12

SCHOOL EDUCATION DEPARTMENT

VELLORE DISTRICT

+2 BIO – ZOOLOGY &ZOOLOGY

LEARNING MATERIAL

(2024 – 2025)

SCHOOL EDUCATION DEPARTMENT , VELLORE DISTRICT

+2 BIO – ZOOLOGY & ZOOLOGY (2024 - 2025)

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CONTENTS

1. Reproduction in organisms

1. What is fission ?
   - Fission is the division of the parent body into two or more identical daughter individuals

2. Define parthenogenesis.
   - Development of an egg into a complete invidual without fertilization

3. What is strobilation ?
   - Transverse fissions occur simultaneously
   - Individuals do not separate immediately from each other eg. Aurelia

4. What is plasmotomy?
   - It is division of multinucleated parent into many multinucleate daughter individuals.
   - Nuclear division later to maintain normal number of nuclei . eg. Opalina

5. What is fragmentation ?
   - A type of asexual reproduction
   - The parent body breaks into fragments
   - Each fragment can develop into a new individual . eg. Sea anemone

6. What is regeneration ?its types
   1. Regrowth in the injured region
   2. The two types are morphallaxis and epimorphosis

7. What is epimorphosis ? its types
   - Replacement of the lost body parts
   - Reparative and Restorative

8. Differentiate seasonal breeders and continuous breeders

Seasonal breeder	Continuous breeder
The animal reproduce at a particular period of the year e.g : frog, lizards	They continue to breed throughout their sexual maturity e.g : honey bees rabbit

9. What is encystment?
   - During unfavourable conditions, amoeba withdraws its pseudopodia.
   - Secretes a protective, chitinous cyst wall around it and becomes inactive

10. What are the three phases of life cycle?
    - **Juvenile phase** : period of the growth between birth and reproductive maturity
    - **Reproductive phase** : organisms reproduce and their offsprings reach maturity
    - **Senescent phase** : degeneration in structure and function of the body

11. Define Arrhenotoky, Thelytoky, Amphitoky
    - **Arrhenotoky**: only males are produced by parthenogenesis .eg:Honey bee
    - **Thelytoky**: only females are produced by parthenogenesis .eg:solenobia
    - **Amphitoky**: males and females are produced by parthenogenesis .eg:aphis

12. Define parthenogenesis ? write a note on its type.
    - Development of an egg into a complete invidual without fertilization
    - **Natural parthenogenesis** : occurs constantly and naturally in their life cycle
    - Two types complete and incomplete
    - **Artificial parthenogenesis** : the unfertilized egg is induced by physical and chemical stimuli eg: sea urchin
    - **Paedogenetic parthenogenesis**: larvae produce a new generation of larvae .eg: liver fluke

13. Describe the different kinds of syngamy
    - **Autogamy** : male female gametes are produced by the same organism .eg: paramecium
    - **Exogamy** : male female gametes are produced by the different parents .eg:human
    - **Hologamy** : the entire mature organisms behave as gametes .eg: trichonympha
    - **Paedogamy** : sexual union of young individuals
    - **Merogamy** : fusion of morphological and physiological identical gametes .eg: monocystis
    - **Anisogamy** : fusion of dissimilar gametes .eg: vertebrates.

2.HUMAN REPRODUCTION

One marks :

1. The mature sperms are stored in the - c. **Epididymis**
2. The male sex hormone testosterone is secreted from – b. **Leydig cell**
3. The glandular accessory organ which produces the largest proportion of semen is- a. **Seminal vesicle**
4. The male homologue of the female clitorisis - b. **Penis**
5. The site of embryo implantation is the - a. **Uterus**
6. The foetal membrane that forms the basis of the umbilical cord is - a. **Allantois**
7. The most important hormone in intiating and maintaining lactation after birth is- c. **Prolactin**
8. Mammalian egg is – c. **lecithal and non cleidoic**
9. The process which the sperm undergoes before penetrating the ovumis – d. **Capacitation**
10. The milk secreted by the mammary glands soon after child birth is called – b. **Colostrum**
11. Colostrum is rich in - **b. Ig A**
12. The Androgen Binding Protein (ABP) is produced by - **c. Sertoli cells**

Two marks and three marks

1. Mention the differences between spermatogenesis and spermiogenesis :-

spermatogenesis	**Spermiogenesis**
It is the process of formation of spermatozoa from germinal cells	It is the process of differentiation of spermatozoa from a spermatid

2. Expand the acronyms :-
   a) **FSH** – Follicle Stimulated hormone.
   b) **LH –** Leutinising hormone
   c) **HCC** – Human placental gonadotropin.
   d) **HPL** – Human Placental Lactogen

3. How is polyspermy avoided in humans**?**

- Once fertilization is happened **cortical granules** form the fertilization membrane around the ovum which preventing further penetration of other sperms.

4. What is Colostrum? Write its significance .
   - Colostrum is a **yellowish** fluid produced by female immediately after parturition.
   - It has large amount of protein and Vitamin A.
   - It is easily digested.
   - It gives immunity to the child.
   - It is rich in **IgA antibodies**.

5. What is Inhibin ? State its functions?
   - It is secreted **by Sertoli cell .**
   - It is involved in the negative feedback control of sperm production.

6. Mention the importance of the position of testes in humans?
   - viable sperms cannot be produced at normal body temperature.
   - So scrotum is placed outside the abdominal cavity to provide a temperature **2-3^{o}C** lower than the normal internal body temperature.
   - Thus the scrotum acts as a **thermoregulator** for spermatogenesis.

7. Define Gametogenesis ?

   The production of male and female gametes form respective sex cells .

8. What is PCOS ?

   The hormonal disorder enlarged ovaries with small cyst on the outer edges .

9. What is fertilization ?

   The fusion of male and female gamete is called fertilization

10. Define : Spermiation?
    Sperms are released into the Cavity of seminiferous tubules by a process called spermiation.

11. Mention the significance of epididymis in the testis?
    - It temporarily stores the sperm
    - Sperm undergo physiological maturation and acquire increased motility and fertilizing capacity.

12. What is Ectopic Pregnancy?
    - The fertilized ovum is implanted outside the uterus
    - 95 % of ectopic pregnancy occur in the fallopian tube

13. What is LH Surge?
    - Maximum secretion of LH during the midcycle of menstrual.
    - Causes rupture of graffian follicle and release of ovum

14. Define : Menopause
    - The phase in a womens life when ovulation menstruation stops.
    - A which is involvege of menopause is 45 -50 years.

15. Name the extra embryonic membrane
    Amnion,Allontois ,Yolk sac and Chorion.

16. Write any 2 functions reproductive system
    - To produce gametes
    - To produce hormones
    - To transport and sustain gametes
    - To nurture the developing offspring

17. What is Inhibin?
    Sertoli cell secrete Inhibin which is involved in negative feedback control of sperm production.

18. List the composition of seminal plasma
    - Fructose
    - ascorbic acid
    - prostaglandins
    - coagulating enzyme – Vesiculase

19. What is acrosome?
    - It is small cap like pointed structure in sperm.
    - It is formed from golgi body of the spermatid.
    - It contains hyaluranidase or Sperm lysin.

