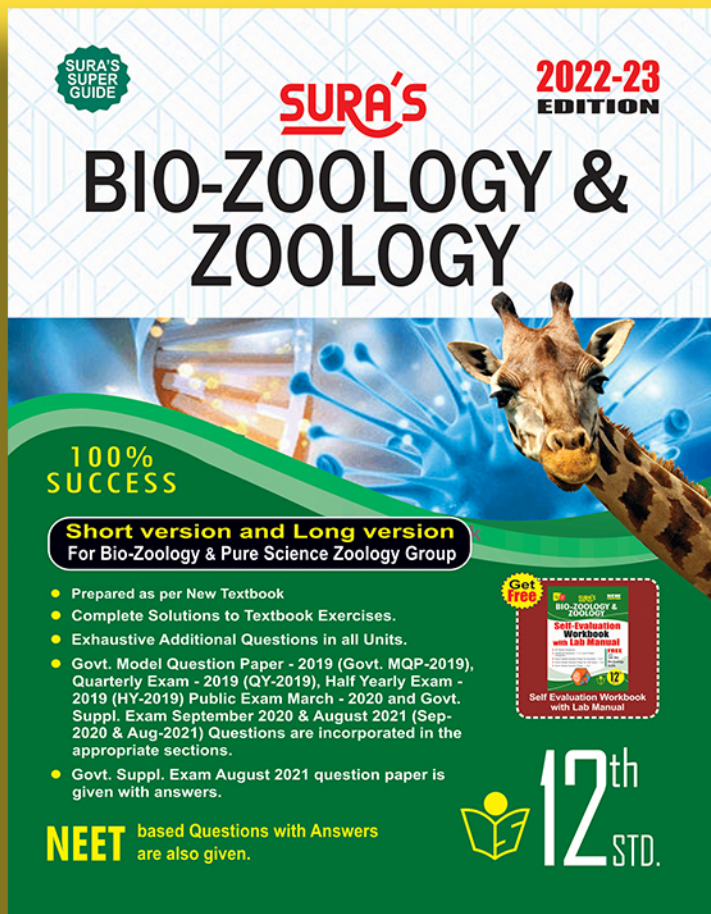


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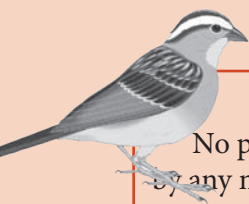
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- Govt. Suppl. Exam August 2021 question paper is given with answers.



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Preface

“Each has his own tree of ancestors,
but at the top of all sits Probably Arboreal.”

- Robert Louis

Respected Principals, Correspondents, Head Masters / Head Mistresses, Teachers,

From the bottom of our heart, we at SURA Publications sincerely thank you for the support and patronage that you have extended to us for more than a decade.

It is in our sincerest effort we take the pride of releasing **SURA'S Bio-Zoology & Zoology** for +2 Standard. This guide has been authored and edited by qualified teachers having teaching experience for over a decade in their respective subject fields. This Guide has been reviewed by reputed Professors who are currently serving as Head of the Department in esteemed Universities and Colleges.

With due respect to Teachers, I would like to mention that this guide will serve as a teaching companion to qualified teachers. Also, this guide will be an excellent learning companion to students with exhaustive exercises and in-text questions in addition to precise answers for textual questions.

In complete cognizance of the dedicated role of Teachers, I completely believe that our students will learn the subject effectively with this guide and prove their excellence in Board Examinations.

I once again sincerely thank the Teachers, Parents and Students for supporting and valuing our efforts.

God Bless all.

Subash Raj, B.E., M.S.

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All the Best



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ZOOLOGY LONG VERSION

(FOR PURE SCIENCE GROUP)

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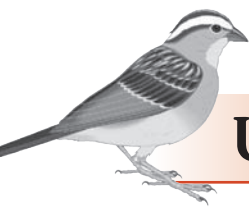
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UNIT I

Chapter

1

REPRODUCTION IN ORGANISMS

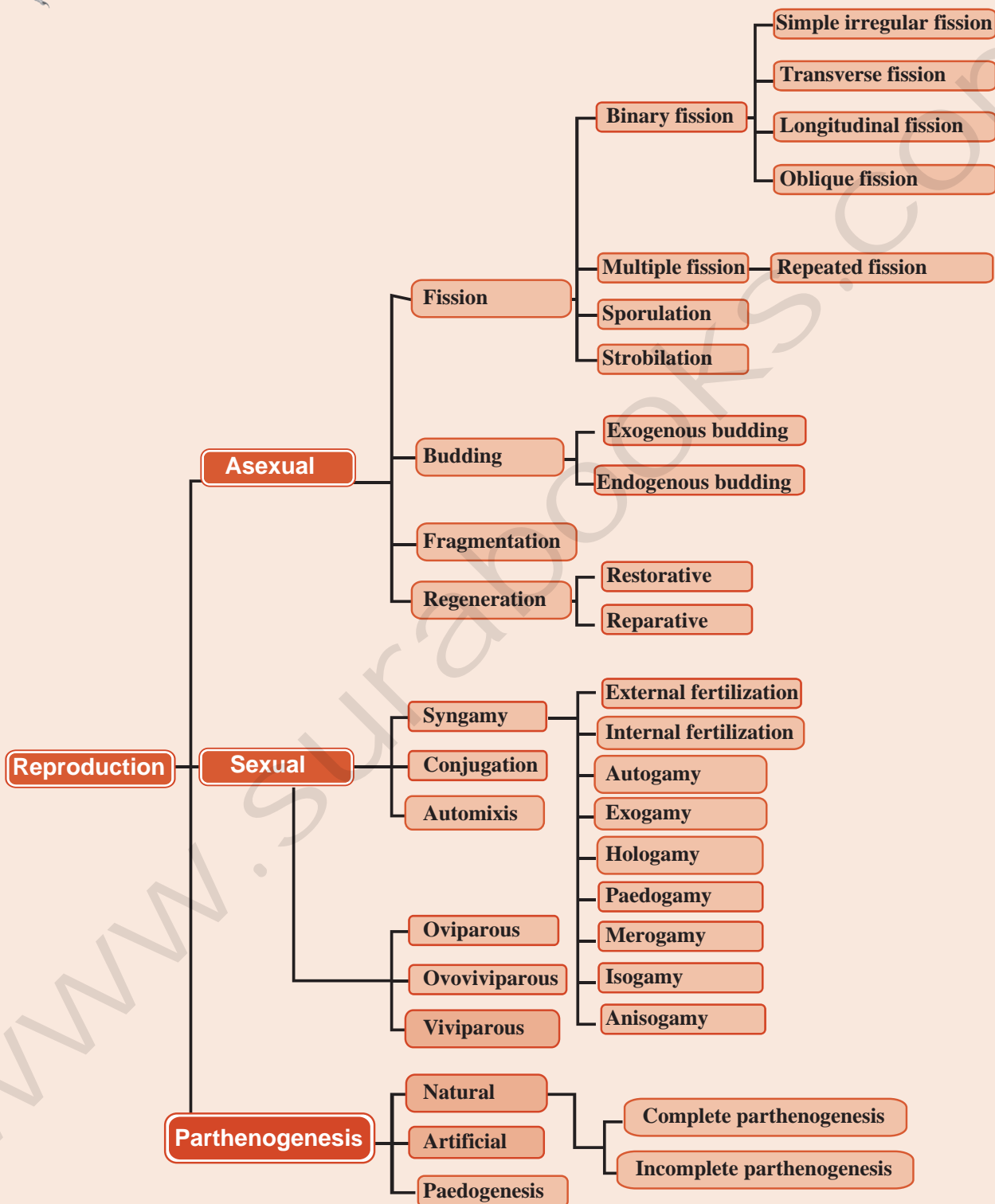
CHAPTER SNAPSHOT

- 1.1 Modes of reproduction
- 1.2. Asexual reproduction
- 1.3. Sexual reproduction

MUST KNOW DEFINITIONS

Asexual reproduction	:	Reproduction by single parent involving amitotic or mitotic divisions only.
Sexual reproduction	:	Participation of two individuals and involves formation of male and female gamete.
Fission	:	Division of parent body into two or more identical Daughter individuals.
Binary fission	:	Parent organism divides into two daughter cells.
Multiple fission	:	Parent body divides into many similar daughter cells.
Strobilation	:	A special type of transverse fission giving rise to number of individuals.
Budding	:	Parent body produces one or more buds which separate from the parent and lead an independent life
Gemmule	:	Internal buds formed in sponge which can tolerate adverse conditions and are a means of asexual reproduction.
Apolysis	:	Separation of gravid proglottids from the body of a tape worm.
Regeneration	:	Regrowth in the injured region.
External fertilization	:	Fusion of male & female gametes takes place outside the body of the female organism.
Internal fertilization	:	Fusion of male and female gametes takes place within the body of the female organism.
Fertilization	:	Fusion of male & female gametes.
Conjugation	:	Type of sexual reproduction between two individuals, where certain amount of nuclear material exchange takes place after which they separate.
Parthenogenesis	:	Development of an egg into a complete individual without fertilization.
Oviparous condition	:	Young ones hatch from eggs laid outside the mother's body.
Viviparous condition	:	Animals give birth to young ones.
Ovoviviparous conditions	:	Embryo develops inside the eggs and remains in the mother's body until they are ready to hatch.

Concept Map





Evaluation

1. In which type of parthenogenesis are only males produced? [QY-2019]

- (a) Arrhenotoky (b) Thelytoky
(c) Amphitoky (d) Both a and b

[Ans. (a) Arrhenotoky]

2. The mode of reproduction in bacteria is by [Aug-2021]

- (a) Formation of gametes
(b) Endospore formation
(c) Conjugation
(d) Zoospore formation

[Ans. (c) Conjugation]

3. In which mode of reproduction variations are seen

- (a) Asexual (b) Parthenogenesis
(c) Sexual (d) Both a and b

[Ans. (c) Sexual]

4. Assertion and reasoning questions:

In each of the following questions there are two statements. One is assertion (A) and other is reasoning (R). Mark the correct answer as

- A. If both A and R are true and R is correct explanation for A.
B. If both A and R are true but R is not the correct explanation for A.
C. If A is true but R is false.
D. If both A and R are false.

I. **Assertion:** In bee society, all the members are diploid except drones.

Reason: Drones are produced by parthenogenesis.

A B C D

[Ans. (A) If both A and R are true and R is correct explanation for A]

II. **Assertion:** Offsprings produced by asexual reproduction are genetically identical to the parent.

Reason: Asexual reproduction involves only mitosis and no meiosis.

A B C D

[Ans. (A) If both A and R are true and R is correct explanation for A]

5. Name an organism where cell division is itself a mode of reproduction.

Ans. Bacteria, Amoeba.

6. Name the phenomenon where the female gamete directly develops into a new organism with an avian example.

Ans. Phenomenon – Parthenogenesis

Eg: Turkey.

7. What is Parthenogenesis? Give two examples from animals. [QY-2019; Aug-2021]

Ans. (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) Ex: Honey bees, Gall fly.

8. Which type of reproduction is effective - Asexual or sexual and why? (OR) Why sexual method of reproduction is better than asexual reproduction?

[PTA-5]

Ans. (i) Sexual reproduction produces variation in the offspring, chances of having genes of both the parents whereas in an asexual reproduction, there is no variation, the offspring will be identical to only one of the parent.

(ii) Thus sexual reproduction is said to be more effective than asexual reproduction.

9. The unicellular organisms which reproduce by binary fission are considered immortal. Justify.

Ans. (i) In **binary fission** (asexual reproduction), the single parental organism divides into two halves and each half forms a daughter individual. This is seen in unicellular organism like bacteria, *Amoeba* etc.

(ii) The parent cell does not die but it becomes a part of the daughter cells formed.

(iii) This means that the same organism keeps splitting into new young ones. So there is no way we could say that the organism has died.

(iv) Thus the unicellular organisms which reproduce by binary fission are considered immortal.

10. Why is the offspring formed by asexual reproduction referred as a clone?

Ans. (i) Asexual reproduction involves a single parent.

(ii) Offsprings produced by asexual reproduction are morphologically and genetically similar to their parents exact copies of their parents and are called clones.

Give reasons for the following: [Sep-2020]

- (a) Some organisms like honey bees are called parthenogenetic animals.
(b) A male honey bee has 16 chromosomes where as its female has 32 chromosomes.

Ans. (a) Development of an egg into a complete individual without fertilization is known as parthenogenesis. It is of two types.

- (i) Natural parthenogenesis occurs in Nature in many animals such as honey bees.
(ii) Artificially it can be induced in animals by physical or chemical stimuli which is called artificial parthenogenesis.

- (b) In honey bees, both sexual reproduction and parthenogenesis occurs, and it is described as incomplete parthenogenesis.

During sexual reproduction, the fertilized eggs (zygotes) develop into queen bee and workers (females). The unfertilized eggs develop into drones (males). Thus honey bees are called parthenogenetic animals.

In honey bees, the normal chromosomal number in a cell is $2n = 32$. Gametes (sperms & egg) will have only $n = 16$ chromosomes since they are haploid.

The female bees are formed by fertilization of gametes.

$$\text{sperm } (n) + \text{egg } (n) = 2n$$

Therefore they have 32 chromosomes. Since the drones (males) are formed from unfertilized eggs(n) they have only 16 chromosomes.

12. Differentiate between the following:

- (a) Binary fission in *Amoeba* and multiple fission in *Plasmodium*
(b) Budding in yeast and budding in *Hydra*
(c) Regeneration in lizard and *Planaria*

Ans.

(a)	Binary Fission in <i>Amoeba</i>	Multiple fission in <i>Plasmodium</i>
	Simple irregular binary fission is seen in <i>Amoeba</i> like irregular shaped organisms.	In <i>Plasmodium</i> , multiple fission occurs in the schizont and in the oocyte stages.

Contractile vacuoles cease to function and disappear.	Multiple fission occurs in the schizont is called schizogony and the daughter individuals are called merozoites.
The nucleoli disintegrate and the nucleus divides mitotically. The cell constricts in the middle, so the cytoplasm divides and forms two daughter cells.	Multiple fission occurs in the Oocyte, it is called sporogony and the daughter individuals are called sporozoites.

(b)

Budding in Yeast	Budding in <i>Hydra</i>
Yeast is a unicellular organism. The single cell produces an outgrowth to form a bud. Nucleus of the parent cell divides and a daughter nuclei enters the bud which is unicellular.	The bud is developed by mitotic divisions of its cells and is multicellular.
A chain of buds may be formed in the parent cell at times.	Chain of buds are not formed.

In both cases, the buds separate and lead an independent life

(c) Regeneration is regrowth in the injured region

Regeneration in <i>Planaria</i>	Regeneration in lizard
It shows the morphallaxis type of regeneration in which the whole body grows from a small fragment	Lizard shows the epimorphosis type of regeneration in which replacement of lost body parts occur.
The whole body can be got by regeneration	It shows the restorative type of regeneration in which several body parts can only develop but the whole body cannot develop.



How is Juvenile phase different from reproductive phase?

Juvenile phase	Reproductive phase
Juvenile phase/ vegetative phase is the period of growth between the birth of the individual upto reproductive maturity.	During reproductive phase/ maturity phase the organisms reproduce and their offsprings reach maturity period.

14. What is the difference between syngamy and fertilization?

Ans.

Syngamy	Fertilization
Process of fusion of two gametes to form zygote.	It refers to the act or process of rendering fertile.
Classified into many types <ul style="list-style-type: none"> • Autogamy • Exogamy • Hologamy • Paedogamy • Merogamy • Isogamy • Anisogamy 	Classified into two types of fertilization, <ul style="list-style-type: none"> • External Fertilization • Internal Fertilization

ZOOLOGY LONG VERSION QUESTIONS (FOR PURE SCIENCE GROUP)

Q.No. 1 to 10 Refer Evaluation.

11. Why are the offsprings of oviparous animal at a greater risk as compared to offsprings of viviparous organisms?

Ans. Oviparous animals lay eggs outside their body. These eggs are exposed to various environmental conditions and may be eaten by predators also.

They face lot of risks until the young ones hatch. But the offsprings of viviparous animals are more safe and protected in the maternal womb until they are born.

12. Refer Evaluation Q.No.11

13. Refer Evaluation Q.No.12

14. Refer Evaluation Q.No.13

15. Refer Evaluation Q.No.14

PTA Question & Answers

CHOOSE THE CORRECT ANSWER || 1 Mark ||

1. Human beings are unisexual animals, the type of syngamy in human beings is [PTA-3]

- (a) autogamy
- (b) exogamy
- (c) hologamy
- (d) paedogamy

[Ans. (a) autogamy]

2. In hydra, the buds develop from [PTA-4]

- (a) ectoderm layer only
- (b) ectoderm and endoderm layers
- (c) ectoderm, mesoderm and endoderm layers
- (d) ectoderm and mesoderm layers

[Ans. (b) ectoderm and endoderm layers]

3. The primary and secondary hosts of Tape worm are respectively. [PTA-5]

- (a) Mosquito and man
- (b) Man and housefly
- (c) Cattle and man
- (d) Man and pig

[Ans. (d) Man and pig]

VERY SHORT ANSWERS || 2 Marks ||

1. Zygote is not formed during the conjugation of *Paramecia*, but we call it as sexual reproduction why? [PTA-2]

Ans. (i) *Paramecium* reproduces both sexually and asexually.

(ii) In *Paramecium*, conjugation is a form of sexual reproduction. It is a temporary union of two individuals of same species for mutual exchanges of genetic materials.

(iii) It can also multiply during nuclear organizations.



Unit Test

[Time: 1 hr]

[Marks: 25]

I. CHOOSE THE CORRECT ANSWER. $10 \times 1 = 10$

- Technique used for cultivation of sponges is based on _____.
(a) Multiple fission (b) Parthenogenesis
(c) Regeneration (d) Autogamy
- Conjugation is a type of _____.
(a) Asexual reproduction
(b) Autogamy
(c) External fertilization
(d) Sexual reproduction
- Choose the correct pair
i. Shark - Placenta
ii. *Taenia solium* - Regeneration
iii. Frog - Continuous breeder
iv. Plasmotomy - *Pelomyxa*
(a) i and iii (b) ii and iii
(c) i and iv (d) i, ii and iv
- (i) Lizard is a continuous breeder.
(ii) Asexual reproduction is also known as somatogenic reproduction
(iii) In repeated fission, young ones do not separate till fission process is completed.
(iv) Strobilation is a kind of longitudinal fission.
(a) i and iii (b) i, ii and iv
(c) ii and iii (d) ii and iv
- Starfish shown ____ type of regeneration.
(a) epimorphosis - reparative
(b) epimorphosis (restorative)
(c) morphallaxis
(d) paedogenesis
- Assertion :** Ovoviviparity is seen in shark
Reason : Placenta is formed to transfer nutrients to the embryo
(a) If both A and R are true and R is correct explanation for A

- (b) If both A and R are true but R is not the correct explanation for A
(c) If A is true but R is false
(d) If both A and R are false.

7. Which statement is incorrect regarding the type of binary fission stated?

- Transverse binary fission is seen in *Planaria*.
- Longitudinal binary fission is seen in *Euglena*.
- Oblique binary fission is seen in *Flagellates*.
- Simple irregular binary fission is seen in *Amoeba*.

8. Division of cytoplasm is called _____

- karyokinesis (b) cytokinesis
(c) *Trichonympha* (d) Paedogamy

9. The mode of asexual reproduction in bacteria is by

- Formation of gametes
(b) Endospore formation
(c) Conjugation
(d) Zoospore formation

10. In which mode of reproduction variations are seen

- Asexual (b) Parthenogenesis
(c) Sexual (d) Both a and b

II. VERY SHORT ANSWER $2 \times 2 = 4$

- What is repeated fission? Give an example.
- Explain Apolysis.

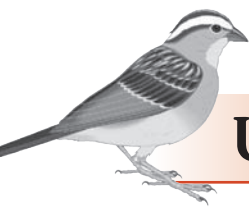
III. SHORT ANSWER $2 \times 3 = 6$

- What is
(a) Merogamy (b) Hologamy
- Draw a gemmula and label any two parts.

IV. LONG ANSWER $1 \times 5 = 5$

- Write a note on parthenogenesis.





