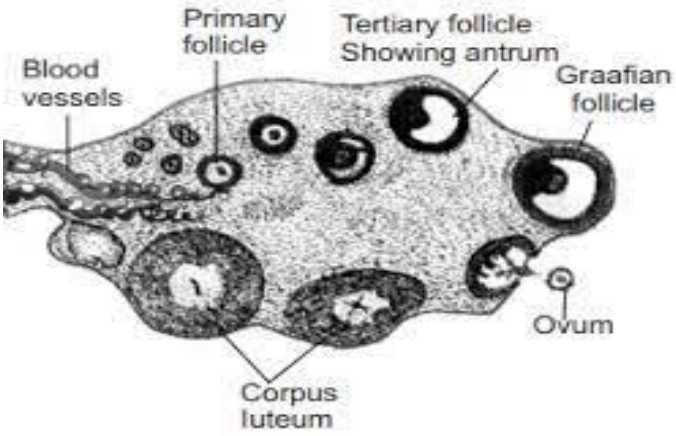


Diagram-2m
Label-1m 3

23.

(a) Grass is a terrestrial plant. Wind is the agent. Pollen grains are light and non-sticky so that they can be transported in wind currents./Any 1 relevant adaptation-1+1/2m

b) Vallisneria is an aquatic plant. In case of vallisneria water is the agent for cross pollination. In female vallisneria the flower reaches to the surface of water by the long stalk and the male flower or pollen grains are released into the surface of water. Female flowers or stigma carried them by water current.-1m+1/2m

3

24. (a)

3'-5'-1/2m
5'-3'-1/2m

(b)
Promoter sequences define the direction of transcription and indicate which DNA strand will be transcribed; this strand is known as the sense strand.-1/2m
The role of the terminator, a sequence-based element, is to define the end of a transcriptional unit (such as a gene) and initiate the process of releasing the newly synthesized RNA from the transcription machinery.-1/2m
(c)

5'-ATGCATGCATGCATGCATGCATGCATGC-3'

3`- TACGTACGTACGTACGTACGTACGTACG - 5`-1/2m

mRNA

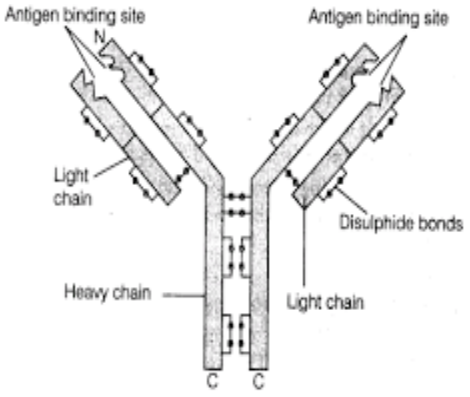
5′- AUGCAUGCAUGCAUGCAUGCAUGC-3′-1/2m

3

25. (a) Sum Total of All the Allele Frequencies is 1: Let there be two alleles A and a in a population. The frequencies of alleles A and a are 'p' and 'q'respectively.(½ Mark)
The frequency of AA individuals in a population is p^2 and it can be explained that the probability that an allele A with a frequency of p would appear on both the chromosomes of a diploid individual is simplythe product of the probabilities, i.e., p^2.
Similarly, the frequency of aa is q^2 and that of Aa is 2pq.(½ Mark)
$p^2 + 2pq+q^2) = 1$,where p^2 represents the frequency of homozygous dominant genotype, 2pq represents the frequency of the heterozygousgenotype and q 2 represents the frequency of the homozygous recessive.(1 Mark)

(b) Factors that affect Hardy–Weinberg equilibrium:
(i) Gene migration or gene flow
(ii) Genetic drift
(iii) Mutation
(iv) Genetic recombination
Natural Selection (Any 2)(½+½= 1 mark) 3

26. (a)



Structure of an antibody molecule

-2m

(b)
Difference between active and passive immunity is that active immunity is developed due to the production of antibodies in one's own body, while passive immunity is developed by antibodies that are produced outside and then introduced into the body.-1m

OR

(a) Amoebiasis is usually transmitted by the following ways: 1. The faecal-oral route. 2. Through contact with dirty hands or objects. 3. By anal-oral contact. 4. Through contaminated food and water. -Any two-1m
(b) Symptoms of malaria: 1. Fever accompanied by shivering. 2. Joint pain or arthralgia. 3. Vomiting. 4. Anaemia caused due to rupture of RBCs or haemolysis.

Any two -1m

(c) 1. Unsafe and unhygienic food and drinks contaminated with the eggs of Ascaris are the main mode of transmission. 2. Eggs hatch inside the intestine of the new host. 3. The larvae pass through various organs and settle as adults in the digestive system. -Any two-1m 3

27.