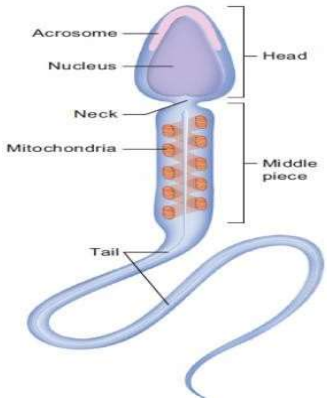
20. What happens when the egg or ovum is not fertilised?
    - The corpus luteum degenerates and leaves ascar tissue called Corpus albicans.
    - It inhibits the disintegration of endometrium leads to menstruation.

21. What is hymen?
    The external opening of the vagina is partially closed by thin ring of tissue called the hymen.

22. What are the 4 parts of the fallopian tube?
    - Infundibulum
    - Ampullae
    - Isthmus
    - Fimbriae

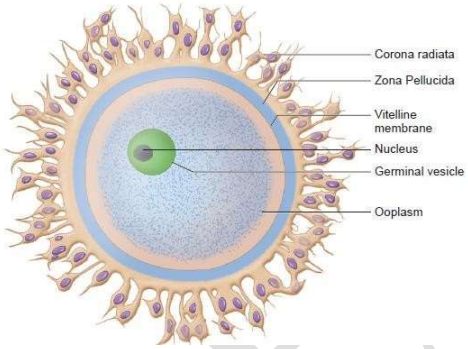
FIVE MARK QUESTIONS

1. Describe the structure of the human Sperm with a neat labelled diagram ?



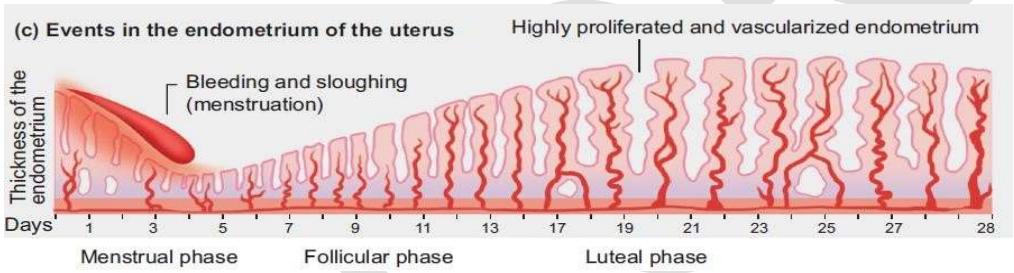
- It is flagellated and motile .
- ➢ It has head , neck and tail .
- ➢ The head has acrosome and nucleus .
- ➢ Acrosome helps to penetrate the ovum at the time fertilization .
- ➢ The neck is short and composed of proximal and distal centrioles .
- ➢ The middle piece has mitochondria . It produces energy for sperm.
- ➢ Tail is the longest part and it helps in movement .

2. Describe the structure of the human ovum with a neat labelled diagram?



- It is microscopic, non - cleidoic
- Egg is alecithal.
- It's cytoplasm is called Ooplasm.
- Ooplasm contains large nucleus called germinal vesicle.
- It has tree coat . outer thick called corona radiata.
- The middle layer is called zona pellucida.
- The inner thin layer is called vitelline membrane.
- Perivitelline space present between the vitelline membrane and zona pellucida.

3. Explain the various phases of menstrual cycle ?



Menstrual cycle:-

It occurs in every 28/29 days. It is from puberty to menopause (except during pregnancy).

Menstrual phase. (3-5 days)

- Progesterone, oestrogen level decreases.
- So uterine endometrial lining and the blood vessels break. It results in menstrual flow for 3 - 5 days.

Follicular Phase (5 -14 days)

- Secretion of FSH and LH induces the following changes.
- Primary follicle of ovary becomes the mature graffian follicle.
- Endometrium regenerates. Follicular development is stimulated.
- Oestrogen is secreted by the follicle cells.

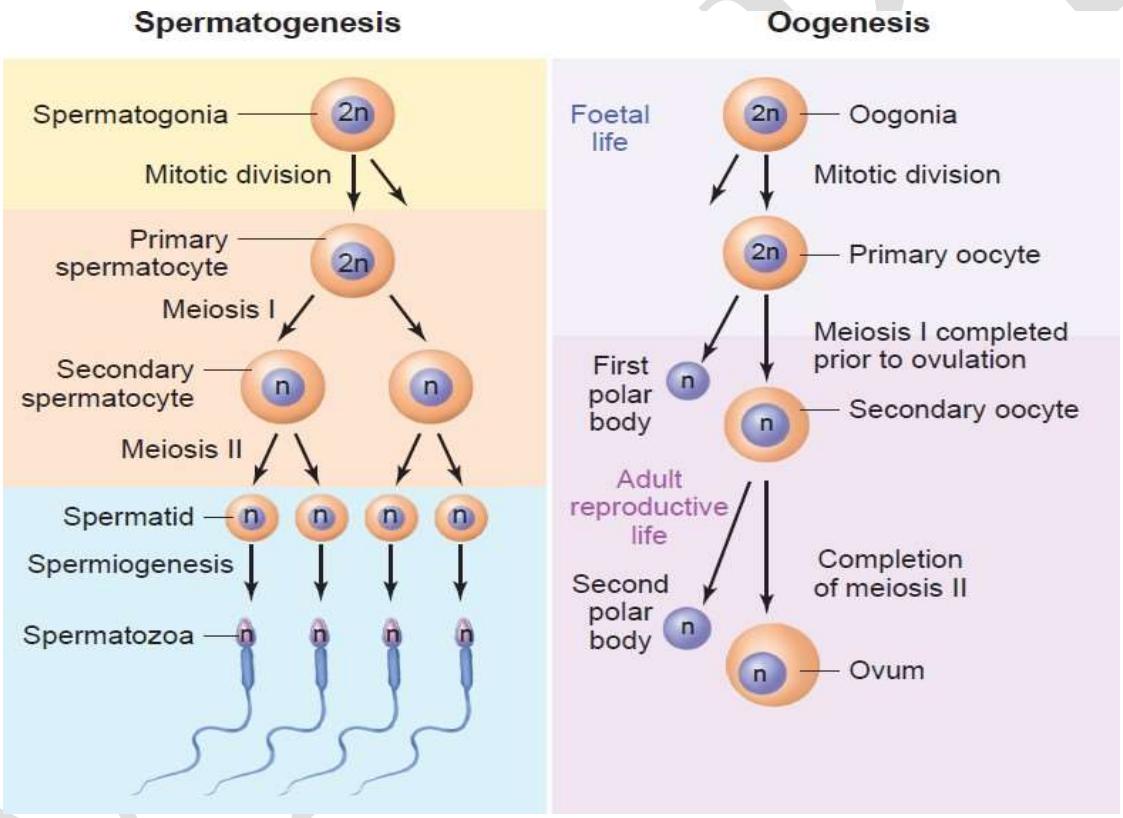
Ovulatory Phase (about 14 day)

- LH and FSH attain peak level.
- LH induces the rupture of graffian follicle .
- Then Ovum is released from the ovary .
- This process is called **Ovulation.**

Luteal or Secretory Phase.

- The empty of the graffian follicle becomes a transitory endocrine gland. It is called **corpus luteum**.
- Corpus luteum secretes **progesterone**. It is needed for the maintenance of endometrium.
- Uterine wall secretes nutritive fluid for the foetus. So this phase is called as secretory phase.
- In the absence of fertilization, the **corpus luteum** degenerates completely and leaves a scar tissue called **Corpus albicans**.