UNIT I

Chapter

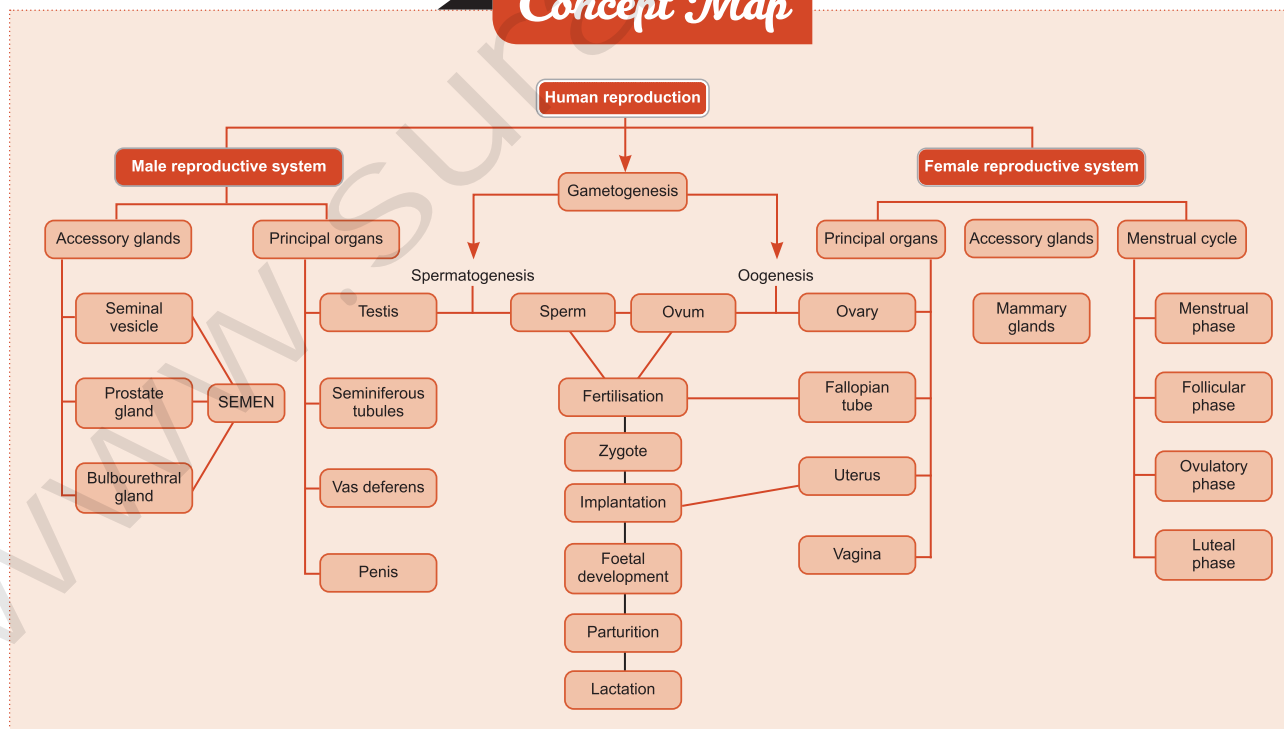
2

HUMAN REPRODUCTION

CHAPTER SNAPSHOT

- 2.1 Human reproductive system
- 2.2 Gametogenesis
- 2.3 Menstrual cycle
- 2.4 Fertilization and implantation
- 2.5 Maintenance of pregnancy and embryonic development
- 2.6 Parturition and lactation

Concept Map





ST KNOW DEFINITIONS

Gametogenesis	: Formation of gametes by spermatogenesis and oogenesis.
Insemination	: Transfer of sperms by the male into the female genital tract.
Fertilization	: Fusion of male and female gametes to form zygote is called fertilization.
Cleavage	: Rapid mitotic divisions of the zygote which convert the single celled zygote into a multicellular structure called blastocyst.
Implantation	: Attachment of blastocyst to the uterine wall.
Placentation	: Formation of placenta which is the intimate connection between foetus and uterine wall of the mother for exchange of nutrients.
Gastrulation	: Process by which blastocyst is changed into a gastrula with three primary germ layers
Organogenesis	: Formation of specific tissues, organs and organ systems from three germ layers.
Parturition	: Expulsion of the foetus from the mother's womb.
Sertoli cells	: Elongated and pyramidal cells which provide nourishment to sperms till maturation.
Semen	: Milky white fluid which contains sperms & seminal plasma
Fallopian tube	: Oviduct or uterine tube which receives the egg after ovulation
Uterus	: Hollow, thick - walled, inverted pear shaped structure in female reproductive system in which implantation of embryo occurs.
Mammary glands	: Modified sweat glands involved in lactation in females and rudimentary in males.
Spermatogenesis	: Process of formation of sperms in seminiferous tubules of testis
Oogenesis	: Process of development of ovum in the ovaries
Spermiogenesis	: The spermatids are transformed into mature sperms by the process of spermiogenesis.
FSH	: Follicle stimulating hormone produced by the pituitary gland
LH	: Lutenizing Hormone produced by the pituitary gland
ABP	: Androgen Binding protein
Acrosome	: Pointed structure at the tip of the sperm head.
Hyaluronidase	: Proteolytic enzyme produced by acrosome of sperm,
Menstrual cycle	: Ovarian cycle occurring once in every 28/29 days during reproductive life of female from menarche to menopause except during pregnancy.
Graafian follicle	: Mature ovarian follicle which releases the egg.
Corpus luteum	: Temporary endocrine gland formed from ruptured graafian follicle during pregnancy.
Placenta	: Disc shaped temporary endocrine organ formed during pregnancy which connects foetus and uterine wall.
Gastrulation	: The transformation of the blastocyst into a gastrula with the primary germ layers by the movement of the blastomeres is called gastrulation.
Gestation	: Period for which the foetus is in the mother's womb.
hCS	: Human Chorionic Somatomammotropin
hCG	: Human Chorionic Gonadotropin
hPL	: Human Placental Lactogen
Polyspermy	: Entry of more than one sperm into the ovum.



Evaluation

1. The mature sperms are stored in the [Aug-2021]
 (a) Seminiferous tubules (b) Vas deferens
 (c) Epididymis (d) Seminal vesicle
[Ans. (c) Epididymis]
2. The male sex hormone testosterone is secreted from
 (a) Sertoli cells (b) Leydig cell
 (c) Epididymis (d) Prostate gland
[Ans. (b) Leydig cell]
3. The glandular accessory organ which produces the largest proportion of semen is
 (a) Seminal vesicle
 (b) Bulbourethral gland
 (c) Prostate gland
 (d) Mucous gland **[Ans. (a) Seminal vesicle]**
4. The male homologue of the female clitoris is
 (a) Scrotum (b) Penis
 (c) Urethra (d) Testis
[Ans. (b) Penis]
5. The site of embryo implantation is the
 (a) Uterus (b) Peritoneal cavity
 (c) Vagina (d) Fallopian tube
[Ans. (a) Uterus]
6. The foetal membrane that forms the basis of the umbilical cord is
 (a) Allantois (b) Amnion
 (c) Chorion (d) Yolk sac
[Ans. (a) Allantois]
7. The most important hormone in initiating and maintaining lactation after birth is
 (a) Oestrogen (b) FSH
 (c) Prolactin (d) Oxytocin
[Ans. (c) Prolactin]
8. Mammalian egg is
 (a) Mesolecithal and non-cleidoic
 (b) Microlecithal and non-cleidoic
 (c) Alecithal and non-cleidoic
 (d) Alecithal and cleidoic
[Ans. (c) Alecithal and non-cleidoic]
9. The process which the sperm undergoes before penetrating the ovum is [Aug-2021]
 (a) Spermiation (b) Cortical reaction
 (c) Spermiogenesis (d) Capacitation
[Ans. (d) Capacitation]

10. The milk secreted by the mammary glands soon after child birth is called
 (a) Mucous (b) Colostrum
 (c) Lactose (d) Sucrose
[Ans. (b) Colostrum]
 11. Colostrum is rich in
 (a) Ig E (b) Ig A
 (c) Ig D (d) Ig M
[Ans. (b) Ig A]
 12. The Androgen Binding Protein (ABP) is produced by
 (a) Leydig cells (b) Hypothalamus
 (c) Sertoli cells (d) Pituitary gland
[Ans. (c) Sertoli cells]
 13. Find the wrongly matched pair [Sep-2020]
 (a) Bleeding phase - fall in oestrogen and progesterone
 (b) Follicular phase - rise in oestrogen
 (c) Luteal phase - rise in FSH level
 (d) Ovulatory phase - LH surge
[Ans. (c) Luteal phase - rise in FSH level]
- Answer the following type of questions Assertion (A) and Reason (R)
- a. A and R are true, R is the correct explanation of A
 - b. A and R are true, R is not the correct explanation of A
 - c. A is true, R is false
 - d. Both A and R are false
14. A - In human male, testes are extra abdominal and lie in scrotal sacs.
 R - Scrotum acts as thermoregulator and keeps temperature lower by 2°C for normal sperm production.
[Ans. (a) A and R are true, R is the correct explanation of A]
 15. A - Ovulation is the release of ovum from the Graafian follicle.
 R - It occurs during the follicular phase of the menstrual cycle.
[Ans. (c) A is true, R is false]
 16. A - Head of the sperm consists of acrosome and mitochondria.
 R - Acrosome contains spiral rows of mitochondria.
[Ans. (d) Both A and R are false]



ention the differences between spermiogenesis and spermatogenesis.

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.

18. At what stage of development are the gametes formed in new born male and female?

- Ans. (i)** In a new born male, spermatogenesis (formation of sperms) starts at the age of puberty. It is initiated due to the increase in the release of Gonadotropin Releasing hormone.
- (ii)** Oogenesis is the process of development of the female gamete or egg in the ovaries. During foetal development, certain cells in the germinal epithelium of foetal ovary divide by mitosis and produce millions of oogonia or egg mother cells.
- (iii)** No more oogonia are added after birth. The oogonial cells enter into prophase I of meiosis to form primary oocytes which are temporarily arrested at this stage.
- (iv)** The primary oocytes then become primary follicles. From birth to puberty, a large number of follicles degenerate. At puberty the primary follicle undergoes further development and finally releases the ovum.

19. Expand the acronyms

- a. FSH b. LH c. hCG d. hPL

- Ans. (a)** FSH – Follicular Stimulating Hormone
(b) LH – Leutinsing Hormone
(c) hCG – Human Chorionic Gonadotropin
(d) hPL – Human Placental Lactogen.

20. How is polyspermy avoided in humans?

Ans. 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.

21. What is colostrum? Write its significance.

[Mar-2020]

Ans. The mammary glands of a female secrete a yellowish fluid called **colostrum** during the initial days after parturition.

Significance :

- (i)** It has less lactose than milk and almost no fat, but it contains more proteins, vitamin A and minerals.
- (ii)** It is rich in IgA antibodies. It helps to protect the infants digestive tract against bacterial infections.
- (iii)** It is the ideal food for infants since it contains all constituents in suitable concentration and is easily digestible.
- (iv)** It is loaded with immune, growth and tissue repair factors.
- (v)** It acts as a natural antimicrobial agent to actively stimulate the maturation of the infant's immune system.
- (vi)** It is fully sufficient till 6 months of age for all infants.

22. Placenta is an endocrine tissue. Justify.

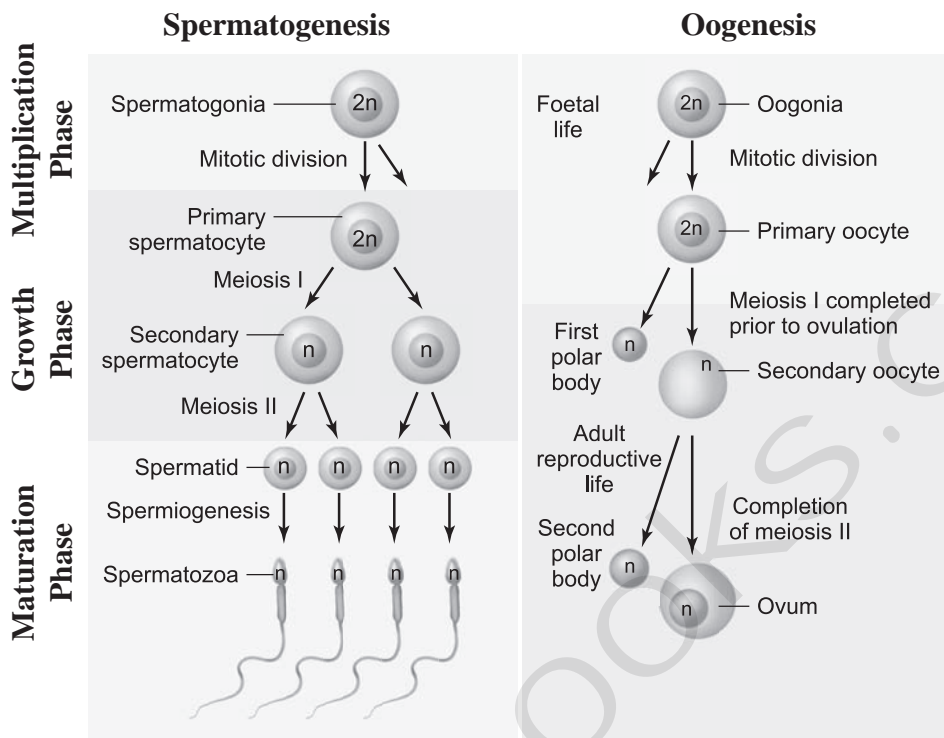
[Mar-2020]

- Ans. (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. Thus placenta is an endocrine tissue.



Give a schematic representation of Spermatogenesis and Oogenesis in humans.

[PTA-I; QY-2019]



31. Explain the various phases of the menstrual cycle.

Ans. Menstrual cycle consists of the following phases

1. Menstrual phase
2. Follicular or proliferative phase
3. Ovulatory phase
4. Luteal or secretory phase

1. Menstrual phase:

- (i) The cycle starts with the menstrual phase when menstrual flow occurs and lasts for 3-5 days.
- (ii) Menstrual flow is due to the breakdown of endometrial lining of the uterus and its blood vessels due to decline in the level of progesterone and oestrogen.
- (iii) Menstruation occurs only if the released ovum is not fertilized.

2. Follicular or proliferative phase:

- (i) The follicular phase extends from the 5th day of the cycle until the time of ovulation.
- (ii) During this phase, the primary follicle in the ovary grows to become a fully mature Graafian follicle and simultaneously, the endometrium regenerates through proliferation.

- (iii) These changes are induced by the secretion of gonadotropins like FSH and LH, which increase gradually during the follicular phase.
- (iv) It stimulates follicular development and secretion of oestrogen by the follicle cells.

3. Ovulatory phase:

- (i) Both LH and FSH attain peak level in the middle of the cycle (about the 14th day).
- (ii) Maximum secretion of LH during the mid cycle called LH surge induces the rupture of the Graafian follicle and the release of the ovum (secondary oocyte) from the ovary wall into the peritoneal cavity. This process is called as ovulation.

4. Luteal or secretory phase:

- (i) During luteal phase, the remaining part of the Graafian follicle is transformed into a transitory endocrine gland called **corpus luteum**.
- (ii) The corpus luteum secretes large amount of progesterone which is essential for the maintenance of the endometrium.
- (iii) It paves way for the implantation of the fertilized ovum.



- (v) The uterine wall secretes nutritious fluid in the uterus for the foetus. So, this phase is also called as secretory phase.
- (vi) During pregnancy, all events of menstrual cycle stop and there is no menstruation.

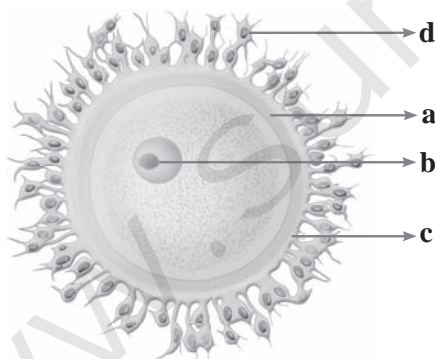
32. Explain the role of Oxytocin and Relaxin in parturition and lactation. [Mar-2020]

Ans. Relaxin – It is a hormone secreted by the placenta and also found in corpus luteum. It helps in relaxation of the pelvic ligaments at the time of parturition.

(i) **Oxytocin** – As pregnancy progresses, increase in oxytocin concentration promotes **uterine contractions** which facilitate downward movement of the foetus. The powerful concentration of the uterine muscles leads to the expulsion of the baby through birth canal resulting in child birth or parturition.

(ii) It causes the **“Let-Down” reflex** - the actual ejection of milk from the alveoli of the mammary glands. During lactation, oxytocin also stimulates the recently emptied uterus to contract, helping it to return to pre-pregnancy size.

33. Identify the given image and label its parts marked as a, b, c and d



Ans. Human Ovum

- a – Vitelline membrane
b – Nucleus
c – Zona Pellucida
d – Corona radiata

34. The following is the illustration of the sequence of ovarian events (a-i) in a human female.



- a) Identify the figure that illustrates ovulation and mention the stage of Oogenesis it represents.
- b) Name the ovarian hormone and the pituitary hormone that have caused the above-mentioned events.
- c) Explain the changes that occurs in the uterus simultaneously in anticipation.
- d) Write the difference between C and H.

Ans. (a) The figure ‘F’ illustrates ovulation. It represents the maturation stage of Oogenesis.

(b) The pituitary hormone leutinsing hormone and the ovarian hormone oestrogen are responsible for the above mentioned events.

- (c) (i) The endometrium of the uterus becomes thicker to receive the fertilized ovum in anticipation. (Implantation)
- (ii) The uterine wall secretes nutritious fluid in the uterus for the foetus.

Difference between C and H:

C-Secondary follicle, H-Corpus luteum

C - Secondary Follicle	H - Corpus Luteum
Found in follicular phase or proliferative phase.	Found in luteal phase or secretory phase
It secretes Oestrogen	It secretes progesterone.
Secondary follicle grows and become a fully mature graafian follicle.	Corpus Luteum degenerates and leaves a scar called corpus albicans.



UNIT I

Chapter

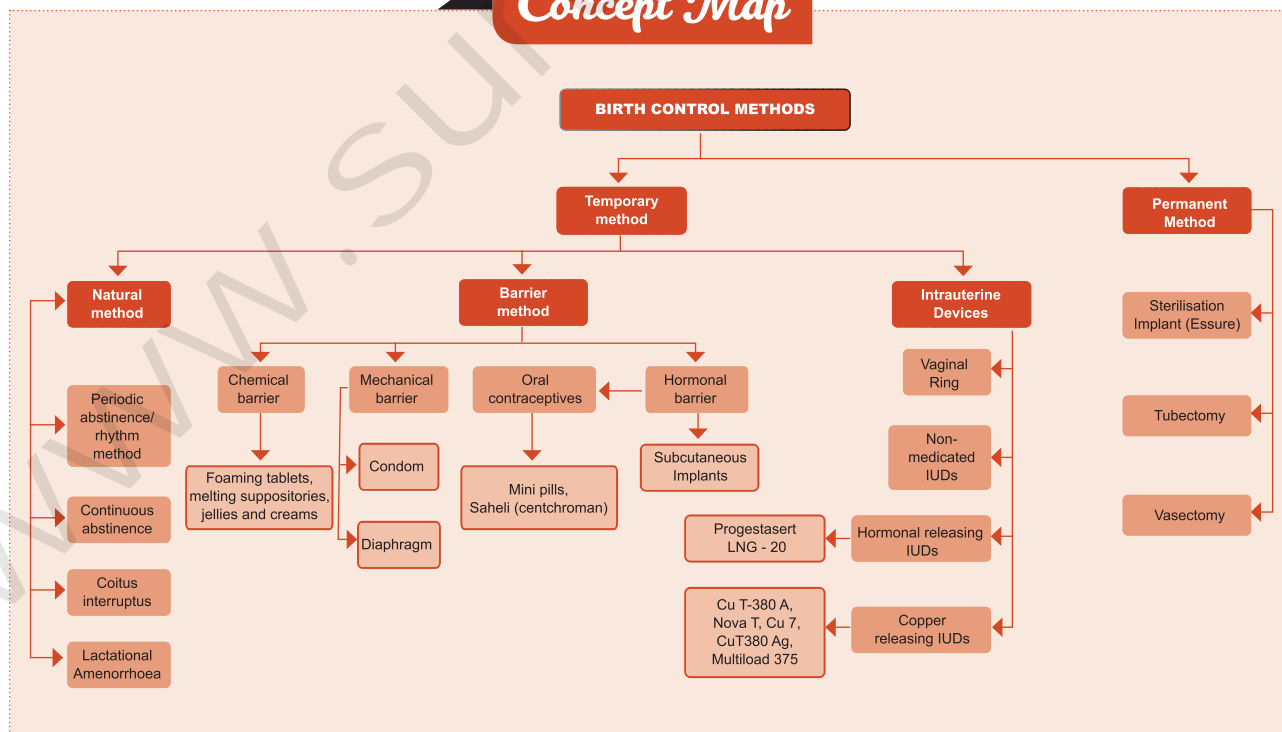
3

REPRODUCTIVE HEALTH

CHAPTER SNAPSHOT

- 3.1. Need for reproductive health problems and strategies
- 3.2. Amniocentesis and its statutory ban
- 3.3. Social impact of sex ratio, female foeticide and infanticide
- 3.4. Population explosion and birth control
- 3.5. Medical termination of pregnancy (MTP)
- 3.6. Sexually transmitted diseases (STD)
- 3.7. Infertility
- 3.8. Assisted reproductive technology (ART)
- 3.9. Detection of foetal disorders during early pregnancy

Concept Map





MUST KNOW DEFINITIONS

Female foeticide	:	Aborting the female in the mother's womb.
Female infanticide	:	Female infanticide is 'killing the female child after her birth.
PCPNDT Act	:	Preconception and prenatal diagnostic technique act.
POCSO Act	:	Prevention of children from sexual offences.
Birth control	:	Voluntary use of Contraceptive procedures to prevent fertilization.
Lactational amenorrhea	:	Delay in ovarian cycles due to lactation.
Barrier method of contraception	:	Ovum and sperm are prevented from meeting to prevent fertilization
Tubectomy	:	Surgical Sterilisation in women
Vasectomy	:	Surgical Sterilisation in men
Azoospermia	:	Absence of spermatozoa in the ejaculate semen.
Infertility	:	Inability to conceive or produce children even after the unprotected sexual cohabitation
Ultrasonography	:	Scanning technique which helps to detect fluid disorders during early pregnancy.
Amniocentesis	:	Taking a small sample of amniotic fluid to diagnose for chromosomal abnormalities.
Foetoscope	:	An instrument used to monitor the foetal heart rate.

