12th STD

PUBLIC EXAM - MARCH 2024
PART - III
BIOLOGY

Reg. No.

TIME ALLOWED : 3.00 HOURS] (with Answers) [MAXIMUM MARKS : 70

Instructions:

1. Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
2. Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

PART - II
BIO-ZOOLOGY (35 Marks)
SECTION - 1

Note : (i) Answer **all** the questions **(8 × 1 = 8)**

(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1. The Androgen Binding Protein (ABP) is produced by :
   (a) Sertoli cells (b) Leydig cells (c) Pituitary gland (d) Hypothalamus
2. The relationship between sucker fish and shark is :
   (a) Commensalism (b) Parasitism (c) Predation (d) Competition
3. Paedogenetic parthenogenesis occurs in :
   (a) Solenobia (b) Aphis (c) Gall fly (d) Honey bees
4. Down's Syndrome is a genetic disorder which is caused by the presence of an extra chromosome number :
   (a) 13 (b) 20 (c) 23 (d) 21
5. Exo-erythrocytic schizogony of Plasmodium takes place in :
   (a) Stomach (b) RBC
   (c) Liver (d) Leucocytes
6. The term 'Biogenesis' was coined by :
   (a) Oparin (b) Thomas Huxley
   (c) Haldane (d) Henry Bastian
7. Project Tiger was launched in the Jim Corbett National Park in the State of _____ in 1973.
   (a) Assam (b) Uttarakhand (c) Kerala (d) Gujarat
8. Adenosine deaminase deficiency causes :
   (a) SCID (b) Haemophilia (c) Hepatitis (d) AIDS

Section - 2

Note : Answer **any four** of the following questions. **(4 × 2 = 8)**

9. Mention any two goals of the human genome project.
10. Define Oligopotency with an example.
11. Draw a neat labelled sketch of Human Ovum.
12. Which is referred as Industrial alcohol? Why is it referred so?
13. What is meant by Sameer?
14. Write the risk factors for cervical cancer.

Section - 3

Note : Answer a**ny three** questions. Q. No. **19** is **compulsory.** **(3 × 3 = 9)**

15. Write a short note on Coprolites.
16. Placenta is an endocrine tissue - Justify.
17. Recently E-waste created dangerous effects in the environment. How will you find solution to avoid the effects due to these wastes?
18. Write the differences between r-selected and K-selected species.
19. By which event PCR help in RNA replication? Write in brief about the chemical reaction of that process.

Section - 4

Note : Answer all the questions. **(2 × 5 = 10)**

20. (a) How can we contribute to promote biodiversity conservation?

(OR)

(b) What are Hardy-Weinberg's assumptions on evolution? Explain them.

21. (a) Classify the drugs on the basis of their effects.

(OR)

(b) Explain the different kinds of syngamy in living organisms.

ANSWERS

Section - 1

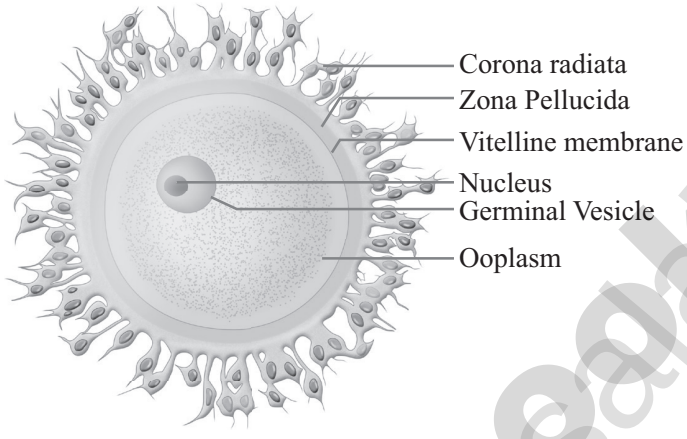
1. (a) Sertoli cells
2. (a) Commensalism
3. (c) Gall fly
4. (d) 21
5. (c) Liver
6. (d) Henry Bastian
7. (b) Uttarakhand
8. (a) SCID

Section - 2

9. **Goals of the human genome Project :**
   (i) Identify all the genes (approximately 30000) in human DNA.
   (ii) Determine the sequence of the 3 billion chemical base pairs that makeup the human DNA.