1. Give a schematic representation of spermatogenesis and Oogenesis in human beings



3. REPRODUCTIVE HEALTH

2 MARKS QUESTIONS

1. Differentiate between female foeticide and infanticide.

Female foeticide	Infanticide
Aborting the female in the mother's womb	Killing the female child after her birth

2. How to prevent STDs?
   - Avoid sex with multiple partners.
   - Use condoms.
   - In case of doubt consult a doctor, diagnose and get treated.

3. Write the symptoms of cervical cancer.
   - Pelvic pain.
   - Increased vaginal discharge.
   - Abnormal vaginal bleeding.

4. What is infertility?
   - Inability to conceive or produce children even after unprotected sexual cohabitation.

5. What is embryo transfer technique?
   - The transfer of an embryo with more than 8 blastomeres stage into uterus is called embryo transfer technique.

6. Expand a. ZIFT. b. GIFT. c. AI. d. IUT.
   a) ZIFT - Zygote Intra- Fallopian Transfer.
   b) GIFT - Gamete Intra- Fallopian Transfer.
   c) AI - Arteficial Insemination.
   d) IUT - Intra Uterine Transfer.

7. What is azoospermia?
   - Absence of spermatozoa in the ejaculate semen on atleast 2 occasions.
   - Observed in 1% of population.

8. How Hepatitis-B and HIV are transmitted?

- Sexual intercourse.
- Sharing infusion needles.
- Surgical instruments.
- Blood transfusion.
- Mother to foetus.

9.Write any two major tasks of RCH (Reproductive and Child Health Care)

- Introducing sex education in schools.
- Educating couples and adults about birth control methods and family planning norms.

10. What is Mayor Rokitansky syndrome?

- Women with this syndrome have ovaries.
- But do not have functional uterus.

4. PRINCIPLES OF INHERITANCE AND VARIATION

1. What is heplodiploidy ?
   - In this sex is determined by the number of sets of chromosome it received
   - In honey bee (queen and workers) fertilized egg developed into female
   - Un fertilized egg by parthenogenesis develop into male
   - Male have haploid chromosome, female have diploid chromosome

2. Distinguish between heterogametic and homogametic

Heterogametic	homogametic
produces two types of gametes	produces only one types of gametes
x chromosomes xy	x chromosomes xx

3. What is lyonisation?
   - Mary lyon suggested that Barr bodies are an inactive chromosomes
   - The number of Barr bodies observed in cell was one less than the nimber of x- chromosomes
   - Xy male have no Barr bodies
   - Xx female have one Barr bodies

4. What is criss-cross inheritance?
   - It is an sex linked inheritance
   - In which a trait is transmitted from male parent to grandson through his daughter .eg: colour blindess

5. What are holandric genes?
    - The genes that are carried on the Y chromosomes

6. Mention the symptoms of phenylketonuria?
    - Mental retardation
    - Light pigmentation of skin and hair
    - The excretion of phenyl pyruvic acid in the urine

7. Define Multiple alleles?
    - Multiple allele of a genes that a particular trait is controlled by three or more alleles of gene.

8. What is karyotyping?
    - Technique by which a complete set of chromosome is separated from a cell and arrange them pairs.

9. What is pedigree analysis?
    - It is a family tree
    - Showing the inheritance path way for specific phenotypic character
    - Used standard genetic symbol

10. Write down the Application of karyotyping?
    - It helps in gender identification
    - It helps to identify the abnormalities of chromosomes like aneuploidy
    - Predicting the evolutionary relationship between species
    - Identify chromosomal aberraations
    - Detect genetic diseases in human

11. Mention the symptoms of Down's syndrome?
    - Severe mental retardation
    - Flattend nose
    - Defective develop central nervous system
    - Ears are malformed
    - The tongue protrudes

12. Explain the male heterogametic?
    - Sex determination the male are heterogametic produced dissimilar gametes
    - Female are homogametic produced similar gametes

    Eg: XX-XY (Human, drosophila)
    XX-XO(Bugs, cockroaches)

13. Explain the female heterogametic?

- Sex determination the female are heterogametic produced dissimilar gametes
- male are homogametic produced similar gametes

Eg : ZO -ZZ (moths, butterflies)
ZW-ZZ (fishes , birds)

14. Explain the mode of sex determination in honey bee?

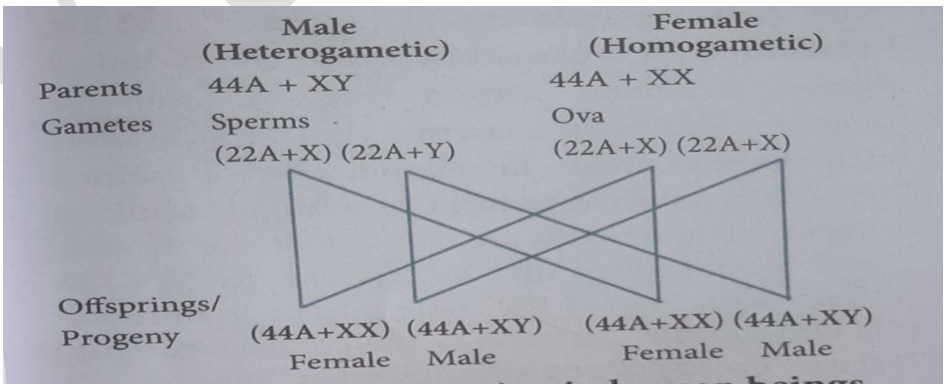
- In this sex is determined by the number of sets of chromosome it received
- In honey bee (queen and workers) fertilized egg developed into female
- Un fertilized egg by parthenogenesis develop into male
- Male have haploid chromosome, female have diploid chromosome
- Haplodiploidy type of sex determination is seen in honeybee.

15. Explain the genetic basics of blood groups in man?

Genotype	Blood group	Antigen	Antibodies
$I^A I^A$	A	A	Anti –b
$I^A I^O$	A	A	Anti –b
$I^B I^B$	B	B	Anti –a
$I^B I^O$	B	B	Anti –a
$I^A I^B$	AB	AB	No antibody
$I^O I^O$	O	O	Anti – ab

16. How sex is determination in human beings?

- Sex- determination in human by XX-XY type
- XX-XY chromosomes are called allosomes
- Females are homogametic (XX) and produced only one type of egg.
- Male are heterogametic (XY) and produced two types of sperm one is X and another



17. What is klinefelter's syndrome?
    - It is due to the presence of an additional X chromosomes
    - AA+XXY karyotype(47 chromosomes)
    - Sterile male
    - Have feeble breast
    - Under developed genitalia
    - High pitched voice

18. What is turner's syndrome?
    - It is due to the loss of a X chromosomes
    - AA + XO karyotype (45 chromosomes)
    - Sterile female
    - Low stature
    - Under developed breast
    - Rudimentary gonads
    - Webbed neck

5.MOLECULAR GENETICS

1. **One gene-one enzyme hypothesis :-**
    - **George Beadle** & **Edward Tatum** in the early 1940"s on *Neurospora* led them to proposed this hypothesis.
    - which states that one gene controls the production of one enzyme.

2. **One gene-one polypeptide hypothesis :-**
    - It was observed that an enzyme may be composed of more than one polypeptide chain and a gene can codefor only one polypeptide chain.
    - One gene controls the production of only one polypeptide chain of an enzyme molecule

3. **Difference between the Euchromatin – Hetero chromatin :-**

No	Euchromatin	Hetero chromatin
1.	In a typical nucleus, some regions of chromatin are loosely packed (lightly stained)	The chromatin that is tightly packed (stained darkly)
2.	Transcriptionally active	Transcriptionally inactive.