(a) Agarose is a polysaccharide, generally extracted from certain red seaweed.-1m

(b) A-cathode-1/2m B-Anode-1/2m

DNA is negatively charged and therefore attracted towards the positively charged end and therefore it moves from the cathode (the negatively charged end) towards the anode (positively charged end) in an electric field.-1m 3

28. (a)

1. Speciation is generally a function of time; unlike temperate regions which are subjected to frequent glaciations in the past, tropical latitudes have remained undisturbed for millions of years and hence had a long time for species diversification.

2. Tropical environments are less seasonal, relatively more constant and predictable; such constant environments promote niche specialization and lead to a greater species diversity.

3. There is more solar energy available in the tropics, which contributes to higher productivity; this in turn might contribute indirectly to species diversity. Any two-2m

(b)

Habitat loss and fragmentation:-1/2

This is the most important cause driving animals and plants to extinction. When large habitats are broken up into small fragments due to various human activities, mammals and birds requiring large territories and certain animals with migratory habits are badly affected, leading to population declines.-1/2m

(ii) Over-exploitation:-1/2m

Humans have always depended on nature for food and shelter, but when 'need' turns to 'greed', it leads to over-exploitation of natural resources. Many species extinctions in the last 500 years (Steller's sea cow, passenger pigeon) were due to overexploitation by humans. Presently many marine fish populations around the world are over-harvested, endangering the continued existence of some commercially important species./-1/2m 3

SECTION - D

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

29. (a) Any insect-1m

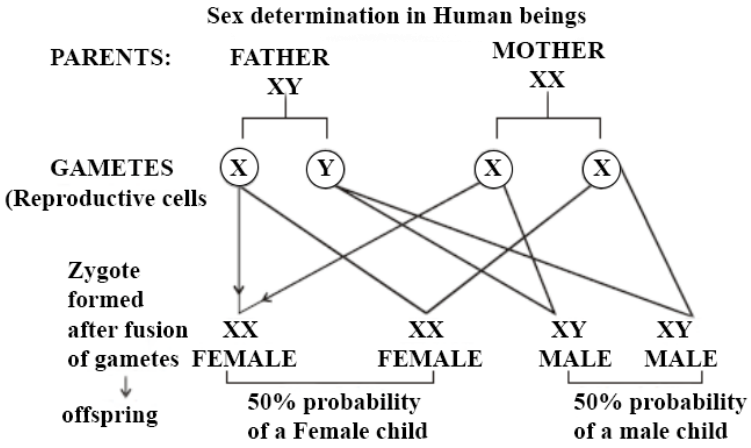
(b) Sperm determines whether a baby will be born as a boy or a girl. About half of his sperm will make a boy and half a girl. The sex of the baby depends on which sperm gets to the egg first. -1m

(c)

Sex determination in birds: Female bird : In birds, females have two different sex chromosomes designated as Z and W chromosomes beside autosomes. Hence, females show heterogamety, that is, two types of gametes will be formed by the female.-2m

OR

(c)



-2m 4

30. (a)

The humoral immune response is mediated by antibody molecules that are secreted by plasma cells. Antigen that binds to the B-cell antigen receptor signals B cells and is, at the same time, internalized and processed into peptides .

(b)

Cell-mediated immunity is primarily driven by mature T cells, macrophages, and the release of cytokines in response to an antigen.

(c)

The immune response to a transplanted organ consists of both cellular (lymphocyte mediated) and humoral (antibody mediated) mechanisms. Although other cell types are also involved, the T cells are central in the rejection of grafts.

OR

(c) The most abundant immunoglobulin in human milk is IgA. 4

SECTION - E

31.

After implantation, finger-like projections appear on the trophoblast called chorionic villi which are surrounded by the uterine tissue and maternal blood. The chorionic villi and uterine tissue become interdigitated with each other and jointly form a structural and functional unit between developing embryo (foetus) and maternal body called placenta (Figure 3.12). The placenta facilitate the supply of oxygen and nutrients to the embryo and also removal of carbon dioxide and excretory/waste materials produced by the embryo. The placenta is connected to the embryo through an umbilical cord which helps in the transport of substances to and from the embryo. Placenta also acts as an endocrine tissue and produces several hormones like human chorionic gonadotropin (hCG), human placental lactogen (hPL), estrogens, progestogens, etc. In the later phase of pregnancy, a hormone called relaxin is also secreted by the ovary.-3m

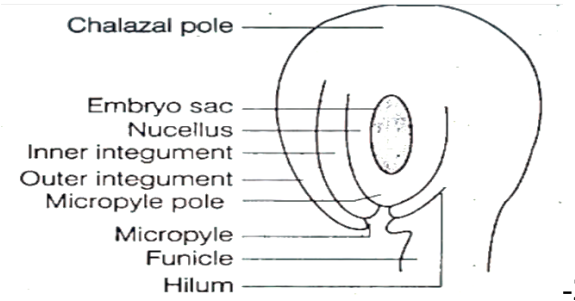
Immediately after implantation, the inner cell mass (embryo) differentiates Figure 3.12 The human foetus within the uterus into an outer layer called ectoderm and an inner layer called endoderm. A mesoderm soon appears between the ectoderm and the endoderm.