10. **Oligopotency :**Refers to stem cells that can differentiate into few cell types.
    Eg: Lymphoid or myeloid stem cells can differentiate into B and T cells but not RBC.

11. **Human Ovum :**



12. *Saccharomyces cerevisiae* is the major producer of ethanol (C_2H_5OH). It is used for industrial, laboratory and fuel purposes. So ethanol is referred to as industrial alcohol.

13. **Sameer,** an App provides hourly updates on the National Air Quality Index (AQI) published by CPCB.

14. **Risk factors for cervical cancer:**
    (i) Having multiple sexual partners
    (ii) Prolonged use of contraceptive pills

Section - 3

15. **Corprolites :** Hardened faecal matter are termed coprolites occur as tiny pellets. Analysis of coprolites enables us to understand the nature of diet on which the prehistoric animals thrived on.

16. **Placenta is an endocrine tissue :**
    (i) Placenta is a temporary endocrine organ formed during pregnancy.
    (ii) During pregnancy, the placenta acts as a temporary endocrine gland and produces large quantities of human Chorionic Gonadotropin (hCG), human Chorionic Somatomammotropin (hCS) or human Placental Lactogen (hPL), oestrogens and progesterone which are essential for a normal pregnancy.
    (iii) A hormone called relaxin is also secreted during the later phase of pregnancy which helps in relaxation of the pelvic ligaments at the time of parturition.
    (iv) hCG, hPL and relaxin are produced only during pregnancy.

17. **E-Waste:**

(i) Electronic waste or e-waste describes discarded electrical electronic devices as well as any refuse created by discarded electronic devices and components and substances involved in their manufacture or use.

(ii) Their disposal is a growing problem because electronic equipment frequently contains hazardous substances.

(iii) E-wastes are basically PCB (Polychlorinated biphenyl) based, which are non-degradable.

(iv) Used electronics which are destined for reuse, resale, salvage, recycling or disposal are also considered e-waste.

(v) Unauthorised processing of e-waste in developing countries can lead to adverse human health effects and environmental pollution.

(vi) Recycling and disposal of e-waste may involve significant risk to the health of workers and communities in developed countries and great care must be taken to avoid unsafe exposure in recycling operations and leaking of materials such as heavy metals from landfills and incinerator ashes.

18.

S. No	R selected species	K selected species
1.	Smaller sized organisms.	Larger sized organisms.
2.	Produce many offspring	Produce few offspring
3.	Mature early	Late maturity with extended parental care
4.	Short life expectancy	Long life expectancy
5.	Only few reach adulthood	Most individual reach maximum life span

19. The PCR technique can also be used for amplifications of RNA in which case it is referred to as reverse transcription PCR (RT-PCR). In this process the RNA molecules (mRNA) must be converted to complementary DNA by the enzyme reverse transcriptase. The cDNA then serves as the template for PCR.

Section - 4

20. (a) Conservation of biodiversity is protection and scientific management of biodiversity so as to maintain it at its optimum level and derive sustainable benefits for the present as well as future generations. It aims to protect species from extinction and their habitats and ecosystems from degradation.

General strategies in conservation

(i) identify and protect all threatened species

(ii) identify and conserve in protected areas the wild relatives of all the economically important organisms

(iii) identify and protect critical habitats for feeding, breeding, nursing, resting of each species

(iv) air, water and soil should be conserved on priority basis

(v) wildlife Protection Act should be implemented

(OR)

(b) (i) Hardy and Weinberg stated that the allele frequencies in a population are stable and are constant from generation to generation in the absence of gene flow, genetic drift, mutation, recombination and natural selection.