4. **What are the uses of HGP.**
   - To examine a persons DNA and to identify genetic abnormalities
   - To diagnose disease and provide genetic counseling
   - To solve challenges in healthcare, agriculture, energy and environmental remediation

5. **What are the advantages of DNA finger printing**.
   - Forensic analysis: It can be used in identification of a person involved in criminal activities
   - Pedigree analysis: Inheritance pattern of genesthro generation and to detect inherited of diseases.
   - Conservation of wild life: to protect endangered species

6. **Differentiate leading and lagging stand?**

	Leading strand	**Lagging strand**
1.	The strand grows continuously without any gap	Its growth is discontinuous
2.	The direction of growth of the leading strand is 5‟→ 3‟	The direction of growth is 3‟→5‟
3.	It is a rapid process	It is a slower process
4.	Only one single RNA primer is required	More number of RNA primer is required.

7. **Differentiate template and coding stand ?**

Template stand	**Coding stand**
Direction 5’’—3’’	**Direction 3’’---5’’**
Transcribe into Mrna	**Not transcribed into mRNA**
Contains anti codons	**Contains codons**
Contains the same nucleotide sequence as the rRNA	**Contains the complementary nucleotide sequence as the tRNA**

8. Give reasons genetic code is universal ?
    - The genetic code is sameprokaryotic and eukaryotic
    - The same genetic code direct the synthesis of protein from amino acids in all organisms
    - E.g : UUU – codes phenylalanine in all organisms

9. Distinguish between structural gene, regulatory gene, operator gene.
   structural gene: it is the gene mRNA required by the cell
   regulatory gene: it is present in between promoter site and operatorsite
   operator gene: these genes are present between promoter and structural gene

MARK QUESTIONS

1. The salient features of genetic code :-

- The genetic codon is a **triplet code**
- 61 codons code for amino acids
- 3 codons do not code for anyamino acid and function as **stop codon (**Termination**)**.
- The genetic code is universal.
- Non-ambiguous code means that one codon will code for one amino acid.
- The codons have fixed direction i.e. from 5'→3' direction called polarity.
- AUG has dual functions. It acts as a initiator codon and also codes for the amino acid methionine.
- UAA, UAG (tyrosine) and UGA (tryptophan) codons are designated as termination (stop) codons and also are known as "non-sense" codons.

2. Write about the Salient features of HGP (MAY-2022)

- The human genome contains 3 billion nucleotide bases.
- An average gene consists of 3000 bases,
- the largest known human gene being **dystrophin** with 2.4 million bases.
- Chromosome 19 has the highest gene density.
- Chromosome 13 and Y chromosome have lowest gene densities.
- The chromosomal organization of human genes shows diversity.
- There may be 35000 - 40000 genes in the genome and almost 99.9 nucleotide bases are exactly the same in all people.
- Functions for over 50 percent of the discovered genes are unknown.
- Less than 2 percent of the genome codes for proteins.
- Repeated sequences make up very large portion of the human genome. Repetitive sequences have nodirect coding functions but they shed light on chromosome structure, dynamics and evolution (genetic diversity).
- Chromosome 1 has **2968** genes, whereas chromosome "Y" has **231** genes.

6. EVOLUTION

MCQ'S

1. The first life on earth originated
   (a) In air
   (b) On land
   (c) In water
   (d) On mountains
2. Who published the book " Origin of species " by natural selection in 1859
   (a) Charles Darwin
   (b) Lamarck
   (c) Weishman
   (d) Hugo De Vries
3. The wings of the birds and butterflies is an example of
   (a) Adaptive radiation
   (b) Convergent evolution
   (c) Divergent evolution
   (d) Variation
4. Who proposed the Germplasm theory
   (a) Darwin
   (b) August weishmann
   (c) Lamarck
   (d) Alfred Wallace
5. Darwin finches are an excellent example of
   (a) Connecting links
   (b) Seasonal migration
   (c) Adaptive radiation
   (d) Parasitism
6. The age of fossils can be determined by
   (a) Electron microscope
   (b) Weighing the fossils
   (c) Carbon dating d) Analysis of bones

7. Evolutionary relationship of an oraganism is
   (a) Ancestry
   (b) Ontogeny
   (c) Phylogeny
   (d) Paleontology
8. The golden age of reptiles was
   (a) Mesozoic era
   (b) Cenozoic era
   (c) Paleozoic era
   (d) Proterozoic era
9. Which period was called " age of fishes "
   (a) Permian
   (b) Triassic
   (c) Jurassic
   (d) Devonian
10. The modern man belongs to which period
   (a) 650-800 CC
   (b) 1200 CC
   (c) 900 CC
   (d) 1400 CC
11. Prebiotic soup was formed in
   (a) River
   (b) Ocean
   (c) Pond
   (d) Air
12. Stanley miller synthesized
   (a) Amino acid
   (b) Proteins
   (c) Nucleoproteins
   (d) Polypeptides

13. Analogous structures are

(a) Normally non functional
(b) Functionally similar
(c) Structurally as well as functionally similar
(d) None of these

14. A vestigial organ of man is

(a) Ileum
(b) Tooth
(c) Ear pinna
(d) Vermiform appendix

15. Which is the correct order of human evolution

(a) Hominid → Homohabilis → Homoerectus → Homosepians
(b) Homohabilis → Homoerectus → Hominids → Homosepians
(c) Homoerectus → Homohabilis → Hominids → Homosepians
(d) Homohabilis → Hominids → Homoerectus → Homosepians

TWO AND THREE MARK QUESTIOS

1. List out the major gases seems to be found in the primitive earth.

Ammonia, methane, hydrogen and water vapour.

2. Differentiate between divergent evolution and convergent evolution with one example for each.

No	**Divergent evolution**	**Convergent evolution**
1.	Structures are similar **structural** patterns but perform **different functions .**	Structures are **different structural** patterns but **similar function.**

2.	Fore limbs of vertebrates bones such as humorous, radius, ulna, carpals, metacarpals and phalanges.	The wings of birds and insects are different structurally but perform the same function**.**

3.Explain how mutations, natural selection and genetic drift affect Hardy Weinberg equilibrium?

In a population **there is no mutation , natural selection , Random mating , gene flow** will not take place, the allele frequencies are also not changed .

4. Who disproved Lamarck‟s Theory of acquired characters ? How ?

- Lamarck‟s "Theory of Acquired characters" was disproved by **August Weismann.**
- Who conducted experiments on mice for 20 generations by **cutting their tails** and breeding them. All mice born were **with tail.**
- Weismann proved that change in the somatoplasm will not be transferred to the next generation but changes in the **germplasm will be inherited**.

5. Mention the main objections to Darwinism.

- Darwin failed to explain the mechanism of **variation.**
- Darwinism explains the **survival of the fittest** but not the arrival of the fittest.
- He focused on small fluctuating variations that are mostly **non-heritable.**
- He did not distinguish between **somatic** and **germinal variations.**
- He could not explain the occurrence of **vestigial organs** and animals have over specialization of some organs .

6. What are coacervates?

- Coacervates are the first pre-cells which gradually transformed into living cells, according to theory of chemical evolution.