ACRONYMS

IUD	:	Intra Uterine Devices Devices inserted by medical experts in the uterus as a Contraceptive measure.
MTP	:	Medical termination of pregnancy (voluntary or intentional termination of pregnancy in a Non-surgical way)
STD	:	Sexually transmitted diseases.
AIDS	:	Acquired immunodeficiency syndrome.
HIV	:	Human immunodeficiency virus.
HPV	:	Human papilloma virus
HBV	:	Hepatitis B Virus
IUI	:	Intra Uterine Insemination
IVF	:	<i>In Vitro</i> Fertilization
ZIFT	:	Zygote intra-fallopian transfer
GIFT	:	Gamete Intra-fallopian Transfer
ICSI	:	Intra-cytoplasmic sperm injection
CVS	:	Chorionic Villus Sampling



Evaluation

1. Which of the following is correct regarding HIV, hepatitis B, gonorrhoea and trichomoniasis?

- (a) Gonorrhoea is a STD whereas others are not.
- (b) Trichomoniasis is a viral disease whereas others are bacterial.
- (c) HIV is a pathogen whereas others are diseases.
- (d) Hepatitis B is eradicated completely whereas others are not.

[Ans. (c) HIV is a pathogen whereas others are diseases]

2. Which one of the following groups includes sexually transmitted diseases caused by bacteria only?

- (a) Syphilis, gonorrhoea and candidiasis
- (b) Syphilis, chlamydiasis and gonorrhoea
- (c) Syphilis, gonorrhoea and trichomoniasis
- (d) Syphilis, trichomoniasis and pediculosis

[Ans. (b) Syphilis, chlamydiasis and gonorrhoea]

3. Identify the correct statements from the following

- (a) Chlamydiasis is a viral disease.
- (b) Gonorrhoea is caused by a spirochaete bacterium, *Treponema pallidum*.
- (c) The incubation period for syphilis is 2 to 14 days in males and 7 to 21 days in females.
- (d) Both syphilis and gonorrhoea are easily cured with antibiotics.

[Ans. (d) Both syphilis and gonorrhoea are easily cured with antibiotics]

4. A contraceptive pill prevents ovulation by

- (a) blocking fallopian tube
- (b) inhibiting release of FSH and LH
- (c) stimulating release of FSH and LH
- (d) causing immediate degeneration of released ovum.

[Ans. (b) inhibiting release of FSH and LH]

5. The approach which does not give the defined action of contraceptive is

(a)	Hormonal contraceptive	Prevents entry of sperms, prevent ovulation and fertilization
(b)	Vasectomy	Prevents spermatogenesis

(c)	Barrier method	Prevents fertilization
(d)	Intra uterine device	Increases phagocytosis of sperms, suppresses sperm motility and fertilizing capacity of sperms

[Ans. (b) Vasectomy - Prevents spermatogenesis]

6. Read the given statements and select the correct option.

Statement 1: Diaphragms, cervical caps and vaults are made of rubber and are inserted into the female reproductive tract to cover the cervix before coitus.

Statement 2: They are chemical barriers of conception and are reusable.

- (a) Both statements 1 and 2 are correct and statement 2 is the correct explanation of statement 1.
- (b) Both statements 1 and 2 are correct but statement 2 is not the correct explanation of statement 1.
- (c) Statement 1 is correct but statement 2 is incorrect.
- (d) Both statements 1 and 2 are incorrect.

[Ans. (c) Statement 1 is correct but statement 2 is incorrect]

7. Match column I with column II and select the correct option from the codes given below.

[Mar-2020]

	Column I		Column II
A.	Copper releasing IUD	(i)	LNG-20
B.	Hormone releasing	(ii)	Lippes loop IUD
C.	Non-medicated IUD	(iii)	Saheli
D.	Mini pills	(iv)	Multiload-375

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

[Ans. (d) A-(iv), B-(i), C-(ii), D-(iii)]



8. Select the incorrect action of hormonal contraceptive pills from the following [Sep-2020]

- (a) Inhibition of spermatogenesis.
- (b) Inhibition of ovulation.
- (c) Changes in cervical mucus impairing its ability to allow passage and transport of sperms.
- (d) Alteration in uterine endometrium to make it unsuitable for implantation.

[Ans. (a) Inhibition of spermatogenesis.]

9. What is Amniocentesis? Why a statutory ban is imposed on this technique?

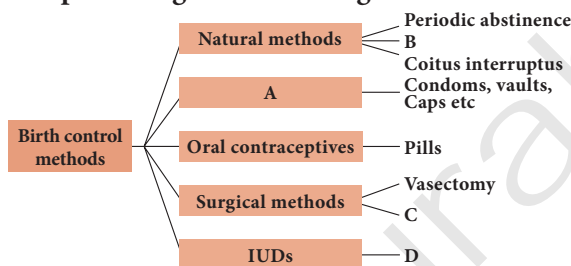
[QY-2019; Mar-2020; Aug-2021]

- Ans. (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.

10. Select the correct term from the bracket and complete the given branching tree



(Barriers, Lactational amenorrhoea, CuT, Tubectomy)

- Ans. A – Barrier methods
B – Lactational amenorrhoea
C – Tubectomy
D – CuT

11. Correct the following statements

- a) Transfer of an ovum collected from donor into the fallopian tube is called ZIFT.
- b) Transferring of an embryo with more than 8 blastomeres into uterus is called GIFT.
- c) Multiload 375 is a hormone releasing IUD.

Ans. (a) Transfer of an ovum collected from donor into the fallopian tube is called **GIFT (Gamete Intra – fallopian transfer)**

- (b) Transferring of an embryo with more than 8 blastomeres into uterus is called **IUT (Intra uterine transfer)**
- (c) Multi load 375 is a **copper** releasing IUD.

12. Which method do you suggest the couple to have a baby, if the male partner fails to inseminate the female or due to very low sperm count in the ejaculate?

Ans. Intra Uterine Insemination (IUI)

Procedure:

- (i) Semen is collected from the husband or a healthy donor.
- (ii) Processed sperm sample is infused into the uterus by passing the vagina.
- (iii) Ovaries are stimulated to produce more ova.
- (iv) Sperm fertilize with egg and results normal pregnancy.

13. Expand the following (a) ZIFT (b) ICSI

- Ans. (a) ZIFT – Zygote intra-fallopian transfer
(b) ICSI – Intra-cytoplasmic sperm injection

14. What are the strategies to be implemented in India to attain total reproductive health?

Ans. These programmes are popularly named as 'Reproductive and Child Health Care (RCH). Major tasks carried out under these programmes are:

- (i) Creating awareness and providing medical assistance to build a healthy society.
- (ii) Introducing sex education in schools about adolescence and adolescence related changes.
- (iii) Educating couples about the birth control methods and family planning norms.
- (iv) Creating awareness about care for pregnant women, post-natal care of mother and child and the importance of breast feeding.
- (v) Encouraging and supporting governmental and non-governmental agencies to identify new methods and/or to improve upon the existing methods of birth control.

Health care programmes such as massive child immunization, supply of nutritional food to the pregnant women, Janani Suraksha Yojana, Janani Shishu Suraksha Karyakaram, RMNCH+A approach etc., are taken up at the national level by the Government of India.

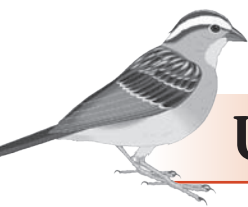
15. Differentiate foeticide and infanticide. [QY-2019]

Ans.	Foeticide	Infanticide
	It refers to 'aborting the foetus in the mother's womb' intentionally.	It is 'killing the child after the birth'.

**16. Describe the major STDs and their symptoms.**

Ans. STD refers to sexually transmitted diseases. Some of the major sexually transmitted diseases and their symptoms are:

Name of the Disease	Causative agent	Symptom	Incubation period
Bacterial STI			
Gonorrhoea	<i>Neisseria gonorrhoeae</i>	Affects the urethra, rectum and throat and in females the cervix also get affected. Pain and pus discharge in the genital tract and burning sensation during urination.	2 to 5 days
Syphilis	<i>Treponema pallidum</i>	Primary stage: Formation of painless ulcer on the external genitalia. Secondary stage: Skin lesions, rashes, swollen joints and fever and hair loss. Tertiary stage: Appearance of chronic ulcers on nose, lower legs and palate. Loss of movement, mental disorder, visual impairment, heart problems, gummas (soft non-cancerous growths) etc	10 to 90 days
Chlamydiasis	<i>Chlamydia trachomatis</i>	Trachoma, affects the cells of the columnar epithelium in the urinogenital tract, respiratory tract and conjunctiva.	2 to 3 weeks or upto 6 weeks
Lymphogranuloma venereum	<i>Chlamydia trachomatis</i>	Cutaneous or mucosal genital damage, urthritis and endocervicitis. Locally harmful ulcerations and genital elephantiasis.	
Viral STI			
Genital herpes	Herpes simplex virus	Sores in and around the vulva, vagina, urethra in female or sores on or around the penis in male. Pain during urination, bleeding between periods. Swelling in the groin nodes.	2 - 21 days (average 6 days)
Genital warts	Human papilloma virus (HPV)	Hard outgrowths (Tumour) on the external genitalia, cervix and perianal region.	1 - 8 months
Hepatitis-B	Hepatitis B virus (HBV)	Fatigue, jaundice, fever, rashes and stomach pain. Liver cirrhosis and liver failure occur in the later stage.	30 - 80 days
AIDS	Human immunodeficiency virus (HIV)	Enlarged lymph nodes, prolonged fever, prolonged diarrhoea, weight reduction, night sweating.	2 to 6 weeks even more than 10 years
Fungal STI			
Candidiasis	<i>Candida albicans</i>	Attacks mouth, throat, intestinal tract and vagina. Vaginal itching or soreness, abnormal vaginal discharge and pain during urination.	–
Protozoan STI			
Trichomoniasis	<i>Trichomonas vaginalis</i>	Vaginitis, greenish yellow vaginal discharge, itching and burning sensation, urethritis, epididymitis and prostatitis.	4 - 28 days



UNIT II

Chapter

4

PRINCIPLES OF INHERITANCE AND VARIATION

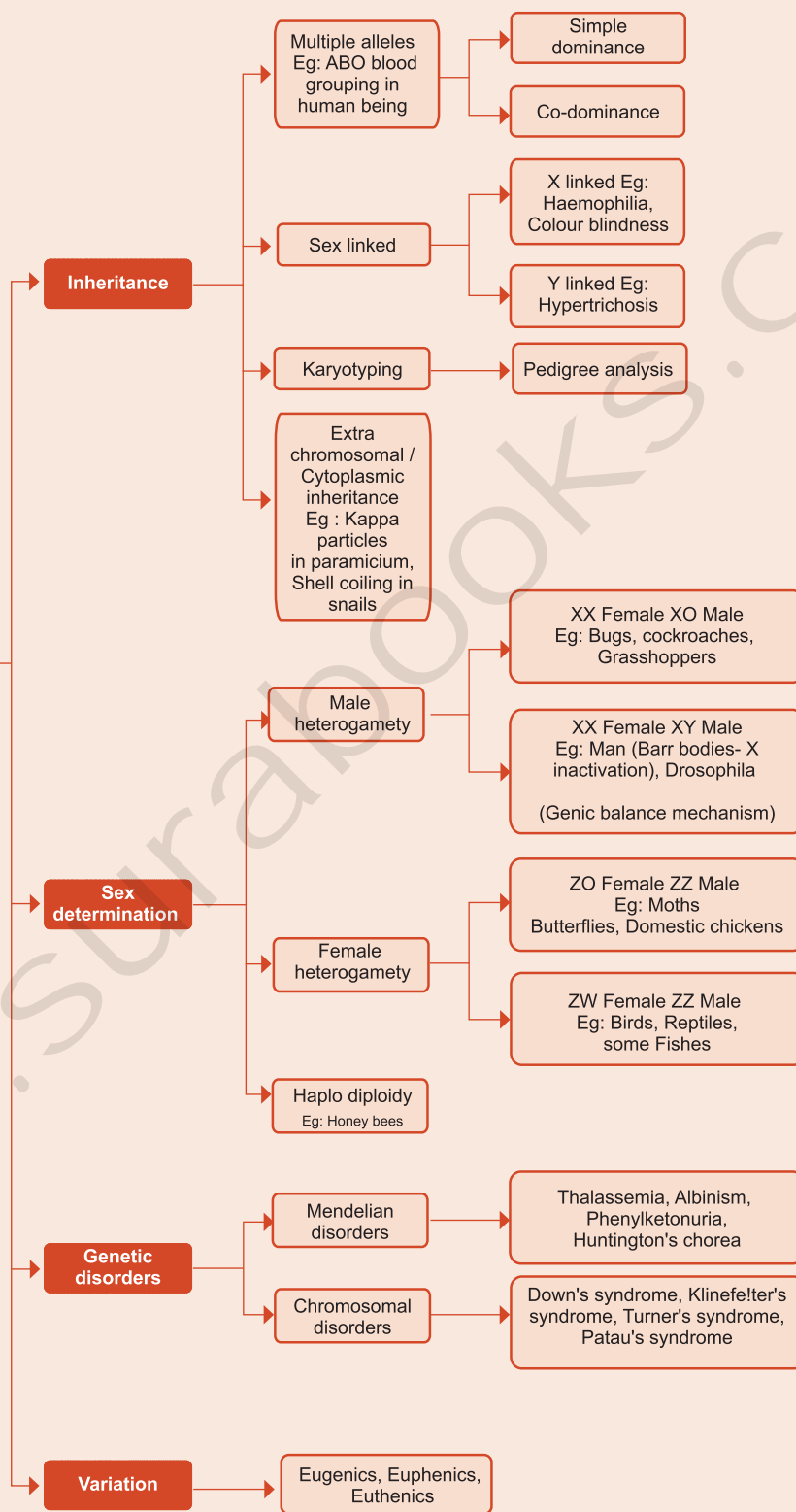
CHAPTER SNAPSHOT

- 4.1 Multiple alleles
- 4.2 Human blood groups
 - 4.2.1 ABO blood types
- 4.3 Genetic control of Rh factor
 - 4.3.1 Incompatibility of Rh factor – Erythroblastosis foetalis
- 4.4 Sex determination in human
 - 4.4.1 Dosage compensation – Barr body
- 4.5 Sex linked inheritance
 - 4.5.1 Inheritance of X - linked genes
 - 4.5.2 Inheritance of Y - linked genes
- 4.6 Karyotyping
- 4.7 Pedigree analysis
- 4.8 Mendelian disorders
- 4.9 Chromosomal abnormalities
- 4.10 Extra chromosomal inheritance
- 4.11 Eugenics, euphenics and eugenics



Concept Map

Principles of inheritance and variation



Unit Test

[Time : 1 hr]

[Marks: 25]

I. CHOOSE THE CORRECT ANSWER. $10 \times 1 = 10$

- ZW - ZZ system of sex determination occurs in ____.**
 - Fishes
 - Reptiles
 - Birds
 - All of these
- Which of the following phenotypes are possible in offspring from the parental combination A X O?**
 - A and B
 - O only
 - A only
 - A and O
- Klinefelters syndrome is characterized by**
 - XXX
 - XO
 - XXY
 - XXX
- In gypsy moth, we find _____ type of sex determination.**
 - ZW - ZZ
 - ZO - ZZ
 - XX - XY
 - XX - XO
- Y - Chromosome was discovered by ____.**
 - Stevens
 - Henking
 - Bertram
 - Sonneborn
- Red - green colour blindness is also called ____.**
 - daltonism
 - glucoma
 - myopia
 - presbyopia
- Karyotyping**
 - XO females**
 - 3n female**
 - Lyon**
 - Metaphase**
 - Barr body**
 - Aneuploidy**
 - Bridges**
 - 1 - A 2 - C 3 - D 4 - B
 - 1 - C 2 - B 3 - D 4 - A
 - 1 - B 2 - D 3 - A 4 - C
 - 1 - C 2 - A 3 - D 4 - B

8. Mark the correct answer as

Assertion (A): The Kappa in *Paramecium* appears to be a bacterium.

Reason (R): Kappa particles are not dependent on the chromosomal genes.

- (a) A and R are true, R is the correct explanation of A

- (b) A and R are true, R is not the correct explanation of A
(c) A is true, R is false
(d) Both A and R are false

9. Choose the mismatched pair:

- SRY - X Chromosome
 - Heterogametic - XX-XO female
 - Barr body - Sex Chromatin
 - Rh factor - Landsteiner
- i and iv
 - ii and iii and iv
 - ii only
 - i and ii

10. Choose the correct statement:

- Y linked genes are transmitted from mother to son.
 - People with $I^A I^O$ gene type have O blood group.
 - Human Y chromosome is shorter than X chromosome.
 - Fertilized eggs develop into Drones.
- i, iv
 - ii, iii, iv
 - i and iii
 - iii only

II. VERY SHORT ANSWER

$2 \times 2 = 4$

11. Define Eugenics.

12. What is criss cross inheritance?

III. SHORT ANSWER

$2 \times 3 = 6$

13. List any three applications of karyotype

14. What is trisomy 21?

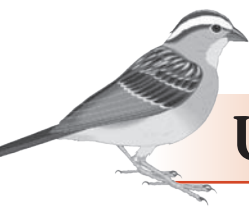
IV. LONG ANSWER

$1 \times 5 = 5$

15. Write a note on genetic control of ABO Blood groups.

(OR)

Write a note on Thalassemia.



UNIT II

Chapter

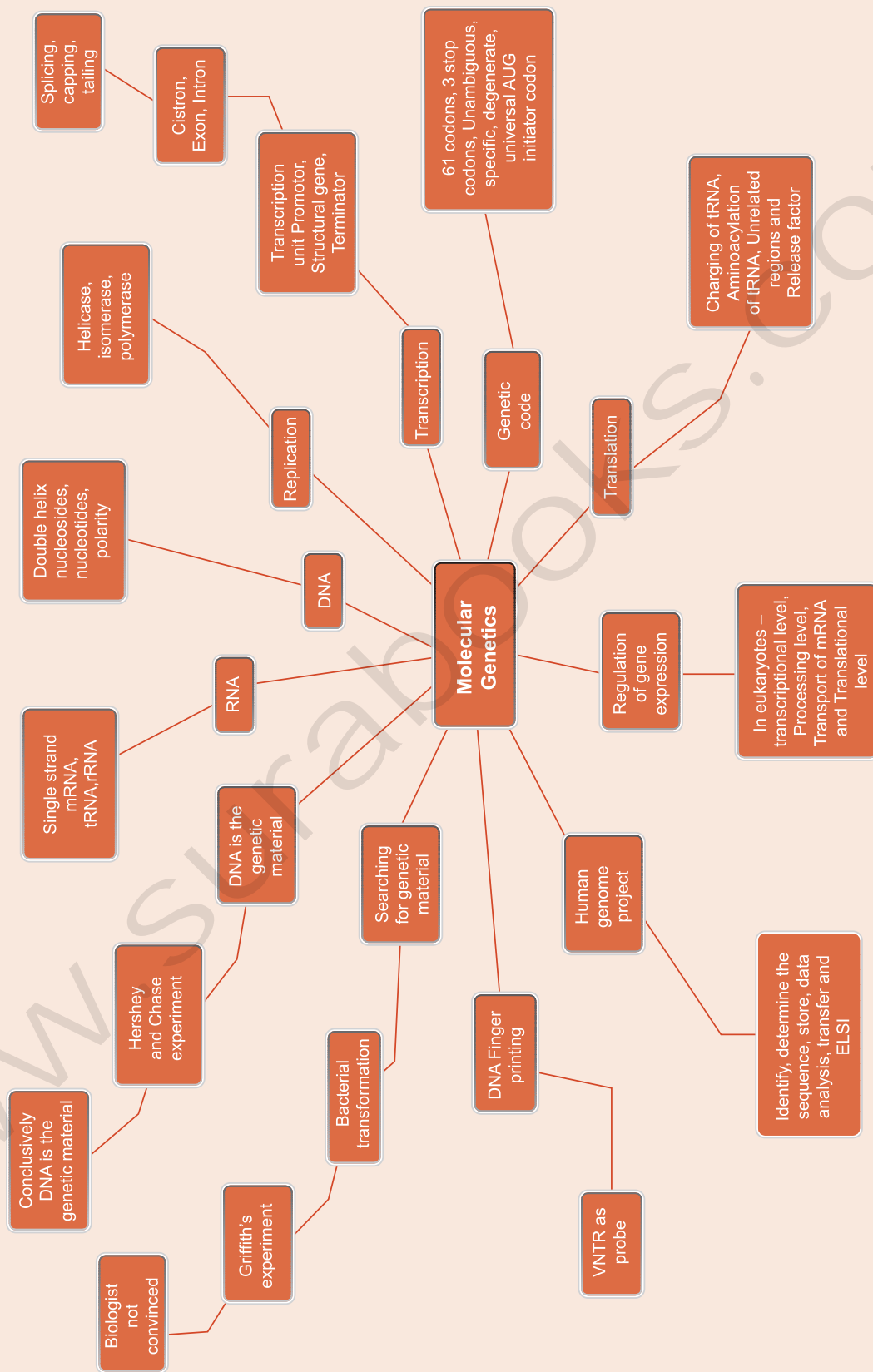
5

MOLECULAR GENETICS

CHAPTER SNAPSHOT

- 5.1** Gene as the functional unit of inheritance
- 5.2** In search of the genetic material
- 5.3** DNA is the genetic material
- 5.4** Chemistry of Nucleic acids
- 5.5** RNA world
- 5.6** Properties of genetic material
- 5.7** Packaging of DNA helix
- 5.8** DNA Replication
 - 5.8.1** Experimental proof of DNA replication
 - 5.8.2** Enzymes and mechanism of replication
- 5.9** Transcription
 - 5.9.1** Transcription unit and gene
 - 5.9.2** Process of transcription
- 5.10** Genetic code
 - 5.10.1** Mutation and genetic code
- 5.11** tRNA – The adapter molecule
- 5.12** Translation
 - 5.12.1** Mechanism of Translation
- 5.13** Regulation of Gene expression
- 5.14** Human Genome Project (HGP)
 - 5.14.1** Goals and methodologies of Human Genome Project
 - 5.14.2** Salient features of Human Genome Project
 - 5.14.3** Applications and future challenges
- 5.15** DNA finger printing technique