(ii) Hence population in Hardy Weinberg is not evolving.

Hardy Weinberg's assumptions include:

No mutation – No new alleles are generated by mutation nor the genes get duplicated or deleted.

Random mating – Every organism gets a chance to mate and the mating is random with each other with no preferences for a particular genotype.

No gene flow – Neither individuals nor their gametes enter (immigration) or exit (emigration) the population.

Very large population size – The population should be infinite in size.

No natural selection – All alleles are fit to survive and reproduce.

21. (a)

Group	Drugs	Effects
Stimulants	Amphetamines, cocaine, nicotine and tobacco	Accelerates the activity of the brain
Depressants	Alcohol, Barbiturates, Tranquilizers	Slows down the activity of the brain
Narcotic/ Analgesics	Opium, Morphine	Act as depressants on the Central Nervous System
Hallucinogens	Lysergic acid diethylamide (LSD), Phencyclidine	Distorts the way one sees, hears and feels
Stimulants, Depressants, Hallucinogens	Bhang (Marijuana), Ganja, Charas	Stimulating action on the CNS and affects the cardiovascular system

(OR)

(b) Different kinds of syngamy (fertilization) are prevalent among living organisms.

(a) **Autogamy** - The male and female gametes are produced by the same cell or same organism and both the gametes fuse together to form a zygote. **e.g.** *Actinosphaerium* and *Paramecium*.

(b) **Exogamy** - The male and female gametes are produced by different parents and they fuse to form a zygote. So it is biparental. **e.g.** Human beings – dioecious or unisexual animal.

(c) **Hologamy** - Lower organisms, sometimes the entire mature organisms do not form gametes but they themselves behave as gametes and the fusion of such mature individuals is known as hologamy **e.g.** *Trichonympha.*

(d) **Paedogamy** - It is the sexual union of young individuals produced immediately after the division of the adult parent cell by mitosis. **e.g.** *Actinophrys.*

(e) **Merogamy** - The fusion of small sized and morphologically different gametes (merogametes) takes place. **e.g.** *Protozoa.*

(f) **Isogamy** - The fusion of morphological and physiological identical gametes (isogametes) is called isogamy. **e.g.** *Monocystis.*

(g) **Anisogamy** - The fusion of dissimilar gametes is called anisogamy (Gr. An-without; iso-equal; *gam*-marriage). Anisogamy occurs in higher animals but it is customary to use the term fertilization instead of anisogamy or syngamy. **e.g.** higher invertebrates and all vertebrates.

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PART - III

ZOOLOGY

Reg. No.

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Instructions : (1) Check the question paper for fairness of printing. If there is any lack of fairness,inform the Hall Supervisor immediately.

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PART - I

Note : (i) Answer **all** the questions. **(15 × 1 = 15)**

(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1. A mRNA molecule is produced by :
   (a) Duplication (b) Replication (c) Translation (d) Transcription
2. Colostrum is rich in :
   (a) Ig D (b) Ig E (c) Ig M (d) Ig A
3. The most common substrate used in distilleries for the production of ethanol :
   (a) Molasses (b) Soyameal (c) Cornmeal (d) Groundgram
4. The wings of birds and butterflies is an example of :
   (a) Divergent evolution (b) Variation
   (c) Convergent evolution (d) Adaptive radiation
5. Without altering water quality, _____ is/are an ideal disinfectant used in waste water treatment.
   (a) Boiling (b) U-V rays (c) Ozonisation (d) Chlorination
6. The ovary remains attached with pelvic wall and the uterus by an ovarian ligament, called :
   (a) myometrium (b) ovarian stroma (c) mesovarium (d) tunica albuginea
7. B cells are activated by :
   (a) Interferon (b) Complement (c) Antigen (d) Antibody
8. GEAC stands for :
   (a) Genetic Engineering Approval Committee
   (b) Genome Engineering Action Committee
   (c) Genetic and Environment Approval Committee
   (d) Ground Environment Action Committee
9. Which of the following is an r-species?
   (a) rhinoceros (b) human (c) whale (d) insects
10. The organization which collects, compiles and publishes the red list of threatened species :
    (a) IUCN (b) WWF (c) UNEP (d) ZSI