7. What are Vestigial organs **?**

- Structures that are of no use to the possessor is called vestigial organs.
- Eg . Human appendix.

8. What is Atavistic organs?

- Sudden appearance of vestigial organs in highly evolved organisms is called atavistic organs.
- E.g. Presence of tail in a human baby is an atavistic organ.

9. Define Connecting link ?

- The organisms which possess the characters of two different groups are called connecting links.
- Eg. 1. *Peripatus* (Annelida and Arthropoda), 2. *Archeopteryx* (Reptiles and Aves).

FIVE MARK QUESTIONS

1. Taking the example of Peppered moth, explain the action of natural selection. What do you call the above phenomenon?

- Industrial **melanism** is a classical case of Natural selection.
- These were available in two colours, **white** and **black**.
- Before industrialization peppered moth both white and black coloured were common in England.
- **Pre-industrialization** witnessed white coloured background of the buildings hence the white coloured moths escaped from their predators.
- **Post industrialization**, the tree trunks became dark due to smoke and soot let out from the industries.
- The black moths camouflaged and escaped from predators and the white moths were easily identified by their predators.
- Hence the **dark coloured moth population was selected** and their number increased when compared to the white moths.
- Organisms that can adapt will survive and produce more progenies resulting in **increase in population** through **natural selection**.

2. Explain Darwin's theory of Natural selection ?

1. Over Production :

All living organisms increase their population in larger number .

Eg. Salmon fish lays about 28 million eggs .

2. Struggle for Existence :

All Organisms struggle for food , space and mate. There are three types .

- struggle for Inter species
- struggle for Intra species
- struggle with Environment

3 . Variation :

- Organisms develops some specific variation for living in the particular Environment such variations are passed on to the next generation.

4. Origin of species by natural selection :

- According to Darwin nature is the most powerful selective force .
- Origin of new species from a small isolated group by Natural selection .
- These new specie become better adapted to the changed environment .

3.Darwin's finches and Australian marsupials are suitable examples of adaptive radiation – Justify the statement

FINCHES :-

- Their common ancestor arrived on the Galapagos about 2 million years ago.
- During that time, Darwin's finches have evolved into 14 recognized species differing in body size, beak shape and feeding behavior .

Marsupials :-

- Marsupials are separated from the common ancestor more than 100 million year ago and each lineage continued to evolve independently.
- Despite temporal and geographical separation, marsupials in Australia and placental mammals in North America have produced varieties of species living in similar habitats with similar ways of life.

4.How does Hardy-Weinberg's expression (p2+2pq+q2=1) explain that genetic equilibrium is maintained in apopulation? List any four factors that can disturb the genetic equilibrium.

- 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.
- Evolution is a change in the allele frequencies in a population over time. Hence population in the Hardy Weinberg is not evolving

Explain the equilibrium :-

- A large population of beetles appear in two colours dark grey(black) and light grey and their colour is determined by 'A" gene 'AA" and 'Aa" beetles are light grey.
- 'A" allele has frequency (P) of 0.3 and „a" allele has a frequency (q) of 0.7 Then p + q = 1
- If a population is in hardy Weinberg equilibrium, the genotype frequency can be estimated by Hardy Weinberg equation

$$(p + q) = p^2 + 2pq + q^2$$

P^2 = Frequency of AA

2pq = Frequency of Aa

q^2 = Frequency of aa

$p = 0.3$, $q = 0.7$

$p^2 = (0.3)^2 = 0.9 = 9\%$ AA

$2pq = 2(0.3)\ (0.7) = 0.42 = 42\%$ Aa

$q^2 = (0.7)^2\ 0.49 = 49\%$ aa

Hence the beetle population appears to be in Hardy Weinberg equilibrium,. Factors effecting the Hardy Weinberg law : 1).Gene flow. 2).Mutation. 3).Crossing over. and 4). Natural selection.

7. HUMAN HEALTH AND DISEASES

one marks

1. Athlete's foot disease in humans is caused by

a) bacteria **b)fungi** c) viruses d) protozoans

2. Find the incorrect pair

a) Stimulants –cocaine ***b) Depressants-tobacco***

c) Narcotic – Opium d) Hallucinogens -LSD

3. The asexual phase of the Plasmodium in the liver of man is called

a) sporogony ***b) schizogony*** c) gametogony d) mesogamy

4. Which of the following is the malaria vaccine

a) DPT b) BCG ***c) S(Mosquirix)*** d) MMR

5. Swine flu is caused by

a) flavi virus b) Rhinovirus c) mumps virus ***d) H1N1 virus***

Two marks

1. List the causative agent, mode of transmission, and symptoms for Diphtheria and Typhoid.

No	Diseases	Causative agent	Site of infection	Mode of transmission	Symptoms
1	Diphtheria	*Corynebacterium diphtheriae*	Larynx, skin, nasal, genital passage	Droplet infection	Fever, sore throat, hoarseness, and difficulty in breathing
2	Typhoid	*Salmonella typhi*	Intestine	Through contaminated food and water	Headache, abdominal discomfort, fever, and diarrhoea

2. Why do you think it is not possible to produce a vaccine against the 'common cold'?

The common cold is caused by more than **150** different strains of **Rhinoviruses.**

Moreover, their RNA genome keeps changing due to **mutation.** Hence it is very difficult to prepare a common vaccine for the disease.

3. What is Kala-azar?

It is caused by a **protozoan**, *Leishmania donovani*, and transmitted by a vector **Phlebotomas**(sand fly) **Symptoms**: weight loss, anaemia, fever, enlargement of spleen and liver.

4. Mention any 3 effects of alcohol and drugs.

***Short-term effects*:** euphoria, pain, dullness of senses, alternation in behaviour, blood pressure, narcosis (deep sleep), nausea, and vomiting.

***Long-term effects*:** Liver cirrhosis, stroke, coronary heart disease and heart attack, Korsakoff syndrome (a chronic memory disorder)

Three marks

1. A patient was hospitalized with fever and chills. Merozoites were observed in her blood.

What is your diagnosis?

- The classic symptoms with release of merozoites, haemozoin toxin, and erythrocyte debris into the bloodstream resulting in **malaria.**
- Symptoms are – **shivering chills, and high fever followed by sweating**.
- Fever and chills are caused partly by malarial toxins that induce macrophages to release **tumour necrosis factor (TNF-α) and interleukin.**

2. (i) Write the scientific name of the filarial worm that causes filariasis.(May-2022)

Wuchereria Bancroft

symptoms of filariasis:

- Inflammation of the lymph nodes
- obstruction of lymph vessels
- causes elephantiasis or filariasis of the limbs, scrotum, and mammary glands.

3. List the common withdrawal symptoms of drug and alcohol abuse.

- *mild tremors to convulsions,*
- *severe agitation and fits,*
- *depressed mood,*
- *anxiety,*
- *nervousness,*
- *restlessness,*
- *irritability,*
- *insomnia,*
- *dryness of throat*, etc,

1. Suggest some ways to prevent drug and alcohol abuse

Effectively dealing with peer pressure:

- To have a better group of friends to avoid peer group pressure on them.

Seeking help from parents and peers:

- Getting advice from parents and friends helps them to vent their feelings of anxiety and guilt.

Education and counselling:

- Create a positive attitude toward dealing with many problems

Looking for danger signs:

- Teachers and parents need to look for signs of addiction

Seeking professional and medical assistance:

- Assistance available from psychologists, psychiatrists, and addiction and rehabilitation programs will help the individual to overcome their problem.