Concept Map





MUST KNOW DEFINITIONS

Replication	:	A process by which DNA makes a copy of itself.
Transcription	:	Process of copying genetic information from one strand of DNA into RNA.
Operon	:	The clusters of gene with related functions are called operons.
Nucleoside	:	When a phosphate group is attached to the 5' carbon of the same sugar, the nucleoside becomes a nucleotide.
Nucleotide	:	When a phosphate group is attached to the nucleoside it becomes a nucleotide.
Genopore	:	The DNA as a nucleoid is organized into large loops held by protein. DNA of prokaryotes is almost circular and lacks chromatin organization, hence termed genophore.
Nucleosome	:	In eukaryotes, chromatin is formed by a series of repeating units called nucleosome.
Semi DNA replication	:	Replication in which the daughter DNA has a polynucleotide strand from one parent and the other strand is newly synthesized.
Leading Strand	:	During replication, the process is continuous in one DNA strand which is called leading strand.
Lagging Strand	:	During replication, the new DNA strand is synthesized in fragments, discontinuously in one strand which is called lagging strand.
DNA ligase	:	Enzyme which acts as paste molecule to join broken DNA fragments.
Replication fork	:	Y shaped structure formed by unwinding of DNA strands at the point of origin of replication.
Template strand	:	During transcription one DNA strand acts as template strand (3' → 5') on which mRNA is transcribed.
DNA finger printing	:	DNA fingerprinting is a technique to identify variations in individuals of a population at the DNA level.
Exon	:	Interrupted coding sequences found in monocistronic structural genes.
Intron	:	The non coding sequences seen in monocistronic structural genes
Genetic codons	:	A sequence of three mRNA bases which codes for an amino acid.
Stop coders	:	The codons on mRNA which signal the termination of protein synthesis.
tRNA	:	Transfer RNA molecule which acts as a vehicle to pick up the amino acid from the cytoplasm based on codes on the mRNA.
SNPs	:	Single Nucleotide Polymorphism (Single base DNA difference)
HGP	:	Human Genome Project
VNTR	:	Variable Number Tandem Repeats

Evaluation

1. Hershey and Chase experiment with bacteriophage showed that

- (a) Protein gets into the bacterial cells
- (b) DNA is the genetic material
- (c) DNA contains radioactive sulphur
- (d) Viruses undergo transformation

[Ans. (b) DNA is the genetic material]

2. DNA and RNA are similar with respect to

- (a) Thymine as a nitrogen base
- (b) A single-stranded helix shape
- (c) Nucleotide containing sugars, nitrogen bases and phosphates
- (d) The same sequence of nucleotides for the amino acid phenyl alanine

[Ans. (c) Nucleotide containing sugars, nitrogen bases and phosphates]

3. A mRNA molecule is produced by _____

[Aug-2021]

- (a) Replication
- (b) Transcription
- (c) Duplication
- (d) Translation

[Ans. (b) Transcription]

4. The total number of nitrogenous bases in human genome is estimated to be about _____

- (a) 3.5 million
- (b) 35000
- (c) 35 million
- (d) 3.1 billion

[Ans. (d) 3.1 billion]

5. *E. coli* cell grown on ^{15}N medium are transferred to ^{14}N medium and allowed to grow for two generations. DNA extracted from these cells is ultracentrifuged in a cesium chloride density gradient. What density distribution of DNA would you expect in this experiment?

- (a) One high and one low density band
- (b) One intermediate density band
- (c) One high and one intermediate density band
- (d) One low and one intermediate density band

[Ans. (d) One low and one intermediate density band]

6. What is the basis for the difference in the synthesis of the leading and lagging strand of DNA molecules?

- (a) Origin of replication occurs only at the 5' end of the molecules.
- (b) DNA ligase works only in the 3' \rightarrow 5' direction

(c) DNA polymerase can join new nucleotides only to the 3' end of the growing stand.

(d) Helicases and single-strand binding proteins that work at the 5' end.

[Ans. (c) DNA polymerase can join new nucleotides only to the 3' end of the growing stand.]

7. Which of the following is the correct sequence of event with reference to the central dogma?

[Aug-2021]

- (a) Transcription, Translation, Replication
- (b) Transcription, Replication, Translation
- (c) Duplication, Translation, Transcription
- (d) Replication, Transcription, Translation

[Ans. (d) Replication, Transcription, Translation]

8. Which of the following statements about DNA replication is not correct?

- (a) Unwinding of DNA molecule occurs as hydrogen bonds break.
- (b) Replication occurs as each base is paired with another exactly like it.
- (c) Process is known as semi conservative replication because one old strand is conserved in the new molecule.
- (d) Complementary base pairs are held together with hydrogen bonds.

[Ans. (b) Replication occurs as each base is paired with another exactly like it]

9. Which of the following statements is not true about DNA replication in eukaryotes?

- (a) Replication begins at a single origin of replication.
- (b) Replication is bidirectional from the origins.
- (c) Replication occurs at about 1 million base pairs per minute.
- (d) There are numerous different bacterial chromosomes, with replication occurring in each at the same time.

[Ans. (d) There are numerous different bacterial chromosomes, with replication occurring in each at the same time]

10. The first codon to be deciphered was _____ which codes for _____.

- (a) AAA, proline
- (b) GGG, alanine
- (c) UUU, Phenylalanine
- (d) TTT, arginine

[Ans. (c) UUU, Phenylalanine]



11. Meselson and Stahl's experiment proved

- (a) Transduction [QY-2019]
- (b) Transformation
- (c) DNA is the genetic material
- (d) Semi-conservative nature of DNA replication

[Ans. (d) Semi-conservative nature of DNA replication]

12. Ribosomes are composed of two subunits; the smaller subunit of a ribosome has a binding site for _____ and the larger subunit has two binding sites for two _____.

[Ans. (mRNA, tRNA)]

13. An operon is a

- (a) Protein that suppresses gene expression
- (b) Protein that accelerates gene expression
- (c) Cluster of structural genes with related function
- (d) Gene that switched other genes on or off

[Ans. (c) Cluster of structural genes with related function]

14. When lactose is present in the culture medium:

- (a) Transcription of *lac y*, *lac z*, *lac a* genes occurs.
- (b) Repressor is unable to bind to the operator
- (c) Repressor is able to bind to the operator
- (d) Both (a) and (b) are correct

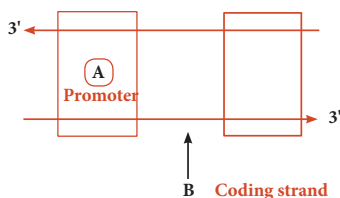
[Ans. (d) Both (a) and (b) are correct]

15. Give reasons: Genetic code is 'universal'.

Ans. 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. Some exceptions are reported in prokaryotic, mitochondrial and chloroplast genomes. However similarities are more common than differences. Most part of the genetic code is universal in prokaryotes and eukaryotes.

16. Name the parts marked 'A' and 'B' in the given transcription unit.



Ans. A-Promoter, B- Coding strand

17. Differentiate - Leading strand and lagging strand.

Ans.

	Leading Strand	Lagging Strand
1.	The replication of DNA on this strand is continuous	The replication of DNA on this strand is discontinuous
2.	DNA ligase is not required	DNA ligase is required for joining discontinuous fragments
3.	The polarity of this strand is 3' → 5'	The polarity of this strand is 5' → 3'
4.	No okazaki fragments are formed.	Okazaki fragments discontinuous fragments are formed

18. Differentiate - Template strand and coding strand.

Ans.

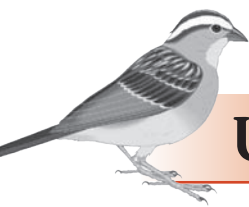
Template Strand	Coding Strand
1) This strand acts as a template for the mRNA synthesis during transcription.	1) The strand act as the non-template strand during transcription.
2) This strand with polarity 3' → 5'	2) Coding strand with polarity 5' → 3'
3) It has a sequence complementary to the mRNA.	3) It has a sequence similar to the mRNA.

19. Mention any two ways in which single nucleotide polymorphism (SNPs) identified in human genome can bring revolutionary change in biological and medical science.

- Ans. (i)** Scientists have identified about 1.4 million locations where single base DNA differences (SNPs = Single nucleotide polymorphism - pronounced as 'snips') occur in humans.
- (ii)** Identification of 'SNIPS' is helpful in finding chromosomal locations for disease associated sequences and tracing human history.

20. State any three goals of the human genome Project. [Mar-2020]

- Ans. (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.
- (iii)** To store this information in databases.



UNIT II

Chapter

6

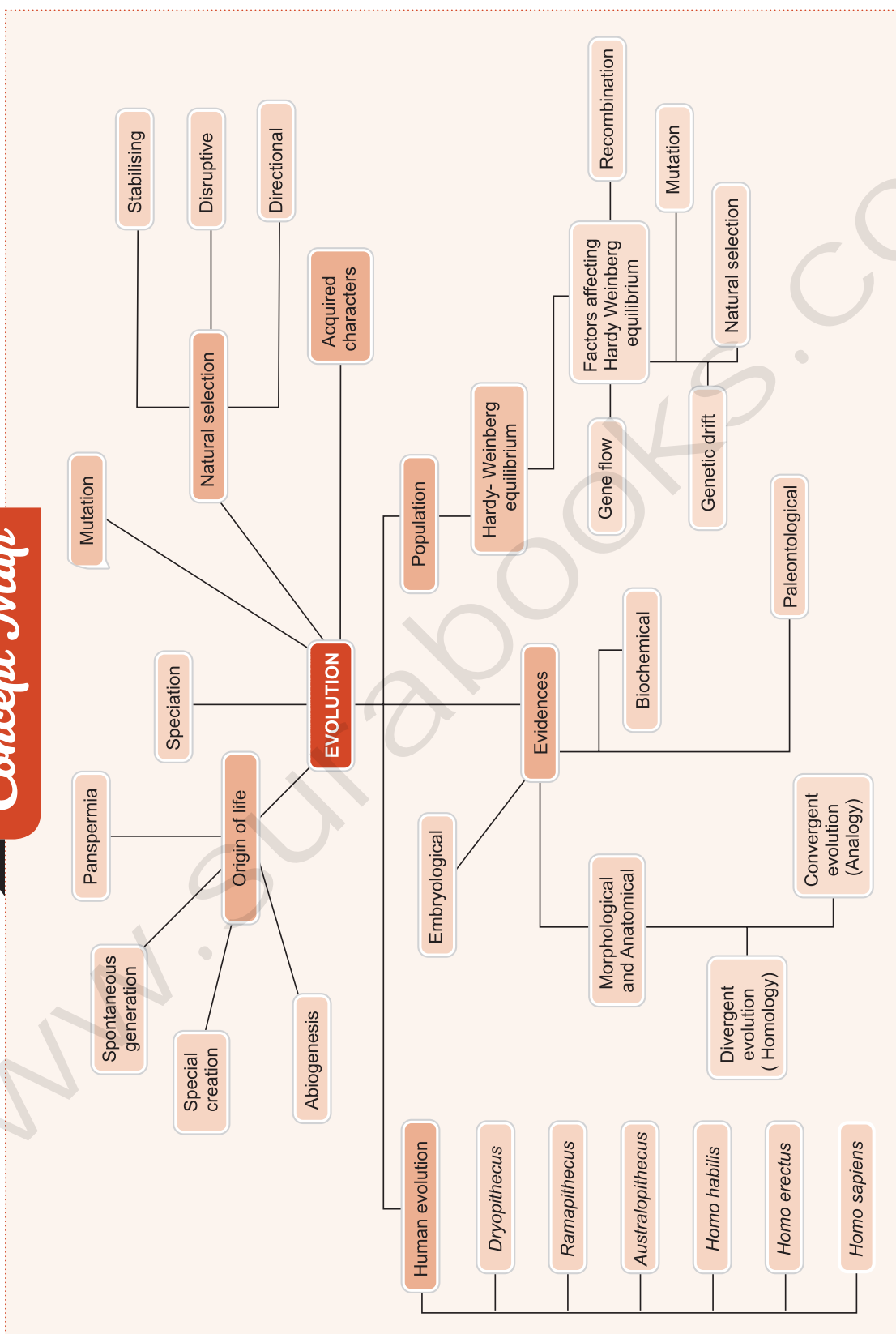
EVOLUTION

CHAPTER SNAPSHOT

- 6.1** Origin of life - Evolution of life forms
- 6.2** Geological time scale
- 6.3** Biological evolution
- 6.4** Evidences for biological evolution
 - 6.4.1** Paleontological evidences
 - 6.4.2** Evidences from comparative anatomy
 - 6.4.3** Embryological evidences
- 6.5** Theories of biological evolution
 - 6.5.1** Lamarck's theory
 - 6.5.2** Darwin's theory of Natural Selection
 - 6.5.3** Mutation theory
 - 6.5.4** Modern Synthetic theory
 - 6.5.5** Evolution by anthropogenic sources
 - 6.5.6** Adaptive Radiation
- 6.6** Mechanism of evolution
 - 6.6.1** Natural selection
 - 6.6.2** Gene flow
 - 6.6.3** Genetic drift / Sewall wright effect
 - 6.6.4** Mutation
- 6.7** Hardy Weinberg principle
- 6.8** Origin and evolution of man
- 6.9** Isolating mechanisms
- 6.10** Speciation
- 6.11** Extinction of animals



Concept Map



Evolution



MUST KNOW DEFINITIONS

Evolution	:	The term evolution is used to describe heritable changes in one or more characteristics of a population of species from one generation to the other.
Abiogenesis	:	Living organisms originated from non living materials.
Biogenesis	:	Life arose from pre-existing life.
Coacervates	:	Large colloidal particles or pre-cells which transformed into first living cells.
Geological time scale	:	Duration of the Earth's history is divided into eras which are further divided into periods. The periods are spilt into Epochs.
Paleontology	:	Study of pre-historic life through fossils.
Fossilization	:	Process by which plant and animal remains are preserved.
Petrification	:	Method of fossilization in which original portion of the dead animal body is replaced molecule for molecule by minerals and original substance is lost through disintegration.
Coprolites	:	Hardened faecal matter of animals of past ages.
Homologous organs	:	Structures which are similar in origin but perform different functions.
Analogous organs	:	Organisms having different structural patterns but similar function.
Vestigial organs	:	Structures which are of no use to the possessor and not needed for existence.
Connecting links	:	Organisms which possess the characters of two different groups.
Atavistic organs	:	Sudden appearance of vestigial organs in highly evolved organisms
Mutations	:	Sudden random changes that occur in organisms.
Darwin's finches	:	14 species of a bird observed by Darwin during his voyage which differed in its body size, beak shape and feeding behavior.
Micro evolution	:	Evolution on a small scale leading to changes in allele frequencies within a population.
Speciation	:	The process by which one species evolves into one or more different species.
Extinction	:	Disappearance of the species from the earth i.e there are no more individuals of that species alive anywhere in the world.



Evaluation

1. The first life on Earth originated _____.
 a) in air b) on land
 c) in water d) on mountain
[Ans. (c) in water]
2. Who published the book “Origin of species by Natural Selection” in 1859?
 a) Charles Darwin
 b) Lamarck
 c) Weismann
 d) Hugo de Vries **[Ans. (a) Charles Darwin]**
3. Which of the following was the contribution of Hugo de Vries? [Aug-2021]
 a) Theory of mutation
 b) Theory of natural Selection
 c) Theory of inheritance of acquired characters
 d) Germplasm theory
[Ans. (a) Theory of mutation]
4. The wings of birds and butterflies is an example of _____.
 a) Adaptive radiation
 b) convergent evolution
 c) divergent evolution
 d) variation
[Ans. (b) convergent evolution]
5. The phenomenon of “Industrial Melanism” demonstrates _____.
 a) Natural selection
 b) induced mutation
 c) reproductive isolation
 d) geographical isolation
[Ans. (a) Natural selection]
6. Darwin’s finches are an excellent example of
 a) connecting links
 b) seasonal migration
 c) adaptive radiation
 d) parasitism **[Ans. (c) adaptive radiation]**
7. Who proposed the Germplasm theory? [Aug-2021]
 a) Darwin
 b) August Weismann
 c) Lamarck
 d) Alfred Wallace
[Ans. (b) August Weismann]
8. The age of fossils can be determined by
 a) electron microscope b) weighing the fossils
 c) carbon dating d) analysis of bones
[Ans. (c) carbon dating]
9. Fossils are generally found in _____.
 a) igneous rocks
 b) metamorphic rocks
 c) volcanic rocks
 d) sedimentary rocks
[Ans. (d) sedimentary rocks]
10. Evolutionary history of an organism is called
 a) ancestry b) ontogeny
 c) phylogeny d) paleontology
[Ans. (c) phylogeny]
11. The golden age of reptiles was [Aug-2021]
 a) Mesozoic era b) Cenozoic era
 c) Paleozoic era d) Proterozoic era
[Ans. (a) Mesozoic era]
12. Which period was called “Age of fishes”?
 a) Permian b) Triassic
 c) Devonian d) Ordovician
[Ans. (c) Devonian]
13. Modern man belongs to which period?
 a) Quaternary b) Cretaceous
 c) Silurian d) Cambrian
[Ans. (a) Quaternary]
14. The Neanderthal man had the brain capacity of
 a) 650 – 800cc b) 1200cc
 c) 900cc d) 1400cc
[Ans. (d) 1400cc]
15. According to Darwin, the organic evolution is due to
 a) Intraspecific competition
 b) Interspecific competition
 c) Competition within closely related species.
 d) Reduced feeding efficiency in one species due to the presence of interfering species.
[Ans. (b) Interspecific competition]



16. A population will not exist in Hardy-Weinberg equilibrium if [Mar-2020]

- Individuals mate selectively
- There are no mutations
- There is no migration
- The population is large

[Ans. (a) Individuals mate selectively]

17. List out the major gases seem to be found in the primitive Earth.

Ans. (i) The primitive Earth had no proper atmosphere, but consisted of ammonia, methane, hydrogen and water vapour.

(ii) Hydrogen and oxygen were formed by splitting of water molecules by uv rays.

(iii) Ammonia & Methane in the atmosphere combined with oxygen to form carbon - dioxide and other gases.

18. Explain the three major categories in which fossilization occur?

Ans. Fossilization is the process by which plant and animal remains are preserved in sedimentary rocks. They fall under three main categories.

(1) Actual remains:

(i) The original hard parts like bones, teeth or shells are preserved.

(ii) It is a most common method of fossilization. When marine animals die, their hard parts like bones, shells, etc., are covered with sediments and are protected from further deterioration.

(iii) The salinity in ocean prevents decay.

(iv) The sediments become hardened to form definite layers or strata. Eg: Woolly Mammoth that lived 22 thousand years ago were preserved in the frozen coast of Siberia.

(2) Petrification:

(i) When animals die, the original portion of their body may be replaced molecule for molecule by minerals and the original substance being lost through disintegration. This is called petrification.

(ii) The principle minerals involved here are iron pyrites, silica, calcium carbonate and bicarbonates of calcium and magnesium.

(3) Natural moulds and casts:

(i) MOULDS: Even after disintegration, the body of an animal might leave indelible impression on the soft mud which later becomes hardened into stones. Such impressions are called moulds.

(ii) CASTS: The cavities of the moulds get filled up by hard minerals and fossilized are called casts.

(iii) COPROLITES: Hardened faecal matter occur as tiny pellets.

Analysis of the coprolites helps us to understand the nature of diet of the pre- historic animals thrived on.

19. Differentiate between Divergent evolution and Convergent evolution with one example for each. [Govt.MQP-2019; Mar-2020]

Ans.

S. No	Divergent evolution	Convergent evolution
1.	Structures which are similar in origin but perform different functions are called homologous structures that brings divergent evolution.	Organisms with different structural patterns but similar function are termed as analogous structures that brings convergent evolution
2.	E.g. Thorn of <i>Bougainvillea</i> and tendril of <i>Curcubita</i> are homologous structures but their functions are different.	E.g. Wings of birds and insects are different in structure, but perform the same function of flight.

20. How does Hardy-Weinberg's expression ($p^2 + 2pq + q^2 = 1$) explain that genetic equilibrium is maintained in a population? List any four factors that can disturb the genetic equilibrium.