11. The average foetal heart beat rate is :
    (a) 120 - 160 beats/minute (b) 120 - 130 beats/minute
    (c) 130 - 150 beats/minute (d) 130 - 160 beats/minute

12. ABO blood group in man is controlled by :
    (a) Sex linked genes (b) Multiple alleles (c) Holandric genes (d) Lethal genes

13. In which mode of reproduction variations are seen?
    (a) Sexual (b) Asexual (c) Parthenogenesis (d) Both (a) and (b)

14. Match the pathogens with respective diseases caused by them and select the correct match using the codes given below :

(A) Leishmania donavani	(i) Amoebiasis
(B) Wuchereria bancrofti	(ii) Kala-azar
(C) Trypanosoma gambiense	(iii) Sleeping sickness
(D) Entamoeba histolytica	(iv) Filariasis

    (a) (A) - (iii), (B) - (i), (C) - (ii), (D) - (iv)
    (b) (A) - (ii), (B) - (iv), (C) - (iii), (D) - (i)
    (c) (A) - (i), (B) - (iv), (C) - (iii), (D) - (ii)
    (d) (A) - (ii), (B) - (iv), (C) - (i), (D) - (iii)

15. Modern man belongs to which period?
    (a) Quaternary (b) Cambrian (c) Cretaceous (d) Silurian

PART - II

Note : Answer **any six** of the following. Question No. 24 is Compulsory. **(6 × 2 = 12)**

16. Differentiate between external and internal fertilizations.
17. How is polyspermy avoided in humans?
18. Write the preventive measures of STDs.
19. What are holandric genes?
20. Give reasons : Genetic code is universal.
21. Define 'Zymology'.
22. What are the three levels of biodiversity?
23. What is Pedogenesis?
24. How will you get desired traits in animals by using modern biotechnology? Give examples.

PART - III

Note : Answer **any six** of the following. Question No. **33** is Compulsory. **(6 × 3 = 18)**

25. What is parthenogenesis? What are its types?
26. Mention the differences between spermiogenesis and spermatogenesis.
27. What is amniocentesis? Why do a statutory ban is imposed on this technique?
28. Who disproved Lamarck's theory of Acquired characters? How?
29. Why is opsonisation efficient in Phagocytosis?
30. List the advantages of biogas plants in rural areas.
31. What are the possible risks of GMOs?
32. Write the common withdrawal symptoms of drugs and alcohol abuse.
33. Define 'Bergmenn's rule'.

PART - IV

Note : Answer **all** the questions. **(5 × 5 = 25)**

34. (a) Explain the different kinds of syngamy in living organisms.

(OR)

(b) Write the differences between active and passive immunity.

35. (a) Explain the applications of DNA fingerprinting techniques.

(OR)

(b) Mention the main objections to Darwinism.

36. (a) What are the various essential properties of water?

(OR)

(b) List the various menstrual disorders.

37. (a) What is Microbial Fuel Cell? Explain.

(OR)

(b) Explain how recombinant insulin can be produced.

38. (a) Explain the methods of disposal of radioactive wastes.

(OR)

(b) List out the various causes for biodiversity losses.

ANSWERS

PART - I

1. (d) Transcription
2. (d) Ig A
3. (a) Molasses
4. (c) Convergent evolution
5. (b) U-V rays
6. (c) mesovarium
7. (c) Antigen
8. (a) Genetic Engineering Approval Committee
9. (d) insects
10. (a) IUCN
11. (a) 120 - 160 beats/minute
12. (b) Multiple alleles
13. (a) Sexual
14. (b) (A) - (ii), (B) - (iv), (C) - (iii), (D) - (i)
15. (a) Quaternary

PART - II

16.