2. Tabulate the causative agent, mode of transmission and symptoms of viral disease

s.no	Diseases	Causative agent	Site of infection	Mode of transmission	Symptoms
1.	Common cold	*Rhinoviruses*	Respiratory tract	Droplet infection	Nasal congestion and discharge, sore throat, cough and headache
2.	Mumps	*Mumps virus* (RNA virus), *Paramyxo virus*	Salivary glands	Saliva and droplet infection	Enlargement of the parotid glands
3.	Poliomyelitis	*Poliovirus* (RNA virus)	Intestine, brain, spinal cord	Droplet infection through faecal oral route	Fever, muscular stiffness and weakness, paralysis and respiratory failure
4.	Dengue fever (Break bone fever)	*Dengue virus* or *Flavi virus* (DENV 1-4 virus)	Skin and blood	Mosquito vector *Aedes aegypti*	Severe flu-like illness with a sudden onset of fever and painful headache, muscle and joint
5.	Chikungunya	*Alphavirus (Toga virus*)	Nervous system	Mosquito vector *Aedes aegypti*	Fever and joint pain, headache and joint swelling

8. IMMUNOLOGY

One marks

1. Paratope is a

a) part of an antibody which binds with an antigen

b) part of the antigen, which binds with the antibody

c) part of antibody, which rejects antigens

d) part of antigen, which rejects antibody

2. Bursa of Fabricius is seen in

a) man ***b) birds*** c) reptiles d) primates

3. A hormone secreted by the thymus that helps in the maturation of T cells

a) thymosin b)relaxin c)thyroxine d)prolactin

Two marks

1 . Given below are some human organs. Identify one primary and one secondary lymphoid

Organ explain its role

Liver, thymus, stomach, thyroid, tonsils.

- Thymus – primary lymphoid organ. T cell maturation occurs in the thymus.
- Tonsils - secondary lymphoid organs that help to fight infections caused by bacteria and viruses.

2. Name and explain the type of barriers that involve macrophages.

- macrophages are modified monocytes that engulf microorganisms called phagocytosis.

3. What are interferons? Mention their role.

- Interferons are antiviral substances produced by mammalian cells.
- It protects uninfected cells from viral infection

4. List out chemical alarm signals produced during inflammation.

- *serotonin, histamine, and prostaglandins*- chemotactic signals leaked by damaged tissues.
- They influx the phagocytic cells into the affected area. This phenomenon is called diapedesis.

5. A person is infected by HIV. How will you diagnose AIDS?

- **ELISA test** - detects the presence of HIV antibodies. It is a preliminary test.
- **Western blot test** - is more reliable and a confirmatory test. It detects the viral core proteins

6. Functions of immunoglobulin:- (March-2023)

1. Agglutination 2.Precipitation

3. Opsonisatio 4. Neutralization

7 . Differentiate Paratope and Epitope

- Epitope - Active part of Antigen, Binds with the antibody.
- Paratope - Active part of antibody, Binds with the antigen

8. Define Anaphylaxis

- Anaphylaxis is the classical immediate hypersensitivity reaction.
- It is a sudden, Systematic, Severe, and **immediate hypersensitivity** reaction occurring as a result of rapid generalized mast–cell degranulation.

9. Define Hapten

- Haptens are substances that are non-immunogenic but can react with the products of a specific immune response.

10 . Define Antigen (Ag)

- It is a molecule that generates an immune response.
- A molecule that reacts with antibodies.

11 . Define Antibodies

- Antibodies are immunoglobulin (Ig) protein molecules synthesized on exposure to antigen that can combine specifically with the antigen.
- classified into five major categories, based on their physiological and biochemical properties. They are **IgG (gamma), IgM (mu), IgA (alpha), IgD (delta) and IgE (epsilon).**

Three marks

1. Innate immunity protects our body against diseases:- (May 2022)

Anatomical barriers :

Skin (prevent the entry of microbes), Mucus membranes (entraps foreign microbes)

Physiological barriers :

Temperature (inhibits the growth of pathogens),

Low pH (kills the microbes),

Chemical mediators- Lysosomes act as antibacterial agents,

Interferons act as antiviral agents.

Phagocytic barriers :

Monocytes, Neutrophils, Macrophages-phagocytose, and digest the whole microbes.

Inflammatory barriers :

Serotonin, Histamine, Prostaglandins. They influx the phagocytic cells into the affected area

Five marks

1. What is vaccine? What are its types?

- A vaccine is a biological preparation that provides active acquired immunity to a particular disease.
- made from weakened or killed forms of the microbes, their toxins, or one of its surface proteins.
- The vaccines are classified into 3 types:

First-generation vaccine :

- Live attenuated vaccines - Measles, mumps, rubella (MMR), and the Varicella (chickenpox) vaccine.
- Killed (inactivated) vaccines – Salk's polio vaccine.
- Toxoid vaccines - contain a toxin or chemical secreted by the bacteria or viruses. *DPT vaccine*

Second-generation vaccine :

- contains the pure surface antigen of the pathogen. E.g. *Hepatitis-B vaccine.*

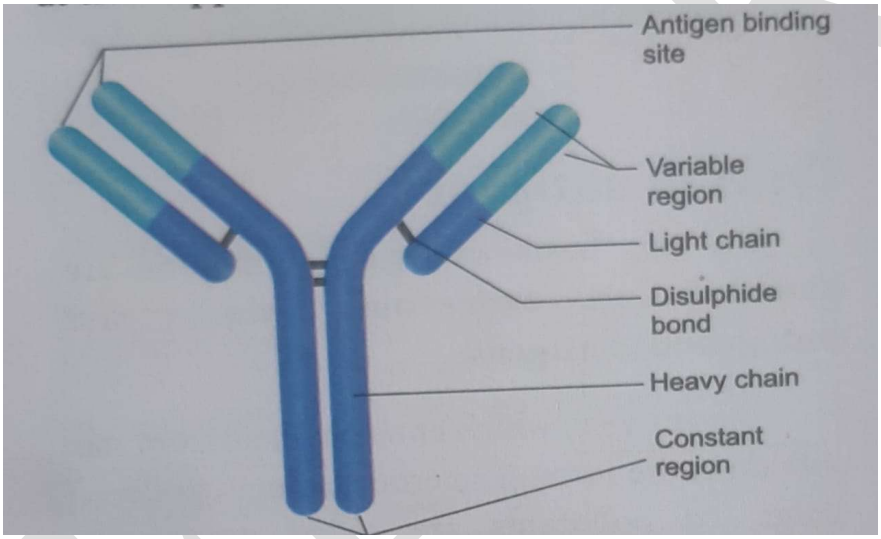
Third-generation vaccine :

- contains the purest and the highest potency vaccines which are synthetic in generation. The latest revolution in vaccine is DNA vaccine or recombinant vaccine

2. Explain the structure of immunoglobulin with a suitable diagram.

(May-2022, March-2023)

- In the 1950s, Porter and Edelman revealed the basic structure of immunoglobulin. An antibody molecule is Y Y-shaped structure that comprises 4 four polypeptide chains.
- Two identical light chains (L) of molecular weight 25,000 Da (214 amino acids).
- Two identical heavy chains (H) of molecular weight 50,000 Da (450 amino acids).
- The polypeptide chains are linked together by di-sulphide (S-S) bonds.
- One light chain is attached to each heavy chain and 2 heavy chains are attached to form a Y-shaped structure. Hence, an antibody is represented by H2 L2.
- Each chain (L and H) has two terminals. They are C - terminal (Carboxyl) and amino or N-terminal.
- Each chain (L and H) has two regions. They have a variable (V) region and a constant (C) region.



