Solution

PREBOARD EXAM- 2 2025-26

Class 12 - Biology

Section A

1. **(a)** Carpel
   Explanation:
   Carpel

2. **(b)** Bacillus thuringiensis
   Explanation:
   Bacillus thuringiensis

3. **(b)** Demecology
   Explanation:
   Demecology

4. **(c)** Nucleases
   Explanation:
   A restriction enzyme (or restriction endonucleases) recognizes a specific base pair sequence in DNA called a restriction site and cleaves the DNA (hydrolyses the phosphodiester backbones) within the sequence. Restriction enzymes are widely found in prokaryotes and provide protection to the host cell by destroying foreign DNA that makes entry to it. It acts as a part of the defense mechanism.
   Restriction enzymes belong to a larger class of enzymes called nucleases. They are of two types: endonucleases and exonucleases.

5. **(b)** Deforestation
   Explanation:
   Deforestation

6. **(b)** Urethra
   Explanation:
   Urethra

7. **(b)** Microinjection
   Explanation:
   Gene transfer in biotechnology can be done by a number of methods. Microinjection is the use of a glass micropipette to inject a liquid substance at a microscopic or borderline macroscopic level. The target is often a living cell but may also include intercellular space.
   Microinjection is one of the best methods to transfer the desired gene into a suitable host.

8. **(d)** Released polypeptide chain
   Explanation:

The figure shown above represents the translation process in which protein is produced. Ribosome provides the site for protein synthesis and t-RNA brings the amino acids. The 'x' is the polypeptide chain produced.

9.

(d) All of these
Explanation:
All of these

10.

(c) Male
Explanation:
Male birds bear ZZ sex chromosome as sex determination is ZO type, in which ZZ is male and ZO is female.

11.

(c) Phenylalanine, Methionine
Explanation:
Phenylalanine, Methionine

12. **(a)** 2, 3
Explanation:
2, 3

13.

(b) Both A and R are true but R is not the correct explanation of A.
Explanation:
The pure line is a strain of genetically pure true-breeding individuals. Members of the pure line are homozygous for one or more characters. In homozygous form both the factors express the same effect. These organisms are said to breed true. They are used for cross breeding in order to get the desired improvement in crops.

14.

(b) Both A and R are true but R is not the correct explanation of A.
Explanation:
Replacement of organic parts by mineral deposits is called petrification. Fossils formed through petrification are termed petrified fossils. These fossils consists of only the hard parts of extinct organisms. Moulds of hardened and fossilized mud that surrounded an extinct individuals have been found. In most cases, the buried individuals have been completely destroyed, but the moulds have retained true copies of their shapes. Sometimes, a mould is found with petrified fossil of the individual also. Such fossils are termed as casts.

15.

(c) A is true but R is false.
Explanation:
A is true but R is false.

16. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
The time between infection with the virus and the onset of symptoms of AIDS (the incubation period) ranges from a few months to ten years or more. Infected persons can spread the virus during the incubation period.

Section B

17. General methods for the production of antibiotics include the following steps:

i. Suitable strains of microorganisms are cultivated in a specialized sterilized nutrient medium.
ii. The microorganisms excrete out certain chemicals into the medium called antibiotics.

iii. As microorganisms are removed by filtration and centrifuging and the antibiotics are isolated from the medium by the method of solvent extraction, absorption and precipitation.

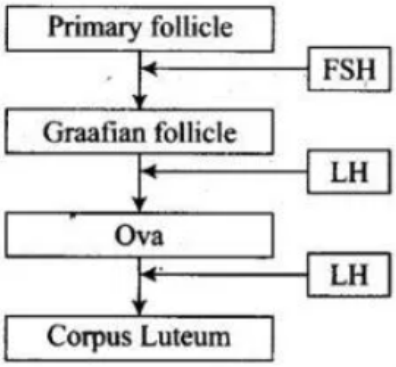
iv. The antibiotics thus formed are purified, concentrated and bioassayed before packing.

18. A → Crustaceans, B → Insects, C → Mosses, D → Fungi

19. (A) - Plasmid, (B) - Nucleoid

Plasmid is used as vector to transfer the gene of interest in the host cell.

20.



21.

- Ophrys employs 'sexual deceit' to get the pollination done as one petal of its flower bears an uncanny resemblance to the female bee in size colour and markings.
- The male bee is attracted as it perceives it as female and 'pseudocopulates' with the flower and during that process gets dusted with pollen from that flower.
- When the same bee 'pseudocopulates' with another flower it transfers the pollen to it and thus pollinates the flower.