External fertilization	Internal fertilization
The fusion of male and female gametes takes place outside the body of female organisms in the water medium. **Eg:** sponges, fishes and amphibians.	The fusion of male and female gametes takes place within the body of female organisms. **Eg:** reptiles, aves and mammals.

17. Once fertilization is accomplished, cortical granules from the cytoplasm of the ovum form a barrier called the fertilization membrane around the ovum. This prevents further penetration of other sperms. Thus polyspermy (entry of more than one sperm into an egg) is prevented.

18. **Prevention of STDs (Sexually Transmitted Diseases)**
    (i) Avoid sex with unknown partner/ multiple partners
    (ii) Use condoms
    (iii) In case of doubt, consult a doctor for diagnosis and get complete treatment.

19. **Holandric genes :**
    (i) The genes present in the differential region of Y chromosome are called Y-linked or holandric genes.
    (ii) The Y- linked genes have no corresponding allele in X chromosome. Eg: Hypertrichosis
    (iii) The Y-linked genes inherit along with Y chromosome and they phenotypically express only in the male sex.

20. The genetic code is universal. All known living systems use nucleic acids and the same three base codons (triplet codon) direct the synthesis of protein from amino acids. Eg: the mRNA (UUU) codon codes for phenylalanine in all cells of all organisms.

21. **Zymology** is an applied science which deals with the biochemical process of fermentation and its practical uses.

22. **Three levels of biodiversity**
    (1) Genetic diversity
    (2) Species diversity and
    (3) Community/Ecosystem diversity.

23. Soil is formed from rocks which are the parent materials of soil, by weathering and is called embryonic soil. This process is known as pedogenesis.

24. (i) Selective breeding methods were carried out to improve the genetic characteristics of live stock and other domestic animals.
    (ii) Transgenesis is the process of introduction of extra (foreign/exogenous) DNA into the genome of the animals to create and maintain stable heritable characters. The foreign DNA that is introduced is called the transgene and the animals that are produced by DNA manipulations are called transgenic animals or the genetically engineered or genetically modified organisms.
    (iii) **Examples :** Mice, rat, rabbit, pig, cow, goat, sheep and fish.

PART - III

25. (i) Development of an egg into a complete individual without fertilization is known as parthenogenesis.
(ii) Parthenogenesis is of two main types namely, Natural Parthenogenesis and Artificial Parthenogenesis.
(iii) **Natural Parthenogenesis** - Ex: Honey bees, Gall fly
(iv) **Artificial Parthenogenesis** - Ex: Annelid, Seaurchin

26.

Spermiogenesis	Spermatogenesis
It is the process of maturation of spermatids into spermatozoa.	It is the process of formation of sperm cells or male gametes.
Follicle Stimulating Hormone (FSH) stimulate testicular growth and enhances the production of Androgen Binding Protein (ABP) by the sertoli cells and helps in the process of spermiogenesis.	Lutenizing Hormone (LH) acts on the Leydig cells and stimulates the synthesis of testosterone which in turn stimulates the process of spermatogenesis.

27. (i) Amniocentesis is a prenatal technique.
(ii) It is used to detect any chromosomal abnormalities in the foetus

Reason for the statutory ban on this technique:

(i) It is being misused to determine the sex of the foetus.
(ii) It creates chance of female foeticide.

28. (i) **Lamarck's "Theory of Acquired characters"** was disproved by August Weismann by the experiments on mice for twenty generations by cutting their tails and breeding them.
(ii) All mice born were with tail.
(iii) Weismann proved that change in the somatoplasm will not be transferred to the next generation but changes in the germplasm will be inherited.

29. (i) Opsonisation or enhanced attachment is a type of antigen-antibody reaction.
(ii) It is a process by which a pathogen is marked of ingestion and destruction by a phagocyte.
(iii) Opsonisation involves the binding of an opsonin i.e. antibody, to a receptor on the pathogen's cell membrane. After opsonin binds to the membrane, phagocytes are attracted to the pathogen. So, opsonisation is a process in which pathogens are coated with a substance called an opsonin, marking the pathogen out for destruction by the immune system. This results in a much more efficient phagocytosis.