9. MICROBES IN HUMAN WELFARE

1. Which microorganism is used for production of citric acid in industries **Aspergillus niger.**
2. The most common substrate used in distilleries for the production of **ethanol is molasses.**
3. Cyclosporin A is an immunosuppressive drug produced from **Trichoderma polysporum.**
4. CO_2 is not released during **lactate fermentation**
5. The gases produced in anaerobic sludge digesters are **methane,hydrogen sulphide and co_2**

1. Diferentiate prebiotics/probiotics

   PREBIOTICS: They are compounds in food that induce the growth or activity of beneficial microorganisms.
   PROBIOTICS: They are live microorganisms intended to provide health benefits when consumed generally by improving or restoring the gut flora.

2. How milk is converted into curd?
   When a small amount of curd is added to milk of suitable temperature (<40'C) the lactobacilli in the milk converts it into curd by digesting the milk protein casein.

3. Fermentor
   It provides controlled environment for growth of microorganisms to obtain desired product.

4. Antibiotics
   They are chemical substances produced by microorganisms which can kill or retard the growth of other disease causing microbes even in low concentration.

5. Queen of Drugs
   Penicillin Antibiotic that kills bacteria

6. Two bio active molecules produced by microbes

Bioactive molecule	Microbe	Uses
Streptokinase	Streptococeus	Used as clot buster for removing clots from blood vessels in myocardial infraction.
Human insulin	E.coli	Diabetic treatment

7. Zymology

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

8. Which is referred as Industrial alcohol? Why?
   1. Ethanol or ethyl alcohol.
   2. It is used for industrial, laboratory and fuel purposes.

9. Biogas-uses
   1. Used for cooking and lighting.
   2.The slurry is used as fertilizer.

10. Microbial fuel cell
    It is a bio electro chemical system that drives an electric current by using bacteria. Works by allowing bacteria to oxidize and reduce organic molecules.

11. Bio remediation
    The use of naturally occurring or genetically engineered microorganisms to reduce or degrade pollutants us called bio remediation.

12. Types of bio remediation
    1.insitu bio remediation
    2.Exsitu bio remediation

13. Onenology
    The science of wine making

14. Brewer's yeast
    Saccharanyces cerevisiae
    It is used for fermenting melted cereals and fruit juices to produce various alcoholic beverages.

15. Superbugs
    A bacterium that has become resistant to antibiotics that usually are used to treat it.

10. APPLICATIONS OF BIOTECHNOLOGY

One marks :

1. The first clinical gene therapy was done for the treatment of SCID.
2. Dollu, the sheep was obtained by a technique known as cloning by nuclear transfer.
3. GEAC is Genetic Engineering Appraisal Committee/
4. How many amino acids are arranged in the two chains of Insulin. Chain A has 21 and Chain B has 30.
5. Vaccines that use components of a pathogenic organism rather than the whole organism are called sub unit recombinant vaccine.
6. Who created dolly by Animal clonind Ian Wilmut.
7. Stem cells that can differentiate into few cell types is oligopotency.
8. In 2980, patent was first given to an organism Pseudomonas putida.

Two marks :

1. What is genetically engineered Insulin?
   Insulin was the first ever pharamacuetical product of recombinant DNA technology administrated to humans. Human Insulin was marketed under the trade name 'Humulin'. Used in diabetes mellitus treatment.

2. Rosie-Explain
   Rosie is the first transgenic cow. The milk produced by it contains human alpha lactalbumin which was nutritionally balanced food for new born babies.

3. Different between somatic and germ line gene therapy

Somatic Cell gene therapy	Germ line gene therapy
Therapeutic genes transferred into somatic cells	Therapeutic genes transferred into the germ cells
Introduction of genes into bone marrow cells, blood and skin cells.	Genes introduced into eggs and sperms
Will not be inherited in later generations	Heritable and passed on to later generations

4. Types of recombinant vaccines
   1.Subunit recombinant vaccine
   2.Attenuated recombinant vaccine
   3.DNA vaccine
5. Interferons
   They are proteinaceous, antiviral, species specific substances produced by mammalian cells.

6. Cloning
   Cloning is the process to produce genetically identical individuals of an organism naturally or artificially.

7. PCR in medical field
   1.To detect genetic disease and viral diseases.
   2.To detect infections disease
   3.To detect cervical cancer

8. Advantages and disadvantages of cloning
   Advantages:
   In clinical trials and medical research
   Production of proteins and drugs
   Aids stem cells research
   Disadvantages-
   Threat to biodiversity
   Causes animals to suffer
   Cloned animals were affected with disease and have high mortality rate.

9. What are stem cells
   They are undifferentiated cells found in most of the multicellular animals.

11. ORGANISMS AND POPULATIONS

One marks :

1. All populations in a given physical area are defined as – **biome**
2. Organisms which can survive a wide range of temperature – **eurytherms**
3. The interaction in nature where one gets benefits on the expense of other is – **commensalism**
4. Predation and parasitism are which type of interactions – **(+,-)**
5. Competition between species leads to – **extinction**
6. r- selected species are – **insects**
7. Animals that can move from fresh water to sea – **catadromous**
8. Some organisms maintain homeostasis by physical means – **regulate**

Two marks and three marks :

1. What is habitat?
   The place where an organism (or) a community live

2. Define ecological niche?
   The physical space occupied by an organism
   Its functional role in the community

3. Van't Hoff's rule?
   Increase of every $10^{o}c$ - rate of metabolic activity double
   Decrease of every $10^{o}c$ – rate of metabolic activity halved

4. Define Bergmann's rule?
   Attain greater body size – colder region. Eg. Birds

5. Define Allen's rule?
   Shorter limbs, ears,appendages – colder region. Eg. Birds

6. Jordon's rule?
   More vertebrate – cold aquatic region. Eg. Fish

7. Eurytherms and stenotherms :

Eurytherms	stenotherms
ganisms can tolerate wide range of temperature e.g : dog ,cat	ganisms can tolerate narrow range of temperature e.g : fish

8. Hibernation and Aestivation :

Hibernation	Aestivation
state of reduced activity to escape from cold winter	state of reduced activity to escape from heat in summer

9.Natality and Mortality :

Natality : number of birth per unit time
Average population
Mortality : number of death per unit time
Average population

10.what is pedogenesis?