OR

a. Brood parasitism - it is a method of parasitism in which the organism lays its eggs in the nest of other birds and let that other bird to incubate them. Example: The cuckoo bird lays its eggs in the nest of crow and during the period of evolution, eggs of cuckoo bird has began to resemble with the eggs of crow.

b. **Co evolution of mutualists - Fig and wasp** is a good example of mutualism and coevolution between a plant species and an animal species. The female wasp uses the fruit and fig for oviposition/egg laying uses seeds within the fruit developing seeds for nourishing its larvae.

Section C

22. **Fermentation:** Fermentation is the anaerobic decomposition process in which organic acids, alcohols, and gases are evolved from nutrient containing microorganisms. These gases are usually waste products of metabolism of the microbes e.g., CO_2 produced during alcoholic fermentation.

Conditions:

i. **Temperature:** A temperature between 25°C to 35°C. At high temperature, the microbes are destroyed and at low temperature, their action slows down.

ii. **Concentration:** Dilution favours fermentation.

iii. **Air:** Presence of air is necessary which improves the activity of enzymes.

iv. **Presence of foreign substances:** Presence of Hg, Pb, AI, Sn, Zn destroy the activity of enzymes but the presence of PO_4^{3-} increase the activity of an enzyme.

23. i. The hormones involved in each stage are as follows:

a. **Hypothalamus-** Gonadotropin-releasing hormone (GnRH)

b. **Pituitary-** FSH and LH

c. **Ovary-** LH

d. **Pregnancy-** Progesterone and Human chorionic gonadotropin (hCG)

ii. The functions of the hormone involved in each stage are as follows:

a. **Hypothalamus:** It releases gonadotropin-releasing hormone (GnRH), which stimulates pituitary.

b. **Pituitary:** After stimulation, it secretes FSH and LH. FSH regulates the functioning of the ovary during follicular phase by stimulating the growth of an ovarian follicle into mature Graafian follicle and secretion of oestrogens from the follicle cells. LH stimulates the mature follicle to rupture and release the ovum(ovulation).

c. **Ovary:** After ovulation LH stimulates the formation of corpus luteum inside the ruptured follicle.

d. **Pregnancy:** Corpus luteum starts the secretion of progesterone and hCG is secreted from the placenta which is essential for the maintenance of pregnancy.

iii. Human chorionic gonadotropin (hCG) hormone is secreted from the placenta.

24. Pea is a annual plant which gives result within a year. Large number of seeds are produced by pea plant in one generation. Pea plant has short life cycle. A large number of true breeding varieties with observable alternative forms for a trait were available.

25. a. Species richness increased with increasing explored area up to a limit.
    b. S = Species richness
    Z = Slope of the line /regression coefficient
    A = Area
    C = Y-intercept

26. Endosperm is a nutritive tissue that supplies food material to the growing embryo. Endosperm is developed from the triploid primary endosperm nucleus (PEN).
    In the angiosperms, there are three methods of endosperm development
    (i) Nuclear type. In this method primary endosperm nucleus divides repeatedly without wall formation to produce a large number of free nuclei.
    (ii) Cellular type. Every division of the primary endosperm nucleus is followed by cytokinesis.
    (iii) Helobial type. This type is intermediate between cellular and nuclear type. The division of PEN is followed by wall formation, which result in the formation of micropylar and chalazal chambers. Now free nuclear divisions occur in both the chambers.

OR

Pollen grain is also known as a male gametophyte. Germ pore, sporopollenin, and generative cell are the parts of male gametophyte. The functions of the following structures are as follows:

a. **Germ pore**- This is present in the exine of the pollen grains. It is the site from where pollen tube emerges.
b. **Sporopollenin**- It is present in the exine of the pollen grains. It protects the pollen grains from enzymes, adverse conditions like high temperature along with strong acids & alkali.
c. **Generative Cells** - These are present in pollen grains. They give rise to two male gametes.

27. a. i. Primary Productivity is defined as the rate of biomass production per unit area, over a time period, by plants during photosynthesis.
    ii. Expressed as $g^{-2}yr^{-1}$ / $(kcal\ m^{-2})yr^{-1}$
    b. i. Gross primary productivity minus respiratory loss is the net primary productivity
    ii. It shows the energy available for transfer to the next trophic level. NPP is utilised by heterotrophs.