30. **Advantages of biogas plants in rural areas :**
(i) Biogas can be produced from raw materials such as agricultural wastes, manures municipal waste, plant material, sewage, food waste, etc., available naturally in rural areas.
(ii) Biogas is produced under anaerobic condition, when the organic materials are converted through microbiological reactions into gas and organic fertilizer.
(iii) The biogas is devoid of smell and burns with a blue flame without smoke.

31. GMOs stands for Genetically Modified Organisms. The possible risks of GMO's include:

Environmental	Health	Agricultural
Toxins in pest-resistant GMOs could negatively impact non-target organisms and harm ecosystems.	Proteins transcribed and translated from transferred genes could cause allergic reactions in humans or other animals – currently GM foods are not properly labelled.	GMOs with pest toxins could increase evolution of resistance in certain pest populations.
Cross-species pollination could spread herbicide resistance genes and create ' super-weeds'.	Antibiotic resistance genes used as markers during gene transfer could spread to pathogenic bacteria.	Big biotech companies hold monopolistic legal rights (patents) over GM seeds.
Biodiversity could be negatively affected by destruction of pests, weeds, and even competing plants.	Transferred genes could mutate and cause unexpected risks.	GMOs do present two major agricultural problems in the forms of pesticide- and herbicide-resistance.

32. The withdrawal symptoms may range from
    (i) Mild tremors to convulsions,
    (ii) Severe agitation and fits,
    (iii) Depressed mood, anxiety, nervousness, restlessness, irritability,
    (iv) Insomnia,
    (v) Dryness of throat, etc, depending on the type of drug abuse.

33. **Bergmann's rule :** Bergman's rule is an eco geographic principle that states that within broadly distributed taxonomic clade, populations and species of larger size are found in colder and of smaller size are in warmer regions.

PART - IV

34. **(a)** Different kinds of syngamy (fertilization) are prevalent among living organisms.
    (a) **Autogamy** - The male and female gametes are produced by the same cell or same organism and both the gametes fuse together to form a zygote. **e.g.** *Actinosphaerium* and *Paramecium.*
    (b) **Exogamy** - The male and female gametes are produced by different parents and they fuse to form a zygote. So it is biparental. **e.g.** Human beings – dioecious or unisexual animal.
    (c) **Hologamy** - Lower organisms, sometimes the entire mature organisms do not form gametes but they themselves behave as gametes and the fusion of such mature individuals is known as hologamy **e.g.** *Trichonympha.*
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(OR)

(b)

S. No.	Active Immunity	Passive Immunity
i.	Active immunity is produced actively by host's immune system.	Passive immunity is received passively and there is no active host participation.
ii.	It is produced due to contact with pathogen or by its antigen.	It is produced due to anti bodies obtained from outside.
iii.	It is durable and effective in protection.	It is transient and less effective.
iv.	Immunological memory is present.	No memory.
v.	Booster effect on subsequent dose is possible.	Subsequent dose is less effective.
vi.	Immunity is effective only after a short period.	Immunity develops immediately.

35. **(a) Application of DNA finger printing :**

(i) **Forensic analysis** - It can be used in the identification of a person involved in criminal activities, for settling paternity of maternity disputes, and in determining relationships for immigration purposes.

(ii) **Pedigree analysis** - Inheritance pattern of genes through generations and for detecting inherited diseases.

(iii) **Conservation of wild life** - In protection of endangered species. By maintaining DNA records for identification of tissues of the dead endangered organisms.

(iv) **Anthropological studies** - It is useful in determining the origin and migration of human populations and genetic diversities.

(OR)

(b) Main objections to Darwinism:

(i) Darwin failed to explain the mechanism of variation.

(ii) Darwinism explains the survival of the fittest but not the arrival of the fittest.

(iii) He focused on small fluctuating variations that are mostly non-heritable.