Ans. Population of beetles:

(i) Appear in 2 colours and the colour is determined.

(ii) Dark grey (black) - 'AA' and 'Aa'

(iii) Light grey - 'aa'

(iv) 'A' allele has a frequency (p) 0.3 and 'a' allele has a frequency (q) 0.7.

ZOOLOGY LONG VERSION QUESTIONS (FOR PURE SCIENCE GROUP)

Q.No. 1 to 30 Refer Evaluation

31. Define isolating mechanism and explain its types with suitable examples.

Ans. Isolation is the separation of the members of a single population into sub-populations so that genetic integrity of the sub-population can be maintained.

(i) **Ecological isolation or habitat isolation** - The members of the same population may be separated from one another by differences in their habitat.

Eg: *Rana areolata* occupies burrows dug by mammals and tortoises during the day and breeds in grassy shallow ponds whereas *Rana grylio* breeds in deep waters. Due to the difference in their habitat, the two species are able to maintain their respective species identities.

(ii) **Seasonal isolation** - Differences in the breeding seasons prevents interbreeding.

Eg: Toad, *Bufo americanus* breeds much early in the spring whereas *Bufo fowleri* breeds very late in the season. They maintain their species identity because of the differences in the breeding seasons.

(iii) **Sexual or ethological isolation/ Behavioural isolation** - Prevents mating due to the difference in their sexual behavior. The species are not separated from one another either in time or in space.

Eg: The mating calls of two closely related species of frogs, grey tree frog and pine wood tree frog are different which prevents interbreeding.

(iv) **Morphological isolation or mechanical isolation** - Differences in their external genitalia that is seen in two different species.

Eg: The size difference between two toad species, prevents their interbreeding.

(v) **Physiological isolation** - Though mating may occur, the gametes are prevented from fertilization due to mechanical or physiological factors.

Eg. The sperms of *Drosophila virilis* survive only for about a day when introduced into the sperm receptacle of *Drosophila americana* while the sperms of *Drosophila americana* live for a longer time.

(vi) **Cytological isolation** - Fertilization does not take place due to the differences in the chromosome numbers between the two species, the bull frog and gopher frog.

(vii) **Hybrid inviability** - The sperm enters the egg, fertilization occurs and the embryo develops into the adult but it dies before reaching maturity.

Eg. Fishes, frogs, beetles, even if fertilization takes place between two species, due to genetic in compatibility they do not leave any surviving offspring.

(viii) **Hybrid sterility** - Hybrids are formed due to inter-specific crosses but they are sterile due to the failure of the chromosomes to segregate normally during meiosis.

Eg. Mule (inter specific cross between a horse and a donkey).

(ix) **Hybrid breakdown** - F1 Hybrids are viable and fertile, but F2 hybrids may be inviable or sterile.

32. Define speciation according to A. E. Emerson and explain its types giving suitable examples.

[Sep-2020]

Ans. Speciation:

(i) A. E. Emerson defines species as a 'genetically distinctive, reproductively isolated natural population'.

(ii) Speciation is a fundamental process in evolution.



Types Sympatric speciation/Reproductive isolation:

- (i) It is a mode of speciation through which new species form from a single ancestral species while both species continue to inhabit the same geographical region. Two or more species are involved.
- (ii) New species formed due to genetic modification in the ancestor that is naturally selected can no longer breed with the parent population.
- (iii) Sexual isolation is strongest.
- (iv) Phenotypic plasticity has emerged as potentially important first step in speciation initiated within an isolated population.

Allopatric speciation/Geographical speciation:

- (i) It is a mode of speciation that occurs when biological populations of similar species become isolated from each other that prevents gene flow.
- (ii) One species becomes two species due to geographical barriers hence new species is evolved. **E.g.** Darwin's finches.
- (iii) The barriers are land separation, migration or mountain formation. When barriers occur between species, change in ecological conditions and environment leads to adaptations that produce differences.
- (iv) If there are no adaptations, they will not survive. Sexual isolation is weakest.

33. Give an account on the major causes for the extinction of a particular species on Earth.

Ans. Causes for extinction of a species may be natural or due to human Intervention.

Natural causes :

- (i) **Environmental events** – Occurrence of Natural disaster such as floods, volcanic eruptions, etc. can wipe out an entire species.
- (ii) **Biological events** – Non availability of foods, spread of infectious diseases can wipe out a species at large.

Human Activities :

- (i) Man is destroying forests in a large scale. Many species are being reduced homeless.

- (ii) Modern technology has a major impact **Eg.** Sparrow population is said to have reduced due to erection of signal towers built as part of communication. (mobile phones)
- (iii) Over exploitation of species for commercial purpose may interfere with food chains and create food deficit for other species.
- (iv) It may also lead to reduction in population of the species.

34. Explain the three level of impact of extinction of species.

Ans. The impact of extinction can be considered at three levels.

- (i) **Species extinction:** Eliminates an entire species, by an environmental event **E.g.** Flood etc., or by biological event **E.g.** Disease or non availability of food resource half or more.
- (ii) **Mass extinction:**
 - (a) Eliminates half or more species in a region or ecosystem. **E.g.** volcanic eruption.
 - (b) Five major mass extinction that occurred since the Cambrian period. This mass extinction is often referred to as K-T extinction.
- (iii) **Global extinction:** Eliminates most of the species on a large scale or larger taxonomic groups in the continent or the Earth. **E.g.** Snow ball Earth and extinction following elevation in CO₂ levels.
- (iv) Extinction events opens up new habitats and so can facilitate the radiation of organisms that survived the mass extinction.

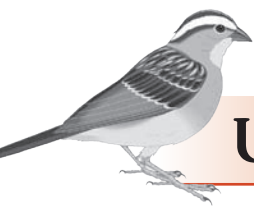
PTA Question & Answers

CHOOSE THE CORRECT ANSWER

1 Mark

1. Match the following and find the correct answer. [PTA-5]

- | | |
|------------------------|--------------------------------|
| (i) Tertiary period | (A) Age of fishes |
| (ii) Jurassic period | (B) Dominance of invertebrates |
| (iii) Devonian period | (C) Mammals and birds |
| (iv) Ordovician period | (D) Golden age of Reptiles |



UNIT III

Chapter

7

HUMAN HEALTH AND DISEASES

CHAPTER SNAPSHOT

7.1	Common diseases in human beings	7.3.7	Antigen-Antibody interaction
7.1.1	Bacterial and viral diseases	7.3.8	Vaccines
7.1.2	Protozoan diseases	7.3.9	Vaccination and immunization
7.2	Maintenance of personal and public hygiene	7.3.10	Hypersensitivity
7.3	Basic concepts of immunology	7.4	Immunodeficiency diseases
7.3.1	Innate immunity	7.5	Autoimmune diseases
7.3.2	Acquired immunity	7.5.1	Tumour immunology
7.3.3	Immune responses	7.6	Adolescence - drug and alcohol abuse
7.3.4	Lymphoid organs	7.6.1	Addiction and dependence
7.3.5	Antigens	7.6.2	Effects of drugs and alcohol
7.3.6	Antibodies	7.6.3	Prevention and control

MUST KNOW DEFINITIONS

Communicable diseases	:	Diseases which are transmitted from one person to another are called infectious diseases or communicable diseases .
Non infectious diseases	:	Diseases are not transmitted from infected to a healthy person.
Vector	:	An insect (organism which carries the pathogen from infected person/things to a healthy person).
Pandemic	:	A disease which has spread worldwide.
Digenic parasite	:	An organism which requires two hosts to complete its life cycle
Hygiene	:	Set of practices performed to conserve good health
Drug abuse	:	The intake of drugs in an amount and frequency that impairs one's physical, Physiological and Psychological functions.
Euphoria	:	A state characterised by mental and emotional preoccupation with the drug by the person.
Alcoholism	:	Initially to control drinking due to physical and emotional dependence on alcohol
Addiction	:	Physical or Psychological need to do or take or use certain substance to the point that it can be harmful to the individual.
Korsakoff syndrome	:	Chronic memory disorder caused by alcohol misuse.
Zoonotic	:	An organism transmitted from animals to humans



Evaluation

1. A 30 year old woman has bloody diarrhoea for the past 14 hours, which one of the following organisms is likely to cause this illness?

(a) *Streptococcus pyogenes*
(b) *Clostridium difficile*
(c) *Shigella dysenteriae*
(d) *Salmonella enteritidis*

[Ans. (c) *Shigella dysenteriae*]

2. Exo-erythrocytic schizogony of *Plasmodium* takes place in _____.

(a) RBC (b) Leucocytes
(c) Stomach (d) Liver

[Ans. (d) Liver]

3. The sporozoites of *Plasmodium vivax* are formed from _____. [Aug-2021]

(a) Gametocytes (b) Sporoblasts
(c) Oocysts (d) Spores

[Ans. (c) Oocysts]

4. Amphetamines are stimulants of the CNS, whereas barbiturates are _____.

(a) CNS stimulant (b) both a and b
(c) hallucinogenic (d) CNS depressants

[Ans. (d) CNS depressants]

5. Choose the correctly match pair.

(a) Amphetamines - Stimulant
(b) LSD - Narcotic
(c) Heroin - Psychotropic
(d) Benzodiazepine - Pain killer

[Ans. (a) Amphetamines - Stimulant]

6. The Athlete's foot disease in human is caused by _____.

(a) Bacteria (b) Fungi
(c) Virus (d) Protozoan

[Ans. (b) Fungi]

7. Cirrhosis of liver is caused by chronic intake of _____.

(a) Opium (b) Alcohol
(c) Tobacco (d) Cocaine

[Ans. (b) Alcohol]

8. The sporozoite of the malarial parasite is present in _____.

(a) Saliva of infected female *Anopheles* mosquito
(b) RBC of human suffering from malaria

(c) Spleen of infected humans
(d) Gut of female *Anopheles* mosquito

[Ans. (a) Saliva of infected female *Anopheles* mosquito]

9. Where do the following events in the life cycle of *Plasmodium* takes place?

Ans. (a) Fertilization - Mosquito's gut.
(b) Development of gametocytes - Red blood cells of human.
(c) Release of sporozoites - Blood stream of human.
(d) Schizogony - Liver of human.

10. Paratope is an _____.

(a) Antibody binding site on variable regions
(b) Antibody binding site on heavy regions
(c) Antigen binding site on variable regions
(d) Antigen binding site on heavy regions

[Ans. (c) Antigen binding site on variable regions]

11. Allergy involves _____. [Aug-2021]

(a) IgE (b) IgG
(c) IgA (d) IgM

[Ans. (a) IgE]

12. Spread of cancerous cells to distant sites is termed as _____.

(a) Metastasis
(b) Oncogenes
(c) Proto-oncogenes
(d) Malignant neoplasm

[Ans. (a) Metastasis]

13. AIDS virus has _____. [HY-2019]

(a) Single stranded RNA
(b) Double stranded RNA
(c) Single stranded DNA
(d) Double stranded DNA

[Ans. (A) Single stranded RNA]

14. B cells that produce and release large amounts of antibody are called _____. [Mar-2020]

(a) Memory cells (b) Basophils
(c) Plasma cells (d) killer cells

[Ans. (C) Plasma cells]

15. Given below are some human organs. Identify one primary and one secondary lymphoid organ. Explain its role. Liver, thymus, stomach, thyroid, tonsils

Ans. (i) Primary lymphoid organ: Thymus is a primary lymphoid organ.

Role:

- (a) It secretes the hormone **thymosin**.
- (b) It stimulates the T cell to become mature and **immunocompetent**.
- (ii) **Secondary lymphoid organ:** Tonsils is a secondary lymphoid organ.

Role:

- (a) The tonsils helps to fight infections.
- (b) They stop invading germs including bacteria and viruses.

16. Name and explain the type of barriers which involve macrophages.

- Ans. (i)** The type of barrier that involves macrophages are the phagocytic barriers which is a type of innate immunity.
- (ii)** In this mechanism, specialised cells such as monocytes, neutrophils and tissue macrophages phagocytose and digest whole microorganisms are involved.

17. What are Interferons? Mention their role.

Ans. Interferons are a group of signalling produced by virus infected cells. They interfere with viral replication and hence named **interferons**.

Role:

- (i) A virus infected cell released interferons induce antiviral state in the uninfected cells.
- (ii) They are chemical mediators under physiological barriers offering innate immunity.

18. List out chemical alarm signals produced during inflammation.

Ans. Chemical alarm signals produced during inflammation: Tissue damage and infection induce leakage of vascular fluid, containing chemotactic signals like **serotonin, histamine and prostaglandins**.

19. Explain the process of replication of retrovirus after it gains entry into the human body.

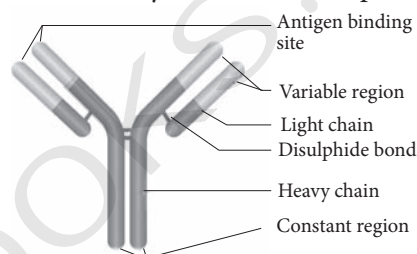
- Ans. (i)** After getting into the body of the person, the virus enters into macrophages where **RNA genome** of the virus replicates to form **viral DNA** by the enzyme **reverse transcriptase**.
- (ii)** This viral DNA gets incorporated into the DNA of host cells and directs the infected cells to produce viral particles.
- (iii)** The macrophages continue to produce virus and acts like a HIV factory.
- (iv)** Simultaneously, HIV enters into helper T-lymphocytes, replicates and produces progeny viruses.
- (v)** The progeny viruses released in the blood attack other helper T-lymphocytes.

Symptoms:

- (i) The person suffers from bouts of fever, diarrhoea and weight loss.
- (ii) The person starts suffering from infections and becomes immune deficient and unable to protect against any infection Due to least number of helper T lymphocytes,

20. Explain the structure of Immunoglobulin with suitable diagram. [QY-2019; Aug-2021]

- Ans. (i)** In the 1950s, experiments by **Porter and Edelman** revealed the basic structure of the immunoglobulin.
- (ii)** An antibody molecule is Y shaped structure.



Structure of immunoglobulin

- (iii)** It comprises of 4 polypeptide chains, **two identical light chains** (L) of molecular weight 25,000 Da (approximately 214 amino acids) and **two identical heavy chains** (H) of molecular weight 50,000 Da (approximately 450 amino acids).
- (iv)** The polypeptide chains are linked together by di-sulphide (S-S) bonds.
- (v)** One light chain is attached to each heavy chain two heavy chains are attached to each other to form a Y shaped structure. Hence, an antibody is represented by H_2L_2 .
- (vi)** Each chain (L and H) has two terminals. They are C - terminal (Carboxyl) and amino or N-terminal.
- (vii)** Each chain (L and H) has two regions. Variable (V) region at one end and a much larger constant (C) region at the other end.
- (viii)** Antibodies responding to different antigens have very different (V) regions but their (C) regions are the same in all antibodies.
- (ix)** In each arm of the monomer antibody, the V regions of the heavy and light chains combines to form an antigen – binding site shaped to 'fit' a specific antigenic determinant.

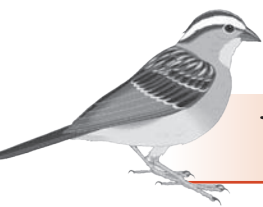
**2. List any five bacterial diseases causative agents, mode of transmission of syndrome.****Ans.**

No	Diseases	Causative agent	Site of infection	Mode of transmission	Symptoms
1	Shigellosis (Bacillary dysentery)	<i>Shigella sp.</i>	Intestine	Food and water contaminated by faeces / faecal oral route	Abdominal pain, dehydration, blood and mucus in the stools
2	Bubonic plague (Black death)	<i>Yersinia pestis</i>	Lymph nodes	Rat flea vector- <i>Xenopsylla cheopis</i>	Fever, headache, and swollen lymph nodes
3	Diphtheria	<i>Corynebacterium diphtheriae</i>	Larynx, skin, nasal and genital passage	Droplet infection	Fever, sore throat, hoarseness and difficulty in breathing
4	Cholera	<i>Vibrio cholerae</i>	Intestine	Contaminated food and water/ faecal oral route	Severe diarrhoea and dehydration
5	Tetanus (Lock jaw)	<i>Clostridium tetani</i>	Spasm of muscles	Through wound infection	Rigidity of jaw muscle, increased heart beat rate and spasm of the muscles of the jaw and face

3. List any five viral diseases, their causative agents, site of infection, mode of transmission and symptoms.**Ans.**

S. No	Diseases	Causative agent	Site of infection	Mode of transmission	Symptoms
1	Common cold	<i>Rhino viruses</i>	Respiratory tract	Droplet infection	Nasal congestion and discharge, sore throat, cough and headache
2	Mumps	<i>Mumps virus (RNA virus)</i> <i>Paramyxovirus</i>	Salivary glands	Saliva and droplet infection	Enlargement of the parotid glands
3	Measles	<i>Rubella virus (RNA virus)</i> , <i>Paramyxovirus</i>	Skin and respiratory tract	Droplet infection	Sore throat, running nose, cough and fever. reddish rashes on the skin, neck and ears
4	Viral hepatitis	<i>Hepatitis - B virus</i>	Liver	Parenteral route, blood transfusion	Liver damage, jaundice, nausea, yellowish eyes, fever and pain in the abdomen
5	Chicken pox	<i>Varicella - Zoster virus (DNA Virus)</i>	Respiratory tract, skin and nervous system	Droplet infection and direct contact	Mild fever with itchy skin, rash and blisters





UNIT III

Chapter

8

MICROBES IN HUMAN WELFARE

CHAPTER SNAPSHOT

- 8.1** Microbes in household products
- 8.2** Microbes in industrial products
 - 8.2.1** Antibiotic production
 - 8.2.2** Fermented beverages
 - 8.2.3** Chemicals enzymes and other bioactive molecules
- 8.3** Microbes in sewage treatment and energy generation
 - 8.3.1** Microbial fuel cell (MFC)
- 8.4** Microbes in the production of biogas
- 8.5** Bioremediation
 - 8.5.1** Microorganisms involved in bioremediation

MUST KNOW DEFINITIONS

Prebiotics	:	Prebiotics are compounds in food (fibers) that induce the growth or activity of beneficial microorganisms.
Probiotics	:	Probiotics are live microorganisms intended to provide health benefits when consumed, generally by improving or restoring the gut flora.
Rennet	:	Enzyme needed for cheese production.
Paneer	:	Made by curdling milk with lemon juice, vinegar and other edible acids (cottage cheese)
Fermentation	:	Breakdown of sugar in absence of oxygen leading to production of alcohol and Carbon dioxide
Antibiotic	:	Chemical substances produced by microorganisms which can kill or retard the growth of other microbes.
Antibiotic resistance	:	Antibiotic resistance occurs when bacteria develop the ability to defeat the drug designed to kill or inhibit their growth.
Single Cell Protein (SCP)	:	Edible unicellular microbes like spirulina which are protein rich and used for human consumption and animal feed.
Antibiosis	:	Antibiosis is the property of antibiotics to kill microorganisms.
Biodiesel	:	Fuel made from vegetable oils, fats or greases
Microbial Fuel Cell (MFC)	:	A bio-electrochemical system that drives an electric current using bacteria.
Biogas	:	Mixture of different gases (mainly methane) produced by anaerobic breakdown of cow dung and agricultural wastes.
Biocontrol	:	Biocontrol is a method of controlling pest by use of microbes such as fungi, bacteria, viruses or by naturally occurring substances derived from plants and animals.
Cry genes	:	Genes found in the bacterium <i>Bacillus thuringiensis</i> .
Delta endotoxin	:	Crystal proteins coded by cry genes, for which code Delta endotoxin of <i>Bacillus thuringiensis</i> which are toxic to insect pests.
Bioweedicides	:	Compounds and secondary metabolites derived from microbes such as fungi, bacteria or protozoa which act as we edicides are called Bioweedicides.
Biofertilizers	:	Formulations of living microorganisms that enrich the nutrient quality of the soil.
Mycorrhiza	:	Symbiotic association between a fungus and roots of plants
Bioremediation	:	The use of naturally occurring or genetically engineered microorganisms to reduce or degrade pollutants is called bioremediation.
Organic farming	:	Organic farming is a technique which involves cultivation of plants and rearing of animals in natural ways.