28. Reproductive health refers to a total well being in all aspects of reproduction i.e. physical, emotional, behavioral and social. A reproductively healthy society can solve all the problems of a nation such as population explosion, sex abuse, sex related crimes, unhygienic conditions and standard living condition. Therefore, for a healthy society, it is important to maintain reproductive health.

Section D

29. i. tRNA is also referred to as soluble RNA (sRNA) because it cannot be easily separated even by ultra centrifugation technique.
    ii. tRNA carries specific type of amino acid at CCA end to the ribosome during protein synthesis. It places the required amino acid properly in the sequence and translates the coded message of mRNA in terms of amino acids.
    iii. The double helix structure is only found in DNA. Ribose is only found in mRNA, DNA has deoxyribose sugar instead. Thymine is found only in DNA, uracil replaces thymine in mRNA. Only the sugar-phosphate backbone is found common in both.
    OR
    Ribosomal RNA is made in the nucleus. Ribosomal RNA binds with proteins to form large and small ribosomal subunits which combine to form ribosomes in the cytoplasm. Genomic RNA may be single-stranded or double-stranded. It is fragmented in influenza virus. Synthesis of rRNA occur in nucleolus.

30. i. RNA interference (RNAi)
    ii. Tobacco plant
    iii. Meloidegyne imcognitia (nematode)
    OR
    Agrobacterium tumefacines vector.

Section E

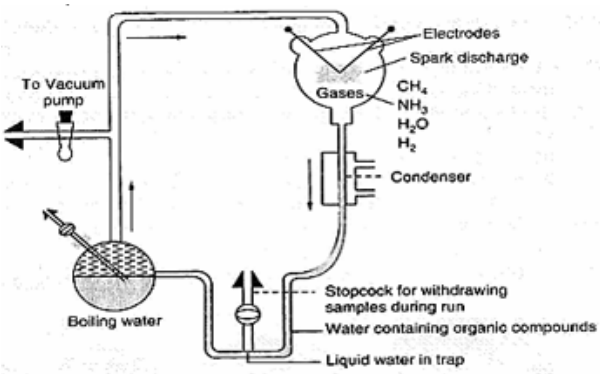
31. The evidence for organic evolution are as follow:

i. **Fossils/ Paleontology evidence:** Fossils of earliest life are scanty and only of prokaryotes mostly. Eukaryotes developed later on.
ii. **Disparity between fossils:** Present-day organisms seem to be related to the fossils of the quaternary period but differ from those of the tertiary period. Fossils of the quaternary period are similarly related to the tertiary period but differ from the ones of the Cretaceous period. These differences are due to changes in the form, structure, and habits of organisms due to evolution.
iii. **Extinct organisms:** Lots of organisms existed on earth for some time and then got extinct like dinosaurs, toothed birds, pteridosperms, giant horsetails, ancestors of man, etc. Extinction happened due to many factors. Some of the extinct forms have left their modified descendants (Man, modern-day Horse) while others have perished without leaving any descendants (Pteridosperm, Dinosaurs).
iv. **Missing Links:** These are transitional or intermediate forms between two groups of organisms which occur only in the fossil state. E.g., *Seymouria*, a missing link between amphibia and reptilia.
v. **Plant vs Animal Fossils:** Ancestral animals have left more fossils as compared to plants evidently due to the presence of slow decaying harder structures in their exoskeleton and endoskeleton.

OR

The theory of biogenesis states that life comes from pre-existing life.
Miller's Experiment:

- Stanly Miller and Urey created conditions similar to the primitive atmosphere using glass apparatus and tubes in the laboratory.
- The electric discharge was created by using electrodes in a closed flask containing methane, ammonia, hydrogen and water vapours at 800°C.
- The chamber containing water was heated to provide water vapour.
- He passed the mixture through a condenser. He circulated the gases continuously in this way for one week and then analysed the chemical composition of the liquid inside the apparatus. He observed a large number of simple organic compounds and some amino acids like alanine, glycine and aspartic acid. Miller proved that organic compounds were the basis of life, which supported opaline's theory.