The average duration of human pregnancy is about 9 months which is called the gestation period. Vigorous contraction of the uterus at the end of pregnancy causes expulsion/delivery of the foetus. This process of delivery of the foetus (childbirth) is called parturition. Parturition is induced by a complex neuroendocrine mechanism. The signals for parturition originate from the fully developed

foetus and the placenta which induce mild uterine contractions called foetal ejection reflex-2m 5

OR

(a)



-2m

(b)

The MMC undergoes meiosis and produces four haploid megaspores with only the chalazal-most megaspore surviving. During metagametogenesis this functional megaspore (FM) develops into the female gametophyte through three syncytial mitotic divisions.

The surviving megaspore enters a mitotic phase to form the haploid megagametophyte containing the egg and two synergids at the micropylar pole, three antipodals at the chalazal pole, and a binucleate central cell.

In an angiosperm, a functional megaspore develops into an embryo sac.-3m

32. (a)Translation of an mRNA molecule occurs in three stages: initiation, elongation, and termination.

- Initiation: The ribosome assembles around the target mRNA and the start codon 5' AUG is recognized.
- Elongation: The tRNA transfers an amino acid to the tRNA bound to the next codon, forming a peptide bond between the two amino acids. The ribosome then translocates to the next codon to continue the process, creating an amino acid chain in the direction from the N terminal to the C terminal.
- Termination: When a stop codon is recognized, the elongation of amino acid chain terminates. The ribosome then folds the polypeptide into its final structure.-3m

(b)

The process of translation will not happen, thus the polypeptidensynthesis is stopped/ hampered. (1 Mark)

The reason for the above is:

RNA polymerase II transcribes mRNAs (½ Mark)

RNA polymerase III helps in transcription of tRNA which is the adaptor molecule/ that transfers amino acids to the site of proteinsynthesis.(½ Mark)

OR

(a)

When the inducer is present in the medium it is absorbed at first slowly into the bacterium. The inducer binds with the repressor attached to the operator gene the repressor leaves the operator gene and allows the RNA polymerase to pass from promotor to the structural genes for

transcription or formation of a polycistronic mRNA. 2+2m

(b)

Since the repressor protein synthesized by the i gene is abnormal, itwill not bind to the operator region of the operon , resulting in a continuous state of transcription process.-1m

5

33.

(a) One of the main objectives of biotechnology is to minimize the use of insecticides on cultivated crops. Explain how insect resistant crops like Bt cotton have been developed using techniques of biotechnology.

By using the techniques of biotechnology, insect resistant crops have been developed. Some strains of Bacillus thuringiensis (Bt) produce protein crystals which contain a toxic insecticidal protein that kill some insects like lepidopterans, coleopterans and dipterans, etc. Specific Bt toxin genes were isolated from Bacillus thuringiensis and cloned in bacteria. Specific Bt toxin genes obtained from Bacillus thuringiensis are used in several crop plants like cotton by providing them resistance from insects. Bt toxins are insect-group specific coded by a gene called cry which are of various types—proteins encoded by the genes cryIAc and cryIIAb control the cotton bollworms, that of cryIAb controls corn borer.-3m

(b)

The Bt toxin dissolve in the high pH insect gut and become active. The toxins then attack the gut cells of the insect, punching holes in the lining. The Bt spores spills out of the gut and germinate in the insect causing death within a couple days.-2m

OR

(a)

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Gene Therapy ADA (Adenosine deaminase) deficiency Lymphocytes from the blood of the patient are grown in a culture, a functional ADA cDNA is introduced into these lymphocytes, which are subsequently returned to the patient. The permanent cure is done by introducing ADA cDNA into cells at early embryonic stages.-2m

(b)

Two chains of DNA sequence corresponding to A and B chains of human insulin prepared, introduced them into plasmids of E. coli to produce separate A and B chains, A and B chains extracted combined by creating disulphide bonds. Detailed

Answer : American Company Eli Lilly used the knowledge of r-DNA technology to produce human insulin in the following way.

1. Preparation of DNA corresponding to A and B chain separately.
2. Extraction of plasmid from bacteria.
3. Insertion of DNA corresponding to A and B chain separately in plasmid.
4. Transforming the bacteria with this recombinant plasmid.
5. Expression of the desired product from this DNA .
6. Purification of A and B chain.
7. Linking them with disulfide bonds so that they act as humans.-3m

5