NAMES TO REMEMBER ORGANISM PRODUCT

<i>Penicillium notatum</i>	:	Penicillin
<i>Streptomyces aureofaciens</i>	:	Chlortetracycline
<i>Streptomyces griseus</i>	:	Streptomycin
<i>Spirulina</i>	:	SCP
<i>Saccharomyces Cerevisiae</i> (Baker's yeast of Brewer's)	:	Bread making Used in alcohol production Used in alcohol production
<i>Leuconostoc mesenteroides</i>	:	Fermentation of Idli / Dosa dough
Lactic acid bacteria	:	Curd production
<i>Aspergillus species</i>	:	enzyme amylase
<i>Trichoderma polysporum</i>	:	Cyclosporin A
<i>Monascus purpureus</i> (yeast)	:	Statin
<i>Streptococcus thermophilus</i>	:	Sterptockinase
<i>Methanobacterium</i>	:	Methanogen (Methane producing bacteria)
<i>Bacillus thuringiensis</i>	:	Delta - endotoxin
<i>Phytophthora palmivora</i> (Fungi)	:	Bioherbicide
<i>Trichoderma</i> (Fungi)	:	Biocontrol agent
<i>Rhizobium</i> (bacteria)	:	Nodulating N ₂ fixing bacterium
<i>Azotobacter</i> (bacteria)	:	Free living Nitrogen fixing bacteria
<i>Azospirillum</i> (bacteria)	:	Free living Nitrogen fixing bacteria
<i>Oscillatoria</i>	:	Cyanobacteria Blue green algae helping in Nitrogen fixation
<i>Nostoc</i>	:	Cyanobacteria Blue green algae helping in Nitrogen fixation
<i>Anabaena</i>	:	Cyanobacteria Blue green algae helping in Nitrogen fixation
<i>Pseudomonas putida</i>	:	Genetically engineered bacteria can digest oil spills
<i>Ideonella sakaiensis</i> (bacteria)	:	Recycling PET plastic
<i>Pestalotiopsis microspora</i> (endophytic fungus)	:	Digest polyurethane (Bioremediation)
<i>Dechloromonas aromatica</i> (Anaerobic bacteria)	:	Bioremediation of Benzene
<i>Phanerochaete chrysosporium</i> (Anaerobic fungus)	:	Bioremediation of pesticides dyes, Cyanides etc.
<i>Dehalococcoides species</i> (Anaerobic bacteria)	:	Bioremediation of trichloroethene



Evaluation

1. Which of the following microorganism is used for production of citric acid in industries?

(a) *Lactobacillus bulgaris*
(b) *Penicillium citrinum*
(c) *Aspergillus niger*
(d) *Rhizopus nigricans*

[Ans. (c) *Aspergillus niger*]

2. Which of the following pair is correctly matched for the product produced by them?

(a) *Acetobacter aceti* - Antibiotics
(b) *Methanobacterium* - Lactic acid
(c) *Penicillium notatum* - Acetic acid
(d) *Saccharomyces cerevisiae* - Ethanol

[Ans. (d) *Saccharomyces cerevisiae* - Ethanol]

3. The most common substrate used in distilleries for the production of ethanol is _____

(a) Soyameal (b) Groundgram
(c) Molasses (d) Corn meal

[Ans. (c) Molasses]

4. Cyclosporin - A is an immunosuppressive drug produced from _____

(a) *Aspergillus niger*
(b) *Monascus purpureus*
(c) *Penicillium notatum*
(d) *Trichoderma polysporum*

[Ans. (d) *Trichoderma polysporum*]

5. CO₂ is not released during [Sep-2020]

(a) Alcoholic fermentation
(b) Lactate fermentation
(c) Aerobic respiration in animals
(d) Aerobic respiration in plants

[Ans. (b) Lactate fermentation]

6. The purpose of biological treatment of waste water is to _____.

(a) Reduce BOD
(b) Increase BOD
(c) Reduce sedimentation
(d) Increase sedimentation

[Ans. (a) Reduce BOD]

7. The gases produced in anaerobic sludge digesters are _____. [Sep-2020]

(a) Methane, oxygen and hydrogen sulphide
(b) Hydrogen sulphide, methane and sulphur dioxide
(c) Hydrogen sulphide, nitrogen and methane
(d) Methane, hydrogen sulphide and CO₂

[Ans. (d) Methane, hydrogen sulphide and CO₂]

8. How is milk converted into curd? Explain the process of curd formation.

Ans. (i) The LAB bacteria grows in milk and convert it into curd and digesting the milk protein casein.

(ii) Process of curd formation A small amount of curd added to fresh milk as a starter or inoculum.

(iii) It contains millions of *Lactobacilli*

(iv) Under suitable temperature ($\leq 40^\circ\text{C}$) *Lactobacilli* multiply and convert milk into curd.

(v) Curd is more nutritious than milk as it contains a number of organic acids and vitamins.

9. Give any two bioactive molecules produced by microbes and state their uses.

Ans. (1) Cyclosporin A, (2) Statins are the bioactive molecules

Cyclosporin A:

(i) It is a bioactive molecule.

(ii) It is produced from the fungus *Trichoderma polysporum*.

USES:

(i) Used in organ transplantation.

(ii) It is also used for its anti-inflammatory, anti-fungal and anti-parasitic properties.

Statins:

(i) It is a bioactive molecule.

(ii) It is produced by the yeast *Monascus purpureus*.

USES:

(i) Used to lower blood cholesterol levels.

(ii) Inhibiting the enzyme which is responsible for the synthesis of cholesterol.



10. Define the following terms: [QY-2019; Aug-2021]

a) Antibiotics b) Zymology c) Superbug

Ans. (a) Antibiotics:

Antibiotics are chemical substances produced by microorganisms which can kill or retard the growth of other disease causing microbes even in low concentration. Antibiotic means "against life".

(b) Zymology: [QY-2019; Sep-2020]

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

(c) Superbug:

"**Superbug**" is a term used to describe strains of bacteria that are resistant to the majority of antibiotics commonly used today.

11. Write short notes on the following. [Aug-2021]

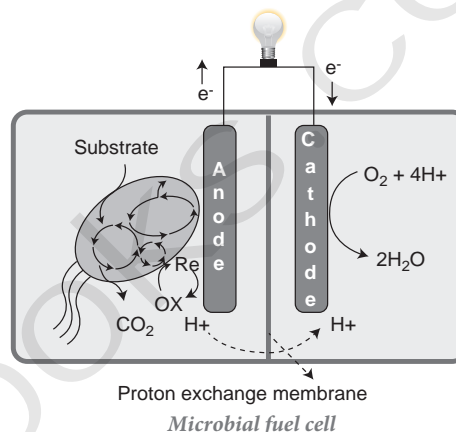
a) Brewer's yeast b) *Ideonella sakaiensis*
c) Microbial fuel cells.

Ans. (a) Brewer's yeast:

- (i) *Saccharomyces cerevisiae* commonly called brewer's yeast.
- (ii) It is used for fermenting malted cereals and fruit juices to produce various alcoholic beverages.
- (iii) Wine and beer are produced without distillation, whereas whisky, brandy and rum are obtained by fermentation and distillation.
- (iv) **Oenology** is the science and study of wine and wine making.
- (v) Wine is made from the fermentation of grape juice.
- (vi) Grape juice is fermented by various strains of *Saccharomyces cerevisiae* into alcohol.
- (vii) **Beer** is produced from germinated barley malt grain by *Saccharomyces cerevisiae*.
- (viii) Rum is made from fermented sugarcane or molasses or directly from sugarcane juice by *Saccharomyces cerevisiae*.
- (ix) **Whisky** is made from fermented grain mash by *Saccharomyces cerevisiae*.
- (x) *Saccharomyces cerevisiae* is the major producer of ethanol (C_2H_5OH). It is used for industrial, laboratory and fuel purposes.

(b) *Ideonella sakaiensis*:

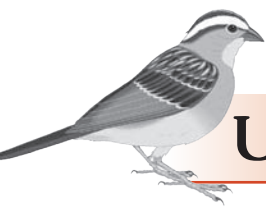
- (i) *Ideonella sakaiensis* is currently tried for recycling of PET plastics.
 - (ii) These bacteria use PETase and MHETase enzymes to breakdown PET plastic into terephthalic acid and ethylene glycol.
 - (iii) This is an example of microorganisms playing a role in Bioremediation.
- (c) Microbial fuel cells (MFC):**



- (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.

12. List the advantages of biogas plants in rural areas.

- Ans. (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)** The biogas plants convert the organic materials into gas and organic fertilizer by anaerobic decomposition by microbes.
- (iii)** The biogas is devoid of smell and burns with a blue flame without smoke.



UNIT IV

Chapter

9

APPLICATIONS OF BIOTECHNOLOGY

CHAPTER SNAPSHOT

- 9.1** Applications in Medicine
 - 9.1.1** Recombinant Human Insulin
 - 9.1.2** Interferons
 - 9.1.3** Recombinant vaccines
- 9.2** Gene therapy
- 9.3** Stem Cell Therapy
- 9.4** Molecular Diagnostics
- 9.5** Transgenic Animals
- 9.6** Biological products and their uses
- 9.7** Animal cloning
- 9.8** Ethical issues

MUST KNOW DEFINITIONS

hGH	:	Human Growth Hormone
Factor VIII	:	A factor needed for normal blood clotting
Interferons	:	Antiviral proteinaceous substances produced by cells infected with viruses.
Recombinant DNA	:	Extracting a gene from one organism and transferring it to the DNA of another organism, of the same or another species. Results in production of rDNA or recombinant DNA.
Subunit recombinant vaccine	:	Vaccines contain components of a pathogenic organism.
Attenuated recombinant vaccine	:	Vaccines containing genetically modified pathogens.
Gene therapy	:	Introducing a normal gene into a person's cells to cure genetic diseases.
Stem cells	:	Undifferentiated cells found in multicellular organisms.
PCR	:	Polymerase Chain Reaction - It is a <i>in vitro</i> amplification technique for synthesizing multiple copies of DNA.
ELISA	:	Enzyme Linked Immuno Sorbent Assay - A test to detect presence of antigens/antibodies in serum/urine etc.
Transgenic animals	:	Animals produced by genetic manipulations.
Totipotency	:	Totipotency refers to the potential of a cell to develop different cells, tissues, organs and finally an organism.
Clone	:	Genetically identical individuals of an organism.
IPR	:	Intellectual Property Rights.
IPP	:	Intellectual Property Protection
GMO	:	Genetically Modified Organism
Trade Mark	:	Any specific symbol or words to identify a particular product or process



Evaluation

1. The first clinical gene therapy was done for the treatment of _____ [Govt.MQP-2019] [Mar-2020]

(a) AIDS (b) Cancer
(c) Cystic fibrosis (d) SCID

[Ans. (d) SCID]

2. Dolly, the sheep was obtained by a technique known as

(a) Cloning by gene transfer
(b) Cloning without the help of gametes
(c) Cloning by tissue culture of somatic cells
(d) Cloning by nuclear transfer

[Ans. (d) Cloning by nuclear transfer]

3. The genetic defect adenosine deaminase deficiency may be cured permanently by

(a) Enzyme replacement therapy
(b) Periodic infusion of genetically engineered lymphocytes having ADA cDNA
(c) Administering adenosine deaminase activators
(d) Introducing bone marrow cells producing ADA into embryo at an early stage of development.

[Ans. (d) Introducing bone marrow cells producing ADA into embryo at an early stage of development]

4. How many amino acids are arranged in the two chains of Insulin?

(a) Chain A has 12 and Chain B has 13
(b) Chain A has 21 and Chain B has 30 amino acids
(c) Chain A has 20 and chain B has 30 amino acids
(d) Chain A has 12 and chain B has 20 amino acids.

[Ans. (b) Chain A has 21 and Chain B has 30 amino acids]

5. PCR proceeds in three distinct steps governed by temperature, they are in order of _____

(a) Denaturation, Annealing, Synthesis
(b) Synthesis, Annealing, Denaturation
(c) Annealing, Synthesis, Denaturation
(d) Denaturation, Synthesis, Annealing

[Ans. (a) Denaturation, Annealing, Synthesis]

6. Which one of the following statements is true regarding DNA polymerase used in PCR?

(a) It is used to ligate introduced DNA in recipient cells
(b) It serves as a selectable marker
(c) It is isolated from a Virus
(d) It remains active at a high temperature

[Ans. (d) It remains active at a high temperature]

7. ELISA is mainly used for _____

[Mar-2020; Aug-2021]

(a) Detection of mutations
(b) Detection of pathogens
(c) Selecting animals having desired traits
(d) Selecting plants having desired traits

[Ans. (b) Detection of pathogens]

8. Transgenic animals are those which have

(a) Foreign DNA in some of their cells
(b) Foreign DNA in all their cells
(c) Foreign RNA in some of their cells
(d) Foreign RNA in all their cells

[Ans. (b) Foreign DNA in all their cells]

9. Vaccines that use components of a pathogenic organism rather than the whole organism are called _____ [Aug-2021]

(a) Subunit recombinant vaccines
(b) attenuated recombinant vaccines
(c) DNA vaccines
(d) conventional vaccines.

[Ans. (a) Subunit recombinant vaccines]

10. Mention the number of primers required in each cycle of PCR. Write the role of primers and DNA polymerase in PCR. Name the source organism of the DNA polymerase used in PCR.

Ans. The number of primers required in each cycle of PCR are two.

Role of Primers DNA Polymerase in PCR:

- (i) During PCR process in the second stage, each separated DNA stand is allowed to hybridize with a primer. This is called renaturation or primer annealing. The primer template is used to synthesize DNA by using Taq-DNA polymerase.
(ii) Annealing is done by rapid cooling of the mixture allowing the primers to bind to the sequences in each of the two strands flanking the target DNA.
(iii) During the third stage known as primer extension or synthesis, the Taq DNA polymerase extends each primer by copying the single stranded template.

Source organism of the enzyme DNA polymerase:
Escherichia coli.



11. How is the amplification of a gene sample of interest carried out using PCR? [Mar-2020]

Ans. The polymerase chain reaction (PCR) is an *in vitro* amplification technique used for synthesising multiple identical copies (billions) of DNA of interest.

- (a) Denaturation
- (b) Renaturation or primer annealing
- (c) Synthesis or primer extension

Denaturation:

- (i) The double stranded DNA of interest is denatured to separate into two individual strands by high temperature. This is called denaturation.
- (ii) Each strand is allowed to hybridize with a primer (renaturation or primer annealing).
- (iii) The primer template is used to synthesize DNA by using Taq – DNA polymerase.
- (iv) During denaturation, the reaction mixture is heated to 95° C for a short time to denature the DNA into single strands that will act as a template for DNA synthesis.

Renaturation (or) Primer annealing:

Annealing is done by rapid cooling of the mixture, allowing the primers to bind to the sequences on each of the two strands flanking the target DNA.

Primer extension (or) Synthesis:

- (i) During primer extension or synthesis the temperature of the mixture is increased to 75°C for a sufficient period of time to allow Taq DNA polymerase to extend each primer by copying the single stranded template.
- (ii) At the end of incubation, both single template strands will be made partially double stranded.
- (iii) The new strand of each double stranded DNA extends to a variable distance downstream.
- (iv) These steps are repeated again and again to generate multiple forms of the desired DNA. This process is also called DNA amplification.

12. What is genetically engineered Insulin?

- Ans. (i)** The insulin which is obtained by recombinant DNA technology is called **genetically engineered insulin**.
- (ii)** This involves the insertion of human insulin gene on the plasmids of *Escherichia Coli*.
- (iii)** Insulin was the first pharmaceutical product of recombinant DNA technology.

13. Explain how “Rosie” is different from a normal cow. [Govt.MQP-2019]

- Ans. (i)** In 1997, Rosie, the first transgenic cow produced human protein enriched milk.
- (ii)** The milk contained the human alpha lactalbumin.
- (iii)** The protein rich milk (2.4 gm/litre) was a nutritionally balanced food for new born babies than the normal milk produced by the cows.

14. How was Insulin obtained before the advent of rDNA technology? What were the problems encountered?

- Ans. (i)** In the early years, insulin isolated and purified from the pancreas of pigs and cows
- (ii)** It was used to treat diabetic patients.

Problems encountered using animal insulin:

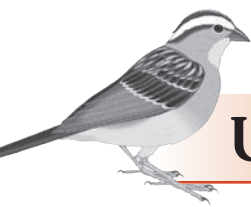
Due to minor differences in the structure of the animal insulin as compared to human insulin, it resulted in the occurrence of allergic reactions in some diabetic patients.

15. ELISA is a technique based on the principles of antigen-antibody reactions. Can this technique be used in the molecular diagnosis of a genetic disorder such as Phenylketonuria?

- Ans. (i)** YES. Phenylketonuria can be diagnosed by ELISA.
- (ii)** Phenylketonuria is an inborn error which occurs due to absence of enzyme required for the conversion of tyrosine into phenylalanine.
- (iii)** The patient where the enzyme protein is absent would give negative result in ELISA when compared to normal individual.

16. Gene therapy is an attempt to correct a Genetic defect by providing a normal gene into the individual. By this, the function can be restored. An alternate method would be to provide gene product known as enzyme replacement therapy, which would also restore the function. Which in your opinion is a better option? Give reasons for your answer.

- Ans. (i)** Gene therapy is a better option because if the gene is replaced, it will be a stable and permanent corrective therapy. The new gene replaced will code for the proper enzyme and help the affected person to overcome the disease.



UNIT V

Chapter

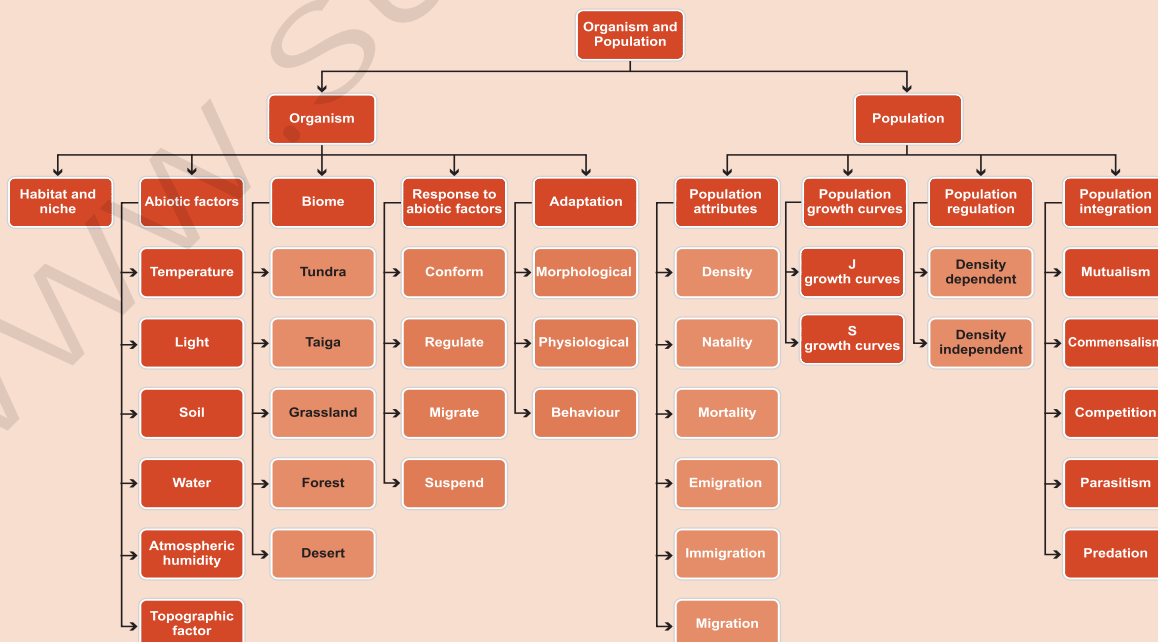
10

ORGANISMS AND POPULATIONS

CHAPTER SNAPSHOT

- 10.1 Organism and its Environment
- 10.2 Habitat
- 10.3 Major Abiotic Components or Factors
- 10.4 Concept of Biome and their distribution
- 10.5 Responses to abiotic factors
- 10.6 Adaptations
- 10.7 Populations
- 10.8 Population attributes
- 10.9 Population age distribution
- 10.10. Growth models / Curves
- 10.11. Population regulation
- 10.12. Population interaction

Concept Map



MUST KNOW DEFINITIONS

Community	:	Community includes all the populations occupying a given area.
Habitat	:	Habitat is a place where an organism or a community of organisms live, including all biotic and abiotic factors or conditions of the surrounding environment..
Ecological niche	:	The physical space occupied by an organism.
Abiotic factors	:	The abiotic factors include the chemical and physical factors which influence or affect organisms and their functioning in their environment.
Eurytherms	:	Organisms which can survive a wide range of temperature are referred to as <i>eurytherms</i>
Stenotherms	:	Organisms which can tolerate only a narrow range of temperature are <i>stenotherms</i> .
Pedosphere	:	The soil zone is known as <i>pedosphere</i> .
Acclimatization	:	Animals are known to modify their response to environmental changes (stress) in reasonably short time spans. This is known as <i>acclimatization</i> .
Biomes	:	Biomes are large regions of Earth that have similar or common vegetation and climatic conditions.
Hibernation	:	Winter sleep of animals
Aestivation	:	Summer sleep of animals
Diapause	:	Some lower animals suspend a certain phase of their life cycle. This is called diapause.
Birth rate	:	$\frac{\text{No. of birth per unit time}}{\text{average population}}$
Death rate	:	$\frac{\text{No. of death per unit time}}{\text{average population}}$
Population density	:	It is usually expressed as the number of individuals per unit area or volume. Eg. 100 Trees per acre.
Crude density	:	It is the size of a population in relation to the numbers per unit of total space. Eg. 1000 fish in a pond.
Ecological density	:	It is the size of a population in relation to the numbers per unit of habitat space. Eg. 1000 fish in the volume of water in the pond.
Migration	:	Mass population movement from one place to another and back.
Immigration	:	Migration of individuals into the population area.
Emigration	:	Migration of individuals out of the population areas.
Intraspecific Interaction	:	Interaction within the members of same.
Interspecific Interaction	:	Interaction among organisms of different species.