The soil is formed from rocks by weathering

Five marks :

1. Properties of water
    - Water is heavier than air
    - Greater buoyancy
    - High latent capacity
    - Universal solvent
    - High surface tension

2. Properties of soil
    - Texture of soil
    - Porosity
    - Permeability
    - Soil temperature
    - Soil water

3. Adaptations of aquatic animals:
    - Body muscles – locomotion
    - Gills – respiration
    - Air bladders – buoyancy
    - Lateral line system – pressure receptors
    - Excretory organ – remove waste

4. Adaptations of terrestrial animals :
    - Earthworm skin – secrete mucus coat
    - Arthropods – well developed tracheal system
    - Many layered skin – prevent from loss of water
    - Obtain water – from food
    - Birds make nests, lay egg – before rainy season

9. r – selection and k- selection species :

r – selection	k- selection
Small size organisms	Larger size organisms
Produce many offsprings	Produce few offsprings
Mature early	Late maturity
Short life span	Long life span
Unstable environment	Stable environment

10. Analysis of two species population interactions:
    Amensalism : large and powerful animal inhibits lower organisms growth
    e.g : Elephant (o) , Ant (-)
    Mutualism : Favourable to both organisms
    e.g : Crocodile(+), Birds (+)
    Competition : Each animals attacked by another
    e.g : Birds (-), squirrel (-)
    Parasitism : Host affected by parasite
    e.g : Man (-) , Tapeworm (+)
    Predation : Large predator kills the prey
    e.g : Lion (+) , Deer (-)

12. BIODIVERSITY AND ITS CONSERVATION

One marks :

1. The region has maximum biodiversity – **tropical forest**
2. Conservation of biodiversity within their natural habitat is – **insitu conservation**
3. Example for exsitu conservation in – **zoological park**
4. Hotspot of biodiversity in india – **western ghats & Eastern Himalayas**
5. The organisation which published the red list of species – **IUCN**
6. Who introduced the term biodiversity – **Walter Rosen**
7. High risk extinction due to habitat destraction is – **Amphibians**

Two marks and three marks :

1. Three level of biodiversity
    - Genetic diversity
    - Species diversity
    - Community diversity

2. Amazon forest is considered to be lunngs of the planet .
    - It is tropical rain forest 14% of the earth
    - Living place for millions of species
    - It gives more o_2 for us

3. What is red data book?
    - A catalogue of the taxa facing risk of extinction

4. What is extinction? And its example
    - When none of one species members are alive any were in the world
    - E.g Dodo bird, dinosaurs

5. Insitu conservation and Exsitu conservation

Insitu conservation	Exsitu conservation
Conservation in natural habitat	Conservation in manmade habitat
Save the predators	Conservation through extinction
e.g : national parks	e.g: zoological parks

6. What is endangered species?
   - A species that identified as to become extent
   - E.g : panda

7. Decrease in biodiversity distribution in polar region why.
   - Temperature
   - Latitude
   - Heavy rain
   - Distance

8. What is mass extinction?
   - Death of mass organisms by environmental catastrophes
   - E.g : Permian period

9. What is co- extinction?
   - Extinction of one species will automatically cause extinction of other species. E.g : orchid bees – forest trees

10.Name of the national parks in tamilnadu

   - Mudumalai – nilgiris
   - Mukurthi - nilgiris
   - Indira Gandhi – Coimbatore

11. Name of the wild life sanctuaries in tamil nadu.
   - Vendanthangal – Chengalpet
   - Mudumalai - nilgiris
   - Indra Gandhi – Coimbatore

Five marks :

1.Various causes for biodiversity losses.

- Habitat loss, Destruction of forest
- Pollution and pollutant
- Climate changes
- Introduction of foreign species
- Over usages of resources
- Industrialization, urbanization.

2. How can we contribute to promote biodiversity conservation?

- Protect species from extinction
- Protect their habitats and ecosystem
- Protect endangered species
- Air, water and soil should be conserved first

3.Write note on protected areas, wild life sanctuaries, WWF

- **protected areas:**

Bio geographical areas where biological diversity along with natural and cultural resources is protected through legal measure
e.g : national park

- **wild life sanctuaries:**

Sanctuaries are land where wild animals and fauna can be ptotected from hunting and poached.
Some restricted human activities are allowed inside the sanctuary area.

- **WWF:**

World wild fund
Non governmental organisation
Wildlife conservation and reduction of human impact on environment.

13. ENVIRONMENTAL ISSUES

One marks :

1. Right to clean water is a fundamental right under the indian constitution – **Article - 21**
2. The thickness of stratospheric ozone layer is measured in – **Dobson units**
3. Highest per capita emitter of carbon dioxide in the world is – **china**
4. The use of microorganism metabolism to remove pollutions such as oil spills in the water bodies – **Bioremediation**
5. Which one is always decreases in a food chain across tropical – **Energy**
6. E- waste generated by the mobile phones contain the metal in most abundant is – **copper**
7. HCFC –compounds have the molecules – **Chlorine**
8. Excess of the fluoride in the drinking water causes – **Fluorosis**

Two marks and Three marks :

1. Expand – CFC, AQI, PAN
    - CFC- chlorofluorocarbon
    - AQI – Air Quality Index
    - PAN – peroxyacetyl Nitrate

2. Define Eutrophication.
    - When run-off from land containing nutrients reaches water bodies like lakes,
    - It results in dense growth of plant life

3. What is Algal bloom?
    - Water pollution can causes eutrophication due to nutrient enrichment,this causes algal bloom

4. Control measures of Eutrophication.
    - Reduced use of excessive fertilizers
    - Checking run off from fields
    - Planting trees along the stream beds.

5. Define BOD
    - Amount of oxygen that would be consumed if all the organic matter in one litre of water were oxidized by bacteria

6. What is SMOG
    - SMOG = Smoke + fog
    - It is a type of air pollution caused by tiny particles

7. What is catalytic converter?
    - Catalytic converters in vehicles help to reduce polluting gases drastically

8. What is Ecosan toilets?
    - Ecological sanitation acceptable system for handling human excreta by using dry composting toilets
    - It reduce water use
    - We can get natural fertilizers

9. Define SAMEER.
    - It provides hourly updates on the national AQI
    - Published by CPCB
    - It an app

10. what is 4R ?

    - Refuse,Reduce, Reuse, Recycle
    - Best remedy for plastic waste pollution

11. what is Biomagnification?

    - Non –degradable substance enter into the food chain get transferrd upto the trophic levels
    - Increasing chemical concentration is termed as Biomagnification
    - e.g: DDT

Five marks :

1. Role of an individual to reduce environmental pollution.
    - Planting trees
    - Using catalytic converters in vehicles
    - Regular servicing the vehicles and machines
    - Avoid the usage of loud speakers
    - Avoid using single use plastics
    - Reduce CFC emission

2. Management of medical waste.
    - Safe removal of Bio-medical waste
    - Recycle the hospital plastics
    - Incineration , autoclaving
    - Land fill and burying

3. Management of E-Waste.
    - Limiting the use of electronic goods
    - Following '4R' principle
    - Disposal – Reuse Resale, Salvage, Recycling

4. Methods of disposal of radioactive waste.
    - Limit generation
    - Dilute and disperse
    - Delay and decay

5. Effects of air pollution.
    - Affects animal respiration
    - Causes irritation in throat, nose, lungs and eyes
    - Reduce body immunity
    - Causes cardio vascular disease
    - Gas leaks can be lethal

6. What are the effects of agrochemicals?
    - Kill beneficial bacteria and soil organisms
    - Cause eutrophication in water bodies
    - Cause skin rashes and irritation of eyes
    - Beneficial insect and animal affected
    - Leads to carcinogenic

7. Write an account on waste water management?

Waste – domestic , industrial , animals wastes

Primary treatment :

i. floating debris – sequential filtration
ii. Soil and pebbles – sedimentation

Secondary or biological treatment :

- Allows vigorous growth of useful aerobic microbes into flocs.
- The microbes consume the major part of the organic matter .
- BOD – reduced

Tertiary treatment :

- UV is an ideal disinfectant for waste water
- It does not alter the quality and inactivates harmful microbes depar