Miller-Urey Experiment

32. Gene therapy is a collection of methods that allows the correction of a gene defect that has been diagnosed in a child/embryo. Here genes are inserted into a person's cells and tissues to treat a disease.
The first clinical gene therapy was given in 1990 to a 4 -year old girl with adenosine deaminase (ADA) deficiency. This enzyme is crucial for the immune system to function. The disorder is caused due to the deletion of the gene for adenosine deaminase. In some children ADA deficiency can be cured by bone marrow transplantation: in others, it can be treated by enzyme replacement therapy, in which functional ADA is given to the patient by injection. But the problem with both of these approaches that they are not completely curative. As a first step towards gene therapy, Lymphocytes from the blood of the patient are grown in a culture outside the body. A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are subsequently returned to the patient. However, as these cells are not immortal, the patient requires "periodic infusion of such genetically engineered Lymphocytes. However, if the gene isolate from marrow cells producing ADA is introduced into cells at early embryonic stages, it could be a permanent cure.

OR

Insulin is synthesised artificially to cure type 1 diabetes or Insulin Dependent Diabetes Mellitus (IDDM) in humans in which beta (β) cells of islet of Langerhans of the pancreas fail to produce the same. Insulin consists of two short polypeptide chains, i.e chain-A and B, linked together by disulphide bridges. Chain-A contains 21, while chain-B contains 30 ammo acids. In mammals, insulin is synthesised as a prohormone which contains an extra stretch called the C-peptide. It needs to be processed before it becomes a fully mature and functional hormone. This is also known as proinsulin. C-peptide is not present in the mature insulin

and is removed during maturation of insulin. Thus, the main challenge for the production of insulin using rDNA technique is getting insulin assembled into a mature form. An American company Eli Lilly produced insulin via recombinant DNA technology in 1983 Insulin production by using recombinant DNA technology is shown in the flow chart below:

DNA sequences corresponding to the two polypeptides, i e. A and B-chains of insulin are synthesised *in vitro*

↓

They are introduced into plasmid DNA of *E coli*

↓

This bacterium is cloned under suitable conditions

↓

The transgene is expressed in the form of polypeptides, i e. A and B-chains secreted into the medium

↓

They are extracted and combined by creating disulphide bridge to form human insulin.

33. a. *Plasmodium falciparum* causes malignant malaria in humans.

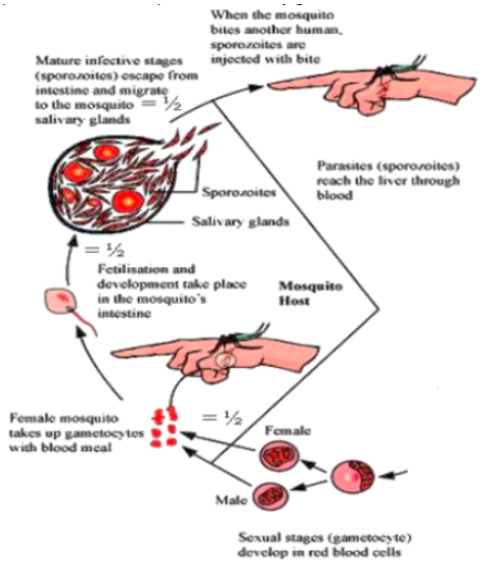
b. The events in the life cycle of Plasmodium which take place in the female Anopheles are as follows:

i. Gametocytes / Male and Female gametes - enter female Anopheles mosquito

ii. Fertilisation and development in the female mosquito gut/stomach.

iii. Sporozoites are transported to the salivary gland.

iv.



c. When Plasmodium gains the entry in the human body then following events are taking place inside the body-

i. The parasite multiplies asexually in RBC

ii. RBC rupture

iii. Release toxic haemozoin

iv. Chill and fever recurring every 3 - 4 days

v. Parasites enter fresh RBC and repeat the cycle.

OR

a.

Active immunity	Passive immunity
Production of antibodies on exposure to antigen in the host body	Introduction of readymade antibodies to protect against the pathogen
Slow process and takes time to give a fully effective response	T lymphocyte production is fast and responds quickly by checking the growth of the pathogen
Natural infection induces active immunity	Inoculation of a pathogen in other organisms synthesizes antibodies which are isolated and used for vaccination

b. Vaccination and immunization keep the human population healthy as it helps in neutralizing the effect of pathogenic agents by producing a massive response against the particular pathogen. They do so because-

- Vaccines generate memory cell (B and T cells) that recognize quickly on subsequent exposure and controls growth of pathogen with massive production of antibodies.
- Preformed antibodies/ antitoxin protect our body from deadly microbes like tetanus and against snake venom.