Evaluation

1. All populations in a given physical area are defined as

(a) Biome (b) Ecosystem
(c) Territory (d) Biotic factors

[Ans. (a) Biome]

2. Organisms which can survive a wide range of temperature are called [Aug-2021]

(a) Ectotherms (b) Eurytherms
(c) Endotherms (d) Stenotherms

[Ans. (b) Eurytherms]

3. The interaction in nature, where one gets benefit on the expense of other is _____.

(a) Predation (b) Mutualism
(c) Amensalism (d) Commensalism

[Ans. (d) Commensalism]

4. Predation and parasitism are which type of interactions?

(a) (+, +) (b) (+, 0)
(c) (-, -) (d) (+, -)

[Ans. (d) (+, -)]

5. Competition between species leads to

(a) Extinction (b) Mutation
(c) Amensalism (d) Symbiosis

[Ans. (a) Extinction]

6. Which of the following is an r-species?

(a) Human (b) Insects'
(c) Rhinoceros (d) Whale

[Ans. (b) Insects]

7. Match the following and choose the correct combination from the options given below. [QY-2019]

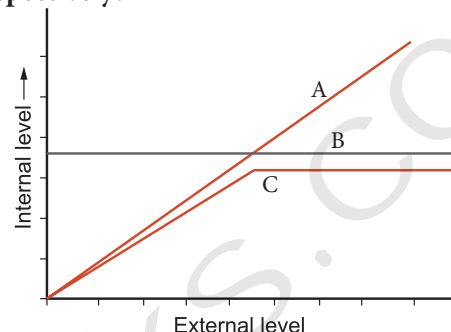
Column I		Column II	
A.	Mutualism	1.	Lion and deer
B.	Commensalism	2.	Round worm and man
C.	Parasitism	3.	Birds compete with squirrels for nuts
D.	Competition	4.	Sea anemone on hermit crab
E.	Predation	5.	Barnacles attached to Whales

Dispersal

a) A-4, B-5, C-2, D-3, E-1
b) A-3, B-1, C-4, D-2, E-5
c) A-2, B-3, C-1, D-5, E-4
d) A-5, B-4, C-2, D-3, E-1

[Ans. (a) A-4, B-5, C-2, D-3, E-1]

8. The figure given below is a diagrammatic representation of response of organisms to abiotic factors. What do A, B and C represent respectively?



S. No	A	B	C
a.	Conformer	Regulator	Partial Regulator
b.	Regulator	Partial Regulator	Conformer
c.	Partial Regulator	Regulator	Conformer
d.	Regulator	Conformer	Partial Regulator

[Ans. (a) Conformer-Regulator-Partial Regulator]

9. The relationship between sucker fish and shark is _____.

(a) Competition (b) Commensalism
(c) Predation (d) Parasitism.

[Ans. (b) Commensalism]

10. Which of the following is correct for r-selected species?

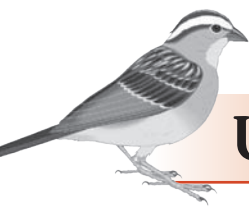
(a) Large number of progeny with small size
(b) Large number of progeny with large size
(c) Small number of progeny with small size
(d) Small number of progeny with large size

[Ans. (a) Large number of progeny with small size]

11. Animals that can move from fresh water to sea called as _____. [Aug-2021]

(a) Stenothermal (b) Eurythermal
(c) Catadromous (d) Anadromous

[Ans. (c) Catadromous]



UNIT V

Chapter

11

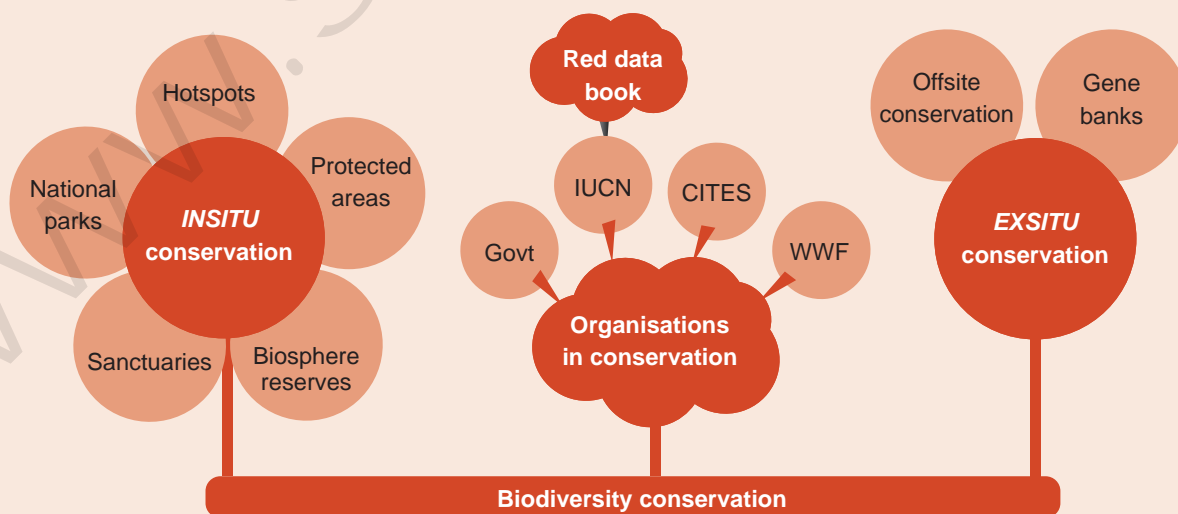
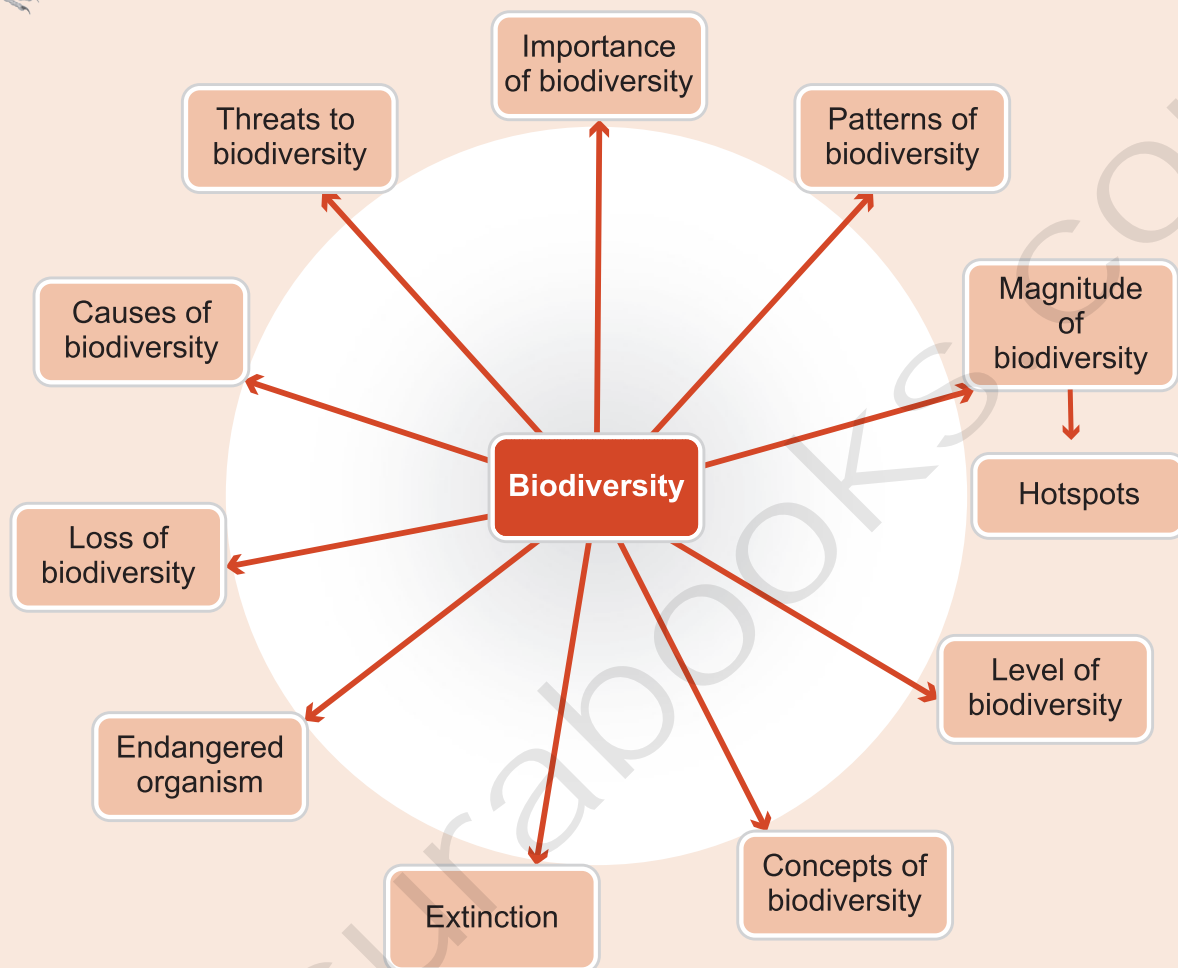
BIODIVERSITY AND ITS CONSERVATION

CHAPTER SNAPSHOT

- 11.1** Biodiversity
 - 11.1.1** Concept of biodiversity
 - 11.1.2** Levels of biodiversity
 - 11.1.3** Magnitude of biodiversity
 - 11.1.4** Patterns of biodiversity distribution
- 11.2** Importance of biodiversity – Global and India
- 11.3** Biogeographical regions of India
- 11.4** Threats to biodiversity
- 11.5** Causes of Biodiversity Loss
 - 11.5.1** Loss of biodiversity
 - 11.5.2** Hot Spots
 - 11.5.3** Endangered organisms
 - 11.5.4** Extinction
- 11.6** IUCN
- 11.7** Biodiversity and its conservation
 - 11.7.2** In-Situ Conservation
- 11.8** Restoration of degraded habitats
- 11.9** Biodiversity Act (BDA)



Concept Map



WHAT YOU MUST KNOW DEFINITIONS

Biodiversity	:	Biodiversity is the assemblage of different life forms.
Species diversity	:	Species diversity refers to the variety in number and richness of the species in any habitat.
Exotic species	:	Non-native or alien species.
Co-extinction	:	Co-extinction of a species is the loss of a species as a consequence of the extinction of another. (Eg. Orchid bees and forest trees by cross pollination.)
Hot spots	:	They are areas with high concentration of endemic species experiencing unusual rapid rate of habitat modification loss.
Extinction	:	Species is considered extinct when none of its members are alive anywhere in the world.
Red Data Book	:	Red Data book or Red list is a catalogue of taxa facing risk of extinction.
IUCN	:	International Union of Conservation of Nature
WPA	:	Wildlife Protection Act
WLS	:	Wild Life Sanctuary
BR	:	Biosphere Reserve
MAB	:	Man and Biosphere Programme
WWF	:	World Wild Fund for Nature
CITES	:	The Convention on International Trade in Endangered Species
ZSI	:	Zoological Survey of India
FREEP	:	The Forestry Research Education and Extension project
CBD	:	The United Nations Convention on Biological Diversity
NBA	:	National Biodiversity Authority

Evaluation

- Which of the following region has maximum biodiversity?
(a) Taiga (b) Tropical forest
(c) Temperate rain forest (d) Mangroves
[Ans. (b) Tropical forest]
- Conservation of biodiversity within their natural habitat is _____
(a) *In situ* conservation
(b) *Ex situ* conservation
(c) *In vivo* conservation
(d) *In vitro* conservation
[Ans. (a) *In situ* conservation]
- Which one of the following is not coming under *insitu* conservation? [Mar-2020]
(a) Sanctuaries
(b) Natural parks
(c) Zoological park
(d) Biosphere reserve
[Ans. (c) Zoological park]
- Which of the following is considered a hotspots of biodiversity in India?
(a) Western ghats
(b) Indo-gangetic plain
(c) Eastern Himalayas
(d) A and C
[Ans. (d) A and C]



The organization which published the red list of species is _____.

- (a) WWF (b) IUCN
(c) ZSI (d) UNEP [Ans. (b) IUCN]

6. Who introduced the term biodiversity?

- (a) Edward Wilson (b) Walter Rosen
(c) Norman Myers (d) Alice Norman

[Ans. (b) Walter Rosen]

7. Which of the following forests is known as the lungs of the planet Earth?

- (a) Tundra forest
(b) Rain forest of north east India
(c) Taiga forests
(d) Amazon rain forest

[Ans. (d) Amazon rain forest]

8. Which one of the following are at high risk extinction due to habitat destruction?

[Mar-2020]

- (a) Mammals (b) Birds
(c) Amphibians (d) Echinoderms

[Ans. (c) Amphibians]

9. **Assertion (A):** The Environmental conditions of the tropics are favourable for speciation and diversity of organisms.

Reason (R): The climate seasons, temperature, humidity and photoperiod are more or less stable and congenial.

- (a) Both Assertion and Reason are true and Reason explains Assertion correctly.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true, but Reason is false
(d) Both Assertion and Reason are false.

[Ans. (a) Both Assertion and Reason are true and Reason explains Assertion correctly]

10. Define Endemism. [Sep-2020]

Ans. The phenomenon in which the organisms are exclusively restricted to a given area.

11. How many hotspots are there in India? Name them.

[Aug-2021]

Ans. There are 4 hotspots in India are

- (a) Himalaya (The entire Indian Himalayan region)
(b) Western Ghats

(c) **Indo-Burma:** Includes entire North-eastern India, except Assam and Andaman group of Islands (And Myanmar, Thailand, Vietnam, Laos, Cambodia and Southern China)

(d) **Sundaland:** Includes Nicobar group of Islands (and Indonesia, Malaysia, Singapore, Brunei, Philippines).

12. What are the three levels of biodiversity?

Ans. There are three levels of biodiversity –
(1) Genetic diversity (2) Species diversity and
(3) Community/Ecosystem diversity.

(1) **Genetic diversity :**

(i) Refers to the differences in genetic make-up (number and types of genes) between distinct species and to the genetic variation within a single species; also covers genetic variation between distinct populations of the same species.

(ii) Genetic diversity can be measured using a variety of molecular techniques.

(iii) India has more than 50,000 genetic variants of paddy and 1000 variants of mango.

(iv) Genetic diversity helps in developing adaptations to changing environmental conditions.

(2) **Species diversity :**

(i) It refers to the variety in number and richness of the species in any habitat. The number of species per unit area at a specific time is called species richness, which denotes the measure of species diversity.

(ii) The Western Ghats have greater amphibian species diversity than the Eastern Ghats.

(iii) The more the number of species in an area the more is the species richness. The three indices of diversity are - **Alpha, Beta** and **Gamma diversity**

(a) **Alpha diversity:** It is measured by counting the number of taxa (usually species) within a particular area, community or ecosystem.

(b) **Beta diversity:** It is species diversity between two adjacent ecosystems and is obtained by comparing the number of species unique to each of the ecosystem.

(c) **Gamma diversity** refers to the diversity of the habitats over the total landscape or geographical area.

Surabooks' XII Std - Bio-Zoology & Zoology

Community/Ecosystem diversity :

- (a) The variety of habitats, biotic communities and ecological processes in the biosphere.
- (b) It is the diversity at ecosystem level due to diversity of niches, trophic levels and ecological processes like nutrient cycles, food webs, energy flow and several biotic interactions.

13. Name the active chemical found in the medicinal plant *Rauwolfia vomitoria*. What type of diversity it belongs to?

- Ans. (i)** Reserpine is the active chemical found in the medicinal plant *Rauwolfia vomitoria*.
(ii) It belongs to genetic diversity.

14. "Amazon forest is considered to be the lungs of the planet"-Justify this statement.

- Ans. (i)** Tropical rain forests occupied about 14% of Earth's land surface earlier which is reducing now.
(ii) The Amazon Rain forest is a classical example of a Tropical Rain forest and is a vast area harbouring millions of species.
(iii) It is the largest Tropical forest in the world with all the features.
(iv) The amazon rain forest is considered to be the lungs of the planet due to its capability of absorbing about 25% of Earth's total carbon dioxide emission.

- (v) It behaves similarly to a pair of human lungs, absorbing the carbon dioxide from the atmosphere and releasing oxygen.

15. "Red data book"-What do you know about it?

- Ans. (i)** Red Data book or Red list is a catalogue of taxa facing risk of extinction.
(ii) WCU – World Conservation Union maintains the Red Data book.

The purpose of preparation of Red List are:

- (i) To create awareness on the degree of threat to biodiversity.
- (ii) Identification and documentation of species at high risk of extinction.
- (iii) Provide global index on declining biodiversity.
- (iv) Preparing conservation priorities and help in conservation of action.
- (v) Information on international agreements on conservation of biological diversity.

Red list has eight categories of species:

- (i) Extinct
- (ii) Extinct in wild
- (iii) Critically Endangered
- (iv) Endangered
- (v) Vulnerable
- (vi) Lower risk
- (vii) Data deficiency
- (viii) Not evaluated.

16. Compare and Contrast the *In-situ* and *Ex-situ* conservation.

[Govt.MQP-2019]

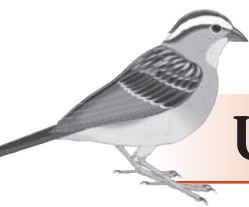
Ans. *In-situ* and *Ex-situ* are two types of biodiversity conservation strategies.

S.No	<i>In-situ</i> Conservation	<i>Ex-situ</i> Conservation
i.	It is the on-site conservation or the conservation of genetic resources in natural populations of plant or animal species.	This is a conservation strategy which involves placing of threatened animals and plants in special care locations for their protection.
ii.	It is the process of protecting an endangered plant or animal species in its natural habitat, either by protecting or restoring the habitat itself, or by defending the species from predators.	It helps in recovering populations or preventing their extinction under simulated conditions that closely resemble their natural habitats.
iii.	National Parks, Biosphere Reserve, Wild Life Sanctuaries form <i>insitu</i> conservation strategies.	Zoological parks and Botanical gardens are common <i>exsitu</i> conservation programs.

17. What are called endangered species? Explain with examples.

[Sep-2020]

- Ans. (i)** A species that has been categorized as very likely to become extinct is an endangered species.
(ii) Endangered (EN), as categorized by the International Union for Conservation of Nature (IUCN)
(iii) Also, it is categorized in the Red data list



UNIT V

Chapter

12

ENVIRONMENTAL ISSUES

CHAPTER SNAPSHOT

- 12.1** Pollution
 - 12.1.1** Classification of pollutants
- 12.2** Air Pollution
 - 12.2.1** Sources
 - 12.2.2** Effects of Air Pollution
 - 12.2.3** Other notable effects of Air pollution
 - 12.2.4** Control of Air Pollution
- 12.3** Water Pollution
 - 12.3.1** Quality of water
 - 12.3.2** Water Pollution
 - 12.3.3** Sources of water pollution
 - 12.3.4** Effect of water pollution on organisms
 - 12.3.5** Effect of water pollution on organisms
 - 12.3.6** Control measures
- 12.4** Noise Pollution
 - 12.4.1** Sources of noise pollution
 - 12.4.2** Effect of noise pollution
 - 12.4.3** Control
 - 12.4.4** Legal protection
- 12.5** Agrochemicals
- 12.6** Biomagnification
- 12.7** Eutrophication
 - 12.7.1** Integrated waste water management
- 12.8** Organic Farming and its Implementation
- 12.9** Solid Waste Management
 - 12.9.1** Waste management practices
 - 12.9.2** Radioactive waste
 - 12.9.3** Medical waste
 - 12.9.4** E-Waste
 - 12.9.5** Plastic waste - solution and Remedies
- 12.10** Ecosan Toilets

WHAT YOU MUST KNOW DEFINITIONS

Pollution	:	Pollution is any undesirable change in the physical, chemical and biological characteristics of the environment due to natural causes and human activities.
Pollutant	:	The agents which cause pollution are called pollutants.
Non degradable pollutants	:	The pollutants that cannot be degraded by natural processes
Air pollution	:	The alterations or changes in the composition of the earth's atmosphere by natural or human activities (anthropogenic factors) are referred as air pollution.
Global warming	:	Increase in the temperature of the earth caused by green house gases
Smog	:	A type of air pollution caused by tiny particles in the air
PAN	:	Peroxyacetyl Nitrate - a secondary pollutant present in Photochemical smog.
Ozone depletion	:	Thinning of the Stratospheric Ozone layer
AQI	:	Air Quality Index
BOD	:	"Biological Oxygen Demand"
Decibel	:	Unit for measuring intensity of noise
Biomagnification	:	Increase in concentration of pollutants (non degradable substances) as they get transferred in levels of food chain
Phytoremediation	:	refers to the technologies that uses living plants to clean up soil, air and water contaminated with hazardous contaminants.
E-Waste	:	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.
4R	:	Refuse, Reduce, Reuse and Recycle (Plan to reduce and manage plastic waste)
Ozone	:	A gas which is present in stratosphere layer of atmosphere and protect us from UV rays.
Ecological sanitation (or) EcoSan	:	Ecological sanitation is a sustainable system for handling human excreta by dry composting toilets



III. MATCH THE FOLLOWING

- | | |
|--------------------------------|-------------------------------|
| 1. DEET | (a) Drycomposting |
| 2. Ecoson | (b) Non-degradable |
| 3. PCB | (c) Organic farming |
| 4. Vermicompost | (d) Allergen |
| [Ans. 1 – d 2 – a 3 – b 4 – c] | |
| 2. 1. Auroville | (a) Acid rain |
| 2. DDT | (b) Wet storage of spent fuel |
| 3. Tajmahal | (c) Water recycling |
| 4. Kalpakkam | (d) Trophic level |
| [Ans. 1 – c 2 – d 3 – a 4 – b] | |
| 3. 1. Flyash | (a) Algal bloom |
| 2. PAN | (b) Colour |
| 3. Red tides | (c) Particulate matter |
| 4. AEGI | (d) Pollutant |
| [Ans. 1 – c 2 – d 3 – a 4 – b] | |

IV. IDENTIFY THE WRONG STATEMENTS

- Cadmium is a non-degradable pollutant.
 - Carbon monoxide is a major component of a Automobile exhaust.
 - Catalytic converter reduce release of industrial pollutants.
 - According to USEPA, there is a direct link between noise and harm.
 - iii
 - i and iv
 - ii and iii
 - iv [Ans. (a) iii]
- Colony collapse syndrome can lower agricultural productivity.
 - Bioremediation is a chemical method of waste water treatment.
 - G.Nammalvar supported inorganic farming.
 - Spent fuel pools are meant for managing Nuclear waste.
 - iv
 - ii and iii
 - i and iv
 - iii and iv

[Ans. (b) ii and iii]

V. IDENTIFY THE CORRECT ASSERTION AND REASON

In each of the following questions there are two statements. One is assertion (A) and other is reasoning (R). Mark the correct answer as

- If both A and R are true and R is correct explanation for A
- If both A and R are true but R is not the correct explanation for A

- If A is true but R is false
- If both A and R are false.