(iv) He did not distinguish between somatic and germinal variations.

(v) He could not explain the occurrence of vestigial organs, over specialization of some organs like large tusks in extinct mammoths, oversized antlers in the extinct Irish deer, etc.,

36. **(a) Essential properties of water :**

(i) Water is one of the main agents in Pedogenesis (soil formation).

(ii) It is the medium for several different ecosystems.

(iii) It is present as moisture in the atmosphere and the outer layers of the lithosphere and is uneven in distribution on the Earth.

(iv) Water is heavier than air and imparts greater buoyancy to the aquatic medium. This enables organism to float at variable levels.

(v) Water has high heat capacity and latent heat, due to which it can withhold large amounts of heat.

(vi) Water is physically unique because it is less dense as a solid (ice) than as a liquid.

(vii) Water is considered as the Universal solvent. It is the main medium by which chemical constituents are transported from abiotic components to the living components of an ecosystem.

(viii) Water has high surface tension. This allows pollen, dust and even water striders to remain at the surface of a water body even though they are denser than the water.

(OR)

(b) Various menstrual disorders :

(i) **Amenorrhoea:** Absence of menstruation is called amenorrhoea.

Primary amenorrhoea: Menarche does not appear till the age of 18.

Secondary amenorrhoea: Absence of menstruation for three consecutive months.

(ii) **Polymenorrhoea :**

1. Menstrual cycle happens shorter than 21 days.
2. It may be due to hyperactivity of the anterior pituitary gland, psychological disturbances and malnutrition.
3. Chronic pelvic inflammation by certain sexually transmitted diseases (STD) such as chlamydiasis or gonorrhoea can cause inflammation in the uterus causing polymenorrhoea.

(iii) **Dysmenorrhoea :** Pain associated with menstruation is called dysmenorrhoea.

There are two types

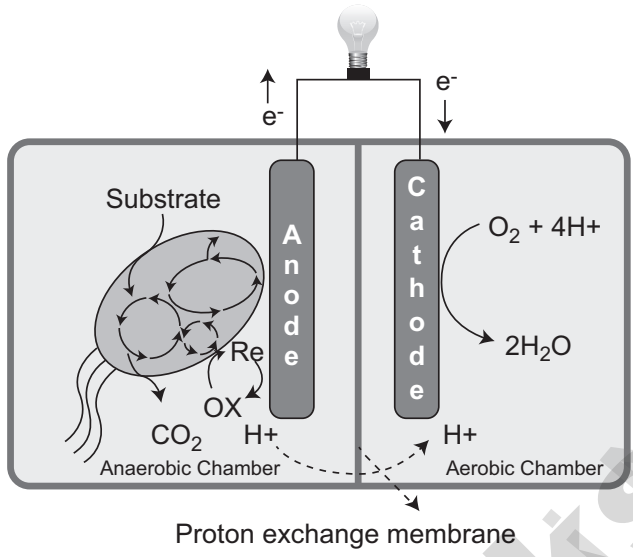
1. **Primary dysmenorrhoea:** Pain or cramps during menstrual period.
2. **Secondary dysmenorrhoea:** Disorder in the Reproductive system like endometriosis or uterine fibroids.

(iv) **Menorrhagia :**

1. Heavy and prolonged menstrual period that disrupts a woman's normal activities is referred to as menorrhagia.
2. It may be due to hormonal imbalance, ovarian dysfunction, uterine fibroids and may also be due to cancer of the ovary, uterus or cervix.

(v) **Oligomenorrhoea :** Oligomenorrhoea is a condition with infrequent menstrual periods. It occurs in women of childbearing age.

37. **(a) Microbial fuel cells (MFC):**



Microbial Fuel Cell

(i) It is a bio-electrochemical system that drives an electric current by using bacteria.

(ii) It mimicks bacterial interaction found in nature.

(iii) MFC cells allow bacteria to oxidize and reduce organic molecules.

(iv) Bacterial respiration is a redox reaction in which electrons are being moved around.

(v) A MFC consists of an anode and a cathode separated by a proton exchange membrane.

(vi) Microbes at the anode oxidize the organic fuel generating protons which pass through the membrane to the cathode.

(vii) Electrons pass through the anode to the external circuit to generate current.

(OR)

(b) Recombinant insulin can be produced :

(i) Production of insulin by recombinant DNA technology started in the late 1970s. This technique involved the insertion of human insulin gene on the plasmids of E.coli.

(ii) The Human insulin is synthesized by the β cells of lslets of Langerhans in the pancreas.

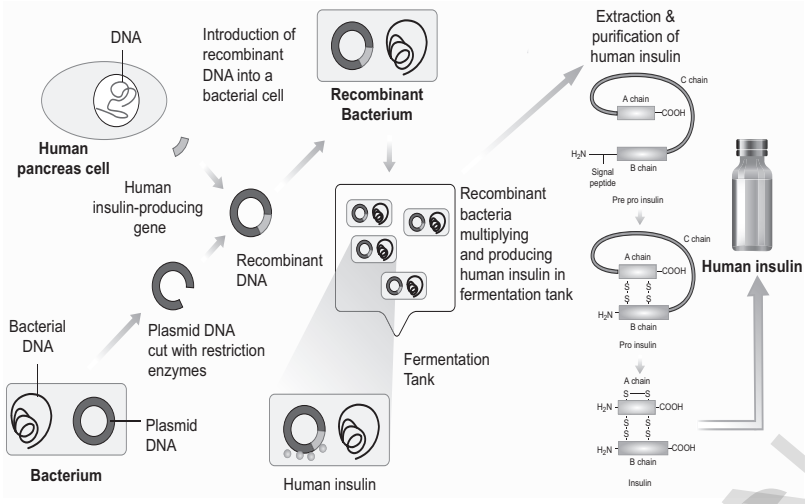
(iii) It is formed of 51 aminoacids which are arranged in two polypeptide chains A and B.

(iv) The polypeptide chain A has 21 amino acids while the polypeptide chain B has 30 amino acids.

(v) Both A and B chains are attached together by disulphide bonds.

(vi) The polypeptide chains are synthesized as a precursor called pre-pro insulin, which contains A and B segments linked by a third chain (C) and preceded by a leader sequence.

(vii) The leader sequence is removed after translation and the C chain is excised, leaving the A and B polypeptide chains.



Human Insulin Production

38. **(a) Methods of disposal of radioactive wastes are:**

(i) **Limit generation** - Limiting the generation of waste is the first and most important consideration in managing radioactive wastes.

(ii) **Dilute and disperse** - For wastes having low radioactivity, dilution and dispersion are adopted.

(iii) **Delay and decay** - Delay and decay is frequently an important strategy because much of the radioactivity in nuclear reactors and accelerators is very short lived.

(iv) **Concentrate and confine process** - Concentrating and containing is the objective of treatment activities for longer lived radioactivity.The waste is contained in corrosion resistant containers and transported to disposal sites. Leaching of heavy metals and radionuclides from these sites is a problem of growing concern.

(OR)

(b) The major causes for biodiversity decline are:

(i) Habitat loss, fragmentation and destruction (affects about 73% of all species).

(ii) Pollution and pollutants (smog, pesticides, herbicides, oil slicks, GHGs).

(iii) Climate change.

(iv) Introduction of alien/exotic species.

(v) Over exploitation of resources (poaching, indiscriminate cutting of trees, overfishing, hunting, mining).

(vi) Intensive agriculture and aquacultural practices.

(vii) Hybridization between native and non-native species and loss of native species.

(viii) Natural disasters (Tsunami, forest fire, earth quake, volcanoes).

(ix) Industrialization, Urbanization, infrastructure development, Transport –Road and (i) Shipping activity, communication towers, dam construction, unregulated tourism and monoculture are common area of specific threats.

(x) Co-extinction.