- Assertion:** Ecological sanitation is a sustainable system for handling human excreta..

Reason: EcoSan toilets are being used in several parts of India and Srilanka.

[Ans. (b) if both A and R are true but R is not the correct explanation for A]

- Assertion:** Payeng's forest is home to Royal Bengal tigers.

Reason: Payeng's promoted organic farming.

[Ans. (c) A is true but R is false]

- Assertion:** Nitrogen oxides are major air pollutants..

Reason: Fossil fuel combustion and automobiles exhausts are the source of sulphur dioxide..

[Ans. (c) If A is true but R is false]

- Assertion:** UV rays penetrate deep into the skin and cause cancer.

Reason: Acid rain damages trees, crops and harms marine animals.

[Ans. (b) if both A and R are true but R is not the correct explanation for A]

ANSWER IN ONE WORD*

- Undesirable change in the environment. [Ans. Pollution]
- Example of a persistant pollutant. [Ans. DDT]
- Example of non-persistent pollution. [Ans. Domestic sewage/vegetable waste]
- An example for a non-degradable pollutant. [Ans. Mercury]
- Gas produced by incomplete combustion of fossil fuels. [Ans. Carbon monoxide]
- A stationary source of air pollution _____. [Ans. Factory/oil refinery]
- A gas for which volcanoes heamoglobin has great affinity. [Ans. Carbon monoxide]
- A gas which is a prime contributor to acid rain. [Ans. Sulphur dioxide/Nitrogen oxides]
- Average human consumption of oxygen per day is _____. [Ans. 550 L]
- Disease caused due to presence of excess fluorine in drinking water. [Ans. Fluorosis]
- Condition of a water body caused due to nutrient enrichment. [Ans. Eutrophication]



MCQs for Higher Studies

CHAPTER 1

REPRODUCTION IN ORGANISMS

1. "Nothing lives forever, but life continues". What does it mean? [AIPMT 1995]
 - a) Older dies but new ones are produced by reproduction
 - b) Nothing can produce without death
 - c) Death has nothing to do with the continuation of life
 - d) Parthenogenesis is must for sexual reproduction
2. A few statements describing certain features of reproduction are given below. Select the options that are true for both sexual and asexual reproduction from the options given:
 - i. Gametic fusion takes place
 - ii. Transfer of genetic material takes place
 - iii. Reduction division takes place
 - iv. Progeny have some resemblance with parents
 - a) i and ii
 - b) ii and iii
 - c) ii and iv
 - d) i and ii
3. A few statements with regard to sexual reproduction are given below:
 - i. Sexual reproduction does not always require two individuals
 - ii. Sexual reproduction generally involves gametic fusion
 - iii. Meiosis never occurs during sexual reproduction
 - iv. External fertilization is a rule during sexual reproduction

Choose the correct statements from the options below:

 - a) i and iv
 - b) i and ii
 - c) ii and iii
 - d) i and iv

4. Given below are a few statements related to external fertilization. Choose the correct statements:

- i. The male and female gametes are formed and released simultaneously
 - ii. Only a few gametes are released into the medium
 - iii. Water is the medium in a majority of organism exhibiting external fertilization
 - iv. Offspring formed as a result of external fertilization have better chance of survival than those formed inside the organism
- a) iii and iv
 - b) i and iii
 - c) ii and iv
 - d) i and iv

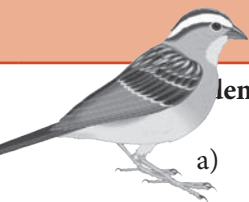
5. Which of the following statements, support the view that elaborate sexual reproductive process develops much later in the organic evolution?

- i) Lower groups of organisms have simpler body design
 - ii) Asexual reproduction is common in lower groups
 - iii) Asexual reproduction is common in higher groups of organisms
 - iv) The high incidence of sexual reproduction is in angiosperms and vertebrates.
- a) i, ii and iii
 - b) i, iii and iv
 - c) i, ii, and iv
 - d) ii, iii and iv

CHAPTER 2

HUMAN REPRODUCTION

1. Select the incorrect statement. [NEET 2016, phase I]
 - a) LH and FSH trigger ovulation in ovary
 - b) LH and FSH decrease gradually during the follicular phase
 - c) LH triggers secretion of androgens from the Leydig cells.
 - d) FSH stimulates the sertoli cells which help in spermiogenesis



Identify the correct statement on 'inhibition' [NEET 2016, phase I]

- is produced by granulosa cells in ovary and inhibits the secretion of FSH
- is produced by granulosa cells in ovary and inhibits the secretion of LH
- is produced by nurse cells in testes and inhibits the secretion of LH
- inhibits the secretion of LH, FSH and prolactin.

3. Several hormones like hCG, hPL, oestrogen and progesterone are produced by

[NEET 2016, phase I]

- ovary
- placenta
- fallopian tube
- pituitary

4. Match column I with column II and select the correct option using the codes given below

[NEET 2016, phase I]

Column I	Column II
A. Mons pubis	1. Embryo formation
B. Antrum	2. Sperm
C. Trophoblast	3. Female external genitalia
D. Nebenkem	4. Graafian follicle

- | | | | | |
|----|---|---|---|---|
| | A | B | C | D |
| a) | 3 | 4 | 2 | 1 |
| b) | 3 | 4 | 1 | 2 |
| c) | 3 | 1 | 4 | 2 |
| d) | 1 | 4 | 3 | 2 |

5. Which one of the following is not the function of placenta? (NEET, 2013)

- To facilitate supply of oxygen and nutrients to embryo
- To secrete oestrogen
- To facilitate the removal of carbon dioxide and material from embryo
- To secrete oxytocin during parturition

6. The testes in human are situated outside the abdominal cavity inside a pouch called scrotum. The purpose served is for [AIPMT 2011]

- escaping any possible compression by the visceral organs.
- providing more space for the growth of epididymis.
- providing a secondary sexual feature for exhibiting the male sex
- maintaining the scrotal temperature lower than internal body temperature

7. Hormones secreted by placenta to maintain pregnancy are [NEET, 2018]

- hCG, hPL, progesterone, estrogen
- hCG, hPL, estrogen, relaxin, oxytocin
- hCG, hPL, progesterone, prolactin
- hCG, progesterone, estrogen, glucocorticoids

8. Match and select the correct option [NEET, 2018]

Column I	Column II
a. Proliferative phase	1. Breakdown of endometrium lining
b. Secretory phase	2. Follicular phase
c. Menstruation	3. Luteal phase

- | | | | |
|----|---|---|---|
| | a | b | c |
| A) | 3 | 2 | 1 |
| B) | 2 | 3 | 1 |
| C) | 1 | 3 | 2 |
| D) | 3 | 1 | 2 |

CHAPTER 3

REPRODUCTIVE HEALTH

1. Which of the following is a hormone releasing Intrauterine Device (IUD)? [AIPMT 2014]

- Multiload 375
- LNG-20
- Cervical cap
- Vault

2. Assisted reproductive technology, IVF involves the transfer of [AIPMT 2014]

- Ovum into the fallopian tube
- Zygote into the fallopian tube
- Zygote into the uterus
- Embryo with 16 blastomeres into the fallopian tube

3. In context of amniocentesis, which of the following statements is incorrect? [NEET-I, 2016]

- It is usually done when a woman is between 14-16 weeks pregnant
- It is used for prenatal sex determination
- It can be used for detection of Down syndrome
- It can be used for detection of Cleft palate



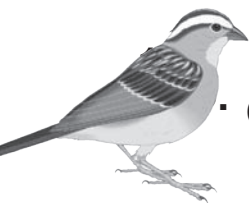
NEET

ANSWERS

1. (C)	2. (C)	3. (A)	4. (A)	5. (B)	6. (A)	7. (B)	8. (B)	9. (A)	10. (A)
11. (B)	12. (A)	13. (A)	14. (B)	15. (A)	16. (B)	17. (B)	18. (B)	19. (A)	20. (C)
21. (B)	22. (C)	23. (B)	24. (B)	25. (C)	26. (B)	27. (C)	28. (D)	29. (C)	30. (D)
31. (B)	32. (B)	33. (C)	34. (B)	35. (B)	36. (D)	37. (C)	38. (B)	39. (B)	40. (D)
41. (A)	42. (B)	43. (D)	44. (D)	45. (C)	46. (D)	47. (A)	48. (B)	49. (A)	50. (B)
51. (B)	52. (C)	53. (B)	54. (B)	55. (A)	56. (C)	57. (A)	58. (D)	59. (A)	60. (A)
61. (A)	62. (B)	63. (D)	64. (B)	65. (D)	66. (A)	67. (B)	68. (C)	69. (B)	70. (D)
71. (A)	72. (D)	73. (A)	74. (B)	75. (C)	76. (B)	77. (A)	78. (B)	79. (C)	80. (C)

Explanatory Notes

- Deiters' cells are supporting cells in organ of corti and neuroglia cells.
- Demography is the statistical and quantitative study of characteristics of human populations and size, growth, density, age and sex distribution and vital statistics are included in the data collected.
- Colles fracture is the transverse fracture of the distal end of the radius (just above wrist) with displacement of hand backward and outward.
- Gull's disease is atrophy of the thyroid gland, which causes myxoedema.
- In the human body changes in the pH of fluids can be dangerous and life-threatening. For example if the pH of blood falls below 7.0 or rises above 7.8, nerves do not function properly and a coma or convulsions may occur.
- Melanocytes are found in the epidermis. They are specialized to produce a dark pigment called melanin. Melanin protects the DNA of the dividing cells in the basal stratum from damage by ultraviolet wavelengths of sun light. Changes in basal cell DNA can lead to skin cancer.
- The Acne vulgaris affects most teenagers and few adults, is an infection of the sebaceous glands by the bacterium propionibacterium acnes, a normal resident of the skin.
- Cephalopodes have paired large eyes, efficient and bulge from the dorsolateral sides of head,. They bear striking resemblance to those of a vertebrate eye, in that a cornea, lens, iris, retina are present.
- The spermatids cannot act directly as the male gamete, so that they have to undergo spermiogenesis. During spermiogenesis spermatids are metamorphosed into sperms.
- Rennin is secreted only in mammals as an inactive proenzyme, called prerennin. HCl activates it into active rennin. It changes the soluble casein protein of milk into insoluble calcium paracaseinate.
- Basal-cell carcinoma rarely metastasizes and is the most common and least dangerous form of skin cancer.



GOVT. SUPPLEMENTARY EXAM. - AUG. 2021

PART III BIOLOGY (WITH ANSWERS)

[TIME : 3.00 Hours]

[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.

Note: Candidate should answer Part-I (Bio-Botany) & Part-II (Bio-Zoology) in separate answer-books.

PART - II (BIO - ZOOLOGY)

SECTION - 1 (35 - MARKS)

- 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. ELISA is mainly used for :
 - (a) Selecting animals having desired traits
 - (b) Detection of mutations
 - (c) Selecting plants having desired traits
 - (d) Detection of pathogens
2. mRNA molecule is produced by:
 - (a) Duplication
 - (b) Replication
 - (c) Translation
 - (d) Transcription
3. Which of the following was the contribution of Hugo de Vries?
 - (a) Theory of inheritance of acquired characters
 - (b) Theory of mutation
 - (c) Germplasm
 - (d) Theory of natural selection
4. Organisms which can survive a wide range of temperature are called :
 - (a) Endotherms
 - (b) Ectotherms
 - (c) Stenotherms
 - (d) Eurytherms
5. The primary treatment of waste water treatment is :
 - (a) Removal of microbes by the application of chlorine
 - (b) Physical removal of solid particles
 - (c) Anaerobic digestion of sludge
 - (d) Large aeration of the water.
6. In a lake, the water is cold and clear, supporting little life. This stage is called as:
 - (a) Mesotrophic
 - (b) Eutrophic
 - (c) Accelerated eutrophic
 - (d) Oligotrophic

7. The mature sperms are stored in the :
 - (a) epididymis
 - (b) seminiferous tubules
 - (c) prostate gland
 - (d) vas deferens
8. The permanent birth control method in males is:
 - (a) Appendectomy
 - (b) Vasectomy
 - (c) Oral contraceptives
 - (d) Tubectomy

SECTION - 2

Answer **any four** questions. (4 × 2 = 8)

9. What is parthenogenesis?
10. What is amniocentesis?
11. Write the central dogma of protein synthesis.
12. What is vaccine?
13. What is Co-extinction?
14. What is referred to as bio-magnification?

SECTION - 3

Answer any three of the following questions. Q.No. **19** is compulsory. (3 × 3 = 9)

15. Write the salient features of mutation theory.
16. Write short notes on microbial fuel cell.
17. Differentiate somatic cell gene therapy from germ line gene therapy.
18. List out any five causes of biodiversity loss.



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GOVT. SUPPLEMENTARY EXAM. - AUG. 2021

(with Answer Key)

[Time Allowed : 3.00 Hours]

PART III - ZOOLOGY

[Maximum Marks : 70]

Instructions:

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

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.

- Allergy involves :
(a) IgA (b) IgE
(c) IgM (d) IgG
- The mode of reproduction in bacteria is by:
(a) Conjugation
(b) Formation of gametes
(c) Zoospore formation
(d) Endospore formation
- According to Alexander Von Humboldt, species - area relationship is $\log S = \log C + Z \log A$, where 'Z' is :
(a) Y-intercept (b) Species richness
(c) Slope of the line (d) Area
- What is the sex of Drosophila which possesses 2A + XXY chromosomes?
(a) Triploid female (b) Diploid female
(c) Triploid intersex (d) Diploid male
- The sporozoites of Plasmodium vivax are formed from:
(a) Oocysts (b) Gametocytes
(c) Spores (d) Sporoblasts
- Vaccines that use components of apathogenic organism rather than the whole organism is called:
(a) DNA vaccines
(b) Subunit recombinant vaccines
(c) Conventional vaccines
(d) Attenuated recombinant vaccines
- Animals that can move from freshwater to seawater is called as:
(a) Catadromous (b) Stenothermal
(c) Anadromous (d) Eurythermal
- Which one of the following is used to lower blood cholesterol level?
(a) Clot buster (b) Cyclosporin A
(c) Statins (d) Tetracycline
- Who proposed the 'Germplasm theory'?
(a) Lamarck (b) Darwin
(c) Alfred Wallace (d) August Weismann
- XO type of sex determination and XY type of sex determination are examples of :
(a) Male heterogamety
(b) Female heterogamety
(c) Male homogamety
(d) Both (b) and (c)
- The process which the sperm undergoes before penetrating the ovum is:
(a) Spermiogenesis (b) Spermiation
(c) Cortical reaction (d) Cortical reaction
- In embryo transfer technique, _____ celled blastomere is transferred into the uterus.
(a) more than 5 (b) more than 8
(c) less than 5 (d) less than 8
- Which one of the following method is not used in biomedical waste disposal?
(a) Autoclaving (b) Incineration
(c) Encapsulation (d) Recycle and reuse
- Which of the following is the correct sequence of event with reference to the central dogma?
(a) Duplication, Translation, Transcription
(b) Transcription, Translation, Replication
(c) Replication, Transcription, Translation
(d) Transcription, Replication, Translation
- The golden age of reptiles was:
(a) Paleozoic era (b) Mesozoic era
(c) Proterozoic era (d) Cenozoic era

PART - II

Answer any Six of the following questions No 24 is compulsory. (6 × 2 = 12)

16. Define : Zymology.
17. What is inhibin?
18. Name the hotspots found in India.
19. Write a note on Chorionic villus sampling.
20. What are holandric genes?
21. Differentiate tubectomy from vasectomy.
22. What is Kala-azar?
23. What is haplodiploidy?
24. Write the causative agent for the following diseases.
 - (i) Cholera
 - (ii) Common Cold
 - (iii) Chockungunya
 - (iv) Bubonic plague

PART - III

Answer any six of the following questions No. 33 is compulsory. (6 × 3 = 18)

25. What are Coacervates?
26. What is referred to as 'industrial alcohol'? Add a note on its uses.
27. Draw a labelled sketch of a spermatozoan.
28. What are the three structural differences between RNA and DNA?
29. What are stem cells? Explain its role in the field of medicine.
30. Classify fertilization based upon the place of occurrence.
31. What are the applications of Karyotyping?
32. Amniocentesis, the foetal sex determination test, is banned in our country. Is it necessary? Comment.
33. How do people acclimatize to higher altitudes within a few days?

PART - IV

Answer all the questions. (5 × 5 = 25)

34. (a) Describe the structure of the human ovum with a neat labelled diagram.

(OR)

- (b) What is the technique which is used in the identification of criminals? Give its other applications.

35. (a) Mention the main objections to Darwinism.

(OR)

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

36. (a) (i) Write the scientific name of the filarial worm that causes filariasis.
- (ii) Write the symptoms of filariasis.
- (iii) How is this disease transmitted?

(OR)

- (b) What are pollutants? Classify them.

37. (a) Write the salient features of human genome project.

(OR)

- (b) Tabulate and analyse the two species population interaction.

38. (a) Describe the structure of the lymph node with a diagram.

(OR)

- (b) Explain how recombinant Insulin can be produced?

ANSWERS

PART - I

1. (b) IgE
2. (b) Formation of gametes
3. (c) Slope of the line
4. (b) Diploid female
5. (a) Oocysts
6. (b) Subunit recombinant vaccines
7. (a) Catadromous
8. (a) Statins
9. (d) August Weismann
10. (a) Male heterogamety
11. (c) Capacitation
12. (b) more than 8
13. (d) Recycle and reuse
14. (c) Replication, Transcription, Translation
15. (b) Mesozoic era

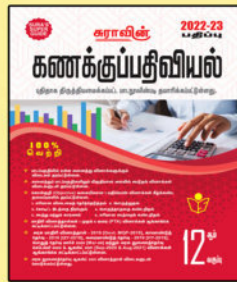
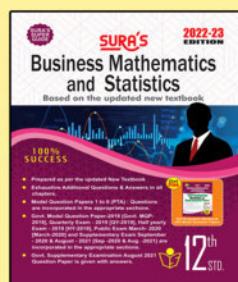
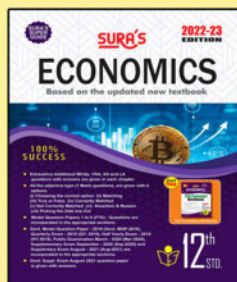
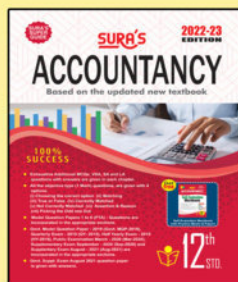
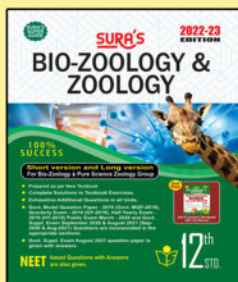
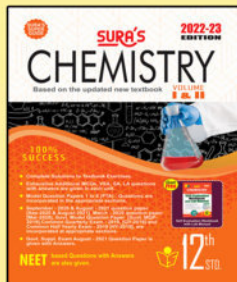
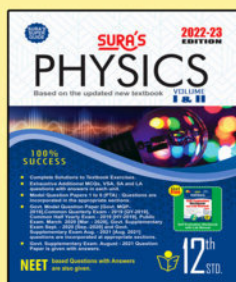
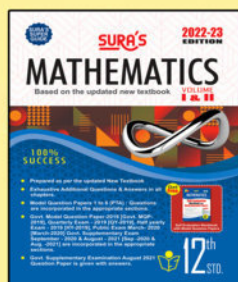
PART - II

16. Zymology is an applied science which deals with the biochemical process of fermentation and its practical uses.
17. Inhibin is a hormone secreted by the sertoli cells in the stratified epithelium of the seminiferous tubule in the testis.
18. (a) Himalaya
(b) Western Ghats
(c) Indo-Burma
(d) Sundalands
19. CVS - Chorionic Villus Sampling. CVS is a prenatal test that involves taking a sample of the placental tissue to test for chromosomal abnormalities.
20. (